جامعة قطر
QATAR UNIVERSITY

كتيب ملخصات وقائع المنتدى

جامعة المستقبل:
إعادة تصوّر البحث والتعليم العالي

المنتدى والمعرض البحثي السنوي لجامعة قطر

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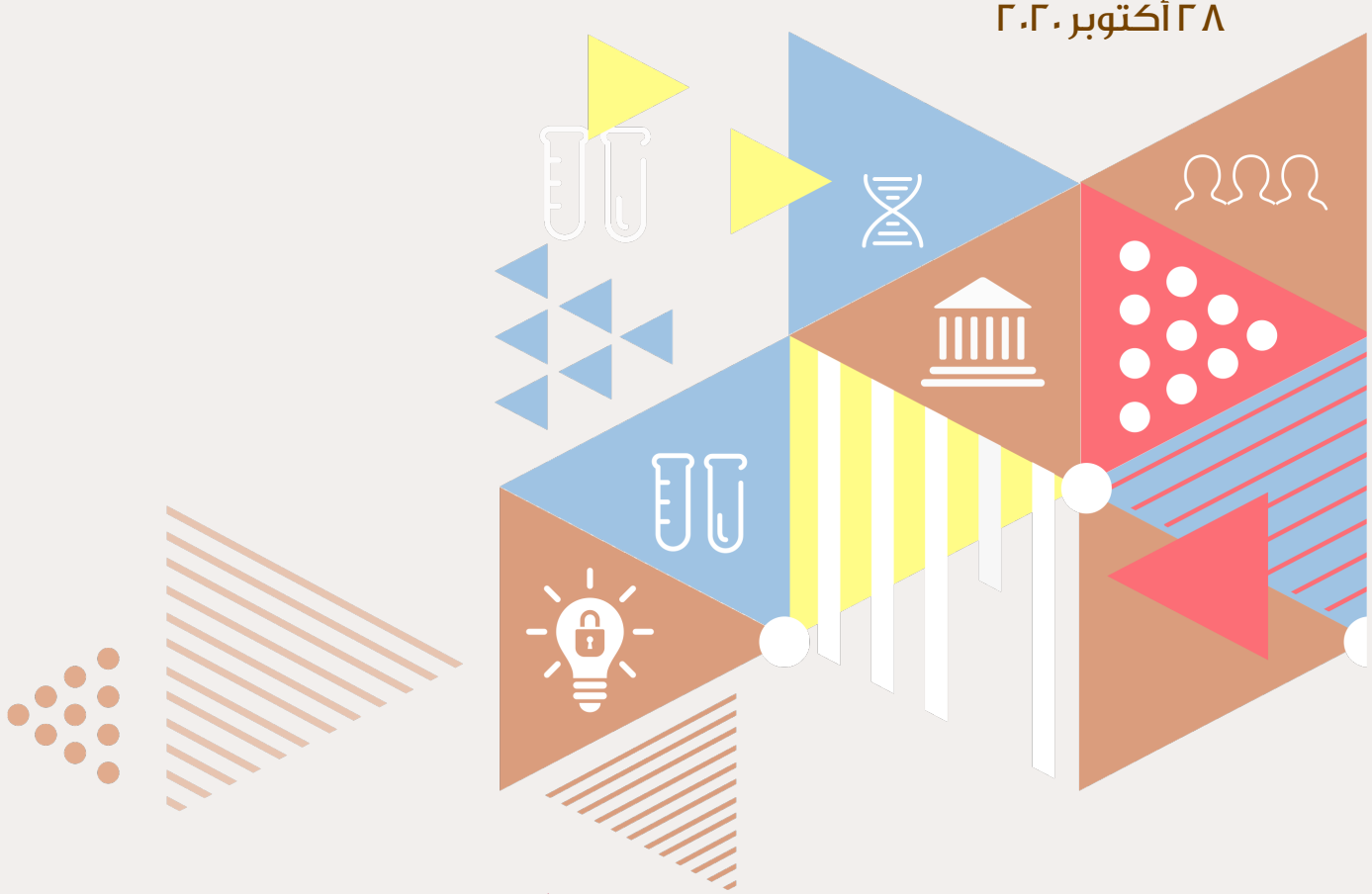

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Book of Abstracts

University of the Future:
Re-Imagining Research and Higher Education

Qatar University Annual Research Forum & Exhibition

28 October 2020

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دارنشر جامعة قطر: نحن دارنشر جامعية غيرربحية، تأسست عام 2018، تعمل على تعزيزونشر الكتب والبحوث المحكَّمة في العديد من مجالات المعرفة. تسعى الدار إلى أن تصبح رائدة في نشر الكتب والمجلات العلمية. كما تهدف الدار إلى دعم رؤية جامعة قطر نحو التميّز في البحث والتعليم في دولة قطر وخارجها.

Qatar University Press (QU Press): We are a nonprofit university publishing house established in 2018, dedicated to promoting the dissemination of peer-reviewed and research-based publications in various fields. QU Press aims to be a leading publisher of scholarly books and journals. QU Press endeavors to support QU's vision towards excellence in research and education in Qatar and beyond.

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نبذة عن المنتدى

المنتدى والمعرض البحثي السنوي لجامعة قطر هو حدث هام يجتمع فيه الطلاب والباحثون والأكاديميون التابعون لكليات الجامعة العشر، والمراكز البحثية والمعاهد والشركاء وأصحاب المصلحة، لتقييم ومراجعة القطاع البحثي للمؤسسة.

يتناول المنتدى لهذا العام موضوع "جامعة المستقبل". فهي جامعة تؤدي دورها في التنمية المستدامة، على الرغم من التحديات الإقليمية والدولية الحالية. هذا الحدث هو فرصة لمناقشة المشاريع البحثية الحالية وتطبيق البرامج الجديدة وفرص للتعاون والابتكارات ومشاريع أخرى ذات صلة تتعلق بخارطة طريق البحث العلمي لجامعة قطر 2018 – 2022، واستراتيجية قطر الوطنية للبحوث، ورؤية قطر الوطنية 2030.

يهدف هذا المنتدى إلى عرض الآلية التي تتبعها جامعة قطر في معالجة القضايا والتحديات التي تواجه المجتمع من خلال البحث القائم على الشراكات النشطة والتفاعلية مع الصناعة وشركاء المصلحة المختلفين، بما في ذلك المؤسسات والمراكز البحثية. كما يسلط المنتدى الضوء على الأبحاث المهمة التي تجري في جامعة قطر والحائزة على مجموعة من الجوائز والتي تعزز رؤية الجامعة وتدعم الأولويات البحثية لدولة قطر وأهداف رؤية قطر الوطنية 2030.

ومن خلال ذلك، تسعى جامعة قطر إلى نشر ثقافة التعلّم القائم على البحث والاكتشافات وتنظيم المشروعات. هذا ويساعد المنتدى الباحثين والطلاب في الجامعة على الاستفادة من الفرص التي يتيحها الشركاء المعنيون.

About the Forum

Qatar University Annual Research Forum and Exhibition (QUARFE) is the meeting point for students, researchers and academics from the University's colleges, centers, and institutes, including partners and stakeholders, to assess and review the institution's research enterprise.

This year's high profile event will revolve around the "University of the Future", a university playing its role in sustainable development, despite the current regional and international challenges. It is an occasion to demonstrate new tools or reports on implementing new programs, collaborations, innovations and other relevant projects that take bearing from the Qatar University (QU) Research Roadmap 2018-2022, Qatar National Research Strategy and Qatar National Vision 2030.

QUARFE offers QU the opportunity to demonstrate how it has been addressing the community's challenges through research anchored on a vibrant partnership with various industries and stakeholders, including institutions and research centers. The forum will also highlight the important and award-winning research being conducted at QU that promotes the vision of the University, and supports the research priorities of Qatar and the goals of the Qatar National Vision 2030.

Through this, the University aims to achieve research-driven learning, discovery, and entrepreneurship. The event also provides leverage for QU faculty and students to be able to access and make the maximum use of opportunities offered by respective partners.

افتتاحية

د. حسن الدرهم، رئيس جامعة قطر

أرحب بكم ضيوفًا ومشاركين في المنتدى والمعرض البحثي السنوي 2020 لجامعة قطر،

لقد اخترتم لهذا المنتدى البحثي المرموق موضوعًا ملهمًا "جامعة المستقبل: إعادة تصوّر البحث والتعليم العالي"، الذي يناقش المتطلبات التي فرضتها التغيرات المتسارعة على مؤسسات التعليم العالي والتي دفعتها إلى إعادة النظر في سياساتها وخططها التقليدية واعتماد برامج وأدوات حديثة تواكب التحولات وتتحسّب وتخطط للقادم من التحديات، كما وتوسّع فرص وخيارات الأساتذة والطلّاب، متجاوزةً الحدود والمسافات.

تُسعدنا إقامة هذا المنتدى في رحاب جامعة قطر، بالرغم من الظروف الطارئة، ونفتخر بمشاركة نخبةٍ من المفكرين والباحثين يتبادلون في جلساتِ نقاشٍ معمّقة الآراءَ والأفكار حول آفاق التحولات المقبلة، والمهام المستقبلية المنتظرة من جامعاتنا، مع التأكيد على الأهمية القصوى لتطوير التعاون العالمي في مجال البحوث كي تكون قادرةً على إنجاز التحوّل الناجح والتصدّي بفاعليّة للحاجات المتوقعة والمتزايدة للمجتمع.

تقف جامعة قطر على الخط الأول في المسيرة الأكاديميّة العالميّة نحو التحوّل والتطور وقد انعكس ذلك واضحًا في خطتها الاستراتيجية 2018–2022 التي نسعى باستمرار إلى توفير كل الشروط العلميّة والفنيّة والبشريّة والماليّة الكفيلة بإنجازها الأمثل وبإنتاج أبحاثٍ أصيلةٍ ومبدعة تواكب التطورات وتساهم في إقامة الاقتصاد المعرفيّ وتحقّق الاستدامة ورؤية قطر الوطنية 2030.

منتدى اليوم حدثٌ نوعيّ غنيٌّ ببرامجه وجوائزه التي تكرّم المبدعين والمتميزين وهو ما كان ليُنجز لولا الجهود المخلصة التي بذلها العاملون في قطاع البحث والدراسات العليا، فلهم ولكم جميعًا جزيل الشكر والعرفان.

Foreword

Dr. Hassan Al-Derham

Qatar University President

I am delighted to welcome you, guests and participants of the Qatar University Annual Research Forum & Exhibition 2020.

For this prestigious Research Forum, you have chosen an inspiring topic "*University of the Future: Re-Imagining Research and Higher Education*". It discusses the requirements imposed by the rapid changes on higher education institutions that have pushed them to reconsider their traditional policies and plans and adopt modern programs and tools, which keep pace with transformations and anticipate the next challenges. In addition, it expands opportunities and options for teachers and students, transcending boundaries and distances.

We are pleased to hold this forum on our campus in spite of the emergency conditions. We are proud to have elite scholars and researchers exchanging thoughtful views and ideas about the prospects of the upcoming transformations and the future roles expected from of our universities. Thus, we emphasize the extreme importance of developing global cooperation in the field of research to achieve a successful transformation and effectively address our community's anticipated and growing needs.

Qatar University stands on the front line in the global academic track towards transformation and development. This has been reflected in the university's 2018-2022 strategic plan, which continually strives to provide scientific, technical, human, and financial conditions that ensure optimal achievement. The strategic plan also facilitates robust and creative research that keeps pace with rapid developments and contributes to establishing a knowledge economy, sustainability, and the realization of Qatar National Vision 2030.

Today's forum is an important event, rich in its programs and awards, honoring creative and distinguished participants. This would not have been accomplished without the sincere efforts made by the affiliates of the Research and Graduate Studies Sector. My gratitude and appreciation to them and to you all.

افتتاحية

أ.د. مريم المعاضيد
نائب رئيس جامعة قطر للبحث والدراسات العليا

التميز في البحث والتعليم هو أحد أهم أهداف رؤية ورسالة جامعة قطر وخطتها الاستراتيجية الجديدة في الانتقال من الإصلاح إلى التحوّل، وقد سعى قطاع البحث والدراسات العليا في الجامعة إلى إنشاءِ قاعدةٍ بحثيّةٍ قادرةٍ على القيام بأبحاثٍ بينيّة عالية المستوى، تتمحور حول الأولويات الوطنية في حقول الطاقة والبيئة والصحة والتكنولوجيا، والعلوم الإنسانية والاجتماعية، أحدثت فارقًا إيجابيًا كبيرًا في مجال الأبحاث المبدعة التي تُماشي التغيرات وتُلبّي الحاجات وتتصدّى للتحديات.

نعمل جاهدين على تعزيز تأثير الأبحاث وتنوعها وفق منهجيّةٍ تحوّلية وطموحة تُحدّد الأولويّات البحثية في مختلف الحقول وتستند على بيئةٍ داعمة وقادرة على التعامل مع المستجدّات والأزمات التي وجدت أفضل تعبيرٍ عنها في التصدّي لجائحة كوفيد-19 من خلال إطلاق منحة جامعة قطر للاستجابة للطوارئ، التي تدعم التحريات والأبحاث الجديدة والمُبكّرة حول الفيروس.

نوفّر للطلبة دراسات عليا حديثة وتدريبًا متقدّمًا من خلال برامج حاصلة على الاعتماد الدولي، ولدينا خدمات وحوافز أخرى تشجع البحث والابتكار وتساعد في إعداد كوادر قديرة في مختلف المجالات وبخاصّة العلوم والتكنولوجيا والهندسة والرياضيات.

أطلقنا دار نشر جامعة قطر وأبحاثًا تعاونيّة وشراكات ومذكرات تفاهم مع الكثير من الجهات المحليّة والعالمية، وفتحنا أبوابً جديدة للتمويل المشترك في مشاريع حيويّة، كما وحافظنا على التقدّم المتواصل للتصنيف العالمي لجامعة قطر. نحرص على نشر الرقمنة والأداء الافتراضي كي ننجز المهام البحثية والتعليمية كما لو أنها داخل المخابر والحرم الجامعي. متمسكون بحماية الملكية الفكرية والحريّة الأكاديميّة، وبراءات الاختراع ومستمرون في تأمين استدامة وتنوّع الموارد والتمويل عبر منحٍ جديدة داخليّة وخارجيّة ومشاريع ريعيّة واعدة تعزّز التعاون مع الصناعة والمجتمع.

سوف نبذل كل الجهود الكفيلة لتطوير المهارات وإطلاق المبادرات الرائدة حتى لا تبقى جامعة قطر عند حدودها اليوم، بل تستعد لتصبح وبجدارة جامعة المستقبل.

Foreword

Prof. Mariam Al-Maadeed

Qatar University Vice-President for Research & Graduate Studies

Excellence in research and education is one of the most important goals of Qatar University's vision and mission and its new strategic plan to move from reform to transformation. The Research and Graduate Studies Sector at the university has pursued a research base capable of carrying out high-level interdisciplinary research, centered on national priorities in the areas of energy, environment, health, technology, and humanities & social sciences. This has made a highly positive impact in the area of innovative research that meets the needs of society and addresses global challenges.

Based on a transformative and ambitious methodology that defines research priorities in various fields, we strive to enhance research and diversify impacts. This approach is based on a supportive environment capable of dealing with novelties and crises, which found its best expression in addressing the COVID-19 pandemic by launching the Qatar University Emergency Response Grant that supports new and innovative studies of the virus.

We provide students with modern graduate studies and advanced training through internationally accredited programs. We have other services and incentives that encourage research and innovation and support in preparing capable graduates in various fields, especially science, technology, engineering, and mathematics.

We launched the Qatar University Press, collaborative research, partnerships, and memoranda of understanding with numerous local and international bodies, opened new doors for co-financing of vital projects, and maintained the continuous progress of Qatar University's global ranking. We are keen to spread digitization and virtual performance to accomplish research and educational tasks as if it were inside the laboratories and on campus. We are committed to protecting intellectual property, academic freedom, and patents. We continue to ensure the sustainability and diversification of resource and to provide financing through new internal and external grants and promising projects that enhance cooperation with industry and community.

We will exert all the necessary efforts to develop skills and launch pioneering initiatives so Qatar University does not remain at the borders of today, but instead, is prepared to become the well-deserved University of the Future.

اللجنة المنظمة

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University of the Future:
Re-Imagining Research and Higher Education

Energy, Environment & Resource Sustainability
(Faculty and Postdoc)

Multifunctional Self-healing Polymeric Nanocomposite Coatings for Corrosion Inhibition of Steel

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Abstract

The present work focuses on the self-healing and corrosion behavior of novel epoxy based coatings containing epoxy monomer (EM) and dodecylamine (DDA) as self-healing and corrosion inhibitors, respectively. The coating self-healing ability and the corrosion inhibition effect have been combined, together, in one single coated layer providing autonomous corrosion protection. Towards this goal, the as-synthesized titania nanotubes (TNTs), with an average size of 20 nm were impregnated with DDA and EM and were thoroughly dispersed into the epoxy used as the matrix and applied on steel. Fourier-transform infrared spectroscopy (FTIR) analysis confirms the presence of DDA loaded nanotubes and the loading of inhibitor was estimated by thermogravimetric analysis. Additionally, the amount of the released corrosion inhibitor was identified by gas chromatography–mass spectrometry (GC-MS). The scanning electron microscopy (SEM), analysis shows the polymer healing of the prepared coatings when damaged. The electrochemical studies indicate that the corrosion rate of the steel samples coated with the epoxy modified with the healing additives decreases after 5 days of immersion in saline water.

Keywords: Nanocontainers; Nanocomposite coatings; Corrosion; Inhibitor; Self-healing

For citation: Bahgat. A, Shakoor R. A., Abdullah. A, "Multifunctional self-healing polymeric nanocomposite coatings for corrosion inhibition of steel", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0001

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University of the Future:
Re-Imagining Research and Higher Education

Energy, Environment & Resource Sustainability
(Faculty and Postdoc)

Self-healing Performance of Smart Coatings Modified with Different Corrosion Inhibitors

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Abstract

Corrosion results in considerable materials and equipment failure. According to one survey, about 1/4 to 1/3 of the total interruption in industries is due to detrimental effects of corrosion. It is, therefore, important to prevent corrosion to guarantee the reliability of the assets. The present work is aimed to explore the purpose of CeO_2 as a carrier for corrosion inhibitors and its capability to release inhibitors, to achieve decent corrosion protection efficiency in epoxy-based polymeric nanocomposite coatings. Amine-based corrosion inhibitors (N-methylthiourea NMTU and Dodecylamine DDA) were used for CeO_2 nano container modification, and corrosion inhibition efficiency has been explored utilizing electrochemical impedance spectroscopy (EIS) in 3.5 wt% NaCl solution. Loading of inhibitor into nanocontainer has been confirmed through Fourier-transform infrared spectroscopy (FTIR) and Brunauer-Emmett-Teller (BET). It was observed that 25% and 29.75% w/w of NMTU and DDA were loaded into nanocontainers, confirmed through Thermogravimetric analysis (TGA). Scanning electron microscopy (SEM) analysis endorsed the formation of a protective layer on a scratch area to protect steel from the external environment. This protective layer played a very important role in protecting steel from progressing corrosion on the defect site from the aggressiveness of the solution. EIS measurements revealed the decent corrosion inhibition efficiency of these inhibitors in order of DDA>NMTU. As a result, they are a favorable solution for longer endurance of coated piping steel and decreased operation expense contributing to economic savings, materials reliability and safety.

Keywords: Ceriumoxide nanocontainers; Nanocomposite; Coatings; Self-healing, Corrosion inhibitor.

For citation: Habib S., Fayyed E., Nawaz M., Khan A., Shakoor A., Karahman R., Abdullah A., "Self-healing performance of smart coatings modified with different corrosion inhibitors", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0002

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Energy, Environment & Resource Sustainability
(Faculty and Postdoc)

Cellulose Microfibers (CMFs) Reinforced Smart Self-healing Polymeric Composite Coatings for Corrosion Protection of Steel

Muddasir Nawaz, Sehrish Habib, Adnan Khan, Abdul Shakoor, Ramazan Kahraman

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Abstract

The use of organic coating for the metals has been widely being used to protect the surface against corrosion. Polymeric coating incorporated with Nanocontainers loaded with inhibitor and self-healing provides better corrosion resistance. Cellulose microfibers (CMFs) used as smart carriers were synthesized and loaded with dodecylamine (DOC)-inhibitor and polyethyleneimine (PEI)-both inhibitor and self-healing agents. Smart polymeric coatings were developed by mixing CMF/DOC and CMFs/PEI into the epoxy matrix. Reference coatings (that has only CMFs) were also prepared for a compersion. Scanning electron microscope (SEM), X-ray diffraction spectroscopy (XRD), Fourier transform infrared spectroscopy (FTIR) and thermal gravitational analysis (TGA) were used to confirm the loading of DOC and PEI onto the CMFs. UV-vis analysis indicates that the self-release of inhibitor from CMFs is sensitive to pH of the solution and the immersion time. Recovery of controlled surface damage confirms the decent self-healing ability of the prepared smart coatings is due to the efficient release of inhibitor (DOC) and self-healing agent (PEI) in the damaged area leading to the formation of a protective film. Electrochemical impedance spectroscopy (EIS) results demonstrate that corrosion resistance of the smart coating increases with an increase in immersion time which is due to the progressive release of inhibitors from CMFs in response to the pH change. Therefore, smart coatings demonstrate superior properties as compared to the reference coatings. The study reveals the polymeric composite coatings have potential to inhibit the corrosion of steel for oil and gas industry.

Keywords: Cellulose microfibers; Smart coatings; Self-healing; Corrosion inhibitors

For citation: Nawaz M., Habib S., Khan A., Shakoor R.A., Kahraman R., "Cellulose microfibers (CMFs) reinforced smart self-healing polymeric composite coatings for corrosion protection of steel"", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0003

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Combustion-Free Synthesis of Lithium Manganese Oxide Composites with CNTs/GNPs by Chemical Coprecipitation for Energy Storage Devices

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Abstract

Nano spinel lithium manganese oxide ($LiMn_2O_4$) was distributed properly on carbon nanotubes (CNTs) and graphene nanoplatelets (GNPs) using chemical coprecipitation method. The original particle size was less than 40 nm, and the average size of the crystallite was 20 nm without the application of any capping agents. Characteristic spectra of spinel structure and a peak of CNTs & GNPs was obtained using X-ray powder diffraction (XRD). CNTs and GNPs in energy storage systems improve the rate capabilities and cyclic efficiency of cathode materials. The suggested technique, chemical coprecipitation, provides new avenues for the production of nano-sized lithium transition metal oxide composites with CNTs and GNPs in an inexpensive and simple way. Higher density energy storage systems raise significant safety issues, and for safety, they are restricted to 30 percent to 50 percent of their ability. The proposed composite would enable the energy storage systems to be used even at high temperatures and higher discharge rates above 60 percent of their ability. Besides, the parasitic reaction between the electrode surface and the electrolyte will decrease, which will increase the battery's projected life span. As an all-solid-state device, the new composite batteries would make the system non-flammable, immune from side reactions, and resistant to capacity erosion.

Keywords: Lithium manganese oxide; Carbon nanostructures; Chemical coprecipitation; Cathode

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SiO2 Coated Li-rich Layered Oxides-Li1.2Ni0.13Mn0.54Co0.13O2 for efficient energy storage applications

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Abstract

Lithium ion batteries (LIBs) are attractive for energy storage application. In this regard, lithium rich layered oxides (LLOs), are considered viable cathodes due to their tempting properties such as lower production cost, faster manufacturing process, excellent reversible capacity, and better electrochemical performance at high voltages. Despite these properties, LLOs lack in cyclic stability and inferior capacity retention. This study proposes a surface modification technique to overcome the above-mentioned limitations in which a layer of silica (SiO_2) has been coated on the particles of $Li_{1.2}Ni_{0.13}Mn_{0.54}Co_{0.13}O_2$. The $Li_{1.2}Ni_{0.13}Mn_{0.54}Co_{0.13}O_2$ was synthesized by a sol-gel process and then coated with SiO_2 (SiO_2=1.0 wt. %, 1.5 wt. %, and 2.0 wt. %). The coatings were undertaken through a dry ball milling technique. Different characterization test such as X-Ray diffraction (XRD), scanning electron microscope (SEM), transmission electron microscopy (TEM), elemental mapping, and X-ray photoelectron spectroscopy (XPS), were utilized to prove phase pure material formation and identify the SiO_2 layer on the surface of Li1.2Ni0.13Mn0.54Co0.13O2. The electrochemical measurements, confirm the improvement in capacity retention and cyclability of SiO_2 coated $Li_{1.2}Ni_{0.13}Mn_{0.54}Co_{0.13}O_2$ samples with reference to the uncoated samples. This improvement can be ascribed to the protective and barrier effect of the coated layer on the LLOs particles avoiding any unwanted side reactions when the cathode is exposed to the electrolyte. A small trade-off between electrochemical performances and the coating thickness confirms the best efficiency of 1 wt.% SiO_2 coated $Li_{1.2}Ni_{0.13}Mn_{0.54}Co_{0.13}O_2$ when compared to other coated samples.

Keywords: Layered oxides; Sol-gel; Coating; Ball milling; Charge/discharge capacity

For citation: James A.J., Nisar U., Monawwar H., Abdul Quddus A., Shakoor R.A., Saleh M., Kahraman R., AlQaradawi S., Aljaber A., "SiO2 Coated Li-rich Layered Oxides-Li1.2Ni0.13Mn0.54Co0.13O2 for efficient energy storage applications", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0005

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Subcritical and Supercritical Operation of Innovative Thermal Mechanical Refrigeration System

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Abstract

Around 17% of the globally generated energy is consumed for residential, commercial, and transportation refrigeration. The current cooling technologies utilize refrigerants with high Ozone Depletion and Global Warming Potentials. Furthermore, the current technologies are expensive alongside with toxicity and flammability hazards. On the other side, energy produced by combustion of fossil fuels results in substantial amounts of waste heat. Therefore, it is necessary to develop new refrigeration technologies that utilize waste heat as a source of energy with eco-friendly refrigerants with zero ozone depletion potential and zero global warming potential. In addition, this thermal mechanical refrigeration (TMR) technology improves the energy efficiency of the source of waste heat system and minimizes the emissions of the carbon dioxide (CO2). In this study, a novel thermo-mechanical refrigeration system is proposed. It operates with low-grade energy sources (such as waste heat) at temperature range of 60 oC to 100 oC. Furthermore, it has the advantage of working with low-frequency driver-compressor unit, which eliminates noise and increases its lifetime. Moreover, the TMR system is adaptable to commercial, transportation, and residential refrigeration applications.

Keywords: Thermal mechanical refrigeration; Isobaric compression; Subcritical; Supercritical; Waste Heat

For citation: Sleiti A., AlAmmari W., AlKhawaja M., Glushenkov M., Kronberg A., "Subcritical and Supercritical Operation of Innovative Thermal Mechanical Refrigeration System", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0006

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Organic Pollutants along the Qatari Coast: A Case Study of the Pearl Oyster (Pinctada radiata)

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Abstract

The Qatari marine environment is endangered due to high industrial expansion and anthropogenic pressure over the last few decades. The presence of common contaminants such as total petroleum hydrocarbons (TPHs) and polycyclic aromatic hydrocarbons (PAHs) is a threat to the marine environment. The aim of this study is to determine the environmental threats and risks posed by organic contaminants to Qatar's marine environment using pearl oyster 'Pinctada Radiata' as the indicator study organism. The samples (marine sediment, seawater, and oysters) were collected four times within two years in different seasons from the four sites (Simaisma, Al Khor, Umm Bab, and Al Wakra), on March 2017, December 2017, May 2018, and November 2018. A total of 144 samples were analyzed, 48 samples of seawater, 48 samples of sediment and 48 samples of oysters. Levels of organic contaminants (TPHs and PAHs) were quantified in seawater, marine sediment and oyster tissues (P. radiata). In addition, the TOC and particle sizes were measured in abiotic matrices as well as the temperature, salinity, and pH of seawater in the study areas. Overall, the organic contaminants (TPHs and PAHs) were more readily detected in oyster tissue samples than marine sediment and seawater samples collected from the same areas. The surface seawater samples showed negligible levels of PAHs, while TPHs were ranged from 1.164 to 271.77 µg/L. The concentration of TPHs and PAHs in surface marine sediment were ranged between (75.02 -1751.82) and (4.25 - 36.73) µg/kg dry weight respectively. In oyster tissue samples, the level of TPHs was ranged from 633.33 to 6666.67 µg/kg dry weight, with the highest concentrations measured in Simaisma, while PAHs concentration showed an extreme variation from 25.90 to 2244.03µg/kg dry weight. The present study could, however, provide useful background information for further investigations to understand the presence of organic contaminants in Qatar's marine environment.

Keywords: TPHs; PAHs; Pinctada radiata

For citation: AlJathelah N.M., Mondal D., Simon H., "Organic Pollutants Along The Qatari Coast: A Case Study of The Pearl Oyster (Pinctada radiata)", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0007

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Novel Flexible Piezoresistive Sensor based on 2D Ti3C2Tx MXene

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Abstract

Stretchable and wearable strain-sensing devices are appropriate for motion detection, biomedical monitoring, human-machine interaction. These pressure sensors are working based on numerous electrophysical phenomena's such as piezoelectric, capacitive and piezoresistive reactions towards mechanical stretching. Piezoresistive sensors are highly favored due to their features like high sensitivity, fast response, easy fabrication and low energy requirement. They are generally fabricated using a suitable polymeric matrix and electrically conductive fillers, such as graphite, graphene or carbon nanotubes. MXenes are a relatively new family of (2D) transition metal carbides, nitrides or carbonitrides, produced by the selective chemical etching of "A" from MAX-phases, where M is a transition metal, A is a group IIIA or IVA element and X is C or N. These nanomaterials are first reported in 2011 by the Gogotsi and Barsoum groups. These materials have received tremendous attention from the scientific community due to their excellent physiochemical properties, electrical conductivity and hydrophilicity. Herein, we report the preparation, characterization and piezoresistive individualities of semiconductive, electrospun mats composed of copolyamide 6, 10 and Ti3C2Tx. We observed that the relative resistance of the sensor increased with an increase in the Ti3C2Tx content, and the materials with higher electrical conductivity showcased a significantly higher sensitivity to applied pressure until reaching the percolation limit (font size can be increased).

Keywords: Mxene polyamide; Piezoresistive; Electrospinning

For citation: Sobolciak P., Sadasivuni K.K., Tanvir A., Krupa I., "Novel flexible piezoresistive sensor based on 2D Ti3C2Tx Mxene"", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0008

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Novel Electroless Deposited Corrosion – Resistant and Anti-Bacterial NiP–TiNi Nanocomposite Coatings

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Abstract

From acidic NiP electroless bath, the co-deposition of TiNi nanoparticles in the NiP matrix to form novel NiP-TiNi nanocomposite coatings (NCCs) on top of API X100 carbon steel using several concentrations of TiNi nanoparticles (0.2, 0.4 and 0.8 g L^{-1} in the bath) is successfully achieved. The influence of the TiNi nanoparticles on the composition, deposition rate, thickness, and morphology of the NiP coating are investigated before and after annealing at 400 ^{o}C. The addition of TiNi nanoparticles into the NiP matrix led to the transform of the amorphous structure of the as-plated NiP into a semi-crystalline one. The microhardness of the composite coating significantly enhances with increasing TiNi concentration up to 0.4 g L^{-1} and further improvement takes place after heat treatment. The electrochemical impedance spectroscopy (EIS) and the colony counting method are carried out to assess the corrosion protection and antibacterial properties, respectively, of the as-deposited and the annealed coatings. The results demonstrate that there is an optimum concentration for the addition of TiNi (0.4 g L^{-1}), which offers the composite coating with the highest corrosion protection that reaches to about 98 %. Below and beyond this concentration as well as after heat treatment, the improvement in the corrosion protection of the composite coatings slightly decreases. Besides, the NiP–TiNi NCCs have effective antibacterial properties as it decreased the cell viability of Escherichia coli from 100 to 19%.

Keywords: Electroless NiP; Composite coating; TiNi; Heat–treatment; Antibacterial

For citation: Fayyad E., Abdullah A., Hassan M., Pathath A.R., Mahmoud K., Jarjoura G., Farhat Z., "Novel Electroless Deposited Corrosion – Resistant and Anti-Bacterial NiP–TiNi Nanocomposite Coatings", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0009

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Analyzing the Urban Heat Island Characteristics and Mitigation Strategies in Eight Arid and Semi-Arid Cities

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Abstract

The aim of the study is two fold: first, the study analyzes the formation of the urban heat island (UHI) in eight different cities in arid and semi-arid region. The analysis is based on land cover / land use (LCLU) classification (urban, green, and bare areas). Second, the study synthesizes the mitigation strategies to reduce the land surface temperature (LST) and hence the UHI effects in the arid and semi-arid cities. The study found that the bare areas have the highest mean LST compared to the urban and green areas. Furthermore, the study found that the LST varies in each of the LCLU categories and hence some areas of the three categories have LST lower or higher than the other categories and hence not always one category has the highest LST compared to the other categories. The outcomes of this study may have key implications for urban planners seeking to mitigate urban heat island effects in arid and semi-arid urban areas.

Keywords: Urban heat island; Land surface temperature; Mitigation strategies; GCC countries

For citation: Abulibdeh A., "Analyzing the urban heat island characteristics and mitigation strategies in eight arid and semi-arid cities", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0010

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Managing the Water-Energy-Food Nexus on an Integrated Geographical Scale

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Abstract

The water-energy-food (WEF) nexus is the subject of much research focusing on different aspects, a wide range of issues, and development of a variety of models and tools. This study takes a different approach by developing a holistic framework that concentrates on the spatial elements of continuity and change associated with WEF transition on national, regional, and international scale. The study also investigates the interconnected challenges that could affect these resources and the actions and polices that should be taken on different geographical scales to address these challenges. The results can help practitioners and policy makers gain a clearer understanding of the state of the knowledge when performing WEF nexus assessments at different geographical scales.

Keywords: Water-energy-food (WEF); Geographical scale; Risks; Policy implications

For citation: Abulibdeh A., Zaidan E., "Managing the water-energy-food nexus on an integrated geographical scale", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0011

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Preparation of Slippery Liquid Infused Porous Surfaces on Polymeric Substrates

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Abstract

Many polymers have been found in bioscience paralleling with advancement in a technology sector. A selection of suitable polymers for using in a biomedical sector is based on many factors such as chemical nature, surface free energy or morphology, which influence cell-polymer surface interactions. However, these materials suffering from infections represent serious issues for their applications. These infections closely relate with biofilm formation, whereby microorganisms are strongly attached to surface forming strong attached multicellular communities. Therefore, a preparation of slippery liquid infused porous surfaces (SLIPS) using low-temperature plasma technique in combination with electrospinning technique was utilized in this research. A multistep physicochemical approach was carried out for this purpose. The first step includes the pre-treatment of polyethylene (PE) and polyurethane (PU) substrates using low-temperature plasma to activate the surface for an adhesion improvement. Subsequently, the 3D porous network consisted of superhydrophobic fiber mats, that was fabricated on the plasma activated substrates using electrospinning technique. Final step consisted of the infusion of natural oils with emphasis on their antimicrobial effect. This complex strategy led to the effective antimicrobial modification of the PE and PU surface potentially applicable in the biomedical field.

Keywords: Polymer; Plasma treatment; Electrospinning; Slippery surface; Antimicrobial activity

For citation: Popelka A., Habib S., Abusrafa A., Zavahir F. S., Abdulkareem A., "Preparation of slippery liquid infused porous surfaces on polymeric substrates", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0012

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Assessment of TPHs and PAHs in the Marine Sediment Relating to Oil and Gas Extraction activity on the western coastline of Qatar

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Abstract

Total petroleum hydrocarbons (TPHs) and Polycyclic aromatic hydrocarbons (PAHs) are priority pollutants which are known to be associated with petroleum products. They are released into the marine environment via accidental spillage, exploration and transportation. The present study aims to assess the impact of petroleum and gas extraction activities on the pollution of coastal marine sediment of the western coastline of Qatar. Sixty-six surface sediment samples were collected along the western coastal area. The concentration of organic hydrocarbons (TPHs and PAHs) were determined using GC-FID and GC-MS, respectively. Sediment characteristics including pH, temperature, TOC and particle size were also measured. The results indicated low concentrations of TPH (<0.001-0.246 µg/g dry weight sediment) and PAHs (<0.001-0.044 µg/g dry weight sediment). The concentrations for both organic pollutants were lower compared to the previous studies done within Qatar and in the Arabian Gulf and also indicated below the available permissible limit set by the Ministry of Municipality and Environment of Qatar and other sediment quality guidelines (SQGs) used worldwide (NOAA).

Keywords: Total petroleum hydrocarbons; Polycyclic aromatic hydrocarbons; Marine sediment; Oil and gas extraction

For citation: Abdulla M.A., "Assessment of TPHs and PAHs in the Marine Sediment Relating to Oil and Gas Extraction Activity on the western coastline of Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0013

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Hybrid Microcapsules Reinforced Smart Coatings for Corrosion Protection in Oil and Gas Industry

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Abstract

Corrosion is one of the critical causes of material loss in metal components. This research is focused on the synthesis, and electrochemical properties of polyelectrolyte layered microcapsules (PMCs) reinforced smart polymeric coating for corrosion protection of steel substrates. For this purpose, monolayer urea-formaldehyde microcapsules encapsulated with linalyl acetate (MLMCs) was synthesized by *Insitu* polymerization. In the next step, phenylthiourea (PTU) was loaded between the layers of polyelectrolytes; polyethylenimine (PEI) & sulfonated polyether ether ketone (SPEEK) on the surface of MLMCs using layer by layer technique. The MLMCs are sensitive to mechanical stress while the PTU in PMCs is triggered by pH stimulus. The newly designed PMCs has linalyl acetate in the core and PTU in the polyelectrolyte layers. Furthermore, 6 wt.% of both MLMCs and PMCs are dispersed in the epoxy resin and applied on the clean steel substrate. Performance comparison showed that the epoxy resin reinforced with PMCs demonstrate enhanced thermal, self-healing and electrochemical properties. This improved performance can be attributed to the efficient release of the self-healing agent and corrosion inhibitor from the PMCs. Conclusively, the epoxy coatings modified with PMCs can be a novel organic coating for the corrosion protection of oil and gas industries.

Keywords: Polyelectrolytes; Urea formaldehyde microcapsules; Coating; Self-healing; Phenylthiourea

For citation: Khan A., Hassanein A., Shakoor R. A., kahraman R., Montemor F., Hasan A., "Hybrid microcapsules reinforced smart coatings for corrosion protection in oil and gas industry", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0014

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Gas Sensor based on PANI/Cu-ZnS Porous Micropshere Film for CO2 detection

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Abstract

In this letter, we report the structural, morphological and CO_2 gas sensing properties of the polyaniline (PANI) coated Cu-ZnS microspheres. PANI coated Cu-ZnS microspheres were prepared by hydrothermal and *in-situ* polymerization method. X-ray diffraction, Fourier transform infrared spectroscopy (FTIR), scanning electron microscope (SEM) and transmission electron microscope (TEM) were used to investigate the structural and morphological properties. The fabricated sensor based on PANI coated Cu-ZnS microspheres exhibits good CO_2 sensing performance with rapid response (31 s) and recovery (23 s) times.

Keywords: Porous microspheres; PANI; Cu-ZnS composite; CO2 gas sensor

For citation: Parangusan H., Bhadra J., Ahmad Z., Mallick S., Touati F., AlThani N.J., "Gas sensor based on PANI/Cu-ZnS porous micropshere film for CO2 detection", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0015

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Capacitive type Humidity Sensor based on PANI decorated Cu-Zns Porous Micropshere

Jolly Bhadra, Hemalatha Parangusan, Zubair Ahmad, Shoaib Mallick,
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Abstract

PANI coated Cu-ZnS porous microsphere structures have been synthesized by hydrothermal method and *in-situ* polymerization process. The synthesized composite is characterized by different techniques in order to study the structural, morphological and surface absorption properties. The experimental observation demonstrates that the PANI/1%Cu-ZnS composite has better sensitivity, fast response and good stability as compared to pure PANI and other PANI/CuZnS compositions. Finally, PANI/1% Cu-ZnS composite has been found to be optimized for the humidity sensors due to its well-distributed roughness, porosity and hydrophilicity. The average response and recovery times of the PANI/1% Cu-ZnS are found to be 42 s and 24 s, respectively, which outperform recent results.

Keywords: Porous microspheres; PANI; Cu-ZnS composite; Humidity sensor

For citation: Bhadra J., Parangusan H., Ahmad Z., Mallick S., Touati F., AlThani N.J., "Capacitive type Humidity sensor based on PANI decorated Cu-ZnS porous micropshere", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0016

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DFT-MD Dissolution of Oilfield Pyrite Scale using Borax

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Abstract

Introduction: Oilfield scales including pyrite form in oil and gas pipelines, underground tubing, and surface equipment thus blocking the flow of fluids and hindering production. Hence, the need for the development of effective chemicals in scale dissolution and removal.

Materials and methods: A computational technique known as Density Functional Theory-Molecular Dynamics (DFT-MD) was employed to investigate the use of borax in scale dissolution. This method aids the understanding at the atomic level of scale dissolution by using Quantum ATK's virtual Nano lab and VASP for model building and DFT-MD calculations respectively. Geometrical studies and radial distribution functions were carried out for data analysis.

Results: The results show that potassium ion preferentially bonds to the sulfur atoms in the top layer of the pyrite surface rather than with iron. Hence, becoming the predominant factor that is responsible for pyrite dissolution. The K-S bonds evolve dynamically and expose the rest of the pyrite surface.

Conclusions/future directions: The presence of a chelating agent alongside borax would prevent Fe-S bond formation. Hence, it is proposed that borax, in conjunction with chelating agents, would be efficient in pyrite scale dissolution and removal. This technique can be used to study other iron sulfide scales such as troilite and greigite, which have different iron to sulfur ratio compared to pyrite. This will consequently help boost production in the upstream sector.

Keywords: Pyrite; Borax; DFT-MD; Oilfield scale

For citation: Onawole A.T., Hussein I., Ahmed M.E.M., Saad M., Aparicio S., "DFT-MD dissolution of oilfield pyrite scale using borax", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0017

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Wind Energy Potential along the Onshore and Offshore Qatar

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Abstract

Wind energy is one among the clean and renewable energy resources. The utilization of non-conventional energies over the conventional sources helps to reduce the carbon emissions significantly. The present study aims at investigating the wind energy potential at select coastal locations of Qatar using ERA5 winds. ERA5 is the updated reanalysis product of the European Centre for Medium-range Weather Forecasts (ECMWF), in which the scatterometer and *in situ* wind data are assimilated to improve the accuracy of predictions, thus the long-term and short-term variabilities are reasonably well captured. Compared to the earlier studies, in this work, we have assessed the wind power at inland and offshore areas of Qatar, considering 40-year long (1979-2018) time series data with hourly ERA5 winds at 10-m height. The results show that there is no significant increase or decrease of wind power around Qatar in the last 40 years in most of the locations, while there is a slight decreasing trend in the offshore areas of Al Ruwais. This indicates that the average wind power is consistently available throughout the years. The links of climatic indices, especially the ENSO events with the wind climate of Qatar, are clearly evident in the long-term data. As obvious, the offshore regions of Qatar have relatively high wind power compared to the land areas. Among the selected locations, the highest annual mean wind power density is obtained in the offshore Al Ruwais (152 W/m^2), followed by offshore Ras Laffan (134 W/m2) and land area of Al Khor (120 W/m^2). The maximum wind power density varies between 1830 and 2120 W/m2 in the land areas, while it is between 1850 and 2410 W/m^2 in the offshore areas of Qatar. The highest wind power is consistently available during the prevalence of shamal winds in winter (January-March) as well as summer (June).

Keywords: Renewable energy; Wind power; Qatar; ERA5; Wind climate

For citation: Mohammed A.V., AlAnsari E.M.A.S.,Razak. S.P., Subramanian V., Ponnumony V., "Wind energy potential along the onshore and offshore Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0018

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Electrical Equivalent Circuit (EEC) based Impedance Spectroscopy analysis of HTM free Perovskite Solar Cells

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Abstract

Monolithic Perovskite solar cells (mPSCs) are the multi-layered organic-inorganic hybrid cells that have been focused due to the affordable cost, ease of fabrication and noteworthy power conversion efficiency (PCE). In this research, we have carried out a systematic study to understand the physical phenomenon inside successive layers of the mpscs using the impedance spectroscopy (IS). This study was performed on the optimized mPSCs with power conversion efficiency over 13%, where $CH_3NH_3PbI_3$, Perovskite has been used as light absorber. The internal electrical processes at the interfaces of the layers of mPSCs devices have been studied and correlated to produce electrical equivalent circuit of the overall device.

Keywords: Perovskite solar cells; Monolithic; Carbon; Impedance spectroscopy

For citation: Ahmad Z., Mishra A., Muhammad A.S., "Electrical equivalent circuit (EEC) based impedance spectroscopy analysis of HTM free perovskite solar cells", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0019

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Multiphase Induction Motor Drives for Gear-Less Electric Vehicle Applications

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Abstract

Qatar has some major research priorities, targeting; reducing carbon footprints, developing smart cities and smart grids; and these demand high deployment of electric cars in near future. Qatar is an highly progressive country adopting to new evolving technologies at a fast pace. The proposed project is aimed at the development of a robust, highly reliable, efficient and wide speed range multiphase motor drive system that falls within the right context of the current research priorities of the Qatar University and the State of Qatar.

The idea here is to use pole phase modulation technique to enhance the speed-torque control region of a multiphase motor drive system so that gear-less opeartion can be achieved in EV.

Advantages and Disadvantages of the proposed pole phase modulated IM drives:

- In high pole operation, the PPMIM drive is able to supply the high initial torque for fast acceleration and hill climbing.
- The rated torque of the PPMIM drive in the high pole is *k* times greater than the low pole mode. For example, in 3-phase 12-pole mode, the 9-phase PPMIM drive is able to supply 3 times of the rated torque as comparted to 9-phase 4-pole mode.
- In low pole mode, the PPMIM drive is able to supply high speed which is *k* times greater than the high pole mode.
- The PPMIM drives are capable to generate 3 or 4 speed and torque variations. So, the mechanical gearbox system in conventional IC Engine based vehicles can be eliminated with the PPMIM drives, which will reduce the size and weight of the vehicle.

Even though the PPMIM drives have several advantages (as mentioned above), on the other side they have a few disadvantages also such as:

- To achieve the high starting torque in high power applications, the PPMIM drives has to operate in high pole and low phase mode, which magnifies the magnitude of space harmonics in the air gap.
- The magnetizing inductance of the machine is inversely proportional to the square of the number of poles, which lowers the power factor.

Keywords: Electric vehicle; Motor drives; Pole phase modulated drive; Multiphase motors

For citation: Iqbal A., AlHitmi M., Praprath A., "Multiphase Induction Motor Drives for Gear-Less Electric Vehicle Applications", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0020

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Soil Respiration Variation under the Canopy of Dominant Tree Species across different seasons in Temperate Forest

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Abstract

Soil respiration is defined as the production of carbon dioxide when soil organisms are active. It is an important process in the ecosystem and has direct influence on climate change. Therefore understanding it under different vegetation types is an essential goal in soil science. The major sources which effect the soil respiration rate are plant roots, the rhizosphere, microbes and soil fauna and these sources are control by various factors like temperature, moisture, nutreint content and oxygen in the soil. Soil respiration rate is important for understanding soil biological activity, nutrient cycling, soil microbial biomass, soil organic matter and its decomposition.Therefore soil respiration was studied under the canopy of ten dominant tree species of temperate forest. Our study determined that highest soil respiration was under the canopy of Eunonymous pendulus (EP) i.e. 20.01 µmolm−2 s−1 and across season it was high during the rains.

Keywords: Soil respiration; Forest; Microbial biomass

For citation: Rawat M., "SOIL RESPIRATION VARIATION UNDER THE CANOPY OF DOMINANT TREE SPECIES ACROSS DIFFERENT SEASON IN TEMPERATE FOREST", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0021

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Multiple Output Contactless Inductive Power Transfer System for Electric Vehicle Battery Charging Station

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Abstract

The proposed system is designed to charge the three different duty vehicles (based on the charging power): heavy-duty vehicle, medium-duty vehicle and small duty vehicle through three different modules (Module-A, B and C) which are connected to one common DC bus. In the proposed system, each module consists of two inductive coils. One is embedded into EV body along with a rectifier and DC-DC converter as a receiver. However, another coil is embedded into the road (on the ground) along with DC-DC converter and high-frequency inverter as a transmitter. Additionally, each module consists of two matching networks with a compensation circuit for effective power transfer. For the analysis and designing of rapid fast charger for different duty range EV, the typical specification of different duty range EV are used. For fast charging of heavy-duty range EV, required charging voltage and current are high (600A/550A) as compared to medium (350V/135A) and low (200V/125A) range EV. To achieve these requirements, different ratings of the converter are utilized in the respective charger. In the proposed system, the dedicated qZS boost converter is utilized to boost the input voltage up to required high voltage demand. However, the receiver buck converter steps down the voltage (step current) to the required level to charge the battery. In the proposed system, by controlling the buck converter the battery is charged either in CC or CV mode. Additionally, the two matching networks together compensate for the capacitive reactance of the coupling plates. The proposed system provides rapid DC charging for different duty range EVs from the AC grid along with a controlled rectifier or DC grid thereby reducing the cost, volume density, and complexity of the charging system.

Keywords: Battery chargers; Wireless chargers; Electric vehicles

For citation: AlHitmi M., Iqbal A., Hassan A., Shakoor R.A., Kahraman R., "Multiple Output Contactless Inductive Power Transfer System For Electric Vehicle Battery Charging Station", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0022

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Innovative Nanostructured Membranes for Reverse Osmosis Water Desalination

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Abstract

Reverse osmosis (RO) is considered as the most widely utilized technique worldwide for water treatment. However, the commercial thin-film composite (TFC) membranes, which are normally made of polyamide (PA) through interfacial polymerization (IP), still experience certain major issues in performance and fabrication. The spin assisted layer-by-layer (SA-LbL) technique was established for overcoming some drawbacks with commercially available PA membranes. Also, recent investigations have recognized the nanoparticle inclusion into the selective layer as a powerful technique for improving the membrane efficiency. Hence, two different methodologies are presented here to improve the membrane performance, i.e., (1) SA-LbL technique to fabricate TFC membrane by the deposition of alternate ultrathin layers of different polyelectrolytes on polysulfone (PSF) commercial ultrafiltration membrane and (2) the nanoclay incorporation into the membranes during IP process to develop TFC membrane. Two types of nanoclays, cloisite (CS)-15A and montmorillonite (MNT), were incorporated to enhance the separation efficiency. This SA-LbL is an innovative method for the RO membrane manufacture, and has not been described earlier to the best of our knowledge. In addition, this work validated for the first time, the efficiency of the two nanoclays at the PA selective layer in the RO membrane. The membrane performance was evaluated using sodium chloride solution in a cross-flow permeation-testing cell for salt rejection and water flux. The results show significant improvement in water flux and salt rejection. The permeation test of 120 bilayers of poly (allylaminehydrochloride)/poly (vinylsulfate) on PSF substrate showed water flux of 37 L/ (m^2.h) and salt rejection of 53%, for a 2000-ppm salt solution feed. The highest water flux of 40 L/m^2.h with 80% salt rejection, relative to the control membrane was obtained for the membranes containing nanoclays at 25^{o}C temperature, 40.0 bar pressure and 2000 ppm feed concentration. Thus, our study demonstrated that these TFC membranes are promising, and these novel fabrication techniques are great tool to manufacture the RO membrane.

Keywords: Reverse osmosis; Nanoclays; Spin assisted layer-by-layer(SA-LbL) technique

For citation: Saleem H., Javaid Z.S., "INNOVATIVE NANOSTRUCTURED MEMBRANES FOR REVERSE OSMOSIS WATER DESALINATION", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0023

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Pretreatment of Cyanobacterial Chroococcidiopsis: Biomass prior to Hydrothermal Liquefaction for Enhanced Hydrocarbon Yield and Energy Recovery

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Abstract

Chroococcidiopsis sp. was grown in 200 L open raceway pond. Biomass density and average biomass productivity were 0.41 g/L and 16.1 g/m^2/d. *Chroococcidiopsis* biomass was harvested by self-settling. Self settled biomass was further subjected to centrifugation to obtain a biomass paste with 25-30% solid content. Centrifuged biomass was dried at 80 °C overnight and used as a feedstock for pretreatment step. Biomass was pretreated in water at 105 °C for 15 minutes. A slurry containing 15 wt% pretreated and untreated biomass (control) in deionized water was prepared and subjected to hydrothermal liquefaction for biocrude oil production. Hydrothermal liquefaction for both pretreated and untreated biomass was conducted at temperatures ranging from (275, 300, 325, 350 °C) in a 500 mL high-pressure PARR reactor for 30-minute reaction holding time. Maximum biocrude yields for pretreated and untreated biomass was 42.4 % and 26.4 % based on ash free dry weight basis. Biocrude oil was characterized for hydrocarbons using GC-MS technique. Biocrude oil obtained from pretreated and untreated biomass contained 58.9% and 41.01% (C8-C19) hydrocarbons. Higher heating values for biomass and biocrude oil were 16.93 and 31.28 MJ/kg, with an energy recovery value of 41.1%.

Keywords: Mxene; Polyamide; Piezoresistive; Electrospinning

For citation: Khan S., Das P., Abdul Quadir M., Thaher M., Al Jabri H., "Pretreatment of cyanobacterial Chroococcidiopsis. biomass prior to hydrothermal liquefaction for enhanced hydrocarbon yield and energy recovery", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0024

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Novel Approach to Study the Diversity of Soil Microbial Communities in Qatar

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Abstract

A broad diversity of microorganisms can be found in soil, where they are essential for nutrient cycling and energy transfer. Recent high-throughput sequencing methods have greatly advanced our knowledge about how soil, climate and vegetation variables structure the composition of microbial communities in many world regions. However, we are lacking information from several regions in the world, e.g. Middle-East. We have collected soil from 19 different habitat types for studying the diversity and composition of soil microbial communities (both fungi and bacteria) in Qatar and determining which edaphic parameters exert the strongest influences on these communities. Preliminary results indicate that in overall bacteria are more abundant in soil than fungi and few sites have notably higher abundance of these microbes. In addition, we have detected some soil patameters, which tend to have reduced the overall fungal abundance and enhanced the presence of arbuscular mycorrhizal fungi and N-fixing bacteria. More detailed information on the diversity and composition of soil microbial communities is expected from the high-throughput sequenced data.

Keywords: Fungi; Bacteria; Soil parameters; High-throughput sequencing; Middle-East

For citation: Oja J., Adenan S., Talaat A.F., Alatalo J., "Novel approach to study the diversity of soil microbial communities in Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0025

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Characterization of the Extracellular Polymeric Substances (EPS) of Virgibacillus Strains capable of Mediating the Formation of High Mg-Calcite and Protodolomite

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Abstract

The origin of dolomite –a common carbonate mineral– is the subject of an ongoing debate. It has been proposed that extracellular polymeric substances (EPS) excreted by microbes contain specific organic molecules that facilitate the incorporation of magnesium in the carbonate minerals. We characterized the EPS produced under different conditions by measuring total carbohydrate (TCHO), total protein (TP) content and by (FTIR) analysis. We report the formation of Mg-carbonates with a mol% Mg higher than 41%, exclusively in association with EPS, rich in carbohydrates (TCHO > than 75% of the total EPS mass). Moreover, FTIR analysis of these EPS revealed the presence of protein secondary structures (e.g., β-sheets) known to favor mineral nucleation. These results suggest that some organic molecules with specific functional groups (e.g., carboxyl and hydroxyl groups) may be of key importance for overcoming the kinetic barriers that else prevent the incorporation of Mg into carbonate minerals, a crucial step for the formation of dolomite in natural environments.

Keywords: Microbial carbonates; Extracellular polymeric substances; Functional groups; High magnesium calcite; Protodolomite

For citation: Aldisi Z., Zouari N., Jaoua S., Dittrich M., AlKuwari H., Bontognali T., "Characterization of the Extracellular Polymeric Substances (EPS) of Virgibacillus strains capable of mediating the formation of high Mg-calcite and protodolomite", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0026

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A study comparing Conventional Heating and Microwave Assistance Heating to Recover Metals from Municipal Solid Waste using Microwave-Assisted Leaching Technique

Mariam Khan, Mohammad Al ghouti, Mustafa Nasser, Khalid Al Kuwari, Oon Heng

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Abstract

This study investigates and compares microwave-heating radiation with conventional heating. Incinerated municipal solid waste (IMSW) bottom ash (BA) and fly ash (FA) was utilized to recover various metals including Co, Cr, Cu, Fe, Mn, Zn,Pb, Al, Cd, Ba, Mg and V using various acid leaching agents i.e. HCl, HNO3 and H3PO4 were utilized and several parameters were altered in order to determine the most effective conditions. The current study concluded that microwave assisted leaching method is effective to recover most of the metals. In addtion, metals from MSW-BA were much easier to recover in contrast with MSW-FA. 71% of Co, 75.69% of Cr, 56.19% of Cd, 35.23% of Ba and 30.2% of Pb, using 2M of HCl and 3M of H3PO4. While 1.48% of Cr, 0.93% of Fe, 1.19% of Mn, and 1.18% of Al were extracted using HCL and H3PO4 from MSW-FA. It was also confirmed that higher power and longer contact time had a positive effect on metal recovery. From cost analysis point of view, microwave assisted leaching was fraction of the cost for conventional heating, making this method comparatively sustainable, energy efficient and safe.

Keywords: Metals; Extraction; Municipal; Solid; Waste

For citation: Khan M., Alghouti M., Nasser M., AlKuwari K., Heng O., "A study comparing conventional heating and microwave assistance heating to recover metals from Municipal Solid Waste using microwave-assisted leaching technique", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0027

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Advanced Degradation of Organic Substance in Water Using No-Ferric Fenton Reaction on Titania Nanotube

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Abstract

Highly reactive OH radicals facilitate advanced oxidation processes (AOPs). AOPs are irreplaceable in environmental remediation including but not limited to pollutant degradation. H_2O_2 leading to OH radicals in iron based fenton systems are well known and few other oxides of alumina and ceria in non-ferrous fenton systems. Majority of studied catalysts materials are in powder form, which limits the catalysts long term applicability in real systems due to separation and regeneration of the catalyst with required catalytic activity, which is costly. In this present work, we have studied anatase phased titania nanotube arrays (TNA) grown on Ti films prepared by an anodization approach for methyl orange (MO) dye degradation under photocatalytic conditions.

Key findings reveal long stability of TNAs over fifty reaction cycles in batch process with higher degree of reproducible performance. Complete removal of MO was achieved after six hours of exposure in AM 1.5 G light (equivalent to 1 sun intensity), where hydrogen peroxide accounted for only $1/200^{th}$ of the amount of initial dye concentration. This superior performance is ascribed to surface oxygen vacancies and Ti^{3+} sites promoting regeneration of peroxide in the ongoing reaction medium that is consequently transformed to OH radicals. This is further confirmed by the experiments conducted with formic acid, a known hydroxyl radical scavenger, where the dye degradation was observed to be minimal at a near zero rate even after six hours of reaction time, upon measurements with UV-visible spectroscopy. About 38% of the initial dye was oxidized after 1 h into the reaction under light irradiation in a typical system whereas activity was hugely promoted to over 55% when it was coupled with a Pt wire in an electroless process, without supply of additional power.

In conclusion, this TNA based new material is highly regarded as environmentally sustainable, easily reusable, non-toxic and commercially viable candidate for real wastewater treatment plants where the treatment plants are usually large tanks constructed in the open space with access to freely available, energetically rich solar power.

Keywords: Titania nanotube; Photocatalysis; Water treatment; Methyl orange; Degradation kinetics

For citation: Elmakki T., Zavahir F.S., Gulied M., Ismail N., Hameed A., Han D.S., "Advanced degradation of organic substance in water using no-ferric Fenton reaction on Titania nanotube", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0028

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Production of Phycocyanin from Marine Cyanobacteria in Open Raceway Pond

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Abstract

Phycocyanin is one of the major light harvesting accessory pigment present in microalgae and cyanobacteria. This water-soluble pigment protein exhibits antioxidant, anti-inflammatory, and neuroprotective effects. Application of this pigment has also been used in dietary nutritional supplements in many food, nutraceutical, cosmetic, and biotechnology industries. In the present study phycocyanin was extracted from locally isolated marine cyanobacteria *Geitlerinema* sp. *Geitlerinema* sp. showed a higher growth during the summer perioed of 0.75 g/L and 0.54 g/L. Similarly, the maximum Phycocyanin obtained was up to 7.1% during summer period.

Keywords: Cyanobacteria; Phycocyanin; Geitlerinema sp.

For citation: Abdul Q.M., Das P., Khan S., Thaher M., AlJabri H., "Production of phycocyanin from marine cyanobacteria in Open raceway pond", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0029

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Ocean Acidification and Carbonate System Geochemistry in the Arabian Gulf

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Abstract

Alkalinity (Alk) and (dissolved inorganic carbon) DIC were measured on high resolution seawater samples, collected on November 2018 and May 2019 at seven stations in the Exclusive Economic Zone (EEZ) of Qatar. Calculated surface PCO2 averaged 472 matm in 2018 and 447 matm in 2019. Thus, the Arabian Gulf is degassing CO2 at present and will not take up atmospheric CO2 until 2042. Ocean acidification is not yet an issue in the EEZ of Qatar. The elevated PCO2 values are due to CaCO3 formation. Normalized NAlk and NDIC were calculated to remove the impact of increasing salinity. NAlk and NDIC decrease corresponding to a CaCO3/OrgC removal ratio of 2/1. We calculated the nitrate corrected and salinity normalized tracer, Alk*. Values of Alk* were negative, and the change in Alk* relative to Hormuz (DAlk*) indicated that there has been an average decrease of Alk* of -130 mmol kg-1. This decrease is due to CaCO3 formation but previous studies found no evidence for coccolithophorids. One obvious possibility is that Alk removal is due to CaCO3 formation in coral reefs. However, recent study of the composition of particulate matter found that the average particulate Ca concentration was 3.6%, and was easily acid soluble (Yigiterhan et al., 2018). These results suggest that a significant amount of particulate CaCO3 is present in the water column. One hypothesis is that the particulate Ca comes from carbonate rich atmospheric dust. Using Al as a tracer for dust and the average Ca/Al ratio in Qatari dust can only explain about 3% of the particulate Ca. An alternative hypothesis is that particulate CaCO3 may form in the water column due to abiological CaCO3 formation, as proposed recently for the Red Sea (Wurgaft et al., 2016). Precipitation of CaCO3 may be induced by the large inputs of nucleation sites in the form of atmospheric dust.

Keywords: Ocean acidification; Marine geochemistry; Climate change; Marine environment; Arabian Gulf

For citation: AlThani J.A., Izumi C., Yigiterhan O., AlAnsari E.M.A.S., Vethamony P., Sorino C.F., Anderson D., Murray J.W., "Ocean Acidification and Carbonate System Geochemistry in the Arabian Gulf", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0030

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Feasibility and Cost Optimization study of Osmotic Assisted Reverse Osmosis Process for Brine Management

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Abstract

Due to the excessive demand to desalinate seawater to satisfy the domestic need in Qatar, it was needed to develop safe and cost effective desalination processes with the consideration of stringent regulation for water quality production and wastewater/brine discharge quality. The direct disposal of brines to the environment raised potential negative impact to the aquatic system and therefore the best practice is to minimize the volume of brine production and reuse it for beneficiary application. Several brine-dewatering techniques include both evaporative and non-evaporative approaches, which are capable to dewater high salinity brines with 50-350 g/L of total dissolved solids (TDS). The commonly adopted technology for dewatering brine is mechanical vapor compression that is known for its significant energy consumption up to 25 kWh/m^3 of produced water for 50% of water recovery[1]. Non-evaporative membrane base technologies are a promising approach to dewater brines with minimum energy usage. Osmotically assisted reverse osmosis (OARO) is an advance membrane based technology for energy efficient and high recovery desalination of saline brine. OARO differ from reverse osmosis (RO) by adding saline sweep on permeate side to reduce osmotic pressure difference across the membrane to generate more water flux. The ongoing research work are based on mathematical/numerical approach that focuses on finding the optimum OARO configuration, inlet hydraulic pressure to avoid membrane burst and cost analysis. However, most of these studies are conducted by considering ideal conditions. In this study, an algorithm for simulating OARO process based on MATLAB and Aspen Plus to model membrane calculation and to design process configuration is considered to the effect of concentration polarization (CP) and reverse solute flux (RSF). The objective is to study the effect of inlet feed concentration and flowrate, sweep concentration and flowrate, inlet hydraulic pressure, number of stages, membrane size and characteristics and module configuration flow. In addition, technical economic analysis to evaluate the economic feasibility of OARO process. The stopping criteria of this model is the quality of water permeating at the feasible operating conditions and the cost. This model demonstrated high potential simulating OARO process to be used as a palate form for the user to predict the behavior of the process by varying operating conditions to desired outcomes.

Keywords: OARO; Modeling; Economical analysis

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Sustainable Hybrid System for Simultaneous Desalting of Liquid Fertilizer and Fuel Generation

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Abstract

The constant utilization of hydrocarbon-based fuels such as petroleum, coal, and natural gas has resulted in the detection of high concentration levels of sulfur containing gases in the atmosphere of many countries, including Qatar. Among those potential air pollutants, the rising concentrations of H_2S and SO_2 are of serious concern. In this work, sulfur-based seed solutions (SBSSs) such as sulfite or sulfide solutions are made by purging sulfur-containing gases released from industry into alkaline solutions. These SBSS solutions are simultaneously utilized towards the production of renewable hydrogen energy via a photoelectrochemical (PEC) process, and are used as draw solutions (DS) to produce diluted fertilizer water by a forward osmosis (FO) desalination process for agricultural irrigation purposes. The continuous bench scale of the integrated PEC-FDFO system was successfully demonstrated for simultaneous hydrogen production and dilution of SBSS DS. The experimental results showed that the reduction potential of SBSS DS in the PEC cell changes with variation of SBSS DS concentration and pH. This resulted in the continuous oxidation of sulfite into sulfate and led to more hydrogen production. Moreover, FDFO process exhibited high percentage of water recovery and DS dilution up to 80% and 68% at high SBSS DS concentration, respectively. In binary mixture of SBSS DS, increasing the concentration of ammonium sulfate $(NH_4)_2SO_4$ led to high water flux to about 42%. The outcomes of this experimental study showed a successful practical continuous integrated system toward hydrogen production and fertigation.

Keywords: PEC; FDFO; Solar

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Hydrogel Sensors for the Agricultural Applications

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Abstract

This work is focused on the design and fabrication of hydrogel sensors for the agricultural applications, "a multi-sensory device". Agriculture is an important contributor to Qatar's economy, as the country is aiming to produce more local products. We chose to use hydrogel in soil, for their high efficiency in absorbing water. The hydrogel will be embedded in a multisensory device that will provide consistent plant watering when soil is dry and in need for water. The multi-sensory device will employ NFC switch "Near Field Communication" which is a wireless communication device used to control water flow for plant irrigation. Also, the experimental work including enhancing soil properties by using Arabic gum (sodium 2-[(7-carboxyheptyl)-C-hydroxycarbonimidoyl]benzen-1-olate), a biodegradable and naturally available polymer. It is proven that it decreases soil porosity, enhances the reinforcement between the soil and the hydrogel therefore retaining more water and preventing evaporation, it also increases plant growth through fixating nitrogen in the soil.

Keywords: Hydrogel; Super absorbent polymers; Multisensory system; NFC device; Arabic gum

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Algae-based Biofertilizer for Date Palm Cultivation in Qatar

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Abstract

Date palm (Phoenix dactylifera L.) is the main fruit crop found in the arid and semi-arid regions of the world. It naturally adapts to the adverse environments of extreme heat and water scarcity and prevents further desertification in addition to producing fruits with high nutritional value. It is seen in many parts of the world that traditional cultivation practices such as mixed planting and chemical fertilizers have led to low fruit quality resulting in low market values. Long generation time also hinders production of the dates. Tissue culture is therefore considered the most promising solution for rapid large-scale production of true-to-type clonal plants. The plantlets originating from in vitro callus proliferation are transferred from synthetic media to soil. The conventional method of using chemical fertilizers also leads to low plantlet viability with increased environmental and health risk. The current research targets the use of a local microalga, Tetraselmis sp. QUCCCM8, identified as an organic source of nutrients, a substitute for chemical fertilizers to acclimatize cultured date palmlets to soil. Soil was supplemented with different concentrations of algal biomass and plant growth was monitored for 3 months. Soil without any fertilizer and soil amended with 1 g conventional fertilizer were used as negative and positive control, respectively. Supplementation with 0.5 g of algal biomass led to higher plant growth rates, 100% survival rates, high ability of rooting (3.17 ± 0.14 roots), higher number of leaves (2.5 ± 0.25 leaves), largest stem thickness, longer shoot (33.75 ± 1.56 cm), and higher total chlorophyll (159.61 ± 9.6 mg L^{-1}) as compared to conventional fertilizer. These stated findings are significantly higher than the control. Furthermore, elemental analysis of the soil showed that supplementation with algal biomass increased the soil total nitrogen, potassium, and phosphorus contents essential for plant growth. Finally, the comparison of heavy metals composition between soils amended with conventional fertilizer and algae-based fertilizer highlights the potential use of algae as a safe and efficient biofertilizer post tissue culture mode of plantlet generation. This enhanced the viability of healthy plantlets without affecting the environment, averting usage of chemical fertilizers.

Keywords: Mxene; Polyamide; Piezoresistive; Electrospinning

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Improvement of Omega-3-rich Microalgae Biomass Production to Support Qatar Food Security

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Abstract

Recently, algae have received considerable interest as one of the most promising feedstocks suitable for animal feed production due to their fast growth, less nutrient requirements and their ability to produce primary and secondary metabolites with high-added value. Different strategies were applied to improve both biomass and metabolites productivities aiming to produce high-quality biomass with low cost and high nutritional value. *Tetraselmis subcoliformis* QUCCCM50, a local marine green alga presenting fast growth, high metabolites content and easy to harvest, was selected as a candidate for feed production. Three different stress conditions were applied to enhance its potential to produce high-value products such as Nitrogen or Phosphorus depletion and high salinity of 100ppt. An assessment of the growth properties and biomass productivity was performed during the growth. After 15 days of cultivation using tubular photobioreactors, the biomass was subjected to metabolites characterization and fatty acids methyl ester profiling. Results showed that the three stress conditions present different impacts on biomass productivity and, lipid quantity and quality. Cultivation under 100 ppt led to the highest increase in lipid content. This culture condition led to 25% increase of the omega-3 fatty acids with the appearance of the docosahexaenoic acid (DHA) and a remarkable increase of the alpha-linolenic acid, comparatively to the control. The enrichment of the *Tetraselmis subcoliformis*' biomass in terms of omega-3 fatty acids enhance its nutritional value and make it very suitable for animal feed production. The optimized culture conditions obtained from the current study will be applied at large scale to enhance the quality of the biomass towards omega-3 enriched animal feed supplement production, and hence support achieving food security in the State of Qatar.

Keywords: Green alga; Stress condition; Omega-3; Food security

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Assessment of anti-proliferative and anti-bacterial Activity of a Desert Microalgal Strain Desmodesmus sp.

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Abstract

Microalgae are believed to be a promising source of different high value products (HVP). HVP are metabolites which are produced during the growth of microalgae and their production is triggered by the physiochemical growth conditions of the microalgae. The present project is aimed at exploring the presence of bioactive compounds in desert microalgae Desmodesmus sp. and to assess its ability to support and improve health care in Qatar.

The isolate was cultivated under conventional conditions as a control, and under 3 different stress conditions to enhance the production of high value products. Then crude algal extracts were used to assess the biological activity. Results of the study suggest that Desmodesmus sp. produces high value products that exhibit great anti-oxidant, anti-proliferative and anti-bacterial activity when cultivated under conventional conditions and under continuous light stress.

Keywords: Anti-oxidant; Anti-proliferative; Microalgae; High value products

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Isolation, Cultivation, and Characterization of Novel Local Marine Micro-Algae for Aquaculture Feed Supplement Production

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Abstract

Aquaculture is considered as a promising alternative to support the food demands of the ever-increasing population. Currently, this sector faces several challenges such as using fishmeal, which is unsustainable and expensive. Therefore, it is necessary to identify an alternative feed component that is sustainable, cost-effective and can provide the essential nutrients required by the fish. In this context, microalgae are considered as a viable source of proteins, lipids, polysaccharides and high-value products (HVPs) such as essential fatty acids, amino acids and vitamins. They play a vital role in the marine food chain and hence can be easily assimilated by the fish. The current research targeted the isolation, identification and characterization of novel marine microalgae from Qatar coastline to produce aquaculture feed supplement. As the climate poses a number of stress factors, such as high light intensities, temperatures and varying salinities, it is expected that novel microalgae with interesting metabolite profiles can be isolated from the environment for developing aquaculture sector in Qatar. Standard plating methods were used to isolate halophilic strains from field waters. PCR-sequencing was used to identify the novel microalgae, cyanobacteria and diatom isolates. Then a comparative analysis of the growth performance and metabolite content was performed to characterize these strains. Results evidenced that the cyanobacteria strain exhibited the highest biomass productivity of 51.4 mg L-1day-1 whereas the highest lipid content was observed in the novel diatom isolate ranging up to 28.62% and the highest amount of carotenoids was detected in the case of the microalgae. As in conclusion, a rich feed supplement blending the three isolates can be considered as an alternative to fishmeal. As a continuation of this research, the potential strains will be cultivated under various stress to increase their nutritional value.

Keywords: Aquaculture; Food security; Sustainable; Microalgae

For citation: Dalgamouni T.A., Kanji S., Cherif M., Rasheed R., Bounnit T., Aljabri H., Saadaoui I., Hamadou R.B., "Isolation, cultivation, and cultivation, and characterization of novel local marine micro-algae for aquaculture feed supplement production", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0037

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Catalytic Decomposition of Ethanol over Bimetallic Nico Catalysts for Carbon Nanotube Synthesis

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Abstract

In this work we investigate the use of NiCo bimetal/oxide as catalyst for hydrogen production from ethanol, with a focus on the deactivation pattern and the nature of the observed carbon deposition. It is well known that sintering and coke deposition during decomposition reaction significantly reduces the activity of the catalysts at higher temperature, by blocking the active sites of the catalysts. During ethanol decomposition reaction, the cleavage of C-C bond produces adsorbed *CH_4 and *CO species that further decompose to form carbonaceous compounds. FTIR *in-situ* analysis was conducted between 50 to 400°C for all the catalysts to understand the reaction mechanism and product selectivity. Cobalt was found to be selective for aldehyde and acetate, whereas bimetallic Ni-Co was selective for the formation of CO at 400°C along with aldehyde. Complete conversion of ethanol was observed at 350°C and 420°C for NiCo and Cobalt respectively indicating an improvement in the rate of conversion when Ni was added to cobalt. The crystallinity, morphology and particle analysis of the used catalyst after reaction were studied using XRD, SEM and TEM respectively. The XRD shows the complete phase change of porous $NiCoO_2$ to NiCo alloy and SEM indicates the presence of fibrous structure on the surface with 91.7 % of carbon while keeping 1:1 ratio of Ni and Co after the reaction. The detailed analysis of carbon structure using HRTEM-STEM shows the simultaneous growth of carbon nano fibers (CNFs) and multiwalled carbon nanotubes (MWCNTs) that were favored on larger and smaller crystallites respectively. Analysis of carbon formation on individual Co catalyst and bimetallic NiCo catalyst shows a clear difference in the initiation pattern of carbon deposition. Metallic Co nanoparticles were found to be more mobile where Co disperses along the catalysts surface, whereas NiCo nanoparticles were relatively less mobile, and maintained their structure.

Keywords: Carbon nanotubes; Ethanol decomposition; Catalyst deactivation; Bimetallic catalysts

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Rational Synthesis, Characterization, and Application of Environmentally-Friendly (Polymer-Carbon Dot) Hybrid Composite Film for Fast and Efficient UV Assisted Cd2+ removal from water

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Abstract

Carbon-dots (CDs) are of particular interest in numerous applications. However, their efficiency for heavy metal removal from wastewater was not yet reported. Herein, we rationally synthesized CDs from petroleum-coke-waste via hydrothermal treatment in the presence of ammonia.This drove the formation of outstanding photoluminescent, water-soluble, biocompatible, and high yield of monodispersed sub-5 nm CDs. The CDs are co-doped with high 10 % of N and 0.2 % of S. The as-prepared CDs possess unprecedented photoluminescent properties over broad pH range making these dots unique efficient pH sensors. Chitosan (CH)-CDs hybrid hydrogel nanocomposite film was further prepared as a platform membrane for the removal of Cd^{2+} metal from wastewater. The prepared CH-CDs membranes show a relatively good mechanical properties, based on stress-resistantance and flexibility in order to facilitate handling. The equilibrium state was reached within 5 minutes. Intriguingly, the UV-light illuminations enhanced the Cd^{2+} removal efficiency of the photoluminescent CDs substantially by four times faster. It was found that adsorption followed pseudo-second-order kinetic and Langmuir isotherm models. The maximum adsorption capacity at 25□ C was found to be 112.4 mg g^{-1} at pH 8. This work paves the way to new applications of CDs in water treatment.

Keywords: Waste management; Water soluble carbon dots; Polymer- Carbon Dot based hybrid composite film; UV-assisted Cd2+removal

For citation: jlassi k., "Rational Synthesis, Characterization, and Application of Environmentally-Friendly (Polymer- Carbon Dot) Hybrid Composite Film for Fast and Efficient UV Assisted Cd2+ Removal from Water", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0040

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Polymeric Nanocomposites Coatings for the Corrosion Protection of Steel

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Abstract

Corrosion is declared as the primary mechanism for the degradation of infrastructure, failure of metallic materials used in various industries such as pipelines in oil and gas industry, which results in huge economic loss, safety issues, and environmental problems. In this research, polymeric Nano composite smart coatings were synthesized and evaluated for its performance. N-Methyl thiourea was chosen as the core material to be encapsulated in Nano tubes using some experimental techniques. The mode of action of the novel smart coating involved two functional strategies. One is the polymeric matrix that offers physical barrier against corrosion. The other strategy involves the release of the loaded nano containers upon the formation of cracks. Once the release occurs, the methyl thiourea can act as corrosion inhibitor and as self- healing agent. Structural characterization was applied to the loaded nanotubes using SEM, XRD, FITR and TGA analyzer. The performance evaluation of the smart coatings was conducted using gamry device via EIS test which showed the increase in corrosion resistance with time and confirmed the efficiency of the new nano composite smart coatings (NMTU) to perform corrosion inhibition and self-healing on the surface of steel substrate, protecting it from corrosion. It can be so applied in various industries and to machine parts to improve their mechanical and anti-corrosive properties. Future researches for the development of new loaded inhibitors nano containers of higher performance and more environmentally friendly is highly recommended. In addition, it is recommended to try these smart coatings in different applications in (Oil and gas, Automotive, Aerospace, Textile, Manufacturing, Electrical fields).

Keywords: Corrosion; Nano composite; Corrosion inhibitor; Encapsulation; Structural characterization

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Alginate-Mediated Synthesis of Hetero-Shaped Silver Nanoparticles and their Hydrogen Peroxide Sensing ability

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Abstract

Silver nanoparticles have been the focus of extensive research for many decades due to their unique physical, chemical and electrical properties. Introducing new environmentally benign methods for the synthesis of silver nanoparticles is of great interest in the research community. In this work we propose a new method for the simple synthesis of stable heterostructured biopolymer (sodium alginate)-capped silver nanoparticles (Ag-NPs) based on green chemistry.The as-prepared nanoparticles were characterized using the ultraviolet–visible (UV–Vis) absorption spectroscopy, X-ray diffraction (XRD), transmission electron microscopy (TEM), Fourier transform infrared spectroscopy (FTIR) and Dynamic light scattering (DLS) techniques. The results showed that the as-prepared Ag-NPs have a heterostructured morphology with particle size in the range 30 ± 18 – 60 ± 25 nm, showing a zeta potential of -62 mV. The silver nanoparticle formation was confirmed from UV-Vis spectra showing 424 nm as maximum absorption. The particle size and crystallinity of the as- synthesized nanoparticles were analyzed using TEM and XRD measurements respectively. FTIR spectra confirmed the presence of alginate as capping agent to stabilize the nanoparticles. The Ag-NPs also showed excellent sensing capability, with a linear response to hydrogen peroxide spanning a wide range of concentrations from 10-1 – 10-7 M, which indicates their high potential for water treatment applications, such as pollution detection and nanofiltration composites.

Keywords: Alginate; Synthesis; Silver nanoparticles; Heterostructure; Sensing

For citation: Bhagyaraj S., Krupa I., "Alginate-mediated synthesis of hetero-shaped silver nanoparticles and their hydrogen peroxide sensing ability", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0042

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Linking Depositional Environments and Diagenetic Processes to Porosity Evolution and destruction in the Arab Formation reservoirs, Offshore oilfields of Qatar

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Abstract

Introduction: The Jurassic Arab Formation is the main oil reservoir in Qatar. The Formation consists of a succession of limestone, dolomite, and anhydrite.

Materials and methods: A multi-proxy approach has been used to study the Formation. This approach is based on core analysis, thin sections, and log data in selected wells in Qatar.

Results: The reservoir has been divided into a set of distinctive petrophysical units. The Arab Formation consists of cyclic sediments of oolitic grainstone/packstone, foraminifera-bearing packstone-wackestone, lagoonal mudstone and dolomite, alternating with anhydrite. The sediments underwent a series of diagenetic processes such as leaching, micritization, cementation, dolomitization and fracturing. The impact of these diagenetic processes on the different depositional fabrics created a complex porosity system. So, in some cases there is preserved depositional porosity such as the intergranular porosity in the oolitic grainstone, but in other cases, diagenetic cementation blocked the same pores and eventually destroyed them. In other cases, diagenesis improved the texture of non-porous depositional texture such as mudstone through incipient dolomitization creating inter-crystalline porosity. Dissolution created vugs and void secondary porosity in otherwise non-porous foraminiferal wackestone and packstone. Therefore, creating a matrix of depositional fabrics versus diagenetic processes enabled the identification of different situations in which porosity was either created or destroyed.

Future Directions: By correlating the collected petrographic data with logs, it will become possible to identify certain "facio-diagenetic" signatures on logs which will be very useful in both exploration and production. Studying the micro and nano-porosity will provide a better understanding of the evolution and destruction of its porosity system.

Keywords: Oil exploration; Carbonates; Reservoir characterization; Qatar

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Tectonic and Geologic Settings of Halul and Al-Alyia Offshore Islands, Examples of Different Evolution Models, Within the Emergence of the Arabian Gulf Geosyncline: A Review

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Abstract

The Arabian Gulf represents a significant water body and strategic pathway, which has pronounced regional and international benefits. This research investigated the evolution of the Arabian Gulf geosyncline. Furthermore, it explored the formation, geologic and tectonic settings of Halul and Al-Alyia offshore Islands, as examples of two different evolution models, within the emergence framework. The Arabian Gulf geosyncline has been emerged during the Cenozoic Era (Late Miocene-Pliocene Epoch), situated in the northeastern collisional marginal part of the Arabian Plate, as a foredeep geosyncline or basin, squeezed or crammed between the stable Arabian Plate and the mobile Euro-Asian Plate, along the subduction zone, within Zagros Mountain Fold Thrust Belt. Halul Island is situated to the northeast of the Greater Doha City and has great national economic value. It has a unique shape, elongated domal structure, oriented from South-West to North-East. The tectonic setting of Halul Island is classified as salt diapirism. The surface geology of this Island is dominated by carbonate rocks, mainly limestone and dolomitic limestone, and some igneous rock, such as basalt and Tholeiite.
Al-Alyia Island is an integral part of the mainland. It is situated within the Greater Doha City's vicinity, in the eastern coastal zone. The Island is oriented from south-east to north-west. It is characterized by a gentle slope and low relief topography. The main rocks forming the island is the limestone and dolomitic limestone of the Simsima /Umm Bab Member of the Upper Dammam Formation of Tertiary age. This fact suggests that the island has a similar geologic setting to the mainland. This study revealed that the Halul Island evolution model is completely different from the evolution model of Al-Alyia Island, as Halul Island is a typical example model of salt dome Island, and remnants of the infracambrian salt basin, while Al-Alyia Island represents a different sedimentation model. This research has been carried out as part of the Environmental Science Center (ESC), Qatar University research agenda.

Keywords: Arabian Gulf; Qatar; Halul and Al-Alyia Islands; Geology; Tectonic and Evolution

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Food, Energy and Water Management Innovation in Doha: A Design-led Nexus Approach

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Abstract

Urban communities are affected by population growth, urbanization and climate change, thus being vulnerable to food, energy and water demand. According to the United Nations, the world's population is expected to increase by 2 billion people in the next 30 years and 68% of them are projected to live in urban areas by then. At the same time, 1/3 of the food produced in the world for human consumption every year gets lost or wasted and still, 795 million people worldwide are malnourished. A sustainable Food, Energy, Water and Waste Nexus is urgent. The Moveable Nexus Project is aiming to give a solution to the FEW Nexus through urban design methods and agricultural practices by practicing the design method, the evaluation effect and the participation. The design method will be practiced through design charrettes and international workshops and the evaluation will be realized by a Food, Energy & Water consumption environmental footprint calculator. Finally, the participation phase will engage the stakeholders and the community at the Doha Living Lab. The Doha Living Lab will quantify the urban FEWW-fluxes through urban agriculture and will try to achieve sustainability in terms of food production, new crops and new production technology, water management, organic waste management, reuse and recycle. The Living Lab will also assess the needs of the community and the involved stakeholders, by engaging them in every process thus enhancing resilience among people and agri-food systems.

Keywords: FEW Nexus; Urban; Food; Agriculture; Campus

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Fabrication and Testing of Polymeric Membranes for Energy-Efficient Separation of Carbon Dioxide from Flue Gas

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Abstract

One of the major problems the world is facing nowadays is Global Warming. The main ten Green House Gases (GHGs) include water vapor (H2O), carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O). The most abundant and dominant greenhouse gas is water vapor but concentration of water vapor depends on temperature and other meteorological conditions, and not directly upon human activities. CO2 is the second-most important one and that is why reduction of CO2 emissions is a vital area of research.

Carbon capture and storage (CCS) is a major strategy that can be used to reduce GHGs emission. CCS divides into three methods: pre-combustion capture, oxy-fuel process, and post-combustion capture. Among them, post-combustion capture is the most important one because it offers flexibility and it can be easily added to the operational units. For CO2 capture, various technologies are used which include: absorption, adsorption, cryogenic distillation, and membrane separation.

Our research focuses on one of the technologies for post-combustion capture, which is membrane separation. In this research, we fabricated four samples of polymeric membranes with different proportions of the components and then tested them for thermal stability, tensile strength, selectivity and permeability.

The membrane can be modified by trying different mixtures of the forming polymers with different percentages. The separated carbon dioxide gas can be used in different applications like fire extinguishers, carbonated beverages or cooling systems. For the future recommendations finding more applications for the use of the separated carbon dioxide gas will benefit the environment and will make this project more successful. The same techniques could be used to fabricate membranes for purifying the methane gas. Further studies must be done to ensure the effectiveness of these membranes when used in the industry.

Keywords: Green house gases (Ghgs); Carbon dioxide (CO2); Carbon capture and storage (CCS); Membrane separation; Polymeric membranes

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Synthesis and Characterization of Ni-P-Ti Nanocomposite Coatings on HSLA Steel

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Abstract

Nickel phosphorus (Ni-P) coatings possess tailored mechanical and anticorrosion properties and have found applications in industries like automotive, oil and gas, electronics, and aerospace. Their properties can further be enhanced by incorporating nanoparticles into their (Ni-P) matrix. In the present study, Ni-P-Ti nanocomposite coatings have been developed on high strength low alloy steel (HSLA) through electroless deposition technique. For this purpose, various concentrations of titanium (Ti) nanoparticles are used in the deposition bath containing 0.0g/L, 0.25g/L, 0.5g/L, 0.75g/L, and 1.0g/L nanoparticles. XDR, SEM, microhardness, and nanoindentation have been carried out to elucidate the role of Ti nanoparticle concertation on the microstructure and mechanical properties of the Ni-P-Ti composite coatings. XRD and EDX results confirm the incorporation of nanoparticles into the Ni-P matrix during deposition processing. SEM and AFM results exhibit the formation of a dense, uniform coating without any observable defects. An increase in the mechanical properties of the Ni-P matrix was observed by the addition of Ti nanoparticles. Superior mechanical properties were shown by the samples containing 0.5g/L Ti nanoparticle concentration. Improvement in the structural, as well as mechanical properties of Ni-P matrix by the addition of Ti, confirms the suitability of Ni-P-Ti composite coatings for various engineering applications.

Keywords: Electroless deposition; Microstructure; Hardness nanoindentation

For citation: Shahzad K., Abdelkhalek Fayyad E.M., Umer M.A., Fayyaz O., Qureshi T., Fatima I., Shakoor A., "Synthesis and Characterization of Ni-P-Ti Nanocomposite Coatings on HSLA Steel", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0047

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Do Oil and Gas Revenues promote Economic Diversification in Qatar?

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Abstract

The aim of this paper is to explore the short- and long-term asymmetric impact of oil prices shocks and oil and gas revenues changes on the total real GDP, and the level of economic diversification of the Qatar economy. To this end, two econometric approaches have been used: (1) the A-B structural vector autoregressive (AB − SVARX) model with exogenous variables where four different asymmetric oil prices and oil and gas revenues measures have been employed, and (2) the nonlinear autoregressive distributed lag (NARDL) model. The results show that, in the short-run, the responses of both total real GDP and non-oil real GDP to negative shocks on real oil prices and real oil and gas revenues are higher than the impact of positive shocks, indicating evidence for the existence of asymmetric impact of shocks in the short-run. However, the results suggest that the impact of shocks do not last more than three quarters. This evidence for the existence of asymmetric behavior is also confirmed by the NARDL analysis, which shows that, in the long run, positive oil prices shocks and oil and gas revenues changes have higher impact on the two proxies of economic activity than negative changes do. A result that confirms the resilience of the Qatar economy to negative shocks and the positive role played by the energy sector in improving the Qatar economic diversification degree. Finally, the results show that the non-oil sector is completely resilient to negative shocks in the long run as the impact of negative shocks are insignificant on the non-oil real GDP. Several policies aimed to improve the level of economic diversification of the country and delink the government revenues from oil and gas revenues are proposed and discussed.

Keywords: Oil and gas revenues; Non-oil real GDP; Diversification; AB – SVARX; NARDL

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Super-hydrophobic Membrane based on PVDF/ZnO Composite Electrospun Nanofibers for wastewater & Oil spill treatment

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Abstract

Industrial development releases plenty of oil/dyes wastes to water making unsafe the environment to live in. This project aims to solve the problems associated with environmental pollution and discharge of industrial effluents to water bodies. This is very important in the global scenario as water is the basis of life. The problem of leaking oil and dyes in water bodies is one of the biggest problems that cause instability in the ecosystem since, it has a negative impact on marine creatures that live in these water bodies. In addition, this damage is transmitted to humans in an indirect way.

The current project aims to develop ZnO/PVDF composite nanofibers using electrospun technique. The fabricated nanofibers were analyzed mainly for their morphology by using scanning electron microscope, X-Ray diffraction, mechanical tensile strength, UV light spectroscope and oil separation experiments was mainly targeted for the proposed research and photocatalytic performance. Using these nanoparticles oil absorption was done for the water contaminated with oil and dye.

The novelty of this particular proposal is defined by the nontoxic material fabrication method in the form of membrane, the fabricated membrane can be used for both absorbing oil & separating dyes from water. We have successfully synthesized the flower-like ZnO architectures by hydrothermal method, developing oil and dye absorbing membrane using electrospinning techniques. It can absorb oil and dyes from water wastes, can be reused many times. The observed results suggest that the fabricated flexible electrospun nanofibers are suitable for the wastewater treatment. Our future recommendations to test different types of dyes not mentioned in this research involve, mixing two dyes together and check testing by the fabricated membrane, testing mixture of both oil and dye wastes together and develope the membrane to be as a sponge, which can hold the oil then collecting this oil and reusing it again.

Keywords: Zinc oxide (Zno); Electrospun technique; Polyvinylidene fluoride (PVDF); UV light spectroscope; Nontoxic material

For citation: Abouhashem A., AlMaadeed A., Almohannadi A., Rajajothi H., Bhadra J., "Super-hydrophobic Membrane based on PVDF/ZnO Composite Electrospun Nanofibers for wastewater & Oil spill treatment", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0049

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Innovations and Hotel Performance in the Aftermath announcement of Qatar Hosting FIFA 2022 World Cup

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Abstract

The innovation-performance relationships continue to raise an ongoing debate in which the existing literature yields no conclusive results mainly in the tourism sector of resource-rich countries. This paper contributes to the literature by proposing a theoretical framework which links four innovations types to five types of performances in the hotel industry. Using a sample of all three, four and five stars hotels in Qatar over six months between 2016 and 2017, the results show the existence of an innovative path beginning from organizational innovation leading to an improvement of the hotels' financial performance. Specifically, the findings suggest that organizational innovation is the stronger driver of service innovation, and market performance is the main driver of financial performance. Accordingly, the results have several recommendations for hotels' managers and Qatari policymakers for successful innovation implemention. The evidence also provides a better understanding of innovation types that drive hotels' performance in the developing world, which may differ from the developed countries.

Keywords: Mega-sport event; Innovations types; Hotels' performance; Environmental performance; Qatar

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Pearl Oyster: From National Icon To Guardian of Qatar's Marine Environment

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Abstract

The NPRP9-394-1-090 project "Pearl Oyster: from national icon to guardian of Qatar's marine environment" had as main aim to develop and apply an integrated suite of chemical and biological methods as early warning tools to assess the "health" of Qatar's marine environment. The central theme consisted in an investigative monitoring program around the use of the pearl oyster, Pictada imbricata radiata, as a sentinel or guardian species. We have characterized the main environmental contaminants of concern at a selected number of sites around the Qatari coast (UmmBab, Al Khor, Al Wakra and Simaisma), during 2 years, in summer and winter. Potential ecological effects of contaminants (targeted and untargeted) were investigated at different biological organization levels (gene, chromosome, cell, individual, population), through a multidisciplinary approach, using classical and genotoxicological endpoints, integrative histopathology and transcriptomic responses to the different environmental stresses. To our knowledge, this is the first time an integrated approach connecting all these disciplines has been applied in the Qatari marine environment. We present here the main results, of this 3 years project, obtained in all different disciplinary approaches. The results of this project will leave a legacy of resources for future Qatari researchers, including an open access transcriptome data base and the first description of common pathologies observed in the pearl oyster P. i. radiata. Moreover, they will also represent a sound science-based baseline data essential for conservation and management planning, by integration of the data from all the different disciplines applied in the project to assess the potential ecological effects of contaminants at different biological levels.

Keywords: Marine environmental health; Marine eco-genotoxicology; Integrative histopathology; Transcriptomics; Pearl oyster

For citation: BenHamadou A.L., Khatir Z., AlShamary N., Hassan H., Hizan Z., AlAshwal A., Chatting M., Hamza S., Giraldes B., Minardi D., Bean T., Bayen S., Lyons B., "Pearl Oyster: from national icon to guardian of Qatar's marine environment", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0051

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Distribution and Diversity of Benthic Marine Macroalgae in Islands around Qatar

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Abstract

Extending into the Arabian Gulf, Qatar is surrounded by a number of islands mostly scattered by the eastern coastline. With the unique physical characteristics of the Gulf, which is a highly saline sea with high seawater temperatures, there is an urge need to investigate the macroalgae living in such harsh environment. Macroalgae plays an important role in the food web as they are primary producers and providers of food for other organisms. They also provide shelter and habitat in the marine ecosystem for herbivorous fish and other invertebrate animals. Additionally, macroalgae plays an outstanding role in reducing CO_2 from the atmosphere and increasing the level of dissolved oxygen in their immediate environment. However, there are few studies on marine macroalgae in Qatar and no previous studies found related to macroalgae from the islands around Qatar. The present work contributes to the macroalgae research by providing the first survey of distribution and diversity of benthic marine macroalgae in islands around Qatar. The marine benthic green, red and brown macroalgae of intertidal and subtidal in marine zone areas around Qatar were collected during Qatar's Islands project, which started 2018. The collected macroalgae are documented and a total of 67 species of macroalgae are recorded for all islands around Qatar, 24 Chlorophyta (Green algae), 25 Rhodophyta (Red algae) and 18 species Phaeophyta (Brown algae). The Red algae are dominant taxon in term of species richness, accounting for an average of 37% of the species at all study sites. The islands which had more species are Al-Beshaireya 58 Species, Al-Aaliya 53 Species, Sheraouh 48 Species, Janan 43 Species and Bu Felaita 37 Species. Our results show that islands located at eastern and southeastern coast of Qatar have more diversity of algae species than those located at the western and northwestern coast.

Keywords: Chlorophyta; Rhodophyta; Phaeophyta; Islands; Arabian Gulf

For citation: AlAShwal A.A., AlNaimi N., AlKhayat J., Giraldes B., AlOmari N., AlFardi N., Sorino C., Abdelbari E., "Distribution and Diversity of Benthic Marine Macroalgae in Islands Around Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0052

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Smart and Robust Nanocomposite Fibers for Self-Powering

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Abstract

Many of the devices, demands power sources for their continuous and long-term operations, self-powering devices with good flexibility, mechanical robustness, highly efficient energy storage performance and environmental friendliness are investigated. Polyvinylidene fluoride hexafluoropropylene (PVDF-HFP) is used as the base polymer in our study. Hybrid combination of nanoparticles –iron oxide (FeO) and titanium dioxide (TiO2) is used to reinforce with the polymer and the electrospinning method was adopted for the sample preparation. This specific method helps the polymer dipoles to align in specific directions so that the resultant fibers exhibit remarkable piezoelectric property. Other than studying the crystallinity and morphology, the energy storage of the material is also investigated, and correlated with the output voltage generation. The research results shows improve in the crystallinity structure of the hybrid nanocomposite thus enhanced piezoelectricity. In addition, it shows improved dielectric constant of the hybrid nanocomposite thus improving storage capabilities of the developed material. Additional researches could be directed to test the ability of the developed hybrid nanocomposite to absorb electromagnetic radiation. In addition, investigating self-cleaning properties due to the presence of TiO2 nanoparticles can be a good study. The established material can be used in numerous applications such as smart electronic textiles, biomedical applications, and artificial intelligence.

Keywords: PVDF-HFP; Nanoparticles; Dipoles

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Piezoelectric Nanogenerators based on Pvdf-Hfp/Zno Mesoporous Silica Nanocomposites for Self-Powering Devices

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Abstract

Due to the rising global concern over energy catastrophe and environmental issues, attention has been diverted towards future energy. In recent times, rechargeable power and renewable energy sources have been considered as an attractive substitute for resolving the future environmental problems. Among them, mechanical energy is one of the most abundant energy sources, and easily transformable to other useful energy forms, such as electrical energy. For such purposes, piezoelectric materials with ability to convert the mechanical energy generated by various activities into electrical energy. In this research work, we have investigated the morphology, structure and piezoelectric performances of neat polyvinylidene fluoride hexafluoropropylene (PVDF-HFP), PVDF-HFP/ZnO, PVDF-HFP/Mesoporous silica, PVDF-HFP 1% and PVDF-HFP 3% ZnO-Mesoporous silica nanofibers, fabricated by electrospinning. Both SEM and TEM images of ZnO nanoparticles shows formation of uniform flake of about 5nm diameter and Mesoporous silica shows uniform spherical morphology with average diameter of 5 µm. EDX plot justifies the presences of Zn, O and Si. An increase in the amount of crystalline β-phase of PVDF-HFP has been observed with the introduction of ZnO and mesoporous silica in the PVDF-HFP matrix are observed in FTIR spectra. All the XRD peaks observed in neat PVDF has the strongest intensity compared to rest of the other XRD peaks of polymer nanocomposite. The XRD spectra of all the nanocomposites have peaks at 17.8°, 18.6° correspond to α- crystalline phase, the peaks observed at 19°, 20.1° correspond to the γ- crystalline phase, and the peak at 20.6° corresponds to the β- crystalline phase. The flexible nanogenerator manipulated from the polymer nanocomposite with 1% ZnO-Mesoporous silica exhibits an output voltage as high as 2 V compared with the neat PVDF-HFP sample (~120 mV). These results indicate that the investigated nanocomposite is appropriate for fabricating various flexible and wearable self-powered electrical devices and systems.

Keywords: Mesoporous silica; Nanocomposites; Piezoelectric

For citation: Abdulkareem A.A., AlSanari N., Daifallah A., Mohamed R., Bhadra J., Ponnamma D., AlThani N., "Piezoelectric Nanogenerators based on Pvdf-Hfp/Zno Mesoporous Silica Nanocomposites for Self-Powering Devices", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0054

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Novel Solar driven Cooling System Integrated with Solar Still System

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Abstract

Novel integrated solar cooling and solar distillation system is introduced to meet the high cooling and fresh water demands in hot and arid regions such as Qatar. The system is composed of a solar-driven ejector cooling system coupled with a single-slope solar still. The introduced novel system is the first study that integrates two solar systems for cooling and water production with outputs significantly higher than any existing system. The results show that the productivity of the solar still is improved by enhancing the evaporation rate (using heating coil) and by increasing the condensation rate (using cooling coil). Simultaneously, this improved the COP of the ejector system by increasing its entrainment ratio with a slight increase in the required solar collector area. The performance of four different scenarios of integration between the proposed cooling and distillation systems is investigated. The results showed that the productivity of the still is five times higher than that of the conventional solar still. The annual produced water considering the hourly variation of the radiant flux was 5067 kg/year, which is 5.7 times more than the conventional systems. The estimated cost of one-liter distilled water per 1 m2 area of the present solar still is $0.04, which is only 18% of the water cost of other still technologies.

Keywords: Integrated solar cooling; Solar distillation; Ejector; Solar still; Evaporation; COP

For citation: Sleiti A.K., AlAmmari W.A., AlKhawaja M. "Novel solar driven cooling system integrated with solar still system", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0055

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Environmentally-Powered WSN for Urban-Scale Mapping and Assessment of Air Quality in Qatar

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Abstract

Environmental monitoring has gained significant importance in outdoor air quality measurement and assessment for fundamental survival as well as ambient assisted living. In real-time outdoor urban scale, instantaneous air quality index estimation, the electrochemical sensors warm-up time, cross-sensitivity computation-error, geo-location typography, instantaneous capacity or back up time; and energy efficiency are the six major challenges. These challenges lead to real-time gradient anomalies that effect the accuracy and pro-longed lags in air quality index mapping campaigns for state and environmental/meteorological agencies. In this work, a gradient-aware, multi-variable air quality-sensing node is proposed with event-triggered sensing based on position, gas magnitudes, and cross-sensitivity interpolation. In this approach, temperature, humidity, pressure, geo-position, photovoltaic power, volatile organic compounds, particulate matter (2.5), ozone, Carbon mono-oxide, Nitrogen dioxide, and Sulphur dioxide are the principle variables. Results have shown that the proposed system optimized the real-time air quality monitoring for the chosen geo-spatial cluster (Qatar University).

Keywords: Air quality; IoT; Gas sensors node; Multi-variable environmental mapping

For citation: Tariq H., Touati F., "Environmentally-Powered WSN for Urban-Scale Mapping and Assessment of Air Quality in Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0056

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The Formation of Sulfide Scales on Carbon Steel in Saturated H2S

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Abstract

There are three contributing elements of corrosion of Carbon Steel in H_2 S environment: the effect of H_2S on water chemistry; electrochemical reactions of the bare iron surface (both anodic and cathodic processes); and the formation and growth of corrosion product layers. The electrochemical reaction commonly contains three stages: first, the reactant transported from the solution (bulk) to the metal surface; then the transfer of the charge reaction on the surface, followed by the reaction product transported away from the iron surface to the bulk solution or the formation and development of the corrosion product which then can decrease the corrosion rate. Development of a robust corrosion model to predict the corrosion process in H_2S requires a mechanistic understanding of all these elements.

An experimental study was carried out to assess the corrosion of C-steel under open-circuit technique conditions and in solutions at several ranges of time and temperatures. The effect of film composition, morphology, structure, thickness, and ion- concentration of corrosion product films formed on pipeline Carbon Steel in an acid sour solution were examined. The electrochemical behavior of the filmed steel was measured, and the film properties assessed using a range of advanced techniques including Scanning Electron Microscopy (SEM), and Raman spectroscopy (RS). The data will be discussed in terms of film formation mechanisms.

Keywords: Scale; Formation; Sulfied

For citation: Alqahtani N., Qi J., Abdullah A.M., Laycock N., Ryan M.P., "The Formation of Sulfide Scales on Carbon Steel in Saturated H2S"", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0057

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Method Validation of Drug Quantification Poster

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Abstract

A lowest detection limit with straight linearity was obtained by developing a method to analyze Phenacetin (Phe) in both aqueous and organic extraction by using Liquid chromatography Triple Quoadrpole mass with electrospray ionization (LCMSMS/ESI). The validation of the developed method was carried out according to ICH Harmonized Tripartite guideline. Validation criteria obtained were; the method detection limit MDL is 0.089 ng/ml, method quantification limit MQL is 0.19 ng/ml while the calibration curve linear from 0.1 to 1000 ng/mL with correlation coefficient R^2 is 0.9994, Accuracy and precision up to 97% and the repeatability inter and intraday for six replicates of three concentration with RSD 2.1%. Separation occurred using Nova Pack C18 4 um, 150 x 3.9 mm column, using acetonitrile: 0.1% Formic acid 60:40% (v:v) at flow rate 1ml/min. the detector was triple quad mass spectrometry at multi-reaction mode MRM to detect parent mass 180.1 at frag 97 to transition fragments 110 and 138 at collision voltages 16 and 12 respectively.

Keywords: Method validation; Phenacetin; LCMSMS

For citation: MohamedAtia F.A., Ahmadi A.A., AlSafran M., "method validation of drug quantification poster"", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0058

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The influence of Carbon Nanotubes on the Thermoelectric Properties of Bismuth Telluride

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Abstract

Thermoelectric materials are devices that have the ability to convert waste heat to electricity. The widespread use of thermoelectric materials is currently limited by the low value their figure-of-merit (ZT). Bismuth telluride (Bi_2Te_3) is a promising thermoelectric material in the near room temperature applications that provides a ZT value ~ 1. In order to overcome the limitation of utilizing thermoelectric materials in waste heat recovery, a ZT value > 2 is required. In this current study multi-walled carbon nanotubes (MWCNT) was incorporated into Bi_2Te_3 bulk matrix system to enhance its mechanical and thermoelectric properties through powder processing techniques. The nanocrystalline Bi_2Te_3/MWCNT composites were prepared using high energy ball milling and spark plasma sintering (SPS) techniques. The structural characterization and the average grain size of both pristine Bi_2Te_3 and Bi_2Te_3/MWCNT was found to be approximately (~ 13 nm) and the average strain was found to be 0.2 using both X-ray Diffraction (XRD) and transmission electron microscopy (TEM) techniques. Vickers Microhardness test shows significant improvement of the nanocomposite hardness up to ~2 GPa as a function of increasing the MWCNT content. As for the dimensionless figure of merit (ZT) of the composite, it is expected to increase above the value of the pure binary Bi_2Te_3 in the temperature range of 298–498 K the addition of MWCNT increased the ZT value from 0.48 to maximum ZT value to 0.61 at 50ºC, while at 150ºC the ZT value was measured to be 0.35 and 0.43 for Bi_2Te_3 and MWCNT/Bi_2Te_3, respectively. It is considered that the enhancement of the thermoelectric performance of the composite mostly derived from the thermal conductivity, which is reduced by an active phonon-scattering at the MWCNT/Bi_2Te_3 interfaces.

Keywords: Thermoelectric; Composite alloys; MWCNT

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Adhesion Improvement between Polyethylene and Aluminium using Eco-Friendly Plasma Treatment

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Abstract

Lamina made of low density polyethylene (LDPE) and Aluminium (Al) is used widely in many applications, especially in food packaging (TetraPak containers). However, it's found that the adhesive bond between LDPE-Al is low due to the hydrophobic surface of LDPE. Therefore, there is a strongly need for surface modification of LDPE. Corona discharge, which is considered as an atmospheric pressure plasma technique was used in this research to treat LDPE surface by adding polar functional groups (e.g. hydroxyl, carbonyl, and carboxyl groups) into the exposed non-polar surface which led to increase surface free energy and then greater wettability and a smaller contact angle, and finally the adhesion between LDPE-Al improved significantly.

Keywords: Polyethylene; Polymer; Aluminum; Adhesion; Plasma

For citation: AlGunaid T. A.H., Popelka A., "Adhesion Improvement between Polyethylene and Aluminium Using Eco-Friendly Plasma Treatment", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0060

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A Preliminary Checklist of the Ants (Hymenoptera: Formicidae) of Qatar

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Abstract

The State of Qatar is a small peninsula located in the northeastern part of the Arabian Peninsula. It is classified as a subtropical desert with an extreme harsh climatic conditions in summer and mild winter. Information on Formicidae of Qatar as well as its insect fauna is poorly documented. So far only six species of Formicidae (ants) belonging to five genera have been recorded from Qatar. At least 300 ant species have been recorded from the Arabian Peninsula (Collingwood et al., 2011). For instance, Collingwood and Agosti (1996) reported a list of 265 ant species in Saudi Arabia. Moreover, Collingwood et al. (2011) published a list of 126 ant species in UAE and Sharaf et al. (2018a) recorded 123 ant species from Oman. This indicates a significant gap regarding our knowledge of the ant fauna and their diversity in Qatar. This study provides the first taxonomic survey of the ant fauna of Qatar. Ant specimens were collected by using aspirator, direct hand collection, litter sifting and pitfall traps during the period of April 2015 to March 2019 from 43 sites around the country. In the present study, 45 species are newly recorded for the ant fauna of the state of Qatar increasing the total number of ant species from Qatar to 51 species, including one additional subfamily, and 16 additional genera.

Keywords: Arabian peninsula; Palearctic region; Formicidae; New records; Qatar

For citation: AlHajri S., Agosti D., "A preliminary checklist of the ants (Hymenoptera: Formicidae) of Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0061

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Fabrication of Flexible Electrically Conductive Polymer Based Micro-Patterns using Plasma Discharge

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Abstract

The application of polymer-based micro-patterns in the field of flexible micro-electronics has become the focus as to replace rigid and planar silicon based integrated circuits with weak bendability. Polyethylene terephthalate (PET) can be used as a substrate because of its excellent flexible and mechanical properties and polyaniline (PANI) is a typical representative of the electrical conductive polymers applicable for this purpose. PANI excels by a stable and controllable electrical conductivity, high environment stability, and ease fabrication. An improvement of electrical conductivity of PANI can be achieved using different nano-particles, such as carbon nanotubes (CNTs). CNTs since their discovery have attracted attention due to their excellent electrical, thermal, and mechanical properties, and had divergent applications, such as complex nano/micro-electronic devices, energy storage and both chemical and bio sensors. This research was focused on the preparation of micro-patterns based on electrically conductive PANI using shaping mold and cold plasma acting as adhesion promoter for PET substrate. The PANI/CNTs nano-composite was used to enhance an electrical conductivity of prepared micro-patterns. The adhesion of prepared micro-patterns was evaluated based on the peel tests measurement. Various microscopic techniques, such as profilometry, scanning electron microscopy and atomic force microscopy (AFM), proved the homogeneous structures of prepared polymer based micro-patterns. Broad dielectric spectroscopy and conductive AFM confirmed electrical behavior of prepared micro-patterns.

Keywords: Polyethylene terephthalate (PET); Plasma; Flexible micro-electronics

For citation: Abdulkareem A.A., Popelka A., Bhadra J., "Fabrication of flexible electrically conductive polymer based micro-patterns using plasma discharge", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0062

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Overview of Polymers for Improved Oil Recovery Treatments

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Abstract

High water production in oil and gas wells reduces significantly the recovery factor. Mechanical as well as chemical methods are applied to shut off water productive zones. Crosslinked polymers showed high efficiency to seal off water zones in high permeability sandstone and fractured carbonate reservoirs. Moreover, emulsified polymeric formulations have been introduced for deep profile modification by changing the wettability of the rock and hence allowing selective plugging of water. This poster provides an overview of the polymeric formulations used for such application.

Keywords: Water shutoff; Polymer engineering; Oilfield chemistry; Conformance control; Improved oil recovery

For citation: Shamlooh M.S., Hamza A., Hussein I., Nasser M., Salehi S., "Overview of Polymers for Improved Oil Recovery Treatments", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0063

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Development of Polymer Modified Graphene Oxide Nanocomposite Membranes to Reduce both Scaling and Biofouling

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Abstract

In seawater reverse osmosis (SWRO), membrane scaling is one of the major issues affecting its widespread application in the desalination industry. In this research, the effect of concentration of calcium and sulfate ions from 20 to 150 mM and temperature from 5 to 35□C on calcium sulfate scaling of reverse osmosis (RO) and Graphene oxide functionalized RO membranes was investigated. It was found that increase of concentration as well as temperature enhances the mineral scaling, where morphology of crystals varies from rod shaped to rosette structures. It was also observed that commonly found seawater bacteria can use antiscalants as an energy/carbon source thereby degrading them and reducing their efficiency to reduce mineral scaling. Moreover, bacteria were found to be capable of inducing/mediating calcium sulfate precipitation on RO membranes, further enhancing the mineral scaling. Therefore, it was important to modify RO membranes capable of simultaneously reduce both mineral scaling and biofouling. For this purpose, RO membrane was modified with antibacterial graphene oxide and polymer antiscalants using microwave radiation technique. It was found that the modified membranes were able to inhibit microbial growth up to 95%, while, mineral scaling was also reduced by 97%. Hence, it was concluded that the coating of polymer modified graphene oxide nanocomposites on RO membranes can simultaneously reduce both biofouling and scaling. So far, such dual characteristics of modified membranes have not been reported in the literature.

Keywords: Biofouling; Scaling; Reverse osmosis; Graphene oxide; Antiscalants

For citation: Ashfaq M.Y., AlGhouti M., Zouari N., Qiblawey H., "Development of Polymer Modified Graphene Oxide Nanocomposite Membranes to Reduce both Scaling and Biofouling", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0064

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Investigation and Biological Control of Toxigenic Fungi and Mycotoxins in Dairy Cattle Feeds

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Abstract

Mycotoxins, the secondary fungal metabolites are important contaminants of food and feed. Among the other contaminants, aflatoxin B1 (AFB1) and OTA are frequently detected in the animal feed product. In the present study, the mixed dairy cow feed products were collected from the supermarkets in Qatar and analyzed for the presence of AFB1 and OTA. Yeast strains were isolated and tested for their biological control activities against aflatoxigenic and ochratoxin fungi. We demonstrated that local 15 yeasts isolates have important antifungal potential activities through the synthesis of volatile organic compounds (VOC) that are able to act against the mycotoxigenic fungi and their synthesis of the mycotoxins. Two Yeast strains (4&2) isolated from fermented food, have shown a great antifungal inhibition growth in-vitro as well as spores inhibition and mycotoxins synthesis.

Keywords: AFB1; OTA; VOC

For citation: Alasmar R.M., Jaoua S., "Investigation and Biological Control of Toxigenic Fungi and Mycotoxins in Dairy Cattle Feeds", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0065

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Novel Method for the production of Water from Humid Environment of Qatar

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Abstract

Water scarcity is the major challenge of the upcoming decades for the entire world. Middle eastern nations are prone to water scarcity due to very less rainfall, scarce fresh water sources, sandy surroundings and harsh humid climatic conditions. Qatar being the leader of natural gas production suffers from the same problem of pure and clean water. Water desalination techniques adopted so far are energy intensive and unknown to oceanic habitat. The use of vapor compression cycle for the condensation of atmospheric water vapor has various limitations such as complex machinery, high power consumption and periodical maintenance. This novel method utilizes heavy humid conditions of Qatar to obtain water from the atmosphere through Peltier Effect. This method uses the dissimilarity of the conductors in the electric circuit such that the current is made to flow through the circuit and the heating and cooling effects are generated at the junctions where cooling temperature of the junction can be achieved below the dew point temperature thus forming the dew which is collected in the closed container as condensed atmospheric water. This technique is superior to other conventional methods of water production due to its cost efficiency, energy saving, simple machinery and portability of the entire system.

Keywords: Water purification; Peltier device; Water generator

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Full-Scale Seawater Reverse Osmosis Desalination Plant Simulator

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Abstract

Reverse Osmosis (RO) is an efficient and clean membrane-based technology for water desalination. This work presents a full-scale seawater reverse osmosis (SWRO) desalination plant simulator using MATLAB/Simulink that has been validated using the operational data from a local plant. It allows simulating the system behavior under different operating conditions with high flexibility and minimal cost.

Keywords: Desalination; Simulator; Reveres osmosis

For citation: Siddiqui H., Elnour M., Meskin N., Zaidi S., "Full-Scale Seawater Reverse Osmosis Desalination Plant Simulator", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0067

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Linking Soil Chemical Parameters and Fungal Diversity in Qatar

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Abstract

Given the vast expanse of Qatar's dryland ecosystems, agricultural productivity and soil stability is highly dependent on the diversity of soil microbiota. The soil environment is a heterogeneous habitat shaped by various components like chemical (organic matter, salinity and nutrients) and biological (fungal diversity and vegetation) properties that form multitudes of different microhabitats. Soil microbial diversity changes along environmental gradients. It is hypothesized that a "stable" microhabitat is one that is inhabited by a large diversity of established microorganisms that are best adapted to the niche. Microorganisms like fungi serve as the underlying biological drivers for biochemical processes within the soil. The key objective of this study is to evaluate the fungal diversity and abundance present within the Qatari soil using molecular-based tools and evaluate potential relationships between the identified fungal communities with chemical properties of the habitat. We found that the composition of fungi and AMF varied between different habitats around Qatar. Despite the lack of significant differences in the measured soil chemical parameters between sampled sites, it is evident that AMF species are more abundant than compared to that of other fungal species in most of the study sites; thus, suggesting that other factors like land use may also be an essential component explaining the variation in fungal communities.

Keywords: Fungal community; Soil microbiota; Culture-independent method; Metagenomics

For citation: Adenan S., Oja J., AbdelFattah T., Alatalo J., "Linking Soil Chemical Parameters and Fungal Diversity in Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0068

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The use of Principle Component Analysis and MALDI-TOF MS for the differentiation of mineral forming Virgibacillus and Bacillus species isolated from Sabkhas

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Abstract

Occurrence of mineral forming and other bacteria in mats is well demonstrated. However, their high diversity shown by ribotyping was not explained, although it could explain the diversity of formed minerals. Common biomarkers as well as phylogenic relationships are useful tools to clustering the isolates and predict their potential role in the natural niche. In this study, combination of MALDI-TOF MS with PCA was shown a powerful tool to categorize 35 mineral forming bacterial strains isolated from Dohat Fshaikh sabkha, at northwest of Qatar (23 from decaying mats and 12 from living ones). 23 strains from decaying mats belong to *Virgibacillus* genus as identified by ribotyping and are shown highly involved in formation of protodolomite and a diversity of minerals. They were used as internal references in categorization of sabkha bacteria. Combination of isolation of bacteria on selective mineral forming media, their MALDI TOF MS protein profiling and PCA analysis established their relationship in a phyloproteomic based on protein biomarkers including m/z 4905, 3265, 5240, 6430, 7765, and 9815. PCA analysis clustered the studied strains into 3 major clusters, showing strong correspondence to the 3 phyloproteiomic groups that were established by the dendrogram. Both clustering analysis means have evidently demonstrated a relationship between known *Virgibacillus* strains and other related bacteria based on profiling of their synthesized proteins. Thus, larger populations of bacteria in mats can be easily screened for their potential to exhibit certain activities, which is of ecological, environmental and biotechnological significance.

Keywords: Mineralization; Biodiversity; MALDI-TOF MS; PCA

For citation: Abdel Samad R., Al Disi Z., Ashfaq M., Zouari N., "The use of Principle Component Analysis and MALDI-TOF MS for the differentiation of mineral forming Virgibacillus and Bacillus species isolated from Sabkhas.", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0069

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Synthesis of High-Antifouling and Antibacterial Ultrafiltration Membranes incorporating Low Concentrations of Graphene Oxide

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Abstract

Membrane treatment for wastewater treatment is one of the promising solutions to affordable clean water. It is a developing technology throughout the world and considered as the most effective and economical method available. However, the limitations of membranes' mechanical and chemical properties restrict their industrial applications. Graphene Oxide (GO) is one of the materials that have been recently investigated in membrane water treatment sector. In this work, ultrafiltration polysulfone (PSF) membranes with high antifouling properties were synthesized by incorporating different loadings of GO. High-oxidation degree GO had been synthesized using modified Hummers' method. The synthesized GO was characterized using different analytical techniques including (FTIR-UATR), Raman spectroscopy, and CHNSO elemental analysis that showed high oxidation degree of GO represented by the its oxygen content (50 wt.%). Morphology and hydrophilicity of membranes were investigated using SEM, AFM and contact angle analyses and showed clear effect of GO on PSF morphology and better hydrophilicity of GO-based membranes caused by the hydrophilic nature of GO and its high oxygen content.

Separation properties of the prepared membranes were investigated using a cross-flow membrane system. Biofouling and organic fouling resistance of membranes were tested using bovine serum albumin (BSA) and humic acid (HA) as model foulants. It has been found that GO based membranes exhibit higher antifouling properties compared to pure PSF. When using BSA, the flux recovery ratio (FRR %) increased from 65.4 ± 0.9 % for pure PSF to 86.9 ± 0.1 % with loading of 0.1 wt.% GO in PSF. When using HA as model foulant, FRR increased from 87.8 ± 0.6 % to 95.6 ± 4.2 % with 0.1 wt.% of GO in PSF. The pure water permeability (PWP) decreased with loadings of GO from 181.7 $L.m^{-2}.h^{-1}.bar^{-1}$ of pure PSF to 181.1 and 167.4 $L.m^{-2}.h^{-1}.bar^{-1}$ with 0.02 and 0.1 wt.% GO respectively. Furthermore, GO based membranes exhibited effective antibacterial performance against Halomonas aquamarina compared to pristine PSF. It can be concluded from the obtained results that incorporating low loading of GO could enhance the antifouling and antibacterial properties of PSF hence improving its lifetime and reuse.

Keywords: Antifouling; Graphene oxide membranes; Polysulfone; Ultrafiltration; Water treatment

For citation: Alkhouzaam A.I., Qiblawey H., Khraisheh M., "Synthesis of High-Antifouling and Antibacterial Ultrafiltration Membranes Incorporating Low Concentrations of Graphene Oxide", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0070

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Micromodel Study on Pore Scale Mechanisms associated with Permeability Impairment in Porous Media

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Abstract

Recently, researchers have been attracted towards the gas production from hydrate bearing sediments considering its abundance in marine continental margins and persisting demand for alternate energy. Dissociation of hydrate into gas and water is the preliminary technique for gas production in hydrate bearing sediments. Expanded fluid volume and gas pressure upon dissociation detach the fines from the grain surface and result in pore throat entrapment. Migration of fines associated with gas flow greatly influence the alteration of permeability of the sediment by clogging pore throats in the flow path. A pore-scale visualization study was implemented to provide a clear insight into the actual mechanisms associated with mobilization and clogging of fines during two-phase flow through a microfluidic chip. Carboxylate modified polystyrene latex particles deposited in the porous media were migrated during drainage with CO2 gas. The detachment of fine particles from the grain surfaces was observed and were retained on the new interface; gas-water interface. The images and videos captured during the experiment were helpful in observing additional pore scale mechanisms responsible for permeability impairment in the porous media. Interface pinning, deformation and resistance to coalescence were found to be other mechanisms in addition to pore clogging.

Keywords: Permeability; Porous media; Fine migration; Pore-scale mechanisms

For citation: Nishad S., AlRaoush R., "Micromodel Study on Pore Scale Mechanisms Associated with Permeability Impairment in Porous Media", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0071

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Developing an Interactive Data Visualization Platform to Present the Adaption of Electrical Vehicles in Washington, California and New York

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Abstract

This paper is an overview of using data visualization tools to provide a better insight into a large amount of data and represent the data in a visualized form. The used data is related to electric vehicles (EV) usage in three different states in the USA, which are California, New York, and Washington. The data was collected from reliable resources to assure the reliability and accuracy of the results, then compiled as a Microsoft Excel workbook, which was then used as a data recourse in Microsoft Power BI. By visualizing the data we will end up with rich visuals which will clarify the data for the end-user. After analyzing the data, a clear vision created and recommendations have been suggested.

Keywords: Data visualization; Electric vehicles; Microsoft power PI; Sustainability; USA

For citation: Ayad H.A., AlObadi M.A., AlKilani L.A., Hussein H.T., Arshad Ra., Kucukvar M., "Developing an Interactive Data Visualization Platform to Present the Adaption of Electrical Vehicles in Washington, California and New York", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0072

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Polymer Nanocomposite-based Moisture Sensors for Monitoring of the Water Contents in the Natural Gas Pipelines

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Abstract

In this study, the polymer-based humidity sensors were investigated for humidity sensing applications. The key advantages of polymers that have garnered this attraction are their lightweight, easy preparation, and low cost of both materials and fabrication process. Different techniques are used to enhance the surface morphology and sensitivity of polymeric films, which include synthesis of nanocomposites, copolymerization techniques, and blending of polymers. The incorporation of nanoparticles to the polymer matrix improves the electrical and mechanical properties of the polymeric film. We have investigated different polymer nanocomposites based humidity sensors on enhancing the sensitivity of the sensor, on achieving faster response and recovery time and lower hysteresis loss as compared to the polymeric humidity sensors. In the first phase, we investigated the PLA-TiO_2 nanocomposite for humidity sensing applications. We have optimized the concentration of TiO_2 in the PLA-TiO_2 nanocomposite and apply acetone for the surface treatment of the sensing film. In the second phase, we studied the PVDF-TiO_2 nanocomposite-based humidity sensor, achieved a linear response of the sensor, and optimized the concentration of PVDF. In the third phase, we incorporated the $BaTiO_3$ nanoparticles within optimized PVDF and studied the dielectric property of the nanocomposite film. PVDF-$BaTiO_3$ sensors show a smaller hysteresis response. In the 4th phase, we blend the PVDF with SPEEK polymer; the optimized concentration of SPEEK improves the sensitivity of the humidity sensors at a lower humidity level.

Keywords: Polymer; Nanoparticles; Sensitvity; Humidity; Sensor

For citation: Mallick S., Ahmad Z., Touati F., "Polymer Nanocomposite-based Moisture Sensors for Monitoring of the Water Contents in the Natural Gas Pipelines", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0073

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Approaches to achieve Sustainable use and Management of Groundwater Resources in Qatar

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Abstract

This paper reviews the hydro-geochemical characterization of Qatar's aquifer. In addition, it highlights the opportunities in the current groundwater management practices to achieve a sustainable groundwater use in Qatar such as assessing and monitoring the groundwater quantity and quality. In this review article, the Driver-Pressure-State-Impact-Response framework is used to analyze the water resource system in Qatar; begins by describing the causal chain from driving forces of impacts and finally state the responses. As the main driver is the intensive use of groundwater for agriculture irrigation, this causes high pressure on groundwater abstraction and deteriorate the state of the groundwater environment in term of quantity and quality, which has an impact on the food and water supply demands. Therefore, the final response highlights the need for the enhancing the rainfall infiltration to the aquifers, recharging the groundwater aquifers using treated sewage effluent or desalinated water development of groundwater treatment techniques, the use of efficient water irrigation practices, the reuse of treated wastewater for irrigation and the development of certain water-use tariff structures and awareness campaigns for farmers.

Keywords: Groundwater; Sustainable use and management; Groundwater resources in Qatar

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Assessment of Tarmat Contamination and its Chemical Characterization along the West Coast of Qatar, Arabian Gulf

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Abstract

Tarmat/Oil residue (hereafter 'TM') is one of the serious threats to the marine ecosystem due to their toxicity, persistence and bioaccumulation problems. To assess the level of TM contamination and to determine the primary differences in the chemical composition, a sampling campaign was conducted in 12 beaches along the west coast of Qatar. TM contamination ranged from 0 to 104 gm-1 with an average value of 9.25 gm-1. Moreover, all the TM samples were found to be highly weathered, blackish and asphalt-like material. Though the current TM pollution level is thirty-fold lesser than those found during 1993 to 1997, the contamination pattern was similar (i.e. northwestern part was highly contaminated). The distribution of TM along the Qatar coast is as follows: Low tide> high tide> berm line. Attenuated Total Reflectance Fourier Transform Infrared (ATR-FTIR) spectroscopy was used to examine the bulk chemical characteristics of the TMs. These bulk chemical characteristics have revealed several features unique to different types of TM samples.

Keywords: Tarmat; Pollution; ATR-FTIR; Qatar

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Development of In-Situ Sensors for CO2 to Fuel Process

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Abstract

Conversion of CO2 into fuel is an interesting and promising field. However, the conversion yield is hard to measure during the conversion process. Here, we have developed two techniques to measure the amount of CO2 while the reaction is taking place. First method is colorimetry, where a chemical is added to the solution, and it changes color depending on the resulting product. The second method is the atomization of the resulting solution. Thereafter, the results were measured by a gas sensor. The prepared sensors are cost effective and portable to use.

Keywords: CO2 conversion; Colorimetric sensors; Atomization sensors

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Operational Performance and Safety Assessment of Signalized Roundabouts

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Abstract

Roundabouts are widely used to reduce the severity of conflicts at intersecting roads. While they tend to provide an acceptable level of traffic operation, their operational benefits are reduced when traffic demands increase. One possible and economic mitigation is to convert the roundabouts into signalized ones to accommodate the demand increase and to further reduce the conflicts. This conversion will allow the roundabouts to perform both functions (safety and operational) within acceptable levels. Accordingly, proper signal timing parameters are often required to achieve the anticipated safety and operational levels. Unlike the operational performance of signalized intersections that can be easily assessed based on field measurements, safety assessment is far more difficult due to the need of historical crash data, which would potentially take years. This study presents the use of traffic simulation to assess the operational performance as well as the safety performance of signalized intersections. At first, a well-calibrated model of a signalized roundabout located in the city of Doha is built in microscopic traffic simulation environment based on field measurements and observations. Secondly, Surrogate Safety Assessment Method (SSAM) is used to analyze the simulated vehicular trajectories to identify the type and severity of conflicts. The results revealed that the implemented signal timing parameters have a significant impact on the safety functionality of the signalized roundabouts.

Keywords: Signalized roundabouts; Safety performance; Microsimulation; Surrogate safety assessment model

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Influence of Water Table Fluctuation on Natural Source Zone Depletion in Hydrocarbon Contaminated Subsurface Environments

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Abstract

Most of the prediction theories regarding dissolution of organic contaminants in the subsurface systems have been proposed based on the static water conditions; and the influence of water fluctuations on mass removal requires further investigations. In this study, it was intended to investigate the effects of water table fluctuations on biogeochemical properties of the contaminated soil at the smear zone between the vadose zone and the groundwater table. An automated 60 cm soil column system was developed and connected to a hydrostatic equilibrium reservoir to impose the water regime by using a multi-channel pump. Four homogenized hydrocarbon contaminated soil columns were constructed and two of them were fully saturated and remained under static water conditions while another two columns were operated under water table fluctuations between the soil surface and 40 cm below it. The experiments were run for 150 days and relevant geochemical indicators as well as dissolved phase concentrations were analyzed at 30 and 50 cm below the soil surface in all columns. The results indicated significant difference in terms of biodegradation effectiveness between the smear zones exposed to static and water table fluctuation conditions. This presentation will provide an overview of the experimental approach, mass removal efficiency, and key findings.

Keywords: Water table fluctuation; Hydrocarbon degradation; Biodegradation

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Development of PLA Fibers as an Antimicrobial Agent with Enhanced Infection Resistance using Electrospinning/Plasma Technology

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Abstract

Humans are vulnerable and easily prone to all kind of injuries, diseases, and traumas that can be damaging to their tissues (including its building unit, cells), bones, or even organs. Therefore, they would need assistance in healing or re-growing once again. Medical scaffolds have emerged over the past decades as one of the most important concepts in the tissue-engineering field as they enable and aide the re-growth of tissues and their successors. An optimal medical scaffold should be addressing the following factors: biocompatibility, biodegradability, mechanical properties, scaffold architecture/porosity, precise three-dimensional shape and manufacturing technology. There are several materials utilized in the fabrication of medical scaffolds, but one of the most extensively studied polymers is polylactic acid (PLA). PLA is biodegradable thermoplastic aliphatic polyester that is derived from naturally produced lactic acid. PLA is characterized with its excellent mechanical properties, biodegradability, promising eco-friendly, and excellent biocompatibility. PLA can be fabricated into nanofibers for medical scaffolds used through many techniques; electrospinning is one of the widely used methods for such fabrication. Electrospinning is a favorable technique because in the preparation of scaffolds, some parameters such as fiber dimensions, morphology, and porosity are easily controlled. A problem that is associated with medical scaffolds, such as inflammation and infection, was reported in many cases resulting in a degradation of tissues. Therefore, a surface modification was thought of as a needed solution which mostly focuses on an incorporation of extra functionalities responsible for the surface free energy increase (wettability). Therefore, plasma technique was a favorable solution for the surface treatment and modification. Plasma treatment enables the formation of free radicals. These radicals can be easily utilized for grafting process. Subsequently, ascorbic acid (ASA) could be incorporated as anti-inflammatory and anti-infection agent on the plasma pretreated surface of scaffolds.

Keywords: PLA; Fibers; Antimicrobial agent

For citation: Mahmoud A., Naser M., Abdelrasool M., Jama K., Hussein M., Abdulkareem A., Kasak P., Popelka A., "Development of PLA Fibers as an Antimicrobial Agent with enhanced infection resistance using electrospinning/plasma technology", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0079

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Pilot Scale Osmotic Concentration Process for Reducing Wastewater Volumes from Gas Processing Facilities in Qatar

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Abstract

Over the past 10-15 years, there has been increasing attention in the development of forward osmosis (FO) technology as a low-energy technical solution to wastewater treatment through the exploitation of the natural osmosis phenomenon across semi-permeable membrane. The significant energy benefit arises in applications where direct recovery of the permeate product from the draw solution (DS) is obviated such as in osmotic concentration (OC) process. In the current research, an OC FO-based pilot-scale unit was applied for wastewater volume reduction from oil and gas processing facilities in Qatar. The pilot unit uses seawater of 40 g/L salinity as a DS and wastewater generated during oil and gas operations as a feed. This feed water is of comparatively low conductivity (2 g/L salinity), making it unusually suited to treatment by OC. Based on FO technology principles, the feed gets concentrated at lower volume with the water permeation through the membrane, meanwhile the water transfer to DS side dilutes it. The diluted DS could be directly discharged into the ocean; so the energy intensive step of DS recovery is entirely eliminated. Two FO membranes (Toyobo and NTU) of hollow fiber configuration were tested to assess their performance and fouling propensity on both synthetic and real wastewaters. Results demonstrated that the membrane-based process can achieve feed water recoveries up to 90% without any scaling issues. Achieved water flux ranges between 1.5 to 12 LMH for feed recoveries between 60 and 90% using a constant dilution rate of the draw solution. Above all, the pilot unit maintained stable water flux of 1.62 and 6 LMH using at 75% feed recovery for over 48 hours of continuous operation Toyobo and NTU membranes respectively.

Keywords: Forward osmosis; Osmotic concentration; Wastewater treatment

For citation: Jalab R., Awad A.M., Nasser M.S., MinierMatar J., Adham S., "Pilot Scale Osmotic Concentration Process for Reducing Wastewater Volumes from Gas Processing Facilities in Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0080

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Shear Behavior of Fiber Reinforced Concrete Beams with Basalt FRP Reinforcing Bars and Glass FRP Stirrups

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Abstract

The State of Qatar suffers from a harsh environment in the form of high temperature that prevails almost all year round in addition to severe humidity and coastal conditions. This exposure leads to the rapid deterioration and the reduction of the life span of reinforced concrete (RC) infrastructure. The full functionality and safe use of the infrastructure in such environments can only be maintained by holistic approaches including the use of advanced materials for new construction.With the developments in materials science, the advanced composites, especially fiber reinforced polymer (FRP) materials are becoming viable alternatives to the traditional construction materials. Having superior durability against corrosion, versatility for easy in-situ applications and enhanced weight-to-strength ratios compared to their counterpart conventional materials, FRPs are promising to be the future of construction materials. More recently, FRP composites made of basalt FRP (BFRP) have been introduced as an alternative to traditional steel reinforcement at a price comparable to glass fibers of about $2.5–5.0 per kg, which is significantly lower than carbon fibers. BFRP bars are characterized by their corrosion resistance, greater strain at failure than carbon fibers, and better chemical resistant than glass fibers, particularly in a strongly alkaline environment. Knowing that FRP bars are anisotropic materials with weaker strength in the transverse direction compared with the longitudinal direction, and having a relatively low modulus of elasticity compared with steel reinforcement, it is important to investigate the concrete contribution to shear strength for beams reinforced with BFRP bars. In addition, due to the elastic performance of the FRP reinforcing bars compared with steel bars, FRP bars fail in a brittle manner. Moreover, concrete itself is a brittle material. Previous investigations have shown that using discrete fibers in concrete increases its ductility due to the large compressive strains exhibited at failure. Therefore, basalt macro-fibers is proposed in this study.

A total of 14 concrete beam specimens were tested under four point loading until failure. The parameters investigated included the reinforcement ratio (2rb, 3.1rb, and 4.53rb, where rb is the balanced reinforcement ratio), the span to depth ratio (a/d=2.5, and a/d=3.3), the spacing between stirrups (S1=170mm, and S2=250mm) and the basalt fiber volume fraction (0%, 0.75% and 1.5%).
Test results clearly showed that both BFRP bars and basalt macro-fibers can be used as sustainable and eco-friendly alternative materials in Concrete Structures in Qatar.

Keywords: Basalt FRP bars; Glass FRP stirrups; Shear performance; Basalt macro-fibers

For citation: ALHamrani A., Alnahhal W., "Shear Behavior of Fiber Reinforced Concrete Beams with Basalt FRP Reinforcing Bars and Glass FRP Stirrups", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0081

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Synthesis and Characterization of Ni-P/Tic Composite Coating through one Step Co-Electrodeposition

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Abstract

Coatings are considered to be a promising solution for the corrosion and wear in various industries. NiP coatings are well known for their anticorrosive behavior but lack mechanical strength. In present study, the effect of sub microscale TiC particles on the structural, morphological, mechanical and electrochemical analysis of Ni-P/TiC coating were carried out through X-ray diffraction(XRD), scanning electron microscopy (SEM), atomic force microscopy (AFM), Vickers microhardness, nanoindentation and potentiodynamic polarization test on Gamry. Co-electrodeposition of the Ni-P/TiC with varying the composition of TiC namely 0.5, 1.0, 1.5 and 2.0g/L. The depostion conditions were optimized for pH, temperature and current density. The surface morphology of coat represents nodular structure with TiC particles embedded in it without any defects. Structural analysis proves the amorphous nature of the coating. Vickers microhardness is observed to increase with the composition and attains highest value at 1.5g/L of TiC in the chemical bath. Nanoindentation results are in agreement with the hardness result. Thus, improvement in mechanical properties of the Ni-P coating is achieved without affecting its corrosion resistance.

Keywords: Electrodeposition; Mechanical properties; Morphology; Structure

For citation: Fayyaz O., Shahzad K., Qureshi T., Fatima I., Shakoor A., Mahdi ElSadig "Synthesis and characterization of Ni-P/TiC composite coating through one step co-electrodeposition", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0082

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Preparation and Characterization of Fe3O4 nanoparticles and its application in Produced Water Treatment and Oil Recovery

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Abstract

Recently, considerable amounts of oil were produced from petroleum industries and lead to serious environmental problems. In this study, Fe_3O_4 (MNPs) were prepared using combustion synthesis method at temperature range from 150 to 350ºC and then applied with different concentrations to the oil/water emulsion. The synthesized MNPs were characterized using various analytical techniques, and their demulsification efficiencies were then evaluated. Results showed that the application of these nanoparticles could significantly improve the efficiency of the demulsification process, Furthermore, the prepared MNPs were still effective after being recycled for 4 cycles and give oil removal about 90%.

Keywords: Oil in water emulsion; Fe3O4 (Mnps); Demulsification efficiency

For citation: Faisal W., Almomani F., "Preparation and Characterization of Fe3O4 nanoparticles and Its Application in Produced Water Treatment and Oil Recovery", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0083

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Parametric Study on Moment Redistribution of Fiber Reinforced Concrete Continuous Beams with Basalt FRP Bars

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Abstract

The state of Qatar is suffering from its harsh environment and coastal conditions, which stand for most of the year. As a result, steel-reinforced concrete structures are subjected to rapid corrosion and deterioration. Therefore, there is a necessity to replace the conventional steel reinforcement by fiber-reinforced polymers (FRP) bars. Apart from FRP bars corrosion resistance, their strength to weight ratio is higher than steel reinforcement, which made the FRP, bars a viable alternative to steel reinforcement. Continuous concrete beams are commonly used elements in structures such as parking garages and overpasses. In such structures, forces could be distributed between the critical sections after cracking. This phenomenon is called moment redistribution. It reduces the congested rebars in connections and enhances the ductility of the members. However, the linear-elastic behaviour of FRP materials makes the ability of continuous beams to redistribute loads and moments questionable.

This study aims to investigate the capability of moment redistribution of basalt fiber reinforced concrete (BFRC) continuous beams reinforced with basalt FRP (BFRP) bars. Eleven reinforced concrete (RC) continuous beams of 200 x 300 x 4000 mm were tested up to failure under five-point loading. The main investigated parameters were the reinforcement ratio (0.6rb, 1.0rb, 1.8rb and 2.8rb; where rb is the balanced reinforcement ratio), stirrups spacing (80 and 120 mm) and volume fractions of Basalt-macro fibers (BMF) (0.75 and 1.5%).

A parametric study was then conducted using a validated finite element (FE) model to extend the investigated parameters that may affect the moment redistribution of RC continuous beams. It was concluded that moment redistribution occurs in beams that have at least a ratio of bottom to top reinforcement of 0.3.

Keywords: Fiber reinforced polymers; Continuous concrete beams; Moment redistribution; Finite element model

For citation: Abushanab A.H., Alnahhal W., "I Parametric study on moment redistribution of fiber reinforced concrete continuous beams with basalt FRP bars", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0084

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Power Electronic Converter for Efficient Home Energy Management

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Abstract

The residential and commercial buildings are going green to reduce the carbon footprint. To improve the energy efficiency of the buildings, the Internet of Things can be used in conjunction with power electronic converters to improve the performance of energy efficient buildings. The distributed generation for the buildings mainly consists of battery energy storage, wind generator, solar PV panels along with the national utility grid. So, the power/energy from renewable sources can be efficiently managed by the power electronics converter. Mainly the power electronic converters are two categories one for the energy utilization side and the second is the generation, transmission, and distribution of the electrical energy. The power electronic converter has been developed to address the multiple source's communications at the central converter, which reduces the utility bill payment to the energy (grid) suppliers and depends fully on the renewable energy sources along with the battery energy storage. To achieve this a novel power electronic converter has been proposed. This directly connects the PV panels with the semiconductor devices, passive components like inductors and capacitors along with the battery energy storage. The resultant output is directly feeding o the utility grid and simultaneously commercial home. A detailed mathematical analysis has been carried out along with the novel switching algorithm has been proposed. The simulation is performed in the MATLAB Simulink to validate the operation/working of the proposed converter. An experimental prototype 500 watt has been developed to test the mathematical validity and a suitable control algorithm has been developed for the proper operation.

Keywords: Pulse with modulation; Distributed power generation; PV (photovoltaic); Power electronics; Energy efficient

For citation: Meraj M., Iqbal A., Nasser M.A.E., "Power Electronic Converter for Efficient Home Energy Management", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0085

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Dimmable LED Driver For DC Distributed Lighting System

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Abstract

This abstract proposes a high brightness, high efficiency, dimmable LED driver based on linear current regulator technology for DC grid distribution systems. The proposed driver has excellent characteristics like the highest lumen per watt, long lifetime, high reliability, compact, low cost, both environmental and user-friendly which makes it suitable for lighting applications. Steady state and small-signal models of the proposed driver are performed which help in minimizing ground current and accurate compensator design, respectively. These two modeling approaches result in the optimization of both the footprint and cost of the driver. The performance of the proposed experimental prototype of the 20W driver is developed to validate the performance at different dimming levels and achieves maximum efficiency of 97%. The applications of the proposed converter are: dimmable home lighting system, advertisement boards and hoardings, industrial lighting systems, road transport indication lamps, indoor and outdoor stadium lighting, automatic street lighting, decorative systems, health appliances and auditoriums and many more.

Keywords: Dimming; Light emitting diode, DC distribution; Electronic circuit; Bjt

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Cantilever Beam Metastructure for Active Broadband Vibration Suppression

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Abstract

This paper presents a beam structure of a new metamaterial-inspired dynamic vibration attenuation system. The proposed experimental research presents a designed cantilevered zigzag structure that can have natural frequencies orders of magnitude lower than a simple cantilever of the same scale. The proposed vibration attenuation system relies on the masses places on the zigzag structure thus changing the dynamic response of the system. The zigzag plates are integrated into the host structure namely a cantilever beam with openings, forming what is referred to here as a metastructure. Experimental frequency response function results are shown comparing the response of the structure to depending on the natural frequency of the zigzag structures. Results show that the distributed inserts in the system can split the peak response of the structure into two separate peaks rendering the peak frequency a low transmission frequency. These preliminary results provide a view of the potential of research work on active-controlled structures and nonlinear insert-structure interaction for vibration attenuation.

Keywords: Vibration attenuation; Metastructures; Cantilever beam; Frequency-response-function

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Effects of Current, Electrodes Spacing and Operational Time on the Removal of Heavy Metals from Primary Treated Municipal Wastewater using Dielectrophoresis

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Abstract

Electrocoagulation (EC) is an emerging technology that has been used to treat heavy metals from different kinds of wastewater. This paper discusses the effects of inducing Dielectrophoretic (DEP) force in EC system for the treatment of heavy metals from primary treated municipal wastewater. In order to achieve the optimum run of DEP, COMSOL software was used to identify the highest force that can be obtained by changing electrodes spacing and applied current. As per the results obtained from experiments and numerical methods, the optimum run was at operational time of 30 min, electrodes spacing of 0.5 cm and applied current of 600 mA (17.14 mA/cm2 current density). In both process aluminium electrodes were used and they were connected to alternative current (AC) power supply. The efficiency of AC-DEP was found to be better than AC-EC. The removal efficiencies of Fe and Mn using AC-DEP were 80.6% and 29.7% respectively, while AC-EC removed 78.23% of Fe and 28.8% of Mn. Moreover, the increase in the aluminium content using AC-DEP and AC-EC was 810.3% and 1330.8% respectively. Furthermore, the energy consumption of AC-DEP was 4.9 kWh/m3 while AC-EC consumed 5kWh/m3.

Keywords: Electrocoagulation; Dielectrophoretic; Wastewater

For citation: Almukdad A.I., Alfahel R.A.F., AlHawari A., "Effects of current, electrodes spacing and operational time on the removal of heavy metals from primary treated municipal wastewater using dielectrophoresis.", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0088

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Development of Sustainable Eco-friendly Geopolymer Composites for Construction Applications

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Abstract

Geopolymerization is a process where silica and alumina rich source materials turns into excellent binding materials by the aid of alkali solutions. Materials such as fly ash are by-products in energy power plants. Fly ash is classified based on its constituent materials. Fly ash class F mainly consists of alumina and silica. Compressive strength of class F fly ash geopolymer mortar is influenced by many factors such as the molarity of sodium hydroxide solution, fluid to binder ratio, Na2SiO3/NaOH ratio, curing duration and curing temperatures. The present study investigates the effect of these factors on the compressive strength of geopolymer mortar. For each combination, three cubes with dimensions of 50 x 50 x 50 mm were casted. After heat curing in the laboratory oven, the samples were tested on a universal testing machine for the compressive strength.

The results showed very high early compressive strength of 63.9 MPa for samples cured at 80 °C and for a duration of 24 hr.

Keywords: Geopolymer; Fluid to binder ratio; Activator solution; Eco-friendly mortar

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A Novel Modified Switched Inductor Boost Converter with Reduced Switch Voltage Stress

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Abstract

DC-DC power converters are necessary to step-up the voltage or current with high conversion ratio for many applications e.g. photovoltaic and fuel cell energy conversion, uninterruptible power supply, DC microgrid, automobile, high intensity discharged lamp ballast, hybrid vehicle, etc. in order to use low voltage sources. In this project, a modified SIBC (mSIBC) is proposed with reduced voltage stress across active switches. The proposed mSIBC configuration is transformer-less and simply derived by replacing one diode of the classical switched inductor structure with an active switch. As a result, mSIBC required low voltage rating active switches, as the total output voltage is shared between two active switches. Moreover, the proposed mSIBC is low in cost, provides higher efficiency and required the same number of components compared to the classical SIBC. The experimental results are presented which validated the theoretical analysis and functionality, and the efficiency of the designed converter is 97.17%. The proposed mSIBC converter provides higher voltage conversion ratio compared to classical converters e.g. boost, buck-boost, cuk, and SEPIC. The newly designed configurations will aid the intermediate power stage between the renewable sources and utility grid or high voltage DC or AC load. Since, the total output voltage is distributed among the two active switches, low voltage rating switches can be employed to design the power circuit of the proposed converter. The classical boost converter or recently proposed switched inductor based boost converter can be replaced by the proposed mSIBC converter in real-time applications such as DC microgrid, DC-DC charger, battery backup system, UPS, EV, an electric utility grid. The proposed power circuitry is cost effective, compact in size, easily diagnostic, highly efficient and reliable.

Keywords: DC-DC converter; High voltage conversion ratio; Switched inductor boost (SI-B) converter; Transformer-less; Voltage stress reduction

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Biological Control of Mycotoxigenic Fungi and Ochratoxin by the In-Vitro Application of a Qatari Burkholderia cepacia Strain (QBC03)

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Abstract

Mycotoxins are secondary metabolites synthesized by mycotoxigenic fungi belonging mainly to three major fungal genera that are *Aspergillus*, *Fusarium* and *Penicillium.* The latter mycotoxigenic fungi contaminate plants and different food commodities and cause various health concerns (carcinogenicity, mutagenicity, nephrotoxicity, etc...) due to their corresponding mycotoxins. One of the most studied mycotoxins is ochratoxin A (OTA) owing to its toxicity level (classified in 2B group as possible human carcinogenic). To remediate the mycotoxins' contamination, physical and chemical techniques can be proposed. However, the safest among all is the biological control approach. In this research, we have used the Qatari strain *Burkholderia cepacia* (QBC03) as a biological agent against mycotoxigenic fungi and the strain has possessed a wide antifungal spectrum against 21 species from different genera. Additionally, the antifungal activity of QBC03's supernatant was explored on the fungal biomass and OTA synthesis of *A. carbonarius* in liquid media, and interestingly; both the biomass and OTA's concentrations were massively reduced upon treatment. The effect of QBC03's supernatant on the fungal spores' germination was examined as well, and it was shown that the conidial germination was completely inhibited. Moreover, the supernatant of QBC03 has induced morphological alteration in the mycelia of the fungal strain. The thermal stability of the antifungal compounds in QBC03's culture supernatant was investigated, and it was shown that metabolites of QBC03 were distinctively thermostable and they were still active even when heated at 100C. The findings of this research prove that *Burkholderia cepacia* strain QBC03 is an excellent candidate for the biological control of mycotoxigenic fungi and their mycotoxins particularly in local regions.

Keywords: Ochratoxin A; Burkholderia cepacia; Qatari microflora; Food safety; Biological control

For citation: Zedan R.H., UlHassan Z., AlThani R., Migheli Q., Jaoua S., "Biological Control of Mycotoxigenic Fungi and Ochratoxin A by The In-Vitro Application of a Qatari Burkholderia cepacia Strain (QBC03)", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0091

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Biocontrol activities of Bacillus megaterium Volatile Organic Compounds (VOCs) against Mycotoxigenic Aspergillus, Penicillium and Fusarium fungi

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Abstract

Mycotoxins are secondary metabolites that are produced by toxigenic fungi once the temperature and humidity are appropriate. Mycotoxins are known to have adverse health effects. There are chemical, physical, thermal and biological tools for controlling fungi. Biological control tools are one of the recent to be investigated for inhibiting the growth of mycotoxigenic fungi. In this project, the effect of volatile organic compounds produced by a Qatari Bacillus Megaterium (QBM344-1) on the growth and mycotoxin production of toxigenic fungi from the genera of *Aspergillus, Fusarium and Penicillium*. Our findings demonstrate that Bacillus has a great potential in controlling the mycotoxigenic fungi by the production volatile organic compounds (VOCs). In addition, the VOCs of B. Megaterium has shown a significant effect in the inhibition of the mycotoxin's synthesis such as aflatoxins, fumonisins and ochratoxins by various mycotoxigenic fungal species (A. flavus, F. verticillioides and P. verrucosum). Interestingly, many VOCs produced by B. Megaterium were detected in GC-MS/MS including nitropropane which is known to possess an antifungal compound as peer to many studies. The findings of our project are substantial for the agricultural and food security future use since B. Megaterium is considered as a safe bacterium that exists naturally in the soil. The bacterial volatiles identified includes nitropropane, which is a known antifungal compound.

Keywords: Bacillus Megaterium; VOCs; Biocontrol; Mycotoxins; Mycotoxigenic fungi

For citation: Saleh A., Jaoua S., "Biocontrol Activities of Bacillus megaterium Volatile Organic Compounds (VOCs) Against Mycotoxigenic Aspergillus, Penicillium and Fusarium fungi", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0092

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Activity of Antibiotic Producing Bacteria Isolated from Rhizosphere Soil Region of Different Medicinal Plants

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Abstract

The rhizosphere soil of medicinal plants is rich in microorganisms that develop antibiotics as natural mechanism of protection against other microbes that live in their vicinity. The present study aims to explore the production of antibacterial agents from rhizosphere soil bacteria of 11 medicinal plants and determine their activity against Gram-negative (*Pseudomonas aeruginosa*, *Escherichia coli*) and Gram-positive (*Bacillus cereus*, *Staphylococcus aureus*) bacteria. Soil samples were collected and used to isolate antibiotic producing bacteria (APB). Those isolates (108) were first tested using Cross-streak method against test bacteria. Then, isolates that showed a positive antibacterial effect (12) were tested by antibiotic susceptibility test (AST) of their cell free supernatant (CFS) and their extracellular and intracellular secondary metabolites extraction which gave positive results. *Staphylococcus aureus* found to be the most sensitive test bacteria with inhibitory zones ranging from 13.5 - 19 mm. Moreover, combinatorial effect of isolates CFS with two organic acids (3% Acetic acid and 0.4 mg/ml Acetylsalicylic acid), two commercial antibiotics (0.016 mg/ml Augmentin and 0.128 mg/ml Doxycycline), and two pure antibiotics (10 mcg/disk Penicillin and 25mcg/disk Carbenicillin) was in vitro evaluated using AST. The combinations of CFS-carbenicillin showed a marked synergistic activity against all test bacteria. The presence of possible antibacterial agents as acetic acid, lactic acid and citric acid in CFS of APB was confirmed by HPLC analysis. Ultimately, in vitro antibacterial study for rhizosphere soil bacteria in this work suggests the possibility of using these bacterial metabolites in clinical infections caused by selected test bacteria, especially when they combine with antibiotics or organic acids.

Keywords: Antibiotic producing bacteria; Cell free supernatant; Antibiotic susceptibility test; HPLC analysis

For citation: Khair N.K., "Activity of Antibiotic Producing Bacteria Isolated from Rhizosphere Soil Region of Different Medicinal Plants", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0093

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Facile Synthesis of Mesoporous Silica Nanoparticles and its Electrochemical Conversion of CO2 to Fuels

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Abstract

The increasing amount of CO2 emissions from the industries is proving to have disastrous consequences on the environment. It would be highly beneficial if this CO2 is to be recycled and converted into useful fuel. The aim of this project involves synthesizing a suitable catalyst which can be used for the electrochemical (EC) conversion of CO2 to fuel. The developed catalyst should be mesoporous silica nanoparticles and loaded on to a metal oxide surface. The synthesis involved a relatively simple procedure of forming a homogenous mixture for the nanoparticles, drying the mixture for 2 days then loading on to the metal nitrate. Finally, multiple scans and tests were run on the synthesized sample to characterize its qualities. The results show that the synthesized mesoporous silica nanoparticles have suitable catalytic properties for electrochemical reduction of CO2 to fuel.

Keywords: Mesoporous silica nanoparticles; XRD; SEM with EDAX; CO2 conversion

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Biosensing Studies on Cuo-Mgo Nanocomposites for Glucose Detection

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Abstract

Approximately 3 million people around the world suffer from diabetes. One of the basic indications of an individual suffering from diabetes can be observed in the form of peaked levels of glucose in the blood. Thus, it is imperative for a non-invasive mechanism to be derived through which glucose levels in the blood can be detected throughout a regular time frame. The aim of this project focuses on synthesis of a nanocomposite, which can be used to detect glucose levels in the blood in a non-invasive manner. The selected nanocomposite was made from a mixture of CuO and MgO. Once synthesized, it was subjected to a series of tests and scans. The results demonstrated effective and efficient glucose detection activity of the CuO-MgO nanocomposite.

Keywords: CuO-MgO; XRD; Raman; SEM with EDAX; Glucose detection

For citation: Riyaz N.U.S., Kannan K., Krishnasamy V., Cabibihan J.J., AlAli A.K., Malik R.A., Sadasivuni K.K., "Biosensing studies on CuO-MgO nanocomposites for glucose detection", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0095

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Non-invasive Electrochemical Detection of Glucose using CuO-NiO/MXene Modified Electrode

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Abstract

High levels of glucose or acetone in breath confirms diabetes disease. One of the analytical devices that detect changes in breath is the electrochemical sensor having high selectivity, easy to use and being able to meet diabetic patient's needs. In this study, sensors were made by fabricating metal oxide coated glassy carbon electrodes and using nafion as a proton conductor. Characterization methods such as X-ray diffraction, FTIR and morphological analysis have been performed for metal oxides to characterize their atomic arrangement and composition. In addition, electrochemical studies were done using Gamry instrument and curves plotted as current in amperes versus voltage to test the coated electrodes conductivity. High selectivity sensors provide promising applications in any field.

Keywords: CuO-NiO/MXene; XRD; SEM with EDAX; Glucose detection

For citation: Elsafi A.M., Krishnasamy V., Kannan K., Cabibihan J.J., AlAli A.K., Malik R.A., Sadasivuni K.K., "Non-invasive Electrochemical Detection of Glucose using CuO-NiO/MXene Modified Electrode", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0096

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Drone-Based Cooling Leakage Measurement from Glass Front Towers

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Abstract

Drones are increasingly gaining more attention these days and they are employed in several applications. At the same time, the steps towards saving energy and improving the efficiency of the buildings are significantly increasing as well. This poster introduces an overall design for a system that will be loaded on a quadcopter to measure the cooling leakage from high-rise buildings in Qatar to meet 2030 vision in environmental development. The proposed design is achieved by using a chip thermal camera to detect the cooling leakage locations. In addition, the drone will need proximity sensors, specifically, Lidar sensor to prevent it from any collision that can happen with the towers. Moreover, a mobile application is built to monitor the tested buildings and the position of the drone.

Keywords: Drone; Energy; Efficiency; Leakage

For citation: Abed H., Abdou N., Zorba N., "Drone-based Cooling Leakage Measurement from Glass Front Towers", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0097

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Construction of Modified CuO-Co3O4-ZnO Electrode for Acetone Detection in Breath

Alaa Mohamed Elsafi[1,2], Vinotha Krishnasamy[2], Karthik Kannan[2], John-John Cabibihan[1], Abdulaziz Khalid Al-Ali[3], Rayaz A. Malik[4], Kishor Kumar Sadasivuni*[2]

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Abstract

Acetone in breath can be used as a biomarker for noninvasive detection of diabetes. The acetone level in breath is substantially high for diabetic patients. In this study, mixed metal oxide nanocomposite of CuO-Co3O4 -ZnO was used for the electrochemical detection of acetone in artificial breath solution. The structural and morphological characterization of synthesized nanocomposite was done by XRD, RAMAN and SEM (EDAX) analysis. The electrochemical study was performed and the metal oxide modified electrode showed the sensitivity of 6.52 µA cm-2 ppm-1 towards the detection of acetone in the artificial solution.

Keywords: Trimetallic nanocomposite; XRD; Raman; SEM with EDAX; Acetone sensing

For citation: Elsafi A.M., Krishnasamy V., Kannan K., Cabibihan J.J., AlAli A.K., Malik R.A., Sadasivuni K.K., "Construction of Modified CuO-Co3O4-ZnO Electrode for Acetone Detection in Breath", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0098

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Corrosion Behavior of Epoxy/Zno-Nio Nanocomposite Coating on Steel Substrate

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Abstract

Corrosion is a very common natural phenomenon, which leads to huge losses especially in the building construction, turbines in the industries and several other fields. In this research we synthesized and developed new coating materials containing ZnO-NiO. The fabricated coating was characterized by using different techniques such as SEM, XRD etc. The efficiency of the coating against corrosion was examined using the Tafel experiments and it was observed that the fabricated coating exhibit excellent anti-corrosion under seawater.

Keywords: Epoxy/ZnO-NiO nanocomposite; XRD; SEM; Corrosion behavior

For citation: Ibrahim M., Parangusan H., Kannan K., Sadasivuni K.K., "Corrosion behavior of Epoxy/ZnO-NiO nanocomposite coating on steel substrate", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0099

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Detection of Acetone in Breath Solution using Nanocomposite Ceo2-Nio-Zno

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Abstract

Acetone level of diabetic patients from their breath can be detected. The effect of CeO2 -NiO-ZnO nanocomposite was studied by adding different concentration of acetone. Structural (XRD, Raman) and morphological (SEM with EDAX) studied were done. The CV response of modified GCE with and without acetone was studied. It was observed that the current gets reduced in the presence of acetone. The sensor shows excellent sensitivity, selectivity and durability. The flexibility is an additional advantage of the sensor.

Keywords: CeO2-NiO-ZnO; XRD; Raman; SEM with EDAX; Acetone detection

For citation: Shafath S., Krishnasamy V., Kannan K., Cabibihan J.J., AlAli A.K., Malik R.A., Sadasivuni K.K., "Detection of acetone in breath solution using nanocomposite CeO2-NiO-ZnO", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0100

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Synthesis, characterization and biosensor applications of CuO-NiO nanocomposite

Sadiyah Shafath[1,2], Vinotha Krishnasamy[2], Karthik Kannan[2], John-John Cabibihan[3], Abdulaziz Khalid Al-Ali[4], Rayaz A. Malik[5], Kishor Kumar Sadasivuni*[2]

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Abstract

The effect of CuO-NiO nanocomposite was studied by addition of various concentrations of acetone. High acetone level in human breath is an indication of the diabetes. Studies were performed to determine the structure (XRD, Raman) and morphology (SEM with EDAX). The CV response of modified GCE with and without acetone was studied. It was observed that in the presence of acetone there is a reduction in current. These sensors show excellent flexibility and can used to fabricate the sensors to stick on the body.

Keywords: CuO-NiO; XRD; Raman; SEM with EDAX; Acetone detection

For citation: Shafath S., Krishnasamy V., Kannan K., Cabibihan J.J., AlAli A.K., Malik R.A., Sadasivuni K.K., "Synthesis, characterization and biosensor applications of CuO-NiO nanocomposite", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0101

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Monitoring the Presence and Investigation of Toxigenic Fungi and Mycotoxins in Poultry Feed and its Products

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Abstract

Contaminating poultry feed and their products with mycotoxins produced by fungi may cause many health effects on animals and human if they were at high concentrations. Therefore, it is imperative to regularly monitor the concentration of mycotoxins specially aflatoxin and ochratoxin A in the poultry feed and their products. In the present study, we demonstrated that Aspergillus flavus was the major contaminant using DNA extraction and gel electrophoresis. Using ELISA kit for ochratoxin A, Ochratoxin A did not exceed the detection limit 50 ng/kg but in one sample has exceeded the European Union maximum limit for aflatoxins of 20 µg/kg through the ELISA aflatoxin All kit. Aflatoxin B1 was detected in chicken liver samples using ELISA aflatoxin B1. Almost all samples were contaminated with fungi but only 4 feed samples showed aflatoxin concentration within the detection limit. Furthere experiments should be done on different liver samples in Qatar to chek the probability of this presence.

Keywords: Poultry feed; Mycotoxin; Poultry products

For citation: Aboumaalie D.A., Jaoua S., "Monitoring the presence and investigation of toxigenic fungi and mycotoxins in poultry feed and its products", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0102

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Using Synthetic Resins for Removal of Emulsified Oil from Produced Water

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Abstract

In this study, adsorption of emulsified oil in produced water was experimented using synthetic resins. Adsorbent dosage, contact time, initial oil concentration, and PH were the main key parameters evaluated for Optipore L493, Amberlite IRA 958, Amberlite XAD 7 and Lewatit AF 5. Oil removal rates have reached up to 98% using AF 5, XAD 7 and L493, while they are lesser than 25% for IRA 958. Isotherm data were fitted using Langmuir, Freundlich, Toth, Flory Huggins and Dubinin-Radushkevich models. Adsorption isotherms for XAD 7 and L 493 were best fitted using Langmuir model, whereas AF 5 curves were best fitted using Dubinin-Radushkevich. Kinetic data describing the rate of adsorption for each resin were studied and fitted using pseudo-first and second order equations in addition to intraparticle diffusion models. The experimental results were best-fitted using pseudo second order kinetics. The obtained results confirm the applicability of the resins for the removal of oil from produced water.

Keywords: Adsorption; Produced water; Resins

For citation: Alsaba W.H., Alenany R., Zamzam M., "Using Synthetic Resins for Removal of Emulsified Oil from Produced Water.", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0103

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Effect of Seagrass Liquid Extracts on Bell Pepper (Capsicum annuum) Under Salt stress Conditions

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Abstract

Salinity is considered as major environmental challenge that affects crop growth and productivity. This study investigated the application of *Haodule univervis* seagrass liquid extract on bell pepper (*Capsicum annuum* L.) under salt stress conditions. The salinity treatments were applied by irrigating bell pepper plants with 0, 50, 100, 150, and 200 mM/l of NaCl with four replications. The bell pepper plants were divided into two groups: one group was sprayed with seagrass extract, and the other group was sprayed with distilled water. The salt treatment was applied at every 10 days interval for only three treatments, and the bell pepper leaves were sprayed about seven days after the salt treatment. The results showed an increase in relative water content (RWC) of salt stressed bell pepper plants sprayed with seagrass extract from 0- 100 mM of NaCl treatment, while RWC decreased at 150 and 200 mM NaCl treatments compared to the control. This indicates stressed bell pepper plants sprayed with seagrass extract had higher RWC than plants sprayed with water at 0-100 mM NaCl treatments. Chlorophyll concentration was decreased dramatically in plants sprayed with water at 50mM of NaCl level. However, chlorophyll concentration increased slightly in plants sprayed with water at 100 mM NaCl level then start declined gradually at 150 mM and 200mM NaCl level. The plants sprayed with seagrass extract showed an increase in chlorophyll concentration at 100 and 150 mM NaCl treatment compared to the control. Fresh weights of plants sprayed with seagrass extract were declined at 50-150 mM NaCl compared to the control. However, the highest dry weights of plants sprayed with seagrass at 100 mM NaCl treatment. In addition, plants sprayed with water did not show variations in fresh and dry weights.

Keywords: Capsicum annuum; Salt stress; Seagrass extract

For citation: Alqahtani N.S., Ahmed T., "Effect of Seagrass Liquid Extracts on Bell Pepper (Capsicum annuum) Under Salt stress Conditions.", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0104

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Thermal, Electrical, and Sensing Properties of Composite Material from Environmental and Industrial Wastage

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Abstract

This work is an endeavour to contemplate a valueadded conductive plastic composite material derived as recycled plastic depending on Polyethylene (PP)/carbon black. We choose to add Carbon black (CB) as a filler material in order to enhance the electrical conductivity as well as other properties associated with the composite. Solution mixing method was adopted to develop this composite where the consequences of CB loadings on various parameters like processability, morphology and thermal stability of the composites were examined. Electrical conductivity increased with the increasing amount of the CB loading. The clearly perceived better filler-matrix interaction and filler dispersion were observed in images obtained from Scanning Electron Microscope (SEM). These are the underlying reason behind the improved electrical, thermal, sensing and dielectric properties of the prepared plastic composite material.

Keywords: Plastic composite material; SEM analysis; Thermal studies; Electrical studies; Sensors

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Highly active Bifunctional Lamo3 (M=Cr, Mn, Fe, Co, Ni) Perovskites for Oxygen Reduction and Oxygen Evolution Reaction in Alkaline Media

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Abstract

Lanthanum based electrocatalytically active perovskites, $LaMO_3$ (M=Cr, Mn, Fe, Co, Ni), were synthesized using a single step solution combustion synthesis technique. The perovskites showed exceptional performance for oxygen reduction reaction (ORR) and oxygen evolution reaction (OER) in alkaline medium. Based on the experimental results and literature survey, it is suggested that the exceptional activity of Mn and Co based lanthanum perovskite catalyst could be due to the optimum stabilization of reaction intermediates involved in the rate-determining step (RDS) of ORR/OER. According to crystal field theory (CFT), the d-orbital of transition metals are affected by the octahedral arrangement of six negative charges around it. The d orbital degenerates by splitting into two high energy (e_g) and three lower energy orbitals (t_{2g}) while maintaining the same average energy level. The rate-determining step in the ORR/OER reaction that based on the e_g orbital filling of B site transition metal cations If the d-electrons are less, the valence state goes up and lowering the e_g orbital filling that results in strong adsorption of oxygenated species on the B site (strong B-OH bond). This strong bonding limits the overall reaction rate by the slow desorption of OH and its derivatives during ORR/OER. Similarly, too high e_g filling causes weak adsorption of oxygenated species that limits the reaction through the slow adsorption of reactants. Therefore, to enhance the activity of ORR/OER reaction it is required to balance the adsorption and desorption of the reactants and the intermediate respectively. The better way is to optimize the e_g orbital filling to be nearly 1 (e_g = 1).Based on the experimental results and literature survey, it is suggested that the exceptional activity of Mn and Co based lanthanum perovskite catalyst could be due to the optimum stabilization of reaction intermediates involved in the rate-determining step (RDS) of ORR and OER.

Keywords: Perovskites; Combustion synthesis; Oxygen reduction reaction; Fuel cells

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Investigation of Bacillus Thuringiensis Plasmid Instability and its Effect on the Synthesis of Crystals

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Abstract

In order to explore plasmid instability in *Bt*, four *Bt* strains belonging to two *Bt* subspecies were cultured at 42°C for 9 days. HD1 and QBT376 belong to subspecies *kurstaki*, while H14 and QBT218 belong to subspecies *israelensis*. Results showed 100% crystal loss for H14 and QBT218, while 76% and 90% crystal loss for HD1 and QBT376, respectively, showing that *cry*-carrying plasmids are more stable in Bt *kurs*. than in Bt *isr*.. HD1, QBT376, and QBT218 cured clones showed significant protease activity compared to their non-cured counterparts. Microscopic observation revealed the delay of sporulation for high number of HD1 and QBT376 cry- clones, while the absence of spores in several H14 and QBT218 cry- clones. Spo-cry- clones of *Bti* strains had irregular elongated cell shape. Kinetics/day of plasmid curing for H14 and QBT218 showed H14 to have higher pBtoxis plasmid stability. The number of vegetative cells in *Bti* strains increased with the increase of curing period. As an attempt to create hybrid *Bt* strains, *cry1Aa* gene was extracted to transform cured and non-cured strains.

Keywords: Bacillus thuringiensis; Kurstaki; Israelensis; Plasmid instability

For citation: Alwa A., Jaoua S., "Investigation of Bacillus Thuringiensis Plasmid Instability and its Effect on the Synthesis of Crystals", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0107

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Assessment of Urban Heat Islands Based on the Relationship Between Land Surface Temperature and Land Use/Land Cover in Greater Doha

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Abstract

Urban heat islands (UHI) are areas with elevated temperatures occurring in cities compared to surrounding rural areas. This study realizes the lack of research regarding the trends of UHIs in desert countries and focuses on Doha. The research includes twelve months of two-time periods; 2000-2019. ArcGIS software was used to compute the land surface temperature (LST) of the city using Landsat images. Land use/land cover (LULC) maps were computed to show how the city has evolved in 19 years. 30 field samples were used to verify the accuracy of the LULC. Results showed UHI in Doha did not display similar pattern to that of cities in subtropical and temperate regions. Higher temperatures were prevalent in out-skirts comprising of barren and built-up areas with high population and no vegetation. Comparatively, the main downtown with artificially planted vegetation and shade from skyscrapers created cooler microclimates. The overall LST of greater Doha has increased by 0.7°C from 2000 to 2019. Furthermore %LULC of built up, vegetation, barren land, marsh land and water body were 29%, 4.5%, 58.6%, 2.8% and 5% in 2000 and 56.5 %, 8.2%, 33.2 %, 0% and 2.1% in 2019 respectively. Overall, there was an increase in built-up and vegetation decrease in water and barren areas and complete loss of marshland. Highest temperatures were recorded for marshland area in year 2000 and barren and built in year 2019. Transect profiles showed positive correlation between NDBI and LST and a negative correlation between NDVI and LST.

Keywords: Urban heat island (UHI); Land use/Land cover (LU/LC); Land surface temperature (LST); Remote sensing; Urbanization

For citation: Siddiqui S.A. "Assessment of Urban Heat Islands Based on the Relationship Between Land Surface Temperature and Land Use/Land Cover in Greater Doha", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0108

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Synthesis and Characterization of Vanadium (IV)-Flavonoid Complexes and its Antioxidant ability toward Superoxide and Radical Scavenging

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Abstract

In this project Vanadium complex -Vanadium (IV) - flavone was synthesized using vanadium (IV) acetylacetonate ($VO(acac)_2$) complex and 3-hydroxy-6-methyl flavone ligand. The complex stability was checked using FTIR and UV-vis spectroscopies. Peackes around 990 cm^{-1} conforms the formation of (V=O) in the complex, as well as (V-O) around 790 cm^{-1}. In UV-Vis spectrum peak around 400-450 nm was noticed, which conforms the formation of the vanadium complex that correspond to the ligand to metal charge transfer (LMCT) transition. The radical scavenging abilities of vanadium complex were investigated using DPPH. The anti-oxidant activity using (BHA) as a standard reference, the complex synthesized displayed strong DPPH antioxidant radical scavenging activity compared to VO(acac)2 and BHA, with IC_{50} value of (105, 95 and 96) mM respectively. The absorbance in which the reducing power occurred were found to be (0.397, 0.825 and 0.228) for the complex, VO(acac)2 and BHA.

Keywords: Vanadium (IV); Flavonoid complexes; UV-Vis analysis; FTIR characterization; Radical scavenging

For citation: Akbar H., Habib S., Mahroof Tahir M., Sreerama L., "Synthesis and characterization of vanadium (IV)-flavonoid complexes and its antioxidant ability toward superoxide and radical scavenging", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0109

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The Impact of the Red Lotus Critical Health Promotion Model on Graduates' Health Promotion Practice

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Abstract

Introduction: The Red Lotus Critical Health Promotion Model (RLCHPM) is used in health promotion teaching, research and practice in multiple countries. The model is designed to support critical health promotion as a public health practice, and responds to calls to move practice away from biomedical-behavioural approaches to health promotion. The RLCHPM includes of a system of values and principles for critical practice including health equity, holistic health paradigm, strengths-based salutogenic approaches, socioecological science, non-maleficence, and empowering engagement processes. The objective of this study was to investigate the impact of the RLCHPM on the practice of graduates from health promotion programs from a university in Australia. **Methods:** We conducted a mixed methods study involving an online survey of graduates from 2008 to 2016, followed by semi-structured interviews with a subset of self-nominated respondents. We used descriptive analyses for survey data and thematic analysis for interview data. **Results:** There was a total of 95 respondents (49% response rate) and 10 of these were interviewed. Participants felt knowledgeable about the model, and confident about their ability to use it. The model was understandable, easy to use, and important, relevant and useful in practice. More than half felt that the model had an impact on their health promotion practice, however less than a quarter felt that the model had an impact on institutional policies in their workplace. Interview data revealed the need for a step-by-step guide for implementing the model in multiple sectors, access to ongoing support for model implementation, and clearer links to other relevant models. **Conclusions:** The RLCHPM is well understood and considered to be important, relevant and useful to the practice of graduates. The study has implications for the use of the model in health promotion degree programs, and in professional development programs for health promotion practitioners.

Keywords: Health promotion; Critical practice; Model

For citation: O'Hara L., Taylor J., "The impact of the Red Lotus Critical Health Promotion Model on graduates' health promotion practice", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0110

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Genome-Wide Association study Identifies a Novel Association Between a Cardiovascular Gene Polymorphism and Superior Athletic Performance

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Abstract

Background: Research into the genetic predisposition to superior athletic performance has been a hindered by the underpowered studies and the small effect size of identified genetic variants. The aims of this study were to investigate the association of common single-nucleotide polymorphisms (SNPs) with endurance athlete status in a large cohort of elite European athletes using GWAS approach, followed by replication studies in Russian and Japanese elite athletes and functional validation using metabolomics analysis.
Results: The association of 476,728 SNPs of Illumina DrugCore Gene chip and endurance athlete status was investigated in 796 European international-level athletes (645 males, 151 females) by comparing allelic frequencies between athletes specialized in sports with high (n=662) and low/moderate (n=134) aerobic component. Validation of results was performed by comparing the frequencies of the most significant SNPs between 242 and 168 elite Russian high and low/moderate aerobic athletes, respectively, and between 60 elite Japanese endurance athletes and 406 controls. A meta-analysis has identified rs1052373 (GG homozygotes) in Myosin Binding Protein (*MYBPC3*; implicated in cardiac hypertrophic myopathy) gene to be associated with endurance athlete status (P=1.43E-08, odd ratio 2.2). Homozygotes carriers of rs1052373 G allele in Russian athletes had significantly greater VO_{2max} than carriers of the AA+AG (P = 0.005). Subsequent metabolomics analysis revealed several amino acids and lipids associated with rs1052373 G allele ($1.82x10^{-05}$) including the testosterone precursor androstenediol (3beta, 17beta) disulfate.
Conclusion: This is the first report of genome-wide significant SNP and related metabolites associated with elite athlete status. Further investigations of the functional relevance of the identified SNPs and metabolites in relation to enhanced athletic performance are warranted.

Keywords: GWAS; SNP; Metabolomics; Metabolites; Elite athletes

For citation: Elrayess M., AlKhelaifi F., Yousri N., AlBagha O., "Genome-wide association study identifies a novel association between a cardiovascular gene polymorphism and superior athletic performance", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0111

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Assessment of an Intensive Education Program on the Treatment of Tobacco-Use Disorder for Pharmacists using OSCE (Objective Structured Clinical Examination)

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Abstract:

Introduction: Tobacco use is one of the main causes of morbidity and mortality in Qatar. The aim of this randomized controlled trial (RCT) is to design, implement, and evaluate an intensive education program on tobacco-use treatment for pharmacists in Qatar. The study objectives are to assess the effectiveness of the program on pharmacists' skills toward tobacco cessation. **Methods:** A random sample of community pharmacists in Qatar was selected for participation. Consenting participants were randomly allocated to intervention or control groups. Participants in the intervention group received an intensive education program on treatment of tobacco-use disorder. A short didactic session on a non-tobacco-related topic was delivered to pharmacists in the control group. The pharmacists' tobacco cessation skills were assessed using an Objective Structured Clinical Examination (OSCE). Six-station OSCE targeting core smoking cessation competencies and skills was completed by participants in both groups. Performance of participants was assessed using validated assessment checklists that comprised analytical and global assessment sections. **Results:** A total of 54 and 32 participants in the intervention and the control group respectively completed the OSCE. Overall, pharmacists in the intervention group performed better in the analytical and global assessment sections than those in the control group. For example, for case 1, mean scores for developing rapport, data gathering and management were 2.76 vs 0.97 (p-<0.001), 5 vs 2.81 (p <0.001), and 3.5 vs 2.25 (p=0.001) respectively for the intervention group compared to the control group. Mean total analytical scores were 12.06 vs 6.4 (p-<0.001) for intervention compared to the control group for case 1. Furthermore, mean global assessment scores for case 1 were 3.19 vs 2.41 (p=0.009) for the intervention compared to the control group. **Conclusion:** The study results suggest that provision of an intensive educational program on the treatment of tobacco use results in improved skills toward tobacco cessation.

Keywords: Tobacco; Education; Pharmacists

For citation: El Hajj M., Awaisu A., Kheir N., Haniki M., Shami R., Saleh R., AlHamad N., Almulla A., Mahfoud Z., "Assessment of an intensive education program on the treatment of tobacco-use disorder for pharmacists using OSCE", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0113

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Antigenica and Genetic Characterization of Identified Rotavirus Strains in Qatar in Response to Rotarix Vaccine Usage

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Abstract:

Aim: To identify genetic and antigenic variation in RV in response to vaccine usage. **Methods**: A total of 231 RV-positive fecal samples were collected from children suffering from AGE during three-year study period between June 2016 and June 2019. The age of the subjects ranged between 2 months and 14 years (median of 16 months). RV genotyping and neutralizing regions, which include both VP4 (P-type) and VP7 (G type), were amplified and sequenced. We characterized amino acid sequence variability and predicted antigenicity compared to the Rotarix vaccine strain. Phylogenetic analyses were performed using MEGA7.0. Fisher's exact test was used to run the statistical analysis for the clinical and demographical characteristics of circulating strains. **Results:** RV infection was most common in children between 3-36 months of age. Among the RV-positive cases, 135 (59.3%) had been vaccinated using either of the RV vaccines available. The number of children vaccinated with one and two-dose was 53 (39.2%) and 82 (60.8%), respectively. The percentage reduction of disease in a vaccinated group of pediatrics compared to an unvaccinated group of pediatrics was 25%. Of these, 108 (78.2%) experienced diarrhea for less than three days, and only eight (6.7%) had diarrhea for more than five days. All vaccinated children showed mild to moderate dehydration except for ten children who were then treated with intravenous fluids. G3 strains were the most strains detected (40%) followed by G2 (17.7%), G4 (16.8%), G9 (15%), G1 (9%), and G8 (0.9%). The dominant RV strains during the study period were G3P [8] (30.8%), G2P [8] (12.3%), G4P [8] (11.7%) and G1P[8] (10.4%). Comparisons of the amino acid residues defining the VP7 and VP4 antigenic domains revealed several mismatches between G1P [8] strains and the G1 and P [8] strains contained in the currently licensed rotavirus vaccines Rotarix. Eighty percent (n=8) of the G1 genotype specimens harbored three amino acid substitutions (N94S, S123N, and M217T) in 7- 1a and 7- 2b antigenic sites in comparison to the Rotarix vaccine. The P [8] strains with G4 and G9 counterparts showed the highest degree of variation among all specimens with known G genotype. These viruses had 15 and 13 substitutions in their VP4 antigenic epitopes when compared with the P [8] component of the Rotarix vaccines. **Conclusion:** This study suggests genetic variability in G1 genotype specimens to escape the vaccine-derived immune response. It also identified the wide diversity of circulating RV genotypes in Qatar.

Keywords: Rotavirus; Diarrhea; Vaccination; Genotypes; Phylogenetic analysis

For citation: Mathew S.M., Ibrahim M., AlThani A., AlAnsari K., Zaraket H., Yassine H.M., "Antigenic and genetic characterization of identified rotavirus strains in Qatar in response to Rotarix vaccine usage", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0114

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Retail Chicken Carcasses as a Reservoir of Antimicrobial- Resistant Escherichia coli

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Abstract:

Background: The dissemination of antimicrobial resistance (AMR) bacteria has been associated with the inappropriate use of antibiotics in both humans and animals and with the consumption of food contaminated with resistant bacteria. In particular, the use of antibiotics as prophylactic and growth promotion purposes in food-producing animals has rendered many of the antibiotics ineffective. The increased global prevalence of AMR poses a significant threat to the safety of the world's food supply. **Objectives**: This study aims at determining the prevalence of antibiotic-resistant *Escherichia coli* (*E. coli)* isolated from local and imported retail chicken meat in Qatar. **Methodology**: A total of 270 whole chicken carcasses were obtained from three different hypermarket stores in Qatar. A total of 216 *E. coli* were isolated and subjected to antibiotic susceptibility testing against 18 relevant antibiotics using disc diffusion and micro- dilution methods. Furthermore, extended-spectrum β-lactamase (ESBL) production was determined via a double-disc synergetic test. Isolates harboring colistin resistance were confirmed using multiplex-PCR and DNA sequencing. **Results:** Nearly 89% (192/216) of the isolates were resistant to at least one antibiotics. In general, isolates showed relatively higher resistance to sulfamethoxazole (62%), tetracycline (59.7%), ampicillin and trimethoprim (52.3%), ciprofloxacin (47.7%), cephalothin, and colistin (31.9%). On the other hand, less resistance was recorded against amoxicillin/clavulanic acid (6%), ceftriaxone (5.1%), nitrofurantoin (4.2%) and piperacillin/tazobactam (4.2%), cefepime (2.3%), meropenem (1.4%), ertapenem (0.9%), and amikacin (0.9%). Nine isolates (4.2%) were ESBL producers. Furthermore, 63.4% were multidrug-resistant (MDR). The percentage of MDR, ESBL producers, and colistin-resistant isolates was significantly higher among local isolates compared to imported chicken samples. **Conclusion:** We reported a remarkably high percentage of the antibiotic-resistant *E. coli* in chicken meat sold at retail in Qatar. The high percentage of MDR and colistin isolates is troublesome to the food safety of raw chicken meat and the potential of antibiotic resistance spread to public health. Our findings support the need for the implementation of one health approach to address the spread of antimicrobial resistance and the need for a collaborative solution.

Keywords: Chicken carcasses; Antibiotic resistance; E. coli

For citation: Eltai N.O., Yassine H.M., AlHadidi S.H., ElObied T., AlThani A.A., Alali W.Q., "Retail Chicken Carcasses as a Reservoir of Antimicrobial- Resistant Escherichia coli", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0115

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Awareness of Disabilities in Pharmacy Program Recruitment Material: Are we doing Enough?

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Abstract:

Introduction: Targeted recruitment of students with disabilities is a novel area in pharmacy education and may help to attract qualified students in light of decreasing applicant numbers. Therefore, the aim of this study was to explore the visibility of disabilities within online recruitment material for pharmacy programs and to determine the location of targeted information available to prospective students with disabilities. **Methods:** The top 50 ranked programs offering a professional pharmacy degree under the Pharmacy and Pharmacology QS subject rankings were identified and included if recruitment material was published in English. Online recruitment material was reviewed for presence of persons with disabilities in photos, presence or description of persons with disabilities in videos, information specific to disabilities on the program website, and information specific to disabilities on the university website (if not located on the program website). **Results:** For inclusion, 41 out of 50 pharmacy schools met the criteria. No institutions displayed visual student disabilities in pictures or videos of recruitment material. Overall, the majority of institutions (88%) provided information for prospective students with disabilities. The type of information offered was highly variable across institutions. Of the top 50 pharmacy schools in the USA, 85% have information on student disability through the pharmacy homepage and 75% of institutions in Europe provided information through the university homepage. Interestingly, 62.5% of schools in Asia did not provide student disability information. **Conclusion:** Recruitment material for pharmacy degree programs should be current, inclusive, and reflective of student populations eligible to be admitted. This study found a distinct underrepresentation of students with disabilities and information pertaining to disabilities within recruitment material for a sample of international pharmacy programs. (*This study has now been published. Hussain FN, Smith A, Wilby K. The Visibility of Disabilities within Pharmacy Program Recruitment Material. INNOVATIONS in pharmacy. 2020; 11(3). doi: https://doi.org/10.24926/iip.v11i3.3339.)

Keywords: Disability; Pharmacy education; Recruitment; Equality; Diversity

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Role of Cdk5rap2 in neocortical inhibition and excitation balance

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Abstract

Autosomal recessive primary microcephaly type 3 (MCPH3) is a congenital disorder characterized by a reduction of the occipitofrontalis head circumference and intellectual disability. MCPH3 patients can also suffer from hyperactivity and seizures. This disorder is caused by biallelic mutations in the Cyclin-dependent kinase 5 regulatory subunit associated protein 2 gene *CDK5RAP2*. Similarly in the mouse, *Cdk5rap2* mutations result in reduced brain size and thinning of the neocortex already at early stages of neurogenesis that persists through adulthood. The microcephaly phenotype in MCPH arises from a neural stem cell proliferation defect. In this study, we report a novel function of Cdk5rap2 in the regulation of dendritic development and synaptogenesis of upper pyramidal neocortical layer neurons using both morphological and electrophysiological approaches.

Keywords: Cdk5rap2; Microcephaly; Neuronal differentiation; Synaptic transmission; Dendritic morphogenesis

For citation: Zaqout S., Becker L.L., Mustafa A., Krämer N., Strauss U., Kaindl A.M., "Role of Cdk5rap2 in neocortical inhibition and excitation balance", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0117

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Systemic properties of Carcinogenesis: Lessons from studies on the Earth and in the Space

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Abstract:

Background: Hundreds of proteins and genes are involved in initiation and growth of tumors. These proteins and genes act in coordinated ways, and their relations are visualized as networks. Networks are more accurate descriptions of cancer regulatory mechanisms, in comparison to lists of oncogenes and tumor suppressors. To extract essential regulators (nodes) and connections (edges), interrogations of these networks are performed, e.g. cancer cells are subjected to different treatments. Interrogations force cancer cells to engage nodes and edges essential for maintaining cancer properties, i.e. drivers, and non-essential followers. The challenge is to discriminate which of the mechanisms drive tumorigenesis, and which are followers. Interrogation of cancer cells under variable g-forces is the treatment to which cancer cells are not normally exposed. Therefore, low (weightlessness) and high (acceleration) g-forces may trigger responses, which may differ in part of followers from responses on the Earth, but still engage carcinogenesis-essential drivers nodes and edges. **Methodology:** Experimental interrogation of human cancer cells to generate carcinogenesis-related regulatory networks was performed by using proteomics, cell biology, biochemistry, immunohistochemistry and bioinformatics tools. We used also reported datasets deposited in various databases. These networks were analyzed with algorithms to extract drivers of carcinogenesis. **Results:** Systemic analysis of human breast carcinogenesis has shown mechanisms of engagement of all known cancer hallmarks. Moreover, novel hallmarks have emerged, e.g. involvement of mechanisms of virus-cell interaction and RNA/miR processing. The breast cancer networks are rich, with >6,000 involved proteins and genes. The richness of the networks may explain many clinical observations, e.g. personalized response to treatments. Systemic analysis highlighted novel opportunities for treatment of cancer, by identifying key nodes of known and novel hallmark mechanisms. Systemic properties of the cancer network provides an opportunity to study compensatory mechanisms. These compensatory mechanisms frequently contribute to development of resistance to treatment. These mechanisms will be discussed. Cancer cells are not "wired" to function in weightlessness. The cells would have to adapt. This adaptation will include preserving mechanisms driving carcinogenesis, in addition to the space-only-related adaptation. Key carcinogenesis regulators in the space would be the same as on the Earth, while "passenger"-mechanisms would differ. Systems biology allows integration of a space- and the Earth-data, and would extract key regulators, and, subsequently lead to better diagnostic. **Conclusion:** Systemic analysis of carcinogenesis studies with different ways of interrogation delivered better diagnostic and novel modalities of treatment.

Keywords: Cancer; Diagnostic; Systems biology; Microgravity

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Gut Microbiota and Health: Understanding the Role of Diet

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Abstract

Gut microbiota plays a major role in regulating the host metabolism and immune system. However, the structure of microbiome population is altered constantly by diverse factors including diet and environment. In particular, the gut microbiome dynamics is influenced by diet composition and their associated metabolites. Many studies in the recent past reported on diet induced dysbiosis in the gut microbiome, the modulating ratio between Firmicutes and Bacteroidetes plays a central role in maintaining the microbiome diversity in the gut and their abundance regulates obese conditions. Although there are several reports on gut microbial dysbiosis (Firmicutes/Bacteroidetes) at phylum level but only few of them highlight at the genera level. In the present study, we focused more on the impact of cafeteria diet (CAF) with respect to the gut microbiome richness at the genera level in SD rats. Three weeks old Sprague Dawley (SD) rats were fed with normal chow diet and cafeteria diet (CAF). After 10 weeks, serum, tissue samples (small intestine and cecum), cecum fecal and fecal pellet were collected. Biochemical analysis from serum, Gene expression analysis of pro-inflammatory markers from tissues and microbiome analysis from fecal samples were analysed. CAF diet fed rat in the present study developed obesity with increased body weight, few of them developed the resistance to weight gain (WGR) and these animal shows significantly increased abundance of Bacteriodetes-Prevotella compared to obese animals. This study suggests that detailed research needed to address the contribution of microbiota abundance at the genera level. We further explored the influence of diet induced microbiota changes on immune response. Further studies on these lines targeting the microbiota changes in the gut at the genera level is warranted to gain more knowledge.

Keywords: Gut microbiota; Cafeteria diet; Obesity; Inflammatory markers; RT-PCR

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Co-Prevalence of Human Papillomavirus and Epstein Barr Virus in Healthy Blood Donors in Qatar

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Abstract:

Introduction: Infections with human oncoviruses such as high-risk human papillomaviruses (HPVs) and Epstein-Barr virus (EBV) are globally prevalent in the adult population. Both viruses are strongly associated with several types of human carcinomas such as cervical, head and neck, nasopharyngeal and gastric. In the present study, we explored the prevalence of these two oncoviruses in the healthy population of Qatar. **Methods:** The study included 385 healthy blood donors that reflect diverse nationalities in the Qatari community (Qatar, Egypt, Syria, Jordan, Pakistan, and India). DNA was extracted from the peripheral blood and genotyping was done using PCR and nested-PCR targeting *E6* and *E7* as well as *LMP1* genes of HPVs and EBV, respectively. **Results:** The age of participants (378 males and 7 females) ranged between 19 and 68 years (mean 37.12 ± 9.3 years). Our data indicate that 55% and 61% of the tested samples were HPVs and EBV positive, respectively. Moreover, we found that there was (40%) co-presence of both HPVs and EBV in our samples. The most common high-risk HPV types in Qatar included HPV 59 (55%), 31 (54%), 52 (49%), 51 (49%), 58 (47%) and 35 (46%). While, HPV 16 and 18 were detected in 38% and 36% of the samples, respectively. Notably, all samples showed multiple HPVs infections. **Conclusion:** Our study reveals for the first time a high prevalence of both EBV and HPVs among healthy individuals in Qatar. More significantly, most cases had multiple HPV types infection in addition to the co-presence of both viruses in a substantial proportion of the samples. Given the important possible cooperative role of these viruses in human carcinogenesis, preventive measures using available and upcoming vaccines are of paramount importance.

Keywords: HPV; EBV; Healthy blood donors; Qatar

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Comparison of Co-Presence of Epstein–Barr Virus and High-Risk Human Papillomaviruses in Colorectal Cancers in the Middle East Region

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Abstract:

Background: Several studies have shown the presence of onco viral DNA in colorectal tumor tissues. Viral infection by onco-viruses such as Human papillomaviruses (HPVs) and Epstein–Barr virus (EBV) are well-known to be involved in the onset and/or progression of numerous human carcinomas. **Methods:** We explored the co-presence of high-risk HPVs and EBV in a cohort of colorectal cancer samples from Lebanon (94) and Syria (102) by PCR, immunohistochemistry and tissue microarray. **Results:** The results of the study point out that 54% of colorectal cancer cases in Syria are positive for high-risk HPVs, while 30% of the cases in Lebanon are positive for these viruses; the most frequent high-risk HPV types in these populations are 16, 18, 31, 33 and 35. Analysis of LMP1 showed similar results in both populations; 36% of Syrian and 31% of Lebanese samples. Additionally, we report that EBV and high-risk HPVs are co-present in these samples. In Syrian samples, EBV and HPVs are co-present in 16% of the population, however, in the Lebanese samples, 20% of the cases are positive for both EBV and HPVs; their co-presence is associated with high/intermediate grade invasive carcinomas. **Conclusion:** These data suggest that EBV and high-risk HPVs are co-present in human colorectal cancers where they can cooperate in the progression of these cancers. Nevertheless, further studies are needed to elucidate the role of those oncoviruses in the development of human colorectal carcinomas.

Keywords: HPV, EBV, Colorectal Cancer, Syria, Lebanon

For citation: Nagi K., Gupta I., AlThawadi H.A, Jabeen A., Malki M.I., Vranic S., AlMoustafa A.E., "Comparison of co-presence of Epstein–Barr virus and high-risk human papillomaviruses in colorectal cancers in the Middle East Region", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0121

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Co-Incidence of Human Papillomaviruses and Epstein–Barr Virus is Associated with Advanced Tumor Stage: A Tissue Microarray Study of Head and Neck Cancers

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Abstract:

Background: Human papillomaviruses (HPVs) and Epstein–Barr virus (EBV), are known oncoviruses and can be co-present and hence cooperate in the development of human carcinomas, including head and neck. **Methods:** We herein explore for the first time the co-prevalence of high-risk HPVs and EBV in 98 head and neck (HN) squamous cell carcinoma (SCC) tissues from Bosnian patients using polymerase chain reaction (PCR) and immunohistochemistry (IHC) analysis, as well as tissue microarray methodology. **Results:** The majority of these cancer tissue cases were from the oral cavity (68%). We found that high-risk HPVs and EBV are co-present in 34.7% of SCC samples; with a significant correlation between various high-risk HPV types and EBV co-incidence ($p=0.03$). Our data showed that 30.8% of oral SCCs are positive for E6 oncoproteins of high-risk HPVs and 44.6% are positive for LMP1 of EBV. The most commonly expressed HPVs in our HNSCC samples include HPV types 16, 18, 45 and 58. More importantly, 37.5% of oral SCCs are positive for both HPVs and EBV, with statistically significant association between high-risk HPV types and EBV ($p<0.05$). More significantly, we report that the co-presence of HPV and EBV is highly correlated with advanced tumor stage ($p=0.035$). **Conclusion:** In conclusion, HPV and EBV oncoviruses are co-present in HNSCC, particularly in oral cancer, where they can cooperate in the initiation and/or progression of this cancer. Thus, further studies are necessary to elucidate the mechanism of high-risk HPVs and EBV cooperation in human carcinomas.

Keywords: HPV, EBV, Head and Neck Cancer.

For citation: Gupta I., AlThawadi H.A., Skenderi F., Malki M.I., Vranic S., AlMoustafa A.E., "Co-Incidence of Human Papillomaviruses and Epstein–Barr Virus is Associated with Advanced Tumor Stage: A Tissue Microarray Study of Head and Neck Cancers", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0122

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Quantification of bioburden in LARC'S Vivarium

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Abstract

Sanitization of cleanrooms in animal facilities is important as it ensures the level of contamination by different means including personnel activities and failures of HVAC system.Cleanrooms are highly controlled to provide a protective working environment . Designed to minimize the transfer of contamination .In our monitoring program we assess the total microbial load and molecules present in living cells as an energy source ATP (adenosine triphosphate). Data of RODAC plate count and ATPase assay (adenosine triphosphate) method from one year of environmental monitoring are discussed.

Keywords: Microbial load, ATP, Contamination, Bacteria

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Elaeagnus Angustifolia: a Promising Medicinal Plant for Cancer Theraby

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Abstract:

Introduction: Elaeagnus angustifolia (*EA*) is a medicinal plant that has been used for centuries in treating many human diseases, in the Middle East, including fever, amoebic dysentery, gastrointestinal problems. However, the effect of *EA* plant extract on human cancer progression especially oral malignancy has not been investigated yet. Thus, first we examined the effect of *EA* flower extract on angiogenesis *in ovo*, and on selected parameters in human oral cancer cells. **Materials and methods:** Chorioallantoic membranes (CAMs) of chicken embryos at 3-7 days of incubation were used to assess the effect *EA* flower plant extract on angiogenesis. Meanwhile, cell proliferation, soft agar, cell cycle, cell invasion and cell wounding assays were performed to explore the outcome of *EA* plant extract on FaDu and SCC25 oral cancer cell lines. On the other hand, western blot analysis was carried out to evaluate E-cadherin and Erk1/Erk2 expression and activation, respectively, in FaDu and SCC25 under the effect of EA extract. **Results:** Our data show that *EA* extract inhibits cell proliferation and colony formation, in addition to the initiation of Scell cycle arrest and reductionof G1/G2 phases. In parallel, *EA* extract provokes differentiation to an epithelial phenotype "mesenchymal-epithelial transition: MET" which is the opposite of "epithelial-mesenchymal transition, EMT": an important event in cell invasion and metastasis. Thus, *EA* extract causes a dramatic decrease in cell motility and invasion abilities of FaDu and SCC25 cancer cells in comparison with their controls. These changes are accompanied by an up-regulation of E-cadherin expression. The molecular pathway analysis of the *EA* flower extract reveals that it can inhibit the phosphorylation of Erk1/Erk2, which could be behind the inhibition of angiogenesis, the initiation of MET event and the overexpression of E-cadherin. **Conclusions:** Our findings indicate that *EA* plant extract can downgrade human oral cancer progression by the inhibition of angiogenesis and cell invasion via Erk1/Erk2 signaling pathways.

Keywords: Chicken Embryo, Elaeagnus Angustifolia, Angiogenesis, Oral Cancer.

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Testing Air Quality of Primary Health Care Centers in Qatar

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Abstract:

Background: Poor indoor air quality results in significant adverse effects on human health. In particular, the hospital atmospheric environment requires high air quality to protect patients and health care workers against airborne disease including nosocomial infections. Monitoring and surveillance programs of air pollutants and communicable diseases are essential as they provide information on the effectiveness of occupational hygiene and hazard control, and beneficial in assessing risks to community and environment. **Objectives:** This study aims to identify, monitor and report the level of air borne bacteria at four PHCC canters in Doha. **Methodology:** Four primary Health Centers (HC) were selected for testing air quality namely, Qatar University HC (North of Doha), AlRayan HC (West of Doha), Um Ghualina HC (Centre of Doha) and Old airport HC (South of Doha). Three sublocations were tested in each health center including a triage room, lobby and outdoor sample; each centre was visited once a month. Two sampling methods were used in this study: Anderson impactor (viable method) and filtration method (non-viable method). Anderson six stages impactor (TISCH Environmental, USA) was used to collect airborne bacteria on nutrient agar plates. Then the samples were incubated at 37 ^{o} C for 24 - 48 hours. The average colony- forming units (CFU) of bacteria was calculated per cubic meter of air (CFU/m^3). On the other hand, the SKC Button Sampler (SKC Inc. PA, USA) was used to collect the airborne bacteria using cellulose ester filters. The collected isolates will be identified by sequencing 16srRNA (Miseq) later. **Preliminary results**: According to our preliminary results, the smallest average number of bacteria in the air was detected in QU HC, 3.2 (CFU/m^3). While the highest average number was 44.7 CFU/m^3 detected in Old Airport HC. Al-Rayyan HC and Om Ghuilina HC exhibited 30 and 20 CFU/m^3 sequentially. **Conclusions:** Our preliminary results depicted that the occupancy pattern, size, and age of the building affect the number of bacteria in the air. However, more samples will be collected for better statistical sample size and analysis. .In addition, the captured airborne bacteria will be identified by 16s r RNA sequencing later.

Keywords: Air Quality, Primary Health Care Centre, Qatar

For citation: Eltai N.O., Abu R.L., Mohamed H.A., AlThani A.A., Qotba H., Yassine H.M., "Testing Air Quality of Primary Health Care Centers in Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0125

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Salmonellosis among Pediatric Population in Qatar: Prevalence, Antibiotic Resistance and Molecular Epidemiology

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Abstract:

Objectives: This study aims to characterize at the molecular level the genes encoding resistance in Salmonella and explain the molecular mechanisms underlying resistance to ceftriaxone, cefepime, amoxicillin-clavulanate, tetracycline, trimethoprim-sulfamethoxazole, chloramphenicol, colistin and azithromycin in Salmonella. It aims as well to characterize the 16S rRNA gene region by restriction fragment length polymorphism (RFLP) to investigate if this region constitutes an appropriate 'coincidental' marker to distinguish important pathogenic Salmonella species. Finally, determine the lineages of Salmonella species and evolutionary relationships among bacteria classified within the same genus. **Methodology:** 246 Salmonella isolates were collected from children under 16 years old during Jan. 2018 - Dec 2019, presented with gastroenteritis at Hamad Medical Corporation. Isolates were tested for antibiotic susceptibility against nineteen relevant antibiotics using E-test. Isolates that harbor antibiotic resistance were confirmed using PCR specific primers for 38 genes. In addition, the variable region of class 1 and 2 integrons were identified by PCR among amoxicillin-clavulanate (AMC) resistant samples. RFLP targeting16S rRNAwas performed using seven restriction enzymes including AluI, Bgl I, Bgl II, EcoR I, SmaI, Hinf I & Hae III. **Results:** Resistance was detected against 15 antibiotics and (38.2%) of isolates were resistant to at least one antibiotic. Overall, high resistance was reported to tetracycline (23.9%), ampicillin (21.1%), AMC (18.7%) and sulfamethoxazole-trimethoprim (13%). Further, 22.4% of the isolates were multidrug-resistant (MDR), with 4.1% being ESBL producers. 90 % of ESBL producers had one of bla CTX-M-Group. Class (1) AMC resistant samples showed the highest resistance to different antibiotics. 16S rRNA-RFLP analysis divided Salmonella isolates into two main groups. **Conclusion**: Our results indicate a high antimicrobial resistance pattern of Salmonella, which necessities the development of regulatory programs to combats antimicrobial resistance. In particular, our results showed high resistance to Class (1) AMC cassette that involves the transmission and expression of the resistance. This might lead to a concern of increased multidrug resistance in the future. This study provides evidence guidance to activate and implement the pillars of an antimicrobial stewardship program in animal and human health to reduce MDR salmonellosis.

Keywords: Salmonella; RFLP; Antibiotic resistance; Children

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Assessment of Metal Organic Framework as Potential Drug Carriers in Cardiovascular Diseases

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Abstract:

Background: Cardiovascular diseases (CVDs) are considered the major cause of death worldwide. Therapeutic delivery to the cardiovascular system may play an important role in the successful treatment of a variety of CVDs, including atherosclerosis, ischemic-reperfusion injury, and microvascular diseases. Despite their clinical benefits, current therapeutic drugs are hindered by their short half-life and systemic side effects. This limitation could be overcome using controlled drug release with the potential for targeted drug delivery using a nanomedicine approach. In the current study, we have assessed the use of a highly porous nano-sized preparation of iron-based Metal-organic Framework (MOF) commonly referred to as MIL-89 as potential drug carriers in the cardiovascular system. **Aims:** To assess the effect of MOFs on the viability and cytotoxicity of human vascular cells and the cellular uptake *in vitro*, and the organ-system toxicity of MOF *in vivo* using the Zebrafish model. **Methods**: Human pulmonary endothelial cells (HPAECs) and pulmonary smooth muscle cells (HPASMCs) were treated with variable concentrations of MOFs. The viability, cytotoxicity and anti-inflammatory effects were measured using AlamarBlue, LDH assay and ELISA. The cellular uptake of MOFs were assessed using light, confocal, and transmission electron microscopes and EDS analysis. Moreover, Zebrafish embryos were cultured and treated with MOFs-nanoparticles at 0 hours post fertilization (hpf) followed by different organ-specific assays at 24, 48, and 72 hpf. **Results:** Although MOFs affect the viability at high concentrations, it does not cause any significant cytotoxicity on HPAECs and HPASMCs. Interestingly, MOFs were shown to have an anti-inflammatory effect. Microscopic images showed an increased (concentration-dependent) cellular uptake of MOFs and transfer to daughter cells in both cell types. Moreover, the in vivo study showed that high concentrations of MOFs delay zebrafish embryos hatching and cause heart deformation, which is currently investigated using cardiotoxicity markers. **Conclusion:** MOFs is a promising nanoparticle prototypes for drug delivery in the cardiovascular system with high cellular uptake and anti-inflammatory effects. Further investigations of MOFs, including diseased models and drug- loaded formulation is required.

Keywords: Nanomedicine; Metal organic framework; Vascular; Cardiovascular

For citation: AlAnsari D.E., Mohamed N.A., Marei I., Yalcin H., AbouSaleh H., "Assessment of Metal Organic Framework as a Potential Drug Carriers in the Cardiovascular Diseases", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0127

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Computational Modeling of Motile Cilia Generated Cerebral Flow Dynamics in Zebrafish Embryo

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Abstract:

Background: Motile cilia are hair-like microscopic structures, which move the fluids along the epithelial surfaces. Cilia cover a wide range of regions in the nervous system, such as the nasal cavity, spinal cord central canal, and brain ventricles. Motile cilia-driven cerebrospinal fluid (CSF) flow in the brain ventricles has an important role in the brain development. Embryos lacking motile cilia develop neurological defects due to altered CSF flow. **Aim:** To investigate the effect of motile-cilia motion on the altered CSF flow, and to understand the role of CSF flow in the brain development and physiology. **Methods:** The dynamics of motile-cilia driven flow is analyzed employing computational fluid dynamics (CFD) modeling. A 2D model is generated using the time-lapse microscopic movies showing movements of a fluorescently labeled motile-cilia in a zebrafish embryo (48-hour post-fertilization). The effects on the generated flow are elucidated by investigating the cilia beating angle, multiple cilia formations, and the phase difference between different ciliary beats. **Results:** Ciliary beating generated a directional flow in the form of a circulating vortex. The angle of ciliary beating significantly affected the flow velocity. As the angle between the wall and cilia decreases, the flow becomes more efficient by achieving higher velocities. Multiple cilia formations increased the flow velocity but the significance of multiple cilia is not as critical as the beating angle. Interestingly, phase difference between the multiple cilia beats increased the directional flow velocity. **Conclusion:** Motile-cilia generated flow dynamics are investigated, and it is concluded that out-of-phase multiple ciliary beating is the optimum form of beating in order to generate a directional flow.

Keywords: Motile cilia; Zebrafish; Cerebral flow; Computational modeling; Brain development

For citation: Salman H.E., Yaksi N.J., Yalcin H.C., "Computational modeling of motile cilia generated cerebral flow dynamics in zebrafish embryo", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0128

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Computational Investigation of Wall Shear Stress Patterns on Calcified Aortic Valve Leaflets

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Abstract:

Background: Aortic valve diseases affect about 25% of the population over 65 years of age. Aortic valve separates the left ventricle from the aorta, and consists of three half-moon shaped leaflets. The leaflets are highly dynamic structures which open during the ventricle contraction and close during the ventricle relaxation. Calcification on leaflet surfaces results in poor valve functioning which deteriorates the valve hemodynamics. Wall shear stresses (WSS) on the leaflet surfaces are considered to be strongly related with the initiation and progression of calcification. **Aim:** To investigate the effect of altered hemodynamics on the valve leaflet calcification, and to understand the role of WSS patterns in the progression of the aortic valve diseases. **Methods:** We investigate the hemodynamics of aortic valves using computational modeling. Fluid-structure interaction approach is employed to accurately determine the complex dynamic motion of valve leaflets. A 3D patient-specific aortic valve model is generated. Using finite element modeling, blood flow velocities, pressures, and WSS values are determined within the entire model, employing numerical techniques to obtain the characteristics of altered hemodynamics and spatial WSS patterns. **Results:** In case of calcification, WSS values are increased at both surfaces of the leaflets. On the ventricularis surface, there is a spatially-regular WSS distribution, which gradually increase from the leaflet attachment region to the leaflet tip. However, a spatially-complex WSS distribution is observed on the aortic leaflet surface. **Conclusion:** Relatively low WSS levels and spatially-complex WSS patterns on the aortic leaflet surface are observed as potential risk factors for the initiation and progression of aortic valve calcification.

Keywords: Aortic valve; Shear stress; Calcification; Heomdynamics; Mechanobiology

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Prevalence and Potential Determinants of Insomnia Disorder in the General Population of Qatar

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Abstract

Aims: To estimate the prevalence of Insomnia Disorder in the household population of Qatar and explore potential associations with depressive and anxiety symptoms in addition to sociodemographic variables. **Methods:** Probability-based sampling was used to select a representative sample (N= 1,611) of Qatar's household population. Face-to-face household interviews were conducted by trained staff using computer-assisted technology with consenting participants who were 18 years or older living in Qatar by the Social and Economic Research Institute (SESRI) at Qatar University as part of the Annual Omnibus survey in February/ March, 2019. The Sleep Condition Indicator (Epsie, 2014), a brief screening tool for DSM-5 criteria, was used to estimate the prevalence of insomnia in Qatar's general population. Depressive and anxiety symptoms were ascertained using the PHQ-9 and GAD-2. Sociodemographic and health information including personal and family history of autoimmune disease were also collected. Univariate, bivariate, and multivariate statistics were conducted. **Results:** The prevalence of insomnia was 5.5% (95%CI: 4.3-6.7) and was higher in females (6.3%) than males (4.6%), though these differences were not statistically significant (P = 0.216). Insomnia was strongly associated with depressive (OR=5.4, P<0.01) and anxiety symptoms (OR=3.0, P<0.05). Having one or more autoimmune diseases were strongly associated with insomnia (OR=3.9, P<0.001) in Qatar's general population. Insomnia was positively associated with younger age (P<0.01) and negatively associated with higher (post-secondary) education (OR=0.4, P<0.05). **Conclusion:** There is a significant association between mental illness and insomnia in Qatar with interesting findings in context of Qatar for role of age, education, and ethnicity. These findings need to be taken into account in provision of mental health services. Future studies should delineate the role of cultural attitudes towards sleep as potential mechanism linking insomnia to mental illness.

Keywords: Insomnia disorder; Depression; Anxiety; Epidemiology; Qatar

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The association between Insomnia Disorder and Depression in the General Population of Qatar: The Role of Inflammatory Disease

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Abstract:

Background: There is emerging evidence that supports a role for inflammatory processes and insomnia in the pathophysiology of depression. However, little is known about the role of inflammation in depression and insomnia in non-clinical populations. **Aims:** We aimed to estimate the association between inflammatory illness, depression and insomnia in the Qatari population. We hypothesized that inflammatory illness would be associated with sub-clinical depression and insomnia in the Qatari population. **Methods:** We used probability-based sampling on a representative sample (N= 1,611) of Qatar's adult household population. Face-to-face interviews were conducted using computer-assisted technology as part of the SESRI's annual omnibus survey in 2019. We used the Espie's (2014) Sleep Condition Indicator, to assess insomnia symptoms, and PHQ-9 and GAD-2 for subthreshold depression (SUBD), major depressive disorder (MDD), and anxiety. Health information including personal and family history of inflammatory disease were also collected. Univariate, bivariate, and multivariate statistics were conducted. **Results:** Among those with no inflammatory disease, the 30-day prevalence of subthreshold and major depression in those with insomnia disorder compared to those without insomnia was (SUBD: 5.3% vs 2.9%; MDD: 7.2% vs 0.6%, P<0.001), respectively. In contrast, among respondents with inflammatory disease, the prevalence of subthreshold and major depression in those with insomnia compared to those without insomnia was (SUBD: 11.8% vs 3.6%; MDD: 17% vs 1.7%, P<0.001), respectively. In crude (adjusted for age, gender, and household type) models with depression as a dependent variable, a statistically significant association between SUBD and insomnia was found (OR=4.2, P<0.01), while much stronger association was found between major depression and insomnia (OR=20.4, P<0.001). **Conclusion:** These findings highlight the possible impact of inflammatory disease on mental health in the otherwise healthy population of Qatar.

Keywords: Insomnia disorder; Depression; Inflammatory disease; Qatar

For citation: Khaled S.M., Petcu C.G., AlThani M.A, AlHamadi A.M., Woodruff P., "The association between Insomnia Disorder and Depression in the General Population of Qatar: the Role of Inflammatory Disease", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0131

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Impact of Heparan Sulphate Binding Domain of Chemokine CCL21 to Migration of Breast Cancer Cells

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Abstract

Lymph node metastasis constitutes a key event in breast cancer progression. Chemokines are small proteins, which can promote metastatic spread by inducing cancer cell migration and invasion. Chemokine function is dependant upon their binding to both cell surface heparan sulphate (HS) molecules and to their specific receptor. Our group has demonstrated a significant increase in chemokine receptor CCR7 expression in cancerous breast epithelia compared to healthy controls. This study is designed to test the hypothesis that a non-HS binding forms of chemokine CCL21 can disrupt the normal response to CCL21, therefore reducing the metastasis of CCR7-expressing cancer cells. Truncated CCL21 chemokine (Δ98-134 c-terminal basic extension), was synthesised to investigate a possible linkage between chemokine binding capacity and cell activation. Wild type (WT) and mutant-CCL21 were tested for their ability to stimulate a dose-dependent increase in intracellular-free calcium in peripheral blood mononuclear cell (PBMC) and breast cancer epithelial cells MDA-MB-231. Mutant-CCL21 at concentrations 5 and 10nM showed potential to mobilise Ca2+ at levels similar to that produced by WT-CCl21. A series of experiments was performed to determine how deletion of the HS-binding site altered the ability of CCL21 to stimulate chemotaxis within a concentration gradient generated by free solute diffusion. PBMC stimulated to migrate by wild-type CCL21 was not significantly different from that stimulated by mutant ($P > 0.05$). Similar results were observed in assays using MDA-MB-231 cells. A further series of experiments was performed to compare the potential of WT and mutant-CCL21 to stimulate the migration of cells across endothelium. In contrast to results for trans-filter migration, it was found that the non HS-binding mutant stimulated no increased in transendothelial cell migration above the background at each of the tested concentrations, 10, 30 and 50 nM respectively ($P>0.05$). However, WT-CCL21 stimulated significant increased PBMC migration at each of the tested concentration (all $P <0.001$). Furthermore, the effect of heparin on chemotactic properties of WT and mutant- CCL21 was examined. Interestingly, heparin (250 µg/ml) completely inhibit the chemotaxis mediated by WT-CCL21 (5nM) ($P < 0.001$), whereas it did not inhibit the chemotaxis at concentrations 100, 250 & 500 µg/ml in response to mutant CCL21 (5nM) ($P > 0.05$). Similar assay will be performed using MDA-MB-231 cells. Work is ongoing to characterise the biophysical properties of mutant-CCL21 and determine its potential role for a therapeutic blockade of the migration of breast cancer cells in-vivo. Our primarily data showed that mutant CCL21 in xenograft brain tumor models showed substantial inhibition of tumour growth. Our results indicate that truncated CCL21 chemokine might be a potential preventive biofactor for human breast cancer metastasis by targeting chemokine receptor genes.

Keywords: Breast cancer; Metastasis; Chemokines; CCL21

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Influenza, RSV, and Other Respiratory Infections among Children in Qatar

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Abstract

Background: Acute respiratory infections (ARIs) lead to high rates of mortality and morbidity among children. However, studies on the etiology of respiratory infections among children in Qatar and surrounding countries are still limited. **Objectives:** To describe the prevalence and seasonality of RSV, influenza, and other respiratory pathogens among children in Qatar. **Methods:** We retrospectively collected data of 33,404 patients <15 years old presented with Influenza-like illness (ILI) from 2012 to 2017. All samples were tested for influenza viruses, while 30,946 were tested for a complete panel of 21 respiratory pathogens. **Results:** At least one respiratory pathogen was detected in 26,138 (78%) of patients. Together, human rhinoviruses (HRV), respiratory syncytial virus (RSV), and influenza viruses comprised nearly two-thirds of all ILI cases, detected in 24%, 19.7%, and 18.5%, respectively. A detection rate of 5-10% was recorded for adenovirus, human parainfluenza viruses (HPIVs), bocavirus (HboV), and human coronaviruses (HCoVs). Other pathogens such as human metapneumovirus (HMPV), enteroviruses, *mycoplasma pneumonia*, and parechovirus had prevalence rates below 5%. ILI positive cases were detected throughout the year. RSV, influenza, HMPV exhibited strong seasonal activity in the winter, while HRV was primarily active during low RSV and influenza activity. The burden of RSV exceeds that of influenza among young age groups (<5 years), affecting 17-30% of ILI cases. Prevalence of influenza, on the other hand, correlated positively with age, ranging from 23% to 32% in age groups above five years. Further, male patients had higher rates of HRV (26%) and adenovirus (9%), whereas females showed a higher prevalence of influenza (22%), and RSV (20%) infections. **Conclusion:** This comprehensive report provides insights into the etiology of ILI among children in Qatar, which represents the Gulf region. Our results reinforce the significance of active surveillance of respiratory pathogens to improve infection prevention and control strategies, particularly among children.

Keywords: Epidemiology; Respiratory infections; Influenza

For citation: Smatti M.K., AlRomaihi H.E., AlKhatib H.A., Coyle Peter V., AlThani A.A., AlMaslamani M.A., Yassine H.M., "Influenza, RSV, and Other Respiratory Infections among Children in Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0133

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The Protective Role of Sestrin2 in High Fat Diet-Induced Nephropathy

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Abstract

Introduction: Obesity is a major risk factor for type-2 diabetes predisposing patients to diabetic nephropathy (DN), the leading cause of end-stage renal failure. Glomerular injury is a prominent pathological feature of DN. Sestrin2 (Sesn2) is a stress-induced protein, but its role in DN has not been investigated. Therefore, we have determined the impact of Sesn2 deletion in a mouse model of obesity-induced nephropathy. **Materials and methods:** We examined the effects of Sesn2-deficiency in a long-term (22 weeks) mouse model of high fat diet (HFD)-induced obesity on glomerular structure. The severity of renal injury and fibrosis in wild type ($Sesn2^{+/+}$) mice (fed HFD or chow diets) was compared to that in Sesn2-deficient mice ($Sesn2^{-/-}$) fed HFD or chow diets. Animal work was carried out under an IACUC-approved protocol. **Results:** Data showed that Sesn2 ablation exacerbated HFD-induced glomerular fibrotic injury as evidenced by mesangial matrix hypertrophy and accumulation of both fibronectin and collagen IV. Western blot analysis revealed that HFD- or chow-fed $Sesn2^{-/-}$ mice exhibited higher protein expression of key lipogenic enzymes, fatty acid translocase CD36 (an indicator of lipid uptake), fatty acid synthase and ATP citrate lyase. Sesn2-deficiency in obese mice resulted in podocyte loss as indicated by reduced expression of synaptopodin. Glomerular lesions like those observed in HFD-fed wild-type mice were detected in $Sesn2^{-/-}$ mice fed a chow diet, indicating that the basal deletion of Sesn2 is deleterious by itself. **Conclusions:** We provide the first evidence that Sesn2 is renoprotective in obesity-induced nephropathy by diminishing lipid accumulation and blocking excessive lipid uptake and *de novo* lipid synthesis. Understanding the protective of Sesn2 should yield novel therapeutic interventions to effectively preserve glomerular function in obesity and diabetes.

Keywords: Obesity; Diabetic kidney disease; Oxidative stress; Sestrin2; Biomaker

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Thermal Stability of 0.9% Sodium Chloride IV Fluid exposed to Short- and Long-Term Extreme Conditions

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Abstract

Purpose: 0.9% sodium chloride IV fluid (normal saline) is critical in a clinical setting and may save lives. Data on thermal stability of normal saline, in out-of-hospital settings, are lacking. The purpose of this study was to evaluate the effect of temperature on normal saline stability. **Method:** Normal saline provided in flexible plastic containers (Qatar Pharma, BA:1929013008, n=96) were stored at constant temperature of 22, 50, or 70°C, and at cyclic temperature of 70°C for 8 hours and 22°C for 16 hours for a period up to 28 days. The containers were sampled at 0, 12, 24, 48 and 72 hours and at 1, 2, 3, and 4 weeks in the short- and long-term study, respectively. Fluid inside containers was evaluated for discoloration, turbidity, bulging, and pH. A 1 mL of normal saline was withdrawn from each container and stored at 4°C until analysis. A 20 µL was diluted in 12 mL distilled water to be injected into ion exchange chromatography instrument (Metrohm, 850 Professional IEC) for the measurement of sodium and chloride levels.
Results: Discoloration or turbidity of normal saline fluid was not observed at any temperature or exposure period. The container slightly bulged at 50˚C and largely bulged at 70˚C & cyclic. The pH was 5.59±0.08 at 22˚C, 5.73±0.04 at 50˚C, 5.86±0.02 at 70˚C and 5.79±0.03 at cyclic. Remaining sodium and chloride levels ranged from 100.2±0.26% to 111.27±4.22% and from 99.04±0.76 to 110.95±2.62%, respectively. **Conclusion:** Normal saline containers are stable up to 4 weeks under simulated constant and cyclic high temperatures. Storage in the cabinet of ambulance vehicles during hot summer season in an arid country like Qatar is to be assessed in real-life conditions.

Keywords: Stability; Temperature; Humidity; Saline; Emergency medical setting

For citation: Akkbik M., Izham M.I.M., Diab M., Moslih A., Makhlouf A., AlShaikh L., Alinier G., "Rachid, Ousama, "Thermal Stability of 0.9% Sodium Chloride IV Fluid exposed to Short- and Long-Term Extreme Conditions", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0135

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Optimized DNA Extracting Method for Oxford Nanopore- Long reads Sequencing from Marine samples

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Abstract

Sustaining social and economic growth is impossible without a holistic environmental vision that places environmental preservation for Qatar's future generations at the forefront. According to the Ministry of Development and Planning and Statistics, the Qatar National Vision (QNV) 2030 aims to direct Qatar towards a balance between developmental needs and the protection of its natural environment, whether land, sea or air. As such, the QNV 2030 includes an emphasis on establishing environmental institutions that can serve as the guardians of Qatar's environmental heritage. The QNV 2030 also emphasizes the importance of increasing citizens' awareness of their role in protecting the country's environment for their children and the nation's future generations. The State of Qatar has chosen to pursue the path of sustainable development, making it the focus of the Qatar National Development Strategy. Given the large-scale industrialization and the limited land availability, the urban environment will be crucial in maintaining native species. The presence of heavy petrochemical firms in Qatar necessitates stressing on researches related to biomonitoring of environmental ecosystem with the aim to understand and provide impactful solution for different environmental challenges affecting Qatari health, and damages to local ecosystem. Due to the extreme temperatures and salinities in the Gulf region, the national biodiversity has adapted to survive under extreme conditions. Furthermore, the barriers that isolate the Arabian Gulf have created an environment that is rich with endemic species that are specific to the region. As such, this project aimed to cover the gap in the genomic analysis of Qatar's rich environment. The goal was to decipher the genetic background of different animal species, marine and environmental species specific to the Qatari environmental landscape that has been previously described by Qatar University's environmental science center. The study also deciphered the microflora in marine environment that is an important building block of the environment and an indicator of its richness. The outcome from this study is to help in preservation of important species in Qatar and will guide the establishment of a national genomic habitat platform in Qatar.

Keywords: Qatar; Sequencing; Marine species; Arabian Gulf

For citation: Boughattas S., Al Batesh D., Giraldes B., Al-Thani A., Benslimane F., "Optimized DNA Extracting Method for Oxford Nanopore- Long reads Sequencing from Marine samples", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0136

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Investigating the Effect of Hyperglycemia on Embryonic Heart Development using the Chick Embryo Model

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Abstract

Congenital heart defects (CHDs) represent the most common form of human birth defects. Maternal diabetes increases the risk of CHD by 3-5 folds. During heart development, little is known about the effects of high blood glucose on the fetal development of CHDs. Chick embryo is a widely used animal model to investigate CHDs. Heart development in this specie closely resembles humans with four chambers/four-valve configuration. In this project, the mechanisms that contribute to heart defects during gestational diabetes were investigated using chick embryo model. Fertilized chicken eggs were injected with glucose to induce hyperglycemia in embryos. Blood glucose level was measured using a glucometer. Cardiac function was assessed via echocardiography. Heart tissues were extracted for histological assessment and for measurement of gene expression of cardiac markers via RT-PCR. Hyperglycemia resulted in increasing the blood flow velocities in the atrioventricular (AV) valve and reduced the ejection fraction at AV and outflow track (OFT) canals. It altered the structure of the hearts and the gene expression of sheer stress markers. Results of this study showed that chick embryo is a good model for investigating the effect of hyperglycemia on the heart function during the development. Hyperglycemia affects the function of the heart valves as well as heart ventricles. These results could identify alterations in the early developmental process that contribute to the increased cardiac malformations risk in babies of diabetic mothers.

Keywords: Hyperglycemia; Chick embryo model; Congenital heart defect

For citation: Benslimane F., Ahmed M., AlThani H., AlSer M., Yalcin H., "Investigating the effect of hyperglycemia on embryonic heart development using the chick embryo model", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0137

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High Vaccine Coverage is Crucial for Preventing the Spread of Infectious Diseases During Mass Gathering

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Abstract

Background: Vaccines are the most cost-effective intervention in public health as they prevent the spread of highly contagious infectious diseases. Because of vaccine implementation and high coverage, Measles was eradicated in 2000, however the recent reappearance of measles in the United States, Europe and globally is alarming. The resurgence of Measles, Diphtheria and Mumps is due to a reduction in vaccine coverage and herd immunity. Vaccine hesitant parents, antivaxxers, and fake news on vaccines are driving the surge in those infectious diseases. The World Health Organization issued the Global Vaccine and Immunization Action Plan to reiterate the importance of vaccine implementation and coverage for several vaccine-preventable infectious diseases in the world. Qatar is preparing for the upcoming FIFA World Cup 2022 therefore maintaining high vaccine coverage, which is critical in preventing infectious diseases spreading during such mass gathering. **Methods:** Literature search for vaccine coverage rates, resurgence of vaccine preventable infectious diseases and risks of mass gatherings. **Results:** Seventeen infectious diseases are currently vaccine-preventable. The cost-effectiveness of vaccine is documented as it is estimated for each dollar spent on vaccines, 10 dollars are saved in disease treatment. A drop in vaccine coverage rates to under 90% lead to the resurgence of measles. Vaccine coverage rate in Qatar is currently at 95% which is one of the highest in the world. Qatar must maintain this high coverage rate to prevent any measles outbreaks during mass gatherings. The planned World Cup event will take place from November 21 till December 18 2022, which is the peak for seasonal influenza. In preparedness for this major event, Qatar should encourage residents and visitors to be vaccinated not just against measles and seasonal influenza, but also hepatitis and meningitis. **Conclusion:** Maintaining 95% vaccine coverage rate is critical for preventing the resurgence of vaccine-preventable infectious diseases during the World Cup mass gathering in Qatar.

Keywords: Vaccine coverage; Community protection; Mass gathering; Preventable infectious diseases

For citation: Zughaier S., "High vaccine coverage is crucial for preventing the spread of infectious diseases during mass gathering", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0138

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Barriers and Motivators of Appropriate Antibiotic Prescription at PHCC in Qatar: Perspective of Physicians and Pharmacists

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Abstract

Antimicrobial resistance (AMR) is a serious public health problem of global concern. The Ministry of Public Health (MOPH) developed the NAP (National Action Plan) to combat AMR in Qatar in collaboration with WHO/EMRO. Tailoring Antimicrobial Resistance Program is a behavioral change methodology that is utilized in this study to tailor behavioral change in relation to antimicrobial use. The study explores barriers and motivators of appropriate antibiotic prescription from the physicians' and pharmacists' perspectives at primary healthcare centers in Qatar. Data were collected from 50 participants across two PHCCs; 30 physicians and 20 pharmacists. Two different interview guides were constructed; one for physicians and one for pharmacists. In-depth, face-to-face, five focus groups were conducted and transcribed verbatim. Inductive qualitative analysis, involving discovering the themes in the interviews, was followed. Data were analyzed using constant comparative techniques. Each transcript was coded, and new themes were added to the codebook as they emerged. The analysis revealed that the factors influencing the prescription of antibiotics in PHCC were embedded within the individual, community, and organizational levels. Participants explained that patients' demographics and practitioners' practices in prescribing AB were among the major barriers. On the other hand, patient's education and engagement regarding appropriate antibiotic use, physician's ability to make the right decision, and build rapport with the patient to gain trust were among the motivators. In addition, auditing AB prescription and the enhancement and utilization of clinical diagnostic tools could play a positive role in changing behavior. The findings would help develop and pilot a behavior change intervention among physicians and pharmacists in the selected PHCCs with the aim of optimizing appropriate antibiotic prescription, which would support the implementation of the antibiotic stewardship program. Effective behavior change interventions should consider multiple factors including individual, community, and organizational factors to optimize appropriate antibiotic prescription, thus decrease the prevalence and burden of antibiotic resistance.

Keywords: Antibiotic prescription; Primary healthcare; Focus group discussions

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The Design of Preceptor Development Program for Health Cluster in Qatar – "The Practice Educators Academy"

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Abstract

Background: Experiential learning is the backbone of many healthcare professional education programs, and the quality of experiential learning is dependent on the skills, experiences, and proficiency of the clinical preceptors who largely contribute to this experience. Preceptors should ideally possess both clinical practice and teaching skills; however, preceptors often do not possess formal training as educators. This research was conducted at Qatar University with the aims of identifying preceptors' educational needs and developing the skills by designing an educational professional development program called: "The Practice Educators' Academy". **Methods:** A mixed-methods triangulation study design was applied to identify preceptors' educational needs quantitatively through a validated survey sent to preceptors (n=325), and qualitatively by conducting 11 focus groups with preceptors (n=20), students (n=42), sand clinical faculty members (n=7). Quantitative and Qualitative data in addition to an extensive literature review were used in designing the academy by an inter-professional healthcare and educational team. **Results:** Principles of learning theories, planning for experiential learning, teaching strategies, students' assessment and feedback, and communication skills for effective preceptorship and conflict resolution were the key domains expressed as preceptors' educational needs. A five-module program syllabus was designed to meet these needs while benchmarking it with international preceptors' educational development programs. The designed syllabus was critically examined and validated by national and international health professional education scholars. **Conclusion:** "The Practice Educators' Academy" is the first intervention nationally and regionally that aims at improving preceptors' teaching skills required to prepare competent health profession graduates. This will advance healthcare outcomes, meet the healthcare needs of Qatari society, and ultimately contribute to achieving Qatar National Vision 2030. Future studies should focus on evaluating the effectiveness of the program in improving preceptors' knowledge and skills, and enhancing students' satisfaction before full implementation at a national level.

Keywords: Capacity building; Experiential learning; Mixed methods research; Professional development; Education research

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Between Immunity, Metabolism, and Development: A story of a Fly Gut!

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Abstract

In addition to its role in initiating immune response in the body, the innate immune system seems to also play a critical role in maintaining homeostatic balance in the gut epithelium. Our recent studies in the Drosophila melanogaster fruit fly model suggest that different innate immune pathways contribute to this homeostatic balance through activating the transcription of genes encoding antimicrobial peptides. We provide evidence that several metabolic parameters are altered in immune deficient flies. We also highlight a role of the gut flora, particularly through its short chain fatty acid, in contributing to this metabolic balance. Interestingly, our data suggest that impaired immunity and metabolic alteration, in turn, exhibit an effect on host development. Collectively, these findings provide evidence that innate immune pathways not only provide the first line of defense against infection but also contribute to host metabolism and development.

Keywords: Innate immunity; Metabolism; Development; Drosophila melanogaster

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Anti-diabetic and Anti-hypertensive Potential of Indigenous Edible plants of Qatar

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Abstract

Aizoon Canariense, Cynomorium Coccineum, Glossonema Edule, and Malva Parviflora, edible desert plants from Qatar, were selected to determine levels of phenolic bioactives and potential health benefits for managing early stages of type 2 diabetes and hypertension. Aqueous extracts of C. Cocineum, contained soluble phenolics and had relatively high levels of antioxidant activity associated with α-glucosidase, α-amylase, and angiotensin- converting enzyme (ACE). G. Edule and M. Parviflora had moderate levels of anti-oxidant potential, soluble phenolics, and ACE inhibitory activity. The medicinal properties associated with C. Coccineum suggest the plant may have potential as a diet-based solution for combating, preventing, and managing the early stage of type 2 diabetes when coupled with an overall healthy life style and pharmacological management strategies.

Keywords: ACE Inhibition; Antioxidant activity; Diabetes

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The Role of GATA3 in Adipogenesis & Insulin Resistance

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Abstract

Background: Impaired adipogenesis plays an important role in the development of obesity-associated insulin resistance and type 2 diabetes. Adipose tissue inflammation is a crucial mediator of this process. In hyperglycemia, immune system is activated partially through upregulation of GATA3, causing exacerbation of the inflammatory state associated with obesity. GATA3 also plays a role as a gatekeeper of terminal adipocyte differentiation. Here we are examining the impact of GATA3 inhibition in adipose tissue on restoring adipogenesis, reversing insulin resistance and potentially lowering the risk of type 2 diabetes.

Results: GATA-3 expression was higher in insulin resistant obese individuals compared to their insulin sensitive counterparts. Targeting GATA-3 with GATA-3 specific inhibitors reversed impaired adipogenesis and induced changes in the expression of a number insulin signaling-related genes, including up-regulation of insulin sensitivity-related gene and down-regulation of insulin resistance-related genes.

Conclusion: GATA3 expression is higher in differentiating adipocytes from obese insulin resistant. Inhibiting GATA3 improves adipocytes differentiation and rescues insulin sensitivity in insulin resistant cells.

Keywords: GATA3; Insulin; Diabetes; Adipogenesis; Obesity

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Effect of Omega-3 Polyunsaturated Fatty Acids on Inflammatory Biomarkers in Chronic Obstructive Pulmonary Disease

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Abstract

Chronic obstructive pulmonary disease (COPD) is a chronic progressive inflammatory disease characterised by airflow limitation. Several pro-inflammatory markers are thought to be involved in the pathogenesis of COPD. Cigarette smoking is a major risk factor for COPD, and diet may be a modifiable risk factor for its progression & management. Dietary supplementation with omega-3 polyunsaturated fatty acids (omega-3 PUFAs) may be effective therapeutically in patient COPD. **Aim**: To determine the plasma basal level of inflammatory biomarkers in the study population, to determine the inflammatory biomarkers release from Peripheral blood mononuclear (PBMCs), and to investigate the effect of omega-3 PUFAs, on inflammatory biomarkers released from PBMCs. **Methods:** Blood samples were collected from 42 subjects; patients with COPD, 15 healthy smokers (HS), and 12 healthy groups (HNS). Selected biomarkers level was measured in Plasma and PBMCs by ELISA. Individual lipid profile analysis was carried out on RBCs fraction. Result: Plasma high levels of CRP and Fibrinogen and low level of CC-16 were observed in COPD patients when compared with healthy controls. The basal release of IL6, IL8, TNFα, and CD31 from PBMCs was significantly differing in COPD and HS groups compared to HNS group. Omega-3 PUFA (EPA and DHA) reduce IL-6, IL-8 and TNF-α release from PBMCs. The fatty acid composition of the erythrocyte membranes in patients group was unmodified. **Discussion:** This study showed that high level of several inflammatory biomarkers that were detected systemically in COPD group might associate with the disease systemic inflammation. EPA and DHA possess the ability to reduce the cytokines production from COPD inflammatory immune cells. Additionally, no correlation was observed between fatty acid profile analysis and COPD.

Keywords: COPD; Omega 3 fatty acid; Inflammation

For citation: AlHaidose A., "Effect of Omega-3 Polyunsaturated Fatty Acids on Inflammatory Biomarkers in Chronic Obstructive Pulmonary Disease", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0144

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A Decision Analytical Model Investigating Cost-Effectiveness of Erlotinib

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Abstract

Background: A decision analytical model investigating cost-effectiveness of Erlotinib was submitted to the UK NICE (National Institute for Health and Care Excellence), which was not based on actual health-state transition probabilities, leading to structural uncertainty in the model. The study adopted a Markov state-transition model for investigating the cost-effectiveness of Erlotinib versus Best Supportive Care (BSC) as a maintenance therapy for patients with non-small cell lung cancer (NSCLC).

Methods: Unlike manufacturer submission (MS), the Markov model was governed by transition probabilities, and allowed a negative post-progression survival (PPS) estimate to appear in later cycle. Using published summary survival data, the study employs three fixed- and time-varying approaches to estimate state transition probabilities that are used in a restructured model.

Results: Post-progression probabilities and probabilities of death for Erlotinib were different than fixed-transition approaches. The best fitting curves are achieved for both PPS and probability of death across the time for which data were available, but the curves start diverging towards the end of this period. The Markov model which extrapolates the curves forward in time suggests that this difference between a time-varying and fixed-transition becomes even greater. Our models produce an ICER of £54k -£66k per QALY gain, which is comparable to an ICER presented in the MS (£55k/QALY gain).

Conclusions: Results from restructured Markov models show robust cost-effectiveness results for Erlotinib vs BSC. Although these are comparable to manufacturer submissions, in terms of magnitude, they vary, and which are crucial for interventions falling near a threshold value. The study will further explore the cost-effectiveness of therapies for NSCLC in Qatar.

Keywords: Non-small cell lung cancer; Decision model; Cost-effectiveness

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A Validated and Applicable Direct Injection LC/MS/MS Method of Fourteen Drugs of Abuse in Urine Samples to Avoid the False Positive/Negative Results of Immunoassay Techniques in Forensic Cases

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Abstract

Many false positive and false negative results have been detected in immunoassay analyses of drugs of abuse in urine samples. A method of direct injection of diluted urine into LC/MS/MS was developed and validated for detection and quantitation of Amphetamine, Methamphetamine, MDMA, MDA, Benzoylecgonine, Ecgonine, Norpseudoephedrine, Ephedrine, Tapentadol, Tramadol, O-desmethyltramadol, Tapentadol, Pregabline, Gabapentine and Methadone to avoid the false positive and false negative results in urine samples. Linearity of Amphetamine, Methamphetamine MDMA, MDA, Benzoylecgonine, Ecgonine, Norpseudoephedrine and Ephedrine was (60-2400ng/mL), for Tapentadol, Tramadol, O-desmethyltramadol, and Methadone was (50-1600 ng/mL), and for Pregabline and Gabapentine was (100-4000ng/mL) and r2 > 0.992 for all analysts. A 440 urine samples have been analyzed using both immunoassay technique and LC/MS/MS by direct injection method giving a good comparison to illustrate how this method was specific, accurate, precise, and applicable for forensic urine samples.

Keywords: LC/MS/MS; Amphetamine; Methamphetamine; Benzoylecgonine; Ecgonine

For citation: Mahdy T., AlSulaiti A., Abdelqader Y., Fikry A., Hag G., Ahmad M., "A Validated and Applicable Direct Injection LC/MS/MS Method of Fourteen Drugs of Abuse in Urine Samples to Avoid the False Positive/Negative Results of Immunoassay Techniques in Forensic Cases", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0146

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The Effect of Subsidies on Healthful Consumption: Systematic Review and Data Synthesis

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Abstract

Background: Prevalence of obesity and overweight has risen to the level of an epidemic. Health policy makers are seeking evidence-based solutions to this problem. This study reviews evidence on the subsidization of healthy foods as a fiscal tool to aid-in the public health response to this epidemic.

Methods: A systematic search of the major databases was performed, and data extracted from studies meeting inclusion criteria. Main outcomes of interest were indicators of purchasing/consumption pattern, or body composition. Preliminary results are presented as a narrative summary.

Results: Search results yielded 22 studies, of which 10 were extracted and 12 excluded. Of the 12 excluded 5 were duplicate studies of reports extracted, and 7 studies did not meet inclusion criteria. Most extracted studies were randomized control trials. The majority of the studies had multiple arms, one of which was typically a multi-component fiscal measure implemented alongside education or skills building. This type of multi-component intervention yielded the most promising results, mainly an increase in the percentage of daily fruit and/or vegetable consumption. This percentage increase varied between studies ranging from 4% up to 35%, with fruit consumption/purchasing responding more favorably to pricing changes compared to vegetable consumption/purchasing.

Conclusion: Although preliminary, the results suggest that multi-component interventions appear to be the most promising in terms of real changes to purchasing behavior. Important considerations include the significant heterogeneity in reported outcomes, and the notable lack of studies assessing for substitution effects. Policy makers, in their examination of these findings, should consider these limitations.

Keywords: Obesity; Policy; Systematic review; Recommendations

For citation: AbuHijleh F.M., "The effect of subsidies on healthful consumption: Systematic review and data synthesis", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0147

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Stepwise Relationship of Exercise Frequency with Serum BDNF Level among Adolescents

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Abstract

Introduction: Regular participation in exercise in adolescents is associated with numerous health benefits, including improved CV, metabolic, muscular, respiratory, immune, cognitive, and neurohormonal functions. Brain-derived neutrophic factor (BDNF) is essential for several body functions, particularly the neural and cognitive functions. However, the dose-effect of exercise participation on BDNF is not fully understood among adolescents. The current study examined the relationship of serum BDNF level with moderate/vigorous exercise frequency in 703 adolescents aged 13-17 years old.

Methodology: ELISA was used to evaluate serum BDNF. Additionally, the SALSA questionnaire was used to obtain the weekly frequency of moderate/vigorous exercise.

Results: The ANOVA revealed differences (p=0.001) in BDNF level according to running frequency. Subsequent posthoc analysis showed that BDNF was greater (p<0.05) in adolescents participating three, four, five, six, and seven versus no and one day of exercise. Furthermore, no differences (p>0.05) were found in BDNF between exercising three, four, five, six, and seven days/week.

Conclusion: The current data revealed stepwise differences in BDNF between running frequencies, peaking at five days/week. These differences in BDNF seems to plateau when participating more than three days/week. The results confirm the importance of exercise for brain health and are consistent with the current recommendations for moderate/vigorous exercise frequency.

Keywords: Adolescents; Exercise; Brain-derived neutrophic factor; Cognitive; Stepwise

For citation: Alomari M., Khabour O.F., "Stepwise Relationship of Exercise Frequency with Serum BDNF Level among Adolescents", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0148

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Protein Intake among Patients with Diabetes is Linked to Poor Glycemic Control

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Abstract

Background: Nutrition therapy is considered a key component of diabetes management. High-protein diets are recently gaining more popularity. Knowledge regarding the potential glycemic effect of protein in people with type 2 diabetes has been a particular interest. **Methods:** This study is a cross-sectional study based on NHANES data collected on participants aged 40 years and older who attended the surveys cohorts of 2011–2012 and 2013–2014. Data on 1058 participants were included in the analysis. Glycemic control was measured as HbA1c level and patients were categorized into quartiles of daily protein intake. Analysis adjusted for age, gender, race and energy intake muscle strength (quartile), sedentary activity, income to poverty ratio, education, smoking, alcohol drinking and BMI. Logistic regression models were produced to investigate the impact of high protein intakes on odds of poor glycemic control (HbA1c $\geq$ 7). **Results:** After controlling for muscle strength (quartile), sedentary activity, income to poverty ratio, education, smoking, alcohol drinking and BMI; patients in Quartile 4 for protein intake had 260% increased risk for poor glycemic control as compared to those in quartile 1. These results are limited because the analysis did not consider the source of protein (animal vs plant). Further studies are needed.

Keywords: Protein intake; Diabetes; Glycemic control

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Academic Programs Accreditation matters for Graduates Employability: A Case From Qu-Health

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Abstract

Background: This study investigated employers' perspectives on the impact of a supervised practice program (SPP), guided by international accreditation standards on the skill development and potential employability of dietetics students.

Methods: This study is based on qualitative research. Fifteen potential employers, who also served as SPP preceptors, participated in this study. Participants were interviewed using semi-structured questionnaire. All interviews were conducted face-to-face by a trained interviewer. Participates were invited to discuss their own experiences in the current SPP, their perceptions of the impact of SPP on skills and attributes of graduates, and their overall ideas of how SPP may contribute to the employability of graduates.

Results: This study found that the SPP program guided by international accreditation standards shaped the duties and responsibilities of preceptors/supervisors and promoted a beneficial relationship between preceptors and SPP students. The benefits to graduates include bridging the gap between classroom didactic knowledge and practice; improving workplace self-confidence; developing competencies such as critical-thinking, communication, interviewing, and counselling skills in various multidisciplinary and multicultural settings. In addition, the preceptors suggested that accreditation-guided SPP contributes to the employability of graduates. In addition, they opined that it reduced the need for orientation and shortened the probation time by providing students familiarity of the work environment and workflow leading to the improved preparedness for work.

Conclusion: SPP based on set of competencies guided by international accreditation standards provides an up-to-date curriculum, improves the quality of the nutrition and dietetics services, and increases the potential employability of the graduates.

Keywords: Dietetics education; Supervised practice program; Employment; Internship; International accreditation standards, Accreditation Council for Education in Dietetics and Nutrition, ACEND

For citation: Bawadi H., jayousi g., Du X., Ganji V., kerkadi a., Mowad J., Abunada t., "Academic Programs Accreditation matters for Graduates Employability: A Case From Qu-Health", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0150

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Blood Biomarkers associated with Autism Spectrum Disorder may Provide Early Diagnosis

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Abstract

Autism spectrum disorders (ASD) are a collection of neuropsychiatric disorders. ASD affects 1 in 87 in Qatar and is expected to increase. The high variability and heterogeneity of the symptoms makes diagnosis of ASD difficult and uncertain, particularly at the early stages of development. If detected early, clinical support can be given to promote optimal development and well-being of children with ASD and even achieve complete remission. The current method of diagnosing ASD is by observations and interviews made by experts in child development to assess child behavior, communication and cognition: the ADOS test. There is often delay in referral for expert diagnosis; delay is typically >18 months in Qatar and >4 years in EU and USA. The diagnostic accuracy is 60 – 70%. Mutations in proteins transporters of amino acids have been linked to some cases of ASD. We hypothesized that levels of amino acids in blood, including amino acids damaged by modification by sugars (glycation), oxidation and nitration may provide novel biomarker for diagnosis of ASD at very young age.

Keywords: Autism; Machine learning; Blood test

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A Systematic review of Pharmacists' input in the Screening, Management and Prevention of Metabolic Syndrome

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Abstract

Objectives: To critically appraise, synthesise, and present the available evidence on pharmacists' input to the screening, prevention and management of metabolic syndrome (MetS). **Design:** Systematic review. **Methods:** The protocol was developed based on the "Preferred Reporting Items for Systematic review and Meta-Analysis Protocols". Studies published in English from January 2008 to December 2018 reporting any pharmacist activities in the screening, prevention or management of MetS were included. The search was conducted in Medline, Cumulative Index to Nursing and Allied Health Literature, International Pharmaceutical Abstracts and Cochrane. Studies were assessed for quality by two researchers, data extracted and findings synthesized using a narrative approach. **Results:** Nine studies were included in the review, with four being randomised controlled trials. Most studies focused on pharmacist input to MetS screening and management. Screening largely involved communicating metabolic parameters to physicians. Studies involving the management of MetS described pharmacists collaborating with physicians and other health professionals. The positive impact was reported in all studies. These included achieving MetS parameter goals, reverting to a non-MetS status, improved medication adherence and self-reported improved lifestyle modification. The populations studied were paediatrics with risk factors and adults with comorbidities and psychiatric patients. Integration within the multidisciplinary team, an easy referral process and accessibility service were potential facilitators and inadequate funding the key barrier. **Conclusion:** The limited number of studies describing pharmacist input in MetS provides some evidence of positive outcomes from screening and management as part of collaborative practice. Further work is required to provide more robust evidence of effectiveness and cost-effectiveness while considering key barriers.

Keywords: Metabolic syndrome; Pharmacist; Screening; Management; Systematic review

For citation: AlAdawi R.M., Stewart D., Ryan C., Tonna A., "A systematic review of pharmacists' input in the screening, management and prevention of metabolic syndrome", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0152

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The Impact of Pharmacist Interventions on Reducing Medication Errors in Pediatric Patients: A Systematic Review and Meta-analysis

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Abstract

Background: Medication errors are avoidable events that could occur at any stage of the medication use process. They are widespread in the healthcare system and are associated with increased risk of morbidity and mortality. Implementing a clinical pharmacist is one strategy that is believed to reduce medication errors in the general population including pediatric patients who are more vulnerable to medication errors due to several contributing factors including the challenges of weight-based dosing. **Aim:** The aim of this study is to qualitatively and quantitatively evaluate the impact of clinical pharmacist interventions on medication error rates for hospitalized pediatric patients. **Methodology:** PubMed, Embase, Cochrane and Google Scholar search engines were searched from database inception to February 2019. Study selection, data extraction and quality assessment was conducted by two independent reviewers. Observational and interventional studies were included. Data extraction was done manually and the Crowe Critical Appraisal Tool (CCAT) was used to critically appraise eligible articles. Summary odds ratios (ORs) with 95% confidence intervals (CIs) were calculated using a random-effects model for rates of medication errors. **Results:** A total of 19 studies were systematically reviewed and 6 studies (29 291 patients) were included in the meta-analysis. Pharmacist interventions involved delivering educational sessions, reviewing prescriptions, attending rounds and implementing a unit-based clinical pharmacist. The systematic review showed that the most common trigger for pharmacist interventions was inappropriate dosing. Pharmacist involvement was associated with significant reductions in the overall rate of medication errors occurrence (OR, 0.27; 95% CI, 0.15 to 0.49). **Conclusion:** The most common cause for pharmacist interventions in pediatric patients at hospital settings was inappropriate dosing. Overall, pharmacist interventions are effective at reducing medication error rates.

Keywords: Medication errors; Pediatrics; Pharmacist

For citation: Naseralallah L.M., Hussain T.A, Pawluk S., Eljaam M., "The Impact of Pharmacist Interventions on Reducing Medication Errors in Pediatric Patients: A Systematic Review and Meta-analysis", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0153

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Sanguinarine Mediated Anti-Tumor activity Via Targeting JAK/STAT3 Pathway in Thyroid Cancer

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Abstract

Sanguinarine (SNG), a natural compound with an array of pharmacological activities, has promising therapeutic potential against a number of pathological conditions, including malignancies. This research is aimed to investigate the antiproliferative and anti-cancer potential of SNG against two well characterized papillary thyroid cancer (PTC) cell lines, BCPAP and TPC-1 .In both cell lines, SNG was able to inhibit cell proliferation in time and dose dependent manner. Western blot analysis revealed increased expression of apoptosis and autophagy markers, caspase-3, cleaved caspase-3, P62, and LC3. SNG modulate its anticancer effect through ROS production, because NAC was able to reverse SNG effect. Interestingly, co-treatment of PTC with SNG and cisplatin amplified anticancer activity. Finally, SNG treatment of PTC spheroid suppressed its growth with downregulation of stemness markers including ALDH2 and SOX2 markers. In conclusion, SNG enhanced the anti cancer activity against PTC cells and the effect is amplified when cisplatin is added.

Keywords: Sanguinarine; JAK/STAT3 pathway; Thyroid cancer

For citation: Ahmed E., Khan A., Prabhu S.K., Siveen K., Nawaz Z., Zayed H., Uddin S., "Sanguinarine mediated anti-tumor activity via targeting JAK/STAT3 pathway in thyroid cancer", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0155

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Assessing the Current Standing of Hamad Medical Corporation Blood Donor Center in Qatar and Developing a Forecast Model for the Blood Stock Needs during the 2022 World Cup Event

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Abstract

Background: In two years from now, Qatar will host the 2022 World Cup competition, which requires high level of preparedness and readiness in different sectors including healthcare. Among different sub-sections of health, the blood bank and the Blood Donor Center will have a major role in this event especially in case of unforeseen incidences. Accordingly, a proper assessment of the current blood resource availability and a prediction of future blood needs helps in overcoming any obstacle that could be faced during the event. **Objectives:** (1) Highlight the process of the blood supply chain, with a detailed delineation of the needed amount of blood components for both routine and emergency situations services, and outline the proper measures taken to deliver the safest and most appropriate blood units and reduce wastage of blood component. (2) Assess the current standing of the Blood Donor Center and corresponding units in Qatar. (3) Develop a forecast model that predicts the number of blood donors in the next four years as a method to evaluate the readiness of the Blood Donor facility to host the world cup event. (4) Explore the potential challenges that could be faced when meeting the benchmark of donation and established an action plan to overcome these anticipated challenges. **Materials and methods:** Both qualitative (interviews) and a quantitative (data collection and analysis) approaches have been implemented in our study. We also established a time series forecast model using Autoregressive Integrated Moving Average (ARIMA). **Results:** The number of donors in the next four years, which is predicted to increase by 26%, will not be able to be accommodated in the current Blood Donor Center facility. Therefore, the established blood stock benchmark will not be met despite that the Center and its corresponding units are fully equipped with high standard equipment and follow international guidelines in the process of blood withdrawal. **Conclusion:** Infrastructure improvements and logistics support for Hamad Medical Corporation Blood Donor Center are required to support the continuously increasing numbers of blood donors for daily demand and during mega events.

Keywords: Forecasting; Demand; 2022 World Cup; Blood Donor Center; Challenges and awareness

For citation: Qush A., Abdel R.M., AlDewik N., Kamareddine L., "Assessing the Current Standing of Hamad Medical Corporation Blood Donor Center in Qatar And Developing a Forecast Model for the Blood Stock Needs During the 2022 World Cup Event", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0156

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Is there an association between Attending Cardiac Rehabilitation Program and Health-related Quality of Life among Patients in Qatar?

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Abstract

Introduction: Cardiovascular disease (CVD) is the primary cause of death worldwide. More patients with CVD are living than before due to medical advancements. Therefore, there is an urgent need for secondary prevention strategies. Cardiac rehabilitation (CR) is a secondary prevention model of care for the management of CVD. **Aim:** This is the first study to explore the association between attending at least the median number of CR sessions and change in HRQOL among patients in Qatar. **Methods:** This retrospective cohort study included all patients who were enrolled in the CR program in Qatar. Secondary data were extracted from patients' records before the CR program (pre-CR) and at patient discharge (post-CR). The SF-36 instrument was used to assess HRQOL among patients. **Results:** The study involved 396 (91.4%) males; the mean age was 52.7±9.8 (SD) years. There was a statistically significant association between attending at least the median number of CR sessions and change in physical functioning scores (95% CI=8.85-29.11/ p-value=0.002), change in social functioning scores (95% CI=0.04-19.38/ p-value=0.04), change in emotional well-being scores (95% CI= 1.92-22.13/ p-value=0.02), and change in general health scores (95% CI=0.38-16.42/ p-value= 0.03), as compared to attending less than the median number of sessions. The models adjusted for age, gender, comorbidities, risk level, depression, and baseline HRQOL scores. **Conclusion:** CR program improved HRQOL. Therefore, there is a need to promote CR utilization and to implement strategies to keep patients in programs. These findings could motivate policymakers to expand CR program capacity, as the sole program in Qatar.

Keywords: Cardiac rehabilitation; Health-related quality of life; Cardiovascular disease; Sessions attended

For citation: Faisal E., AlHashemi M., Papasavvas T., TurkAdawi K., "Is There an Association between Attending Cardiac Rehabilitation Program and Health-related Quality of Life among Patients in Qatar?", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0157

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The association between Health Information Seeking and Behavior Change Related to Physical Activity among Qatari Adolescents

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Abstract

Objectives: This study is aimed at exploring health information seeking behavior among Qatari adolescents and assessing the influence of information obtained from different sources on PA behavior change. In addition, the study aims to identify possible correlates of PA behavior change among Qatari teens. **Methods:** This is a study involving the secondary analysis of data from a nationally representative cross-sectional survey conducted in 2017 among 1050 Qatari students aged 13-19 years. Self-reported information on demographics, psychosocial factors, PA, and sources used to obtain health information were collected. Main outcome was the attempt to change PA behavior. Logistic regression analysis accounting for survey design information was carried out to examine the association between the outcome and information sources used to attempt PA change, and to find independent predictors for this attempt. The estimated average marginal effects (AME), also known as risk differences, were derived from the results of logistic regression model, to have a sense of the absolute effect size reflecting the difference in the probability of the outcome associated with a change in the explanatory variable, adjusting for all the other covariates. **Results:** Teenagers in Qatar, especially girls, were not active enough. Nearly 68% of the respondents tried to change PA behavior (65% male versus 72% female), and 46% were physically active (55% males versus 38% females). About 89% of adolescents rated PA as an important topic for them personally. Based on information from interpersonal, traditional, online, and social media sources about 65%, 55%, 51%, and 54% of adolescents respectively attempted to change their PA behavior. Results from multivariable logistic regression showed that teens who used information from interpersonal and online sources to try to change their behavior had 9 times (OR=9.35, 95% CI: 4.15-21.08, P<0.001) and nearly 3 times (OR=2.53, 95% CI: 1.50-4.27, P=0.001) higher odds of change in PA, respectively. The odds of attempt to change PA were 2 times higher among older adolescents (16-19 years) (OR=2.17, 95% CI: 1.37-3.44, P= 0.002) and among teens who considered PA as important to them (OR=2.34, 95% CI: 1.13-4.84, P=0.023(. The estimated AMEs of using information from interpersonal sources and online sources on the probability of attempting PA change were about 46-percentage point and 16-percentage point increase respectively. For older adolescents and those considering PA important, the AMEs on the attempt to change PA were 11 and 14-percentage points respectively. All were sizable and significant differences (P<0.05). **Conclusion:** Physical activity level is still suboptimal among Qatari adolescents with obvious persistent gender gap. The results showed that interpersonal and online sources are important in fostering behavior change among Qatari adolescents, in addition to the influence of age and personal value of PA on initiating such changes. Policymakers can benefit from this research in designing appropriate pa interventions that adapt multiple delivery approach. It is recommended that future pa-related behavior change interventions in Qatar are age- and gender- sensitive and stress the importance and relevance of pa to teen's health.

Keywords: Adolescents; Health information seeking; Physical activity

For citation: Ali L.A.M., Khaled S., Abdel R.M., "The Association Between Health Information Seeking and Behavior Change Related to Physical Activity among Qatari Adolescents", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0158

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Patient Factors associated with Adherence and Change in Cardiac Risk Factors among Cardiac Rehabilitation Patients in Qatar

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Abstract

Background: Cardiovascular disease is the number one killer in Qatar (1). Cardiac rehabilitation (CR) is a secondary prevention model of care for cardiac patients. It is proven that CR reduces cardiovascular mortality by 20% (2). However, CR is underutilized worldwide, with low enrolment and adherence rates (3). This study aims (a) to investigate factors associated with adherence (median number of sessions, i.e. 21), and (b) to examine the relationship between adherence and change in cardiac risk factors, i.e. blood pressure, cholesterol, and low-density lipoprotein (LDL). **Method:** This retrospective cohort study included 714 cardiac patients, aged ≥18 years, who were referred to the cardiac rehabilitation program in Qatar. Data were collected from patients records from January 2013-September 2018. Logistic regression models were used to assess factors associated with adherence. Multiple linear regression models were used to examine the relationship between number of CR sessions attended and changes in cardiac risk factors. **Results:** The mean age of the study population was 52.7±10.1 years (mean ± SD). The majority of patients were males (n=641, 89.8%) and non-Qatari (n= 596, 83.5%),i.e. similar to Qatar population profile of 75% males and 15% Qatari, one fourth were smokers (n=185, 25.91%), and one fifth (n=128, 18.8%) had severe depression. Patients with AACVPR moderate- and high-risk levels were more likely to adhere compared to those with low risk. Percutaneous intervention and musculoskeletal disease were negatively associated with adherence. We found clinically significant improvements among adherents compared to non-adherents; reduction of 10% in cholesterol, and 15% in low density lipo-protein. **Conclusion:** This study provides new insights in Qatar, setting into factors that lead patients to adhere to their CR sessions. These factors represent opportunities for targeted interventions to improve CR utilization.

Keywords: Cardiovascular disease; Cardiac rehabilitation; Adherence

For citation: Saad R., AlHashemi M., Papasavvas T., TurkAdawi K., "Patient factors associated with adherence and change in cardiac risk factors among cardiac rehabilitation patients in Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0159

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The role of Qatar Community Pharmacists in Depression care: A Survey of Attitudes, Practices and Perceived Barriers

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Abstract

Background: Negative attitudes and stigma to mental health constitute major barriers to healthcare provision and access to treatment for patients with depression across the globe. Community pharmacists are among the most accessible healthcare providers who may play a significant role in depression care. This study aims to describe current practices, attitudes and perceived barriers of community pharmacists towards the provision of depression care, and investigates how pharmacists' attitudes, along with several sociodemographic and professional characteristics, are associated with these practices. **Methods**: A cross-sectional online survey targeting all practicing community pharmacists in Qatar using an adapted survey instrument. Responses were measured on a 5-point-Likert scale. Study outcomes were scores of attitudes towards depression, scores of self-reported depression care practices and perceived barriers for depression care. Descriptive univariate and bivariate analyses of study outcomes were conducted, along with a multivariate regression to investigate how pharmacists' characteristics and attitudes affect their practice. **Results**: Three hundred fifty-eight pharmacists answered the survey, making a response rate of 39%. Pharmacists' attitudes to depression were moderately positive (mean score=3.41, SD= 0.26). However, the extent of pharmacists' involvement in depression care was very low (mean score=2.64, SD= 0.94). Three major barriers were the lack of access to patients' medical records (83.21%), lack of patients' insight on major depression and the importance of treatment (81.85%) and the lack of needed knowledge and training on mental health (79.63%). Female pharmacists were significantly less involved in depression care compared to male pharmacists (p= 0.006). Depression practice score increased with an increasing score of attitudes (p =0.001) and decreased with the number of years since the last pharmacy degree graduation (p=0.02). The presence of a private area for counselling patients was associated with higher scores of practice (p=0.03). **Conclusion:** Pharmacists' moderately positive attitudes towards depression and its care were not reflected in their current practices. Findings from the study imply the need for actions and training programs for pharmacists to improve their attitudes and practices towards depression care.

Keywords: Community pharmacist; Depression; Attitude; Practice; Barrier

For citation: Shami R., Alam M.F., ElHajj M., "The Role of Qatar Community Pharmacists in Depression care: A Survey of Attitudes, Practices and Perceived Barriers", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0160

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Clinical Utility and Cost Effectiveness of Complement 3 and Complement 4 in different Clinical Subspecialties in Hamad Medical Corporation

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Abstract

Background: Complement system is one of ancient innate immune systems in our body fighting against pathogens and foreign bodies. Either one of its three pathways, classical, alternative or lectin activates it. Because of its role and importance in combating against different pathological conditions, it works through defined proteins including regulators and inhibitors. However, over or under stimulation of complement system can lead to various diseases. A number of analytical assays are used to measure complement proteins and its activation states considering complement 3 (C3), complement 4 (C4) as the most common test used. **Objectives:** Our aims are to study the clinical utility and cost effectiveness of C3 and C4 among different clinical subspecialties in Hamad Medical Corporation (HMC), Doha-Qatar. **Design and methods:** A retrospective study was conducted using electronic medical records to generate patient's list from clinical immunology laboratory at HMC. Data on 326 patients were collected from 1st January till 31st March, 2017 and used as pilot study after omitting duplications. The data was studied for its demographical, disease categories, C3 and C4 test results. C3 and C4 test cost were calculated inside HMC and compared to other healthcare providers in country and abroad. **Results:** A total of 326 patients, 148 males and 178 females (M/F ratio:0.8:1), of age (mean age ±SD) of 36 ± 17.6 years. 289(86%) were >15 years and 47(14%) were 15 or less. Kidney diseases (34%), autoimmune diseases (25%), and allergic diseases (18%) were the top 3 diseases, and constituted 77% of all diseases. 45/336 (13.4%) showed low C3, C4, or both. Mean levels of C3 (±SD) was 120.8 ±36.3 mg/dl, and C4 was27.85±11.9 mg/dl. High C3 and C4 levels were observed in 53 (15.7%) of patients. The cost of performing one test either C3 or C4 in HMC is 22 QR ($6), while other healthcare providers inside the country costed 150-300 QR ($41.2-$82.4). **Conclusion:** Autoimmune diseases, renal diseases and joist diseases were the most common diseases with low C3 and C4 levels. Although the cost of a single test of C3 or C4 is low, the total annual cost is huge. The treating physician is recommended to exercise judicious clinical wisdom when ordering C3 or C4 tests as diagnostic tools.

Keywords: Complement; Clinical utility; Autoimmune diseases

For citation: Naji F.E., Ehlayel M., AlDewik N., Malki A., "Clinical Utility and Cost Effectiveness of Complement 3 and Complement 4 in Different Clinical Subspecialties in Hamad Medical Corporation", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0161

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The effect of Renin Angiotensin System Blockers versus Calcium Channel Blockers on Progression towards Hypertensive Chronic Kidney Disease: A comprehensive systematic review based on Randomized Controlled Trials

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Abstract

Background: Decline in estimated Glomerular filtration rate (eGFR) is associated with further progression of chronic kidney disease. Evidence suggests that Renin Angiotensin System blockers (RAS), which can be angiotensin-receptor blockers (ARBs) or Angiotensin converting enzymes Inhibitors (ACEIs), have reno- protective effect, but results are variable. Similarly, effects of Calcium channel blockers (CCBs) are shown to have a role in protecting renal function but differ across studies. Hence, the relative effect of ARBs or ACEIs as well as CCBs, and their administration as monotherapy, remain uncertain. **Purpose:** To summarize and determine the pooled effect of RAS versus CCBs on progression towards hypertensive CKD amongst diabetic as well as non-diabetic patients with CKD of any stage from I-IV. **Data sources:** All language studies in PubMed, the Cochrane Library Central, Clinical Registry of unpublished Trials, WHO, Embase, Scopus, ProQuest, reference lists, and expert contacts up to September 2019. **Study selection:** This study included all the full text articles that studied diabetic and non-diabetic patients with eGFR ≥ 15 ml/min per 1.73m3 or Urinary albumin excretion levels (UAE) ≤ 300mg/d during RAS based treatment an intervention in direct comparison with CCBs treatment based approach as comparator at baseline and at the end of follow-up. However, pooling of all the included studies using meta-analysis was not feasible due to substantial study heterogeneity and the small number of included studies that are meta-analyzable. So, studies were selected for systematic review, and out of which, all the meta-analyzable studies were quantitatively analyzed on the basis of main outcomes such as (i) Relative risk for CKD progression and (ii) Mean differences in SBP and DBP for both the arms. Doi plot and funnel plot were used for detection of publication bias. **Results:** Review with seven included trials, and meta-analysis using IVhet model was done on three studies for primary CKD outcome and four studies for secondary BP outcomes. RAS blockers and CCBs did not show any statistically significant differences in terms of its effects on further progression CKD with RR of 0.90 [95% CI 0.69, 1.16]. Moreover, there was no statistically significant difference in BP from baseline to final end points between CCBs and RAS inhibitors with WMD of -2.09 mmHg [95% CI -5.96, 1.79] for mean SBP change and -0.71 mmHg [95% CI -2.16, 0.73] for mean DBP change. **Conclusion:** Evidence asserts no difference between RAS and CCB concerning the risk of progression for CKD and in terms of mean BP differences. However, the study have its own set of limitations due to which more well designed and well conducted RCTs with robust findings are required to confirm the inferences based on this review.

Keywords: HTN; High BP; Elevated blood pressure

For citation: Rafeeque A., Alam M.F., "The effect of Renin angiotensin system blockers versus calcium channel blockers on progression towards hypertensive chronic kidney disease: A comprehensive systematic review based on Randomized controlled trials", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0162

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Prevalence of Consanguinity among ASD Individuals: Systematic Review & Meta-analysis

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Abstract

Aim: We aim to estimate the global prevalence of consanguinity among the ASD families and compare that among different populations. **Methods:** Meta-analysis of observational studies reporting prevalence of consanguinity among ASD families was searched systematically in important databases including EMBASE, PubMed and Academic Search Complete. Individual studies were screened by two reviewers independently, extracted data and assessed the risk of bias using a risk of bias tool (Hoy's tool). Random Effect model was used to calculate pooled weighted estimates due to considerable heterogeneity. Subgroups analysis was also calculated. **Results:** 10 publications were identified based on our inclusion criteria from 8 different countries, 4 of them were from the Gulf Cooperation Council (GCC) and the rest were from: Lebanon (2 studies), Egypt, Jordan, Iran, and Israel). Studies varied in ASD cases numbers as it ranged between 49 -500, and the total ASD individuals in all studies were 1581. All studies address consanguinity among the ASD families despite the variation in the methods. The pooled estimate of consanguinity among ASD families was 24% Subgroup analysis by the study country led to a higher pooled estimate of consanguinity of 38% in the GCC countries compared to other than GCC countries with a pooled estimate of 16%. In addition, the overall odd ratio calculated from the case-control studies included in our meta-analysis was 1.5. **Discussion:** To our knowledge, this is the first meta-analysis that studied the prevalence of consanguinity among ASD families worldwide. Children born to consanguineous parents have been reported to have lower social behavior and cognitive ability, which are the main problems with ASD children. Our study qualitatively reviewed the prevalence of consanguinity among ASD families throughout the world and 10 eligible studies from eight countries were identified. We quantitatively synthesized the results and the key findings of this study showed a 24% overall pooled estimate of consanguinity among ASD families. GCC countries showed a high estimated pooled prevalence of consanguinity among ASD families as 38% compared to countries other than GCC 16%, which was higher than our overall pooled prevalence. This high estimate among GCC countries can be related to the high rates of consanguineous marriage in the GCC countries compared to the worldwide rates (20%). In Qatar, the rate of consanguineous marriage reported as 54%. This high rates among GCC countries may be due to factors like rooted cultural beliefs, social life and customs in addition to, economic benefits of keeping wealth within the families. **Conclusion:** The globally estimated pooled consanguinity prevalence among ASD patients was 24%, GCC countries showed a higher pooled prevalence (38%).

Keywords: Autism spectrum disorder; Autism; Prevalence; Consanguinity

For citation: Elhag S., Abdalhakam I., Abel R.M., "Prevalence of consanguinity among ASD individuals: Systematic Review and Meta-analysis", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0163

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Visualization of Factor Viii with Flow-Cytometry as a tool for Novel Gene Therapy Approach in Hemophilia A

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Abstract

Haemophilia A is a genetic X-linked disorder, characterized by coagulation Factor VIII (FVIII) deficiency and leading to pathological bleedings. The disease occurs at a rate of 1 in 5000 males' births. The treatment is the administration of plasma-derived or recombinant Factor VIII, which is expensive and leads to the development of inhibitory antibodies in around 40% of patients affected by the severe form of the disease. The disease becomes for these patients as life threatening. In new approaches to treat Haemophilia include gene therapy (GT), cells corrected through genetic modifications are used to produce in Haemophilia A patients FVIII protein in a sustained manner, as long-term treatment for this disorder. The cells of choice should be persistent and equipped with the machinery for large protein assembly and secretion. So far, target cells for Haemophilia gene correction are mostly liver cells, although they are highly immunogenic and exposed to immune-mediated destruction after GT. Based on literature evidences, bone marrow transplantation can correct Haemophilia A in mice, providing evidence that Hematopoietic stem cells (HSC) or their progeny are able to produce FVIII. We chose the approach of correcting HSC with lentiviral vectors carrying the FVIII gene cassette. Whereas classically FVIII protein is visualized on adherent cells through immunohistochemistry staining, flow-cytometry (FC) literature publications are very scarce. FC analysis is an attractive method for analysing hematopoietic cells, and in general, a versatile method for protein visualization. However, large proteins as FVIII are difficult to be carefully analysed, and the method requires several steps of optimization. This joint project with Dr. Muhammad Elnaggar, aims to optimize a method to characterize large proteins as FVIII with a reliable FC staining protocol. To this aim, we used cell lines to evaluate the expression and secretion pathways of FVIII, the intracellular requirements to fold and secrete large proteins, and the toxicities of protein accumulation, in case of GT mediated protein overexpression. For this purpose, the FC experiments were performed to optimise the FC protocol for FVIII visualization, by improving blocking efficacy, antibody-labelling efficacy and to ensure accuracy and validity through qPCR and FC double staining. This FC protocol proved its validity and usefulness in visualizing and studying functionally FVIII.

Keywords: Flow-cytometry; Factor VIII; Gene therapy; Hemophilia A

For citation: AlMohannadi A.K., Deola S., Malki A., "Visualization of Factor Viii with Flow-Cytometry as a tool for Novel Gene Therapy Approach in Hemophilia A", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0164

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Molecular Characterization of Influenza Virus in Intestines and its Effect on Intestinal Microbiota

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Abstract

Background: Influenza predominantly causes respiratory diseases; however, gastrointestinal symptoms are not uncommonly reported, particularly among high-risk groups. Influenza virus RNA has been also detected in stools of patients infected with pandemic and seasonal influenza, however, the role and the clinical significance of intestinal infection has not been clearly demonstrated. **Methods:** Here, we used NGS technology to investigate molecular characterization of viral RNA shedding in feces of adults with active influenza infection. Paired nasal and fecal samples were collected from 295 patients showing to emergency department at Hamad Medical Corporation with flu-like symptoms during January 2018 and April 2019. **Results:** Among these, 90 nasal samples were positive for influenza, of which, 26 fecal samples were positive for influenza in real-time PCR and only five showed virus growth in both monolayer and 3D cell culture. Full genome sequencing of isolated viruses revealed some unique mutations that we are currently in the process of studying their effect on virus kinetics. Then, we investigated the potential impact of respiratory influenza infection on intestinal microbiota diversity and composition. Microbiome analysis results suggest that changes in gut microbiota composition in influenza-infected patients are significantly associated with (1) influenza virus type, and (2) the presence of viral RNA in intestines of infected patients. We also identified bacterial taxa for which relative abundance was significantly higher in the patients with severe respiratory symptoms. **Conclusion:** Altogether, our findings suggest that influenza viruses can affect intestinal environment either by direct intestinal infection or indirectly by modulating intestinal microbiota.

Keywords: Influenza; Intestine; NGS; Evolution

For citation: AlKhatib H., AlMaslamani M., Coyle P., Pathan S., AlThani A., Yassine H.M., "Molecular characterization of influenza virus in intestines and its effect on intestinal microbiota", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0165

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Replication Dynamics, Pathogenicity, and Evolution of Influenza Viruses in Intestinal Caco-2 Cells

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Abstract

Background: Influenza virus is a major cause of respiratory infections worldwide. Besides the common respiratory symptoms, namouras cases with gastrointestinal symptoms have been reported. Moreover, influenza virus has been detected in feces of up to 20.6 % of influenza-infected patients. Therefore, direct infection of intestinal cells with influenza virus is suspected; however, the mechanism of this infection has not been explored. **AIM:** To investigate influenza virus replication, cellular responses to infection, and virus evolution following serial infection in human Caucasian colon adenocarcinoma cells (Caco-2 cells). **Method:** Two influenza A subtypes (A/H3N2 and A/H1N1pdm 09) and one influenza B virus (B/Yamagata) were serially passaged in Caco-2. Quantitative PCR was used to study hormones and cytokines expression following infection. Deep sequencing analysis of viral genome was used to assess the virus evolution. **Results:** The replication capacity of the three viruses was maintained throughout 12 passages, with H3N2 virus being the fastest in adaptation. The expression of hormone and cytokines in Caco-2 cells was considerably different between the viruses and among the passages, however, a pattern of induction was observed at the late phase of infection. Deep sequencing analysis revealed a few amino acid substitutions in the HA protein of H3N2 and H1N1 viruses, mostly in the antigenic site. Moreover, virus evolution at the quasispecies level based on HA protein revealed that H3N2 and H1N1 harbored more diverse virus populations when compared to IBV, indicating their higher evolution within Caco-2 cells. **Conclusion:** The findings of this study indicate the possibility of influenza virus replication in intestinal cells. To further explain the gastrointestinal complications of influenza infections in-vivo experiments with different influenza viruses are needed.

Keywords: Influenza; Intestine; NGS; evolution

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Prevalence of At-Risk Marriages among Couples attending Premarital Screening (PMS) Programs: A Systematic Review and Meta-Analysis

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Abstract

Background: Hemoglobinopathies are among the most common inherited genetic diseases. The World Health Organization estimates that at least 5% of the world's population are carriers for hemoglobinopathies (2.9% for thalassemia and 2.3% for sickle cell disease). Programs like premarital screening (PMS) have been developed in most Middle East countries on a mandatory basis to reduce at-risk marriages by providing counseling after a confirmed "genetic carrier" state for hemoglobinopathies. **Aim/Objective:** The aim of this systematic review and meta-analysis was to estimate the prevalence of at-risk marriages globally and see the variation by region, income level, ethnicity, study period, implementation year of PMS program, study design and consanguinity proportion. **Methods:** Different databases such as PubMed, Science Direct, and Scopus were searched systematically by using key terms and MeSH Terms. Studies from Google Scholar and reference lists of studies were also collected, and the author extracted all relevant data. Two reviewers independently conducted quality assessment by using Hoy et al (2012) risk of bias tool. Quality effects model (QEM) was used due to considerable heterogeneity observed between studies. Subgroup analysis and sensitivity analysis were also performed for assessing the causes of heterogeneity. **Results:** A total of 15 studies were included in this meta-analysis. The overall pooled prevalence of at-risk marriages among total couples at-risk was 64% (95% CI: 49%- 78%). Estimates of several subgroups were found to be different as compared to the overall pooled estimate. Funnel plot and Doi plot indicated the presence of publication bias. Sensitivity analysis including only studies with low risk led to a pooled estimate of 52% (CI: 46%, 57%) and indicated absence of publication bias. **Conclusion and recommendations:** The pooled estimates varied widely and there was a substantial heterogeneity among studies, therefore, there is a need for more well-designed studies across different countries. Moreover, the importance of the quality of counseling sessions should be stressed and combined with efforts in other community sectors, such as high schools where students can attain high knowledge regarding genetic diseases before the age of marriage.

Keywords: Genetic carrier; Consanguinity; At-risk marriages; Hemoglobinopathies; Premarital screening

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Child Disciplinary Practices in relation to Household Head Education and beliefs in Five Middle East and North African (MENA) countries: Cross Sectional study-Further analysis of Multiple Indicator Cluster survey data

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Abstract

Introduction: Internationally, eight out of ten children are exposed to violent discipline by their caregivers. To reduce the prevalence of violent discipline against children, we should understand the social and economic factors that affect the choice of disciplinary methods. Despite the high prevalence of violent discipline in the Middle East and North African (MENA) region, only a few studies explored disciplinary methods in this region. **Aim:** This study aims to determine the prevalence of positive and violent disciplinary practices in five selected MENA countries and assess their association with household head education and beliefs of physical punishment. **Methods:** This is a cross-sectional study design based on available secondary data from the Multiple Indicator Cluster Survey on its fourth round (MICS-4). A child was selected randomly from the household, and the Parent-Child Conflict Scale (CTSPC) tool was used to report disciplinary methods the child encountered during the last month period preceding the survey. Univariate and multivariable logistic regression were used to investigate the association between disciplinary practices with household head education and respondent's beliefs of physical punishment. The analysis was conducted using pooled data from all selected surveys and also for individual countries. **Result:** The overall prevalence of positive discipline was only 15% (95% CI: 14.4-15.8), in the five countries, while the prevalence of violent discipline was 80% (95% CI: 79.0 -80.5). The prevalence of positive discipline was highest in Qatar (40%; 95% CI: 35.0-44.4) and lowest in Tunisia (5%; 95% CI: 4.3-5.9) while the prevalence of violent discipline was highest in Tunisia (93%; 95% CI: 92.1-94.1), and lowest in Qatar (50%; 95% CI: 44.7-55.0). Overall, the household head education was not significantly associated with either positive or violent discipline after adjusting for covariates. However, respondents believe of disciplinary methods was significantly associated with both positive and violent discipline (OR=5.88; 95% CI: 4.97-6.96) and (OR=6.27; 95% CI: 5.40-7.28), respectively. **Conclusion:** High rates of violent discipline in the MENA region might indicate an increase in mental, behavioral, and social problems and disorders in our future generation. Rapid action is needed to reduce the worsening of violent discipline, and it is consequences. There is a need for educational programs for caregivers to teach them alternative non-violent methods of discipline. Besides, these numbers should inform policymakers about the importance of the existence and the implementations of laws, policies, and regulations to protect children from all forms of violence to protect our future youths and ensure their health and wellbeing.

Keywords: Child discipline; Violent discipline; Positive discipline; Education; Beliefs of physical punishment

For citation: Hamdan A., Abdel R.M., "Child Disciplinary Practices in Relation to Household Head Education and Beliefs in Five Middle East and North African Countries: Cross Sectional Study-Further Analysis of Multiple Indicator Cluster Survey Data", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0168

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Antibiotics Prescription Patterns in Primary Health Care in Qatar – A Population based study from 2017 to 2018

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Abstract

Background: Antibiotics are antimicrobial drugs used in the treatment and prevention of bacterial infections. They played a pivotal role in achieving major advances in medicine and surgery (1). Yet, due to increased and inappropriate use of antibiotics, antibiotic resistance (AR) has become a growing public health problem. Information on antibiotic prescription patterns are vital in developing a constructive approach to deal with growing antibiotic resistance (2). The study aims to describe the population based antibiotic prescriptions among patients attending primary care centers in Qatar. **Methodology:** A population based observational study of all medications prescribed in the all Primary Health Care Centers during the period of 2017-2018 in Qatar. Records with all medication prescriptions were extracted and linked to medical diagnosis. Antibiotics prescriptions records were compared to non- antibiotics records using logistic regression model in identifying the potential predictors for antibiotic prescriptions. **Results:** A total of 11,069,439 medication prescriptions given over a period of two-years, we found about 12.1% (n= 726,667) antibiotics prescriptions were antibiotics, and 65% of antibiotics are prescribed and received by the patients at the first visits. Paracetamol (22.3%) was the first highest medication prescribed followed by antibiotics (12.1 %) and vitamin D2 (10.2 %). More than half of all antibiotics prescribed during the period of January 2017 to December 2018 were Penicillin (56.9%). We found that half of the antibiotics (49.3 %) have been prescribed for the respiratory system comparing to the other body system. We found that males were 29% more likely be given an antibiotic compared to females (OR=1.29, 95% CI= 1.24- 1.33). **Implications:** The study provides a baseline data to enable PHCC management to design effective intervention program to address the problem of antibiotics resistance. Furthermore, it will help the policymakers to comprehend the size of the issue and develop a system to manage the antibiotics therapy. **Conclusion:** Antibiotics was the second highest medication prescribed in the Primary Health Care Centers in Qatar after paracetamol and most of the patients received it at the first visit. Most of the prescriptions in Primary Health Care Centers in Qatar were for the respiratory system, and Penicillin was the highest class prescribed. Male visitors were prescribed antibiotics more than female visitors.

Keywords: Antibiotics; Antimicrobial; Resistance; Inappropriate; Penicillin

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Economic Evaluation of CYP2C19 Genotype-Guided Antiplatelet Therapy Compared to Universal use of Ticagrelor or Clopidogrel in Qatar

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Abstract

Background: Patients having CYP2C19 loss-of-function alleles and receiving clopidogrel are at higher risk of adverse cardiovascular outcomes. Ticagrelor is a more effective and expensive antiplatelet that is unaffected by the CYP2C19 polymorphism. The main aim of the current research is to evaluate the cost-effectiveness among CYP2C19 genotype-guided therapy, universal ticagrelor, and universal clopidogrel after a percutaneous coronary intervention (PCI). **Methods:** A two-part simulation model, including a one-year decision-analytic model and a 20-year follow-up Markov model, was created to follow the use of (i) universal clopidogrel, (ii) universal ticagrelor, and (iii) genotype-guided antiplatelet therapy. Outcome measures were the incremental cost-effectiveness ratio (ICER, cost/success) and incremental cost-utility ratio (ICUR, cost/quality-adjusted life years [QALY]). Therapy success was defined as survival without myocardial infarction, stroke, cardiovascular death, stent thrombosis, and no therapy discontinuation because of adverse events, i.e. major bleeding and dyspnea. The model was based on a multivariate analysis, and a sensitivity analysis confirmed the robustness of the model outcomes. **Results:** Against universal clopidogrel, genotype-guided therapy was cost-effective over the one-year duration (ICER, USD 6,102 /success), and dominant over the long-term. Genotype-guided therapy was dominant over universal ticagrelor over the one-year duration and cost-effective over the long term (ICUR, USD 1,383 /QALY). Universal clopidogrel was dominant over ticagrelor over the short term, and cost-effective over the long-term (ICUR, 10,616 /QALY). **Conclusion**: CYP2C19 genotype-guided therapy appears to be the preferred antiplatelet strategy, followed by universal clopidogrel, and then universal ticagrelor for post-PCI patients in Qatar.

Keywords: Clopidogrel; Ticagrelor; Economic evaluation; Cytochrome P450 2C19; Percutaneous coronary intervention

For citation: AlMukdad S.I., Elewa H., AlBadriyeh D., "Economic Evaluation of CYP2C19 Genotype-Guided Antiplatelet Therapy Compared to Universal Use of Ticagrelor or Clopidogrel in Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0170

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Post-Translational Modifications of Albumin in Cancer – A Rich Source for Diagnostic and Monitoring of Treatment

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Abstract

Albumin is in contact with all cells in a body. This major protein in a plasma accesses all tissues and organs and has a number of different roles. Albumin was found to have more than 50 post-translational modifications (PTMs). Some of the albumin PTMs showed correlation with tumorigenesis. Examples of PTMs of albumin are reported at www.phosphosite.org. Modifications like glycation of patients with breast cancer is seen higher as compared to healthy control. We hypothesize that several novel post-translational modification in albumin could be related to cancer and can be used as biomarkers. We performed mass spectrometry and 2D gel electrophoresis analysis of serum albumin for 32 most common PTMs. We identified most of these PTMs in albumin. We observed that human cancer cells affected PTMs profile of albumin. Examples of affected PTMs are phosphorylation, palmitolylation, geranyl- geranylation etc. We observed also differences in PTMs profiles of albumin from serum of a healthy person and cancer patient. O - GlcNAcylation, farnesylation, glutathionylation, S- nitrosylation etc PTMs were found to differ. Our data show that PTMs of albumin can be easily detected. Our trial with 32 PTMs can be expanded to detect up to a hundred known PTMs. These PTMs may correlate with cancer development, and may be used as markers in cancer diagnostic and prognostic.

Keywords: Albumin; Post translational modifications; Cancer, 2D gel elcetrophoresis; Mass spectrometry

For citation: Kannan S., Souchelnytski S., "Post-translational modifications of albumin in cancer – a rich source for diagnostic and monitoring of treatment.", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0171

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Altered Inflow Hemodynamics affects Heart Development in a Side Specific Manner in the Embryonic Heart

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Abstract

Background: Hemodynamics, forces from the flowing blood in the heart, is a major epigenetic factor for heart development. Disturbed hemodynamics were shown to induce cardiac malformations in the embryonic heart. Clinically relevant congenital heart defects (CHDs) can be introduced surgically in the lab by disturbing the hemodynamics, like Hypoplastic left heart syndrome (HLHS), characterized by underdeveloped left ventricle is underdeveloped. Left atrial ligation (LAL) on chick embryo is an experimental technique to produce a HLHS-like phenotype. **Aims:** To reveal mechanobiological mechanisms associated with disturbed hemodynamics that influence the progression of left ventricular hypoplasia using chick embryo model. We also introduce a new technique which we called right atrial ligation (RAL), to examine effect of flow disturbance in right heart. **Methods:** We combined multiple novel techniques in this research: Heart function was assessed via Echocardiography. Computational fluid dynamics (CFD) analysis was adapted for detailed hemodynamics assessment, such as wall shear stress and blood flow patterns. Heart morphology was assessed by histology, and micro-CT. **Results:** Echocardiography and CFD analysis showed flow and WSS levels decreased for the flow constricted side resulting in the flow diversion to the opposite side: LAL diverted flow to right side and RAL to left side. This disturbance resulted in underdevelopment of left heart (valve and ventricle) in LAL and underdevelopment of right heart in RAL, revealed with histology and micro-CT. Left side was affected more compared to right side, demonstrating higher plasticity in left heart. **Conclusion:** This study indicates the critical importance of altered inflow hemodynamics in cardiac development specifically valve and ventricle development. Our comprehensive approach can be used to predict the initiation and growth of congenital heart defects.

Keywords: Congenital heart defects; Chick embryo; Mechanobiology; Hemodynamics; Hypoplastic left heart syndrome

For citation: Alser M.W., Salman H.E., Yalcin H., "Cagatay Altered inflow hemodynamics affects heart development in a side specific manner in the embryonic heart", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0172

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The Influence of Shear Stress on Nanomaterials uptake by MDA-231 Breast Cancer Cells

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Abstract

Introduction: Recently, nanotechnology products have been used for a variety of applications including the medical field. Two-dimensional (2D) nanomaterials have attracted a growing interest due to its unique properties and ultrathin structure. One common example is MXene, which can be used for cancer photothermal therapy. **Methodology:** In this study, two 2D nanomaterials, MXene and MXene/Au nanocomposite were fabricated as photothermal agents. To mimic physiological tumor microenvironment, nanocomposites were tested on MDA-231 breast cancer cells under fluid shear stress (~ 0.1 Dyn/cm^2) using a perfusion setup. The uptake of these nanomaterials was tested under fluid flow compared to static culture, to assess influence of shear stress in material uptake. The uptake was assessed using confocal microscopy, scanning electron microscopy (EDS) and transmission electron microscopy. Furthermore, viability assessment was performed after exposing the treated cells to laser at different power densities and durations by live/dead assay. **Results:** This study revealed that there is insignificant difference in cellular uptake under fluid flow compared to static culture. Although when exposed to PTT laser irradiation, MXene alone could increase the temperature up to 100 ° C, its cellular uptake is very low (~ 3 ug/ml) which could only increase the temperature up to 44 ° C which was not sufficient to induce protein denaturation and cellular damage. **Conclusion:** MXene can be a good candidate for PTT for cancer treatment, but its cellular internalization should be enhanced. This can be achieved by coating the MXene surface and labeling the material with certain ligands that is cancer cell specific.

Keywords: Shear stress; Nanomaterial; Cancer; Photothermal therapy; Mxene

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The Impact of Pharmacist Care on Diabetes Outcomes in Primary Care Settings: An Umbrella Review of Systematic Reviews

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Abstract

Objective: To systematically review published systematic reviews (SRs) examining the impact of pharmacist interventions in multidisciplinary diabetes care teams on diabetes-related clinical, humanistic, and economic outcomes in primary care settings. **Methods:** PubMed, EMBASE, Scopus, Database of Abstracts of Reviews of Effects, Cochrane Library, Joanna Briggs Institute (JBI) Database, Google Scholar, and PROSPERO were searched from inception to 2018. Studies published in English evaluating the effect of pharmacist interventions on diabetes outcomes were included. Two independent reviewers were involved in the screening of titles and abstracts, selection of studies, and methodological quality assessment. **Results:** Seven SRs were included in the study. Three of them included only randomized controlled trials, while the rest involved other study designs. Educational interventions by clinical pharmacists within the healthcare team were the most common types of interventions reported across all SRs. Pharmacist's interventions compared to usual care resulted in favorable significant improvements in hemoglobin A1c (HbA1c), fasting blood glucose, blood pressure, body mass index, total cholesterol, low-density lipoprotein, high-density lipoprotein and triglycerides in more than 50% of the SRs. Improvement in HbA1c was the mostly reported clinical outcome of pharmacist intervention in the literature (reported in six SRs). Pharmacist's interventions led to significant cost-saving ($8–$85,000 per person per year), cost-utility, and cost-benefit (benefit-to-cost ratio range from 1:1 to 8.5:1) versus usual care. Pharmacist's interventions improved patients' quality of life (QoL) in three SRs; however, no conclusion can be drawn due to the use of diverse QoL assessment tools. **Conclusion:** Most SRs support the benefit of pharmacist care on diabetes-related clinical, humanistic, and economic outcomes in primary care settings. Improvements in diabetes outcomes can significantly reduce the burden of diabetes on the healthcare system. Hence, the incorporation of pharmacists into multidisciplinary diabetes care teams is beneficial and should be strongly considered by clinicians and health policymakers.

Keywords: Pharmacist care; Collaborative care; Primary care

For citation: Abdulrhim S.H., Sankaralingam S., Mohamed I.M.I., Awaisu A., "The Impact of Pharmacist Care on Diabetes Outcomes in Primary Care Settings: An Umbrella Review of Systematic Reviews", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0174

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Evaluating the Impact of a Collaborative Care Model in Diabetes Management in a Primary Healthcare setting in Qatar using Real-World data

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Abstract

Objectives: To evaluate the impact of collaborative care model (CCM) on diabetes-related outcomes among patients with diabetes attending a primary care setting. **Methods:** A multiple-time series, retrospective, observational study with a control group among patients with diabetes followed-up at Qatar Petroleum Diabetes Clinic. The impact of CCM on glycemic control, blood pressure, lipid profile, and anthropometrics was evaluated at baseline and up to 17 months of follow-up. Quantitative data were analyzed descriptively and inferentially using SPSS. **Results:** CCM significantly improved ($p<0.05$) the mean values (baseline vs. 17 months) of glycated hemoglobin A_{1c} (6.9% vs. 6.5%), random blood glucose (194.38 mg/dL vs. 141.23 mg/dL), low-density lipoprotein cholesterol (3.7 mmol/L vs. 2.8 mmol/L), total cholesterol (5.43 mmol/L vs. 4.34 mmol/L), weight (78.52 Kg vs. 77.85 Kg), and body mass index (30.41 Kg/m^2 vs. 30.17 Kg/m^2) over 17-months within the intervention group; whereas, no significant changes occurred within the control group. Similarly, the between group comparisons demonstrated the superiority of CCM over usual care in improving several clinical outcomes. **Conclusion:** Inefficiencies in delivering diabetes care can be circumvented by the integration of CCM. The implementation of CCM in a primary healthcare setting improved several diabetes-related outcomes over 17-months.

Keywords: Collaborative care; Diabetes; Clinical outcomes; Primary care

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PAMAM Dendrimers as anti-HER2 Positive Breast Cancer Treatment

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Abstract

Background: Poly (amidoamine) dendrimers (PAMAMs) are widely used in drug delivery systems and gene transfection as drug carriers. They also exert several biological effects like modulating gene expression, particularly EGFR (ErbB1) signaling pathway, which raises the question of whether these polymers can also inhibit the phosphorylation of HER2 (ErbB2) in breast cancer. However, this area hasn't been investigated before. **Methods:** In this study, we evaluated the anticancer effects of different generations and surface chemistries of PAMAMs on HER2 positive breast cancer cells (SkBr3 and ZR-75 cell lines). Cell viability and morphological changes were evaluated upon treatment with PAMAMs. In addition, their effect on colony formation in soft agar was assessed. Additionally, western blot was performed to understand the underlying mechanisms of action. **Results:** PAMAMs anticancer effects were found to follow a specific trend, as they were more significant in cationic polymers and in higher generations. Cationic PAMAMs reduced cell viability of HER2 positive breast cancer cells up to 5.1% in SkBr3 and to 28% in ZR-75 ($p<0.001$), in a dose and time-dependent manner. Cationic polymers also resulted in changing the morphology in the examined cell lines, as well as inhibiting colony formation in soft agar compared to controls ($p<0.001$). The mechanism of action was found to be mediated by inhibiting the phosphorylation of erbB2 and JNK1/2/3. **Conclusion:** These anticancer effects of PAMAM dendrimers make them promising molecules, which can add benefit to current anti-HER2 treatments and be employed successfully in different biomedical applications.

Keywords: Poly (amidoamine) dendrimers; PAMAMs; HER2-positive; Breast cancer

For citation: Kheraldine H., Akhtar S., AlMoustafa A.E., Rachid O., "PAMAM Dendrimers as Anti-HER2 Positive Breast Cancer Treatment", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0176

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Strengthening the Quality of Clinical Pharmacokinetic studies: Development and Validation of a Critical Appraisal Tool for Clinical Pharmacokinetic Research

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Abstract

Background: Robust critical appraisal tools for pharmacokinetic studies are lacking. The aim of this study is to develop a valid and reliable critical appraisal tool for clinical pharmacokinetic studies. **Methodology**: A systematic review was conducted through Embase and Pubmed to identify quality markers of clinical pharmacokinetic studies. Quality-related questions were formulated to help in appraising pharmacokinetic studies. Experts were approached to participate in a modified Delphi process to achieve their consensus regarding the formulated questions based on percentage of agreement between panelists, median and interquartile range. Content and face validity of the tool were assessed twice and by a psychometric expert. Four raters were selected to apply the tool on 30 clinical pharmacokinetic articles to calculate Kappa values to determine inter-rater and intra-rater reliability. **Results**: Quality markers of clinical pharmacokinetic studies were identified from fifteen articles. Sixty-four quality-related questions were formulated, but 42 were assessed by twenty-five panelists, who consented to participate in the modified Delphi process rounds. In round 1, 12 out of 42 items reached ≥80 % of agreement, median ≥ 4, and interquartile range ≤ 1. In round 2, 6 out of 28 items met ≥80% of agreement, a median ≥ 4, and interquartile range < 1. In round 3, 3 out of 3 items achieved ≥80% of agreement, a median ≥ 4, and interquartile range < 1. This tool proved to be valid and reliable in appraising retrospective and prospective clinical pharmacokinetic, bioequivalence, and population pharmacokinetic studies. **Conclusion**: A valid and reliable clinical pharmacokinetic critical appraisal tool containing twenty-one questions was developed.

Keywords: Pharmacokinetics; Critical appraisal tool; Reporting guidelines; Quality markers

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The Perspectives of Healthcare Professionals and Patients on the Value of Collaborative Care Model for Diabetes in Primary Healthcare settings in Qatar

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Abstract

Background: Diabetes mellitus (DM) is one of the top health priorities in Qatar due to its high prevalence of 15.5%, which is projected to increase to 29.7% by 2035. DM management is still challenging despite healthcare advancement, warranting the need for a comprehensive Collaborative Care Model (CCM). Therefore, we aim to evaluate the value of CCM in DM care at a primary healthcare (PHC) setting in Qatar. **Methodology:** This study was a qualitative exploration of healthcare professionals' (HCPs') and patients' perspectives on the value of CCM provided at the center. Twelve patients and twelve HCPs participated in semi-structured one-to-one interviews. Qualitative data were analyzed and interpreted using a deductive coding thematic analysis process. **Results:** The interviews resulted in 14 different themes under the predefined domains: components of CCM (five themes), the impact of CCM (three themes), facilitators of CCM provision (three themes), and barriers of CCM provision (three themes). The majority of the participants indicated easy access to and communication with HCPs at QPDC. Participants appreciated the extra time spent with HCPs, frequent follow-up visits, and health education, which empowered them to self-manage DM. Generally, participants identified barriers and facilitators related to patients, HCPs, and healthcare system. **Conclusion:** The providers and users of CCM had an overall positive perception and appreciation of this model in PHC settings. Barriers to CCM such as unpleasant attitude and undesirable attributes of HCPs and patients, unsupportive hospital system, and high workload must be addressed before implementing the model in other PHC settings.

Keywords: Collaborative care; Diabetes; Primary care; Perspectives

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Design, Synthesis and Biological Evaluation of Novel Chalcone Analogs as Potential Therapeutic Agents for Castration-Resistant Prostate Cancer

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Abstract

Prostate cancer (PCa) is the second most frequently diagnosed malignancy, as well as a leading cause of cancer-related mortality in men globally. Despite the initial response to hormonal targeted therapy, the majority of patients ultimately progress to a lethal form of the disease, termed as castration-resistant prostate cancer (CRPC), which currently lacks curative therapeutic options and is associated with poor prognosis. Therefore, the development of novel treatment modalities for PCa is urgently needed. Chalcones, also known as 1,3-diphenyl-2-propen-1-ones, are among the highly attractive scaffolds being investigated for their antitumor activities. Three series of 18 cyclic (tetralone-based) and two acyclic chalcone analogs, in which ring B was either substituted with nitrogen mustard or replaced by pyrrole or pyridine heterocyclic rings, were designed, synthesized and evaluated as potential therapies for CRPC. Compounds were synthesized by Claisen-Schmidt condensation reaction, purified using column-chromatography or recrystallization and characterized by ^{1}H-NMR, ^{13}C-NMR and LC-MS. The compounds' in-vitro cytotoxicity was evaluated against three prostate cancer cell lines (PC3, DU145, and LNCaP). Among the tested compounds, OH14, OH19 and OH22 showed potent antiproliferative activities at low micromolar levels with IC_{50} values ranging between 4.4 and 10 µM against PC3 and DU145 cell lines. Detailed biological studies of the lead molecule OH19 revealed that it significantly induces apoptosis through upregulation of Bax and downregulation of BCL-2. In addition, OH19 potently inhibits colony formation and reduces cell migration of androgen-independent PCa cell lines (PC3 and DU145). The molecular pathway analysis show that the anticancer activity of OH19 is associated with attenuation in the phosphorylation of Akt and ERK. Furthermore, OH19 inhibits blood vessel formation in the chick chorioallantoic membrane (CAM) model as compared to control. These results indicate that OH19 could serve as a potential promising lead molecule for the treatment of CRPC and thus, further in-vitro and in-vivo studies are warranted.

Keywords: Chalcones; Tetralones; Anticancer; Synthesis

For citation: Hussein O., Alali F., AlMoustafa A.E., Khalil A.D., "Synthesis and Biological Evaluation of Novel Chalcone Analogs as Potential Therapeutic Agents for Castration-Resistant Prostate Cancer", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0179

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Conjugation of CTGF with Reduced Graphene Oxide Nanoparticles for the Development of Wound Healing Hydrogel Patch

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Abstract

Non-healing chronic wounds are the key concern in type-2 diabetes that frequently leads to chronic infections, finally causing amputation of limbs, organs etc. Decrease in the proliferation and migration of cells such as keratinocytes and fibroblasts is the major reason for the development of such chronic diabetic wounds. Multiple evidences have shown that CTGF and reduced graphene oxide possesses angiogenic property and promote wound healing by promoting proliferation and migration of fibroblasts and keratinocytes cells.Conjugation of rGO with CTGF using EDC-NHS chemistry is a novel approach to accelerate the wound healing process. In the current work, we have developed a rGO/CTGF incorporated GelMA hydrogel dressing to improve wound healing by increasing proliferation and migration of cells as well as promoting formation of new blood vessels for increased supply of nutrients, oxygen and growth factors to wound area

Keywords: Wound healing; Reduced graphene oxide; CTGF; GelMA

For citation: Syed R.R., augustine R., Zahid A.A., Hasan A., "Conjugation of CTGF with Reduced Graphene Oxide Nanoparticles for the development of wound healing hydrogel patch", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0180

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Exploration of Sleep Quality and Sleep Hygiene among QU students

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Abstract

Sleep is an important component of healthy lifestyles. Worldwide reports suggest that one in every three adults suffers from insomnia. University students are vulnerable to insomnia due to their stressful lifestyle and inconsistent sleeping schedules, which contribute to poor, sleep hygiene. The purpose of this study is to explore the prevalence of sleeping problems among university students in Qatar and to investigate factors contributing to insomnia development. A cross-sectional survey utilizing two validated sleep questionnaires, the Pittsburgh sleep quality index (PSQI) and the sleep hygiene index (SHI), were administered to Qatar University (QU) students in either English or Arabic. An online survey was sent to all QU students through e-mail. Descriptive and inferential statistics were used to analyse and report the findings. A total of 2,062 students responded to this survey. Most of the respondents were females, Qataris, and the majority of them belonged to the colleges of Arts and Sciences, Business and Economics or Engineering. Around 25% of the participating students reported previous use of sleep aids. The findings indicated that the majority of the students had poor sleep quality (69.7%) and poor sleep hygiene (79%). A positive association was found between sleep quality and sleep hygiene ($r = 0.39$; $p < 0.0001$). College distribution and marital status were shown to significantly influence sleep quality ($p = 0.031$ and $p = 0.02$ respectively). The regression analysis revealed that sleep hygiene had the greatest effect on sleep quality (accounting for 7% of the variance) and individuals with good sleep hygiene were 4 times more likely to have good sleep quality. The findings of this study suggest that poor sleep quality and inadequate sleep hygiene practices are common among university students in Qatar, both of which may have a negative impact on students' academic performance which warrants further investigation in future studies.

Keywords: Insomnia; Sleep hygiene; Sleep quality; University students

For citation: Ali R.M., Zolezzi M., Awaisu A., "Exploration of sleep quality and sleep hygiene among QU students", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0181

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Association between Soft Drink Consumption and Bone Mineral Density among Qatari Women- Analysis of Qatar Biobank data

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Abstract

Background: Decrease in bone mineral density (BMD) increases the risk of osteopenia and osteoporosis. It is common in older women, as the BMD tends to decrease with age, particularly after menopause. While age and hormonal changes are well-established risk factors, other factors have been investigated for possible links to increase the risk of osteoporosis. These factors include dietary patterns and lifestyle. **Aim:** To explore the association between soft drink consumption and BMD. **Method:** This cross-sectional study included data from 1000 Qatari women age ≥ 40 year's participated in the Qatar Biobank Study. BMD levels were measured using the Dual-Energy X-ray Absorptiometry (DXA) scan and the soft drink consumption was assessed using a food frequency questionnaires. Multiple quantile regression models were used to assess the association between bone mineral density and soft drink consumption. **Results:** While most of the participants did not drink soft drinks (68%), around one third reported consuming soft drinks. A total of 16.4% of participants reported consuming soft drinks < 1 time/ week and 15.6% of participants reported consuming soft drinks ≥ 1 time/ week. There was an inverse association between BMD and soft drink consumption. Compared with non-consumers, ≥ 1 time/week consumption of soft drink had a -0.034 95%CI (-0.056, -0.012) at 0.25 quantile for BMD after adjusting for age, BMI, menopausal status, smoking status, physical activities, milk intake, and fruit and vegetable consumption. Also, BMD was negatively associated with regular soft drinks, but not with diet soft drink and energy drink. **Conclusion:** High consumption of soft drink is inversely related to BMD among Qatari women. Further longitudinal and clinical studies are required before developing public health intervention to improve bone health by reducing soft drink consumption.

Keywords: Bone mineral density; Soft drink; Diet & energy drink; Qatari; Women

For citation: Hamid A., Shi Z., Thalib L., "Association between Soft Drink Consumption and Bone Mineral Density among Qatari Women- Analysis of Qatar Biobank Data", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0182

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Improving Waiting Times in Hand Surgery Clinic at Rumailah Hospital, Qatar

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Abstract

Background: The quality and efficiency of healthcare delivery are key drivers that influence hospital quality as well as patient satisfaction. The patient waiting time is the period of time that passes between patients first seeking medical treatment from the healthcare system and their admittance for consultation and diagnosis. The hand surgery clinic at Rumailah Hospital (RH) in Qatar has seen that only 12% of new patients who had been referred for urgent treatment from the accident and emergency department had received an appointment within 14 days. **Aim:** To increase the percentage of patients with new, urgent referrals to the hand surgery clinic at Rumailah Hospital from the accident and emergency department to be seen within 14 days from the current 12% to 20% by the end of October 2019 and from 20% to 60% by the end of April 2020. **Methodology:** This is a Quality improvement Project used the Institute for Healthcare Improvement model for improvement, the team used the root cause analysis to identify the bottleneck in the process, the Plan- Do - Study - Act (PDSA) cycles facilitates testing the selected changes: increase capacity, triage acciedent and emergency referrals, and clear the back log. **Results:** After implementing the changes, we observed increase in the proportion of patients who received appointments within 14 days of the referral, from 22% in July to 26% in August and 40% in September and October, 2019. **Conclusion:** The project team did extensive research in understanding the complex process of OPD appointment and clinic consultation. The project team tested three change ideas that yielded to manage the percentage of patients who received appointments within 14 days. The team is planning to test the next change idea to improve the triaging process by implementing electronic triaging, which is expected to reduce the waiting time for an appointment in the clinic.

Keywords: Waiting time for appointments; Patient satisfaction; Long waiting time; Improving waiting time; Managment of waiting time in emergency

For citation: AbdalHadi S.A., Abousaad A., Shraim M., "Improving Waiting Times in Hand Surgery Clinic at Rumailah Hospital, Qatar.", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0183

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Reducing the Incidence of Exposure to Blood and Body Fluids

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Abstract

Methods: We used a Pareto chart to identify priority areas for our project based on magnitude of incidence of BBF exposures. A driver diagram was developed with four main primary drivers including risk awareness, attitudes and practice, staff experience, and leadership engagement. Intervention ramps and changes were implemented using multiple PDSA cycles addressing staff knowledge and awareness about BBF exposure prevention and management using surveys and learning brochures and assessment of staff compliance with safe practice. The project included the following measures (i) outcome measure: number of days between BBF exposure incidents; (ii) Process measures: BBF exposure risk awareness score, attitude and practice score, and proportion of staff compliant with BBF exposure safe practice; (iii) BBF reporting exposure score and proportion of staff satisfied with BBF exposure prevention and management policy. Ethical approval of the project was not required. **Results:** About 80% of BBF exposure incidents were due to needlestick injuries. Emergency unit, operating theatre, hemodialysis unit, laboratory unit, and utility services accounted for 80% of all BBF exposure incidents. Around 47% of the incidents occurred among nurses. Our project was associated with increase in attitude and safe practice score form 75% to 100%. The compliance with safe practice increased from 77% to 86%, and reporting of exposure increased from 75% to 100%. Staff satisfaction increased from 65% at baseline to 96%. Knowledge about prevention and management of BBF exposure (safe practice) increased from 60% to 92% in the hemodialysis unit. However, the median number of days between BBF exposures increased from 13 days at baseline to 18 days in May 2019. **Conclusion:** Our quality improvement project has identified the priorities clinical areas accounting for the majority of BBF exposure incident. The initial phase of the project in hemodialysis unit was associated with significant increase in knowledge scores about prevention and management of BBF exposure, compliance with safe practice, and staff satisfaction. In addition, the project was associated with significant increase in reporting of BBF exposure, which explains why we were not able to increase the median number of days between BBF exposures to 50 days. We have started spreading our interventions and change ideas to other units in Al-Khor general Hospital. Quality improvement projects can reduce the incidence of BBF exposure having the priority areas identified and the relevant drivers are addressed appropriately.

Keywords: Quality improvement; Blood and body fluid; Exposure; Risk; Prevention

For citation: Sallam N., Hassan R., Shurrab A., AlDeeb Y., Shraim M., "Reducing the incidence of exposure to blood and body fluids", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0184

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Production of active long lasting CNGRC-CPG2 Fusion Protein using PEGylation to be used in Ligand Directed Cancer Therapy

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Abstract

Aminopeptidase N (APN) is one of the important enzymes highly expressed in metastatic cancers, thus employed as a marker to target tumor cells. CPG2-CNGRC fusion protein is produced to target high APN expressing cancer cells, with the prodrug results in high toxic effect. Since PEGylation of CPG2 has shown an improved favorable in vitro stability and immunotoxicity, we performed a site-directed PEGylation (thiol group directed) of the CPG2-CNGRC fusion protein and examined the effect of PEGylation on the resulting fusion protein's therapeutic efficacy. CPG2 kinetic activity was substantially enhanced following PEGylation of the single fusion protein (PEG CPG2-CNGRC). The binding affinity of the produced PEGylated fusion proteins to their cellular marker (APN) was notably reduced in case of the double fusion protein compared with non-PEGylated ones. Moreover, the cytotoxic effect of methotrexate and ZD2767P (prodrug) in association of the PEGylated fusion proteins was investigated and found that the cytotoxic effect of prodrug with PEGylated single fusion protein was improved significantly (low cell survival). Similar finding was found following MTX treatment where lower binding and kinetic activity of the PEGylated double fusion proteins resulted in higher MTX toxic effect (lower cell survival) in comparison with the non-PEGylated double fusion protein. Thus, although PEGylation is known for its usually favorable effect on the protein/drug pharmacodynamics, our results indicated that with our different fusion proteins (single and double fusion proteins) PEGylation improved their properties differintially.

Keywords: Pegylation; LDEPT; CNGRC; CPG2

For citation: AlMansoori L.J., Elsinga P., Goda S., "Production of active long lasting CNGRC-CPG2 fusion protein using PEGylation to be used in Ligand Directed Cancer Therapy", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0185

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The use of Drosophila Melanogaster as a Model Organism to study the effect of Bacterial Infection on Host Survival and Metabolism

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Abstract

Enterobacteriaceae, a large family of facultative anaerobic bacteria, encloses a broad spectrum of bacterial species including *Escherichia Coli, Salmonella Enterica, and Shigella Sonnei* that produce enterotoxins and cause gastrointestinal tract diseases. While much is known about the regulation and function of enterotoxins within the intestine of the host; the lack of cheap, practical, and genetically tractable model organisms has restricted the investigation of others facets of this host-pathogen interaction. Our group, among others, has employed Drosophila Melanogaster, as a model organism to shed more light on some aspects of host-pathogen interplays. In this project, we addressed the effect of Escherichia Coli, Salmonella Enterica, and Shigella Sonnei infection on altering the metabolic homeostasis of the host. Drosophila melanogaster flies were orally infected with Escherichia Coli, Salmonella Enterica, or Shigella Sonnei, a method that mimics the natural route used by enteric pathogens to gain access to the gastrointestinal tract in humans. The results of our study revealed that both Escherichia Coli and Shigella Sonnei pathogens were capable of colonizing the host gut, resulting in a reduction in the life span of the infected host. Escherichia Coli and Shigella Sonnei infected flies also exhibited altered metabolic profiles including lipid droplets deprivation from their fat body (normal lipid storage organ in flies), irregular accumulation of lipid droplets in their gut, and significant elevation of systemic glucose and triglyceride levels. These metabolic alterations could be mechanistically attributed to the differential down-regulation in the expression of metabolic peptide hormones (Allatostatin A, Diuretic hormone 31, and Tachykinin) detected in the gut of Escherichia Coli and Shigella Sonnei infected flies. Salmonella Enterica; however, was unable to colonize the gut of the host; and therefore, Salmonella Enterica infected flies exhibited a relatively normal metabolic status as that of non-infected flies. Gaining a proper mechanistic understanding of infection-induced metabolic alterations helps in modulating the pathogenesis of gastrointestinal tract diseases in a host and opens up for promising therapeutic approaches for infection induced metabolic disorders.

Keywords: Host-pathogen interactions; Escherichia Coli; Salmonella Enterica; Shigella Sonnei; Metabolism

For citation: AlAsmar J., Rashwan S., Kamareddine L., "The use of Drosophila Melanogaster as a Model Organism to study the effect of Bacterial Infection on Host Survival and Metabolism", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0186

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Experiences of Weight-based Oppression in Qatar

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Abstract

Introduction: Weight-based oppression is a widespread phenomenon in Western countries. External sources of weight-based oppression include exposure to stigmatizing or exclusionary social, cultural, economic, political and built environments, weight bias and discrimination, and weight-based bullying and violence. Internal sources of weight-based oppression are the internalized negative attitudes, values and beliefs people hold about body weight. Weight-based oppression is associated with a range of psychological, physiological and behavioral harms such as depression, anxiety, disordered eating, hypertension, allostatic load, cortisol reactivity and oxidative stress. Research on weight-based oppression is largely absent from the Arab region. The objectives of the study were to examine the internalized attitudes, values and beliefs related to body weight, and experiences of external weight based oppression, including teasing, bullying, stigmatization, and discrimination among staff, faculty and students at Qatar University. **Methods:** We conducted in-depth semi-structured interviews with 29 participants (25 females) aged 18 to 53 years who were recruited using convenience and snowball sampling. Thematic analysis was used to identify major themes. **Results:** Internal and external weight-based oppression were experienced by all participants and regarded as so common in Arabic culture as to be normative. There were five major themes that related to the various types of weight based oppression experiences, internalized feelings about weight based oppression, and the timing, source and impact of weight based oppression. **Conclusion:** Weight-based oppression in the Arab region is an important and unrecognized public health issue. Programs should be developed to reduce exposure to weight-based oppression in all sectors. Reducing teasing, bullying and negative experiences related to body weight in childhood should be a public health priority.

Keywords: Stigma; Mental health; Oppression; Body weight; Childhood

For citation: OHara L., Alajaimi B., Alshowaikh B., "Experiences of weight-based oppression in Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0187

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Evaluating the Impact of a brief Health at Every Size-Based activity on body positivity and internal weight-based oppression

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Abstract

Introduction: Internal weight-based oppression WBO is the internalized negative attitudes, values and beliefs people hold about body weight, and is associated with depression, anxiety, body image disturbance, disordered eating, avoidance of physical activity, and increased calorie consumption. Conversely, body positivity encompasses body acceptance, body appreciation, and body love, and adaptive approaches protective of health and wellbeing. The objective of the study was to evaluate the impact of the brief activity on body positivity and internal WBO in female students at Qatar University. **Methods:** The study used a quasi-experimental pre-post evaluation design, with quantitative assessment of body positivity and internal weight-based oppression before a brief activity (pre), immediately afterwards (post), and 10 weeks later (follow up), and qualitative assessment at the 10-week follow up. *Love your Body*, a Health at Every Size-based activity, was developed and delivered by public health students as part of the Mental Health Festival. The 10-minute activity involved Yay scales, positive affirmation stickers, photography, postcards, and gratitude writing. Evaluation measures used were the Body Appreciation Scale 2 (BAS-2), Modified Weight Bias Internalization Scale (M-WBIS), Fat Attitudes Assessment Toolkit Size Acceptance (FAAT-SA) and Self Reflection (FAAT-SR) subscales, and an open-ended questionnaire. **Results:** A total of 35 female undergraduate students completed assessments at all time points. Self-reflection and body appreciation increased significantly after the activity. All measures showed a trend towards improvement from pre to post assessment, but a return to baseline or near baseline status after 10 weeks. Qualitative results suggested that improvements were sustained at follow up. **Conclusion:** The activity had a positive effect on participants' body appreciation and self-reflection in the short term, but these improvements were not sustained over the longer term. The high number of missing responses compromised the potential to determine findings that are more robust.

Keywords: Health at every size; Brief intervention; Body positivity; Internal weight-based oppression; Evaluation research

For citation: Ahmed H., Elashie S., OHara L., " Evaluating the Impact of a brief Health at Every Size-based activity on body positivity and internal weight-based oppression", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0188

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Factors associated with Vitamin D Deficiency in Women: Lesson from Biobank in Qatar

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Abstract

Background: Vitamin D deficiency is affecting the health of humans around the world, and different factors associated with it were studied among different populations. Vitamin D deficiency was studied more often as a predictor to diseases. However, certain factors that could be associated with vitamin D deficiency were not explored among women, specifically in Qatar. **Objective:** To explore potential risk factors of vitamin D deficiency among women aged 20 to 65, using a sample of records from women volunteers to Qatar Biobank. **Hypothesis:** The study potential factors (age, BMI, education, income, milk consumption, occupation, pregnancy, physical activity and soft drinks) are associated with vitamin D deficiency. **Methodology:** We assessed some potential risk factors to vitamin D deficiency using data from Qatar Biobank (n=1000). Women aged 20-65 years old were included in the study. Univariate and multiple logistic regression models were used to model the association between our study potential factors (age, BMI, education, income, milk consumption, occupation, number of children, physical activity, and soft drinks) and being vitamin D deficient. Analysis was conducted using Stata (IC) version 15.0. **Results:** 654 women out of 1000 had vitamin D deficiency (serum level<20ng/mL), and 346 women that had normal level of vitamin D (serum level>20ng/mL)**.** Vitamin D deficiency was significantly associated with women who drank soda 1-3 per month (p-value= 0.038) and 1-3 per week or more (p-value= 0.021). Also, women who were 41-50 years old (p-value= 0.006), 50 years and older (p-value= 0.000) and women who were students as their occupation (p-value= 0.003). **Conclusion:** Vitamin D deficiency was common among women in Qatar, as found in the present study. Students, women who drank soda, and younger age (<50) had the highest vitamin D deficiency.

Keywords: Vitamin D deficiency; Risk factors; Qatar Biobank; Women

For citation: AlThani S., Mohammed M., Ahmed H., "Factors Associated with Vitamin D Deficiency in Women: Lesson from Biobank in Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0190

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Factors affecting Ceasarean Section among Women in Qatar

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Abstract

Background: Cesarean section (CS) delivery is one of the top concerns when it comes to women in maternity age, given the fact that CS rates are on the rise globally and especially in Qatar. Many socioeconomic, demographic, clinical and institutional factors that are likely to play a role in that increase. The aim of this study is to investigate factors that may affect the CS delivery in Qatar. **Objective:** Identify the factors playing a major role in the increase of CS rates among women in Qatar and determine the significance of the strength of their effect on the issue. **Methodology:** Using Multiple Indicator Cluster Survey (MICS) 2012. The study focused on the women's questionnaire with a final sample of 761 women aged 19- 49 years whom have had given birth in their lifetime before the survey after applying an inclusion criteria to the 5809 women in the dataset. IBM SPSS 26 was used to perform descriptive analysis to describe our data, bivariate analysis to assess the associations between variables, multivariate analysis to adjust for external confounders within these associations, and multilevel analysis to assess the significance of variations within levels of the clustered dataset. To investigated factors of: age of women, frequency of watching TV, level of school, antenatal care by whom, assistance at delivery by whom, place of delivery, and weight of baby. **Results:** The study found that the odds ratio of CS for mothers less than 25 is lower by 54.4% than women 35 years and above with (p-value = 0.020; 95% CI 0.235 -0.883). Furthermore, the type professional who assisted the birth specially nurses, plays a significant role for the outcome of whether they experience CS or not; the odds ratio of that is 51.8% than any other professional with. One of the other significant associations with CS rates was the place of birth (p-value = 0.000; 95% CI 0.207- 0.634) as mothers who give birth governmental hospitals have CS rates lower by 63.8% than those who deliver in private hospitals. **Conclusion:** The study found a significant association between age of women, frequency of TV watching, assistance at birth, and place of birth with the outcome of the study which is undergoing CS delivery or not. These results can be used as evidence-base for further research on cesarean section delivery in Qatar.

Keywords: Ceasarean section; Women health; Factors

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In Vitro Comparison of Two Single Layer Hand Sewn End-to-End Anastomosis Techniques in Normal Equine Jejunum: A Pilot study

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Abstract

Background: The equine small intestine can be affected by a variety of disorders, which may require some form of bypass or anastomosis procedure. Several small intestinal anastomosis techniques have been reported in scientific literature with the intention to minimize post-operative complications, however to our knowledge there are no published descriptions of the hand- sewn end-to-end single layer simple continuous Appositional technique for equine jejunojejunostomy. **Objective:** To compare and evaluate differences in the single layer continuous Appositional and the single layer continuous Lembert with respect to construction time, leakage pressure and bursting pressure; for the purpose of small intestinal anastomosis in the horse. **Hypothesis:** We hypothesized that the time spent in the execution, leakage pressure and bursting pressure will be similar between the single layer continuous Lembert and the single layer simple continuous Appositional techniques. Since this is a pilot study, it is the first step to prove the efficacy of the Appositional technique by showing its similarity with the Lembert technique, considering the latter to be the 'gold standard'. **Methodology:** Thirty-Seven intestinal segments from two horses were used to compare the single layer continuous Appositional and single layer continuous Lembert techniques. The time taken to execute the anastomoses, and the number of bites taken for each pattern, were recorded. Biomechanical testing was performed to determine leakage pressure and bursting pressure. Statistical analysis was performed using GraphPad Prism 8. **Result:** The comparison in construction time between the Lembert group (mean, 24.23 mins, n=19) and the Appositional group (mean, 21.74 mins, n=18) were found to be statistically insignificant (P=0.3088). There was also no changes in Leakage pressure (P=0.3862) and bursting pressure (P=0.3135) between the two groups. **Conclusion:** This study has demonstrated that the Appositional technique is a viable alternative to the Lembert technique, with respect to construction time, leakage and bursting pressures, for the purpose of end-to-end jejunojejunal anastomosis in the horse.

Keywords: Intestinal Anastomosis; Lembert technique; Appositional technique; Equine Jejunojejunostomy

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Development and in Vitro Testing of a Nitric Oxide Nanoparticle Carrier for Acute Lung Injury

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Abstract

Acute respiratory distress syndrome (ARDS) is an infectious clinical condition in which gas exchange inside the airways and alveoli are disturbed. Fluid filled lungs need to be mechanically ventilated for airway reopening.Ventilation might further damage delicate lung tissue and lead to edema,a phenomenon known as ventilator-induced lung injury VILI is a result of propagation of small air bubbles in gas exchange sites, injuring epithelial cells due to shear stress. Potential rescue of epithelial cells (EPCs) under injurious stresses is possible by altering their mechanical properties and hence deformation amount under stress (decreased stiffness, decreased deformation). This is possible by altering the cytoskeleton. Nitric oxide (NO) inhalation therapy for ARDS enhances oxygenation. In addition, NO secretion was shown to decrease stiffness in various tissue types which can aid as a treatment of conditions like ARDS.One issue with using NO is that the life-time is too short so the treatment is not very effective. We have used nanoparticles, which secretes NO in aqueous environment. We hypothesize that Administration of NO through releasing polymers will soften lung cells and suppress inflammatory markers which enhance survival of lung cells against shear stress.

Keywords: Respiratory distress; Nitric oxide; Nanoparticles

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Toxicity Evaluation of Stearamidopropyl Dimethylamine Surfactant on Embryonic development of Zebrafish

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Abstract

Background: Surfactants best known for their use in the industry of detergents, household products, and cosmetics. Usually, the amount of released surfactants into the environment is diluted during secondary water treatment. However, there is always a risk of releasing untreated and polluted wastewater containing high amounts of surfactants without knowing the harmful effect on biotic and abiotic elements of the environment. SAPDMA is a surfactant that is used mostly in cosmetics, conditioning agents, and recently in corrosion inhibition. The classification of SAPDMA as a "safe" or "green" surfactant by different environment or chemical agencies is ambiguous, and the literature is lacking. **Aim:** The aim of this study is to evaluate the safety of SAPDMAusing the zebrafish embryo model. **Methods:** Zebrafish embryos were exposed to different concentrations of SAPDMA and the effect was assessed by different toxicity assays. This includes mortality/ survival assay to assess the median lethal dose (LC50) teratogenicity assay to assess the no observed effect concentration (NOEC); and organ specific toxicity assays including cardiotoxicity, neurotoxicity (using locomotion assay), and hemoglobin synthesis (using odianisidine staining). **Results:** Exposure of zebrafish embryos to SAPDMA caused mortality in a dose-dependent manner with a calculated LC50 of 2.3 mg/L. Thus, based on the LC50 value and according to the Fish and Wildlife Service Acute Toxicity Rating Scale, SAPDMA is classified as "moderately toxic". The NOEC, the concentration that did not cause any significant teratogenicity, was 0.1mg/L. However, this concentration caused significant organ specific and cytotoxic effects, suggesting that harmless concentrations of SAPDMAare lower than 0.1 mg/L. **Conclusion**: Our data indicate that SAPDMA at very low concentrations causes adverse effects on zebrafish embryos. Thus, we recommend that the use of SAPDMA in industry should be re-evaluated and monitored by the environment and public health agencies.

Keywords: Stearamidopropyl dimethylamine; Zebrafish; Toxicity

For citation: AlJighefee H., Abdin R., Nasrallah G., Aljamal O., "Toxicity Evaluation of Stearamidopropyl Dimethylamine Surfactant on Embryonic Development of Zebrafish", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0194

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Investigating the Efficacy of Natural Blood Glucose Lowering Compounds in the Prevention of Congenital Heart Defects during Maternal Diabetes using the Chick Embryo

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Abstract

Diabetes is a metabolic disorder that is characterized by hyperglycemia. Although there are several drugs available for diabetes, patients tend to follow natural remedies. However, the use of these natural remedies lacks scientific evidence of its effect. Therefore, the aim of this project was to first identify the histological changes of the developing heart in a hyperglycemic environments. Secondly, test the efficacy of selected natural compounds in lowering blood glucose levels and to assess its gene expression changes.

Keywords: Diabetes; Hyperglycemia; Gene expression

For citation: Haddad B., Elhashmi Z., Yalcin H., Benslimane F., Hussain H.A., "Investigating the efficacy of natural blood glucose lowering compounds in the prevention of congenital heart defects during maternal diabetes using the chick embryo", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0195

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Unraveling Gene Expression Profiles of Cardiac Genes that Participate in Embryonic development of Congenital Heart Defects using Chick Embryo

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Abstract

Hypoplastic left heart syndrome (HLHS) is a rare but serious subtype of congenital heart defect (CHDs) at which the hemodynamics are disturbed. In this project, HLHS was introduced surgically by left atrial ligation (LAL) to embryonic chicks and the subsequent effects of it were studied. Different tests were done post-LAL to study cardiac morphology, function, and gene expression of cardiac markers.

Keywords: Hypoplastic left heart syndrome; Congenital heart defects; Left atrial ligation

For citation: Nasr A., Omar A., Alser M., Yalcin H., Benslimane F., "Unraveling Gene Expression Profiles of Cardiac Genes That Participate in Embryonic Development of Congenital Heart Defects Using Chick Embryo", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0196

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West Nile Virus Seroprevalence among Qatari and Immigrant Populations within Qatar

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Abstract

Background: West Nile virus (WNV) is one of the most widely spread arboviruses worldwide and a highly significant pathogen in humans and animals. Despite frequent outbreaks and endemic transmission being reported in the Middle East and North Africa (MENA), seroprevalence studies of WNV in Qatar are highly lacking. **Aim:** This study aims to investigate the actual prevalence of WNV among local and expatriate communities in the Qatar using a large sample size of seemingly healthy donors. **Method:** A total of 1992 serum samples were collected from donors of age 18 or older and were tested for the presence of WNV antibodies. Serion enzyme-linked immunosorbent assay (ELISA) commercial microplate kits were used to detect the presence of the WNV IgM and IgG. The seropositivity was statistically analyzed using SPSS software with a confidence interval of 95%. **Results:** The seroprevalence of anti-WNV IgG and IgM in Qatar was 10.3% and 3.4%, respectively. The country-specific seroprevalence according to nationality for WNV IgG and IgM, respectively, were Sudan (37.0%, 10.0%), Egypt (31.6%, 4.4%), India (13.4%, 3.2%), Yemen(10.2%, 7.0%), Pakistan (8.6%, 2.7%), Iran (10.6%, 0.0%), Philippines (5.4%, 0.0%), Jordan(6.8%, 1.1%), Syria (2.6%, 9.6%), Palestine (2.6%, 0.6%), Qatar (1.6%, 1.7%), and Lebanon (0.9%, 0.0%). The prevalence of both IgM and IgG was significantly correlated with the nationality ($p \leq 0.001$). **Conclusion:** Among these tested nationalities, Qatar national has a relatively low burden of WNV disease. The highest prevalence of WNV was found in the Sub Saharan African nationalities like Sudan and Egypt. The seroprevalence of WNV is different from the previously reported arboviruses such as CHIKV and DENV, which was highest among Asian countries (India and Philippines). Further confirmatory tests such as viral neutralization assays are needed to confirm the IgM seropositivity in these samples since these samples could be a source of viral transmission through blood donation.

Keywords: West Nile virus; Middle East and North Africa; Prevalence

For citation: Kunhipurayil H., Ahmed M., Nasrallah G., "West Nile Virus Seroprevalence Among Qatari And Immigrant Populations Within Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0197

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In Vitro Comparison of Two Single Layer Hand Sewn end-to-end Anastomosis Techniques in Normal Equine Jejunum: A Pilot Study

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Abstract

Background: The equine small intestine can be affected by a variety of disorders, which may require some form of bypass or anastomosis procedure. Several small intestinal anastomosis techniques have been reported in scientific literature with the intention to minimize post-operative complications, however to our knowledge there are no published descriptions of the hand- sewn end-to-end single layer simple continuous Appositional technique for equine jejunojejunostomy. **Objective:** To compare and evaluate differences in the single layer continuous Appositional and the single layer continuous Lembert with respect to construction time, leakage pressure and bursting pressure; for the purpose of small intestinal anastomosis in the horse. **Hypothesis:** We hypothesized that the time spent in the execution, leakage pressure and bursting pressure will be similar between the single layer continuous Lembert and the single layer simple continuous Appositional techniques. Since this is a pilot study, it is the first step to prove the efficacy of the Appositional technique by showing its similarity with the Lembert technique, considering the latter to be the 'gold standard'. **Methodology:** Thirty-Seven intestinal segments from two horses were used to compare the single layer continuous Appositional and single layer continuous Lembert techniques. The time taken to execute the anastomoses, and the number of bites taken for each pattern, were recorded. Biomechanical testing was performed to determine leakage pressure and bursting pressure. Statistical analysis was performed using GraphPad Prism 8. **Results:** The comparison in construction time between the Lembert group (mean, 24.23 mins, n=19) and the Appositional group (mean, 21.74 mins, n=18) were found to be statistically insignificant (P=0.3088). There was also no changes in Leakage pressure (P=0.3862) and bursting pressure (P=0.3135) between the two groups. **Conclusion:** This study has demonstrated that the Appositional technique is a viable alternative to the Lembert technique, with respect to construction time, leakage and bursting pressures, for the purpose of end-to-end jejunojejunal anastomosis in the horse.

Keywords: Equine; Jejunojejunostomy; Lembert

For citation: Alkharraz H., Nader R., AlAsmakh M., Johnson J., "In Vitro Comparison of Two Single Layer Hand Sewn End- to- End Anastomosis Techniques in Normal Equine Jejunum: APilot Study", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0198

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In Vivo Investigation of Cardiac benefits of Sodium Glucose Cotransporter Inhibition using the Zebrafish Model

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Abstract

Type 2 diabetes mellitus (T2DM) affects >16% of adults in Qatar. Newly emerging class of antidiabetic drugs, focused on SGLT inhibition were observed to reduce CVDs risks in diabetic patients. Up to date, the mechanism contributing to the CV benefits remains unrevealed. Zebrafish embryos were injected with different morpholinos to knockdown SGLT genes and study their effects on cardiac parameters. SGLT1 inhibition caused the most severe effects on zebrafish embryos with survival rate ~10 %. It also caused tube-like structured heats with edema, affecting significantly the cardiac output and diameter, and increased cardiac markers expressions. Analysis acquired correlates with literature data of SGLT1 predominant expression in heart tissues.

Keywords: T2DM; CVDs; Zebrafish.

For citation: Essa A., Aldous N., Benslimane F., Yalcin H., "In Vivo Investigation of Cardiac Benefits of Sodium Glucose Cotransporter Inhibition Using the Zebrafish Model", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0199

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Quantifying Gut Microbiome in Rats with Adenine-Induced Chronic Kidney Disease and the effect of Treatment with Gum Arabic

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Abstract

Chronic kidney disease (CKD) affects ~10% of Qatar's population. Recently, dysbiosis in the gut microbiome has been associated with CKD. It is not understood whether CKD affects the gut microbiome or the dysbiotic gut microbiome leads to CKD. Gum Arabic (GA) is a fiber-rich dietary substance that has a potential to enhance the gut microbiome, therefore it could treat CKD. The aim of this study is to quantify the gut microbiome in CKD rats and to evaluate the GA as a potential treatment for CKD.

Keywords: Chronic kidney disease; Gut microbiome; Gum Arabic

For citation: AlBaniali A., Shoair B., AlAsmakh M., Aljamal O., Sohail M., "Quantifying Gut Microbiome in Rats with Adenine-Induced Chronic Kidney Disease and the Effect of Treatment with Gum Arabic", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0200

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Prevalence of Antinuclear Antibodies (ANA) among Healthy Individuals with Different Nationalities in Qatar

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Abstract

Background: Detection of antinuclear antibodies (ANA) by different immunoassays (usually indirect fluorescence assay IFA) is the most common and sensitive screening test used for the diagnosis of many types of autoimmune disease such as systemic lupus erythematosus (SLE). Moreover, a high titer of ANA can be frequently found in healthy individuals, making it not a very specific marker of autoimmunity. However, the information about the prevalence of these false positive ANA in a healthy individual is not well investigated around the world particularly in Asia and MENA region including Qatar. **Objectives:** The aim of this study was to **(i)** estimate the prevalence of ANA among male healthy individuals of local and expatriate communities residing in Qatar and **(ii)** to evaluate the performance of a new commercial ELISA kit using two quality control parameters; analytical sensitivity (endpoint titration) and positive predictive value (PPV). **Methodology:** Sera collected from a total of 2965 volunteer donors of age 18 years or older, attending Hamad Medical Corporation between 2013 and 2016, were used to test for the presence of ANA IgG using Bioprobes Srl microplate ELISA kits. All positive ELISA kit results were retested using the IFA IgG for the detection of ANA nuclear staining patterns. **Results:** ANA prevalence among the healthy population was 0.34%, as only 10 samples out of 2965 were positive by the ANA ELISA. An additional 12 borderline samples were also detected raising the prevalence to 0.74% (22/2965). The Irani nationals had the highest prevalence of ANA with 1.83%. About 70% of the samples had a nuclear-speckled staining pattern. ELISA kit showed excellent performance efficiency, i.e., similar titration score to IFA for positive samples and high PPV (100%). **Conclusion:** This is the first ANA comprehensive study in the MENA region with such a large sample size. According to literature and our own literature review, the average prevalence of ANA in healthy individuals in a different part of the world is usually about 3-15%; however, in Qatar, it is only 0.34%. We recommend using the new Dia. Pro ELISA kit for ANA screening as this kit showed high efficiency for detecting ANA in comparison to the gold standard IFA assay.

Keywords: ANA; MENA; Prevalence

For citation: Debnath R.P., Amanullah F., Nasrallah G., "Prevalence of antinuclear antibodies (ANA) among healthy individuals with different nationalities in Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0201

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The Microbiome and Epigenome Profile in Pediatric Type 1 Diabetes in Qatar

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Abstract

This study focused on Qatar's pediatric population that has witnessed a steep increase in the incidence of the disease. In order to understand this, we analyzed the blood and stool samples of a pilot group of 21 T1D subjects (age 6-12 years old) for the microbiome composition, Short Chain Fatty Acid (SCFA) levels and methylation profiles using 16s rDNA sequencing, gas Chromatography and Infinium methylation assay respectively.

Keywords: Pediatric; T1D; Microbiome.

For citation: Bakhash R.B., Sulaiman F., AlShafai M., Terranegra A., "THE MICROBIOME AND EPIGENOME PROFILE IN PEDIATRIC TYPE 1 DIABETES IN QATAR", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0202

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Smartphone Addiction among Qatar University Students: A Cross-Sectional study

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Abstract

Aims: The aim of this study was to: (I) estimate the prevalence of SPA among students in Qatar University (QU); (II) assess the correlation between daily duration of smartphone use (SPU) and SPA; (III) assess the relationship between SPA with (a) current Grade point Average (GPA), (b) psychological distress, and (c) students' perceived negative impact of SPU on their learning and academic performance, sleep at night, social activity, and physical and mental health. **Methods:** We used a cross-sectional study using a self-administered survey to address the aims of the study. An electronic survey was distributed to all QU students registered in the Fall 2019 in addition to a paper survey distribution to fifteen classes, selected at random from all colleges in QU. The survey used smartphone addiction scale (SAS) to measure SPA; General Health Questionnaire 28 (GHQ-28) to measure the likelihood of student having "psychological distress"; ten statements to identify students perceived negative impact of SPU on academic performance, sleep at night, physical and mental health, and social activity; current GPA as a measure of academic performance. Descriptive statistics and multivariable linear and logistics regression analyses were performed to analyses the data. The Study was ethically approved QU institutional review Board. **Results:** A total of 717 students participated in the study. The mean daily duration of SPU among students was 6.5 hours per day (SD= 3.7), and he prevalence of SPA was 59%. Duration of SPU in hours and SPA score (r=0.282, p= <0.001). The prevalence of psychological distress among students was 51.0%. Increase in daily duration of SPU, male gender, presence of psychological stress, not having a chronic disease, and not performing physical exercise in the previous week were independently associated with increased odds of SPA. We found a significant interaction between gender and psychological distress with SPA. Male students with psychological distress were at lower odds of SPA than female students with psychological distress (OR= 0.39; 95% CI 0.17, 0.87). SPA was a statistically significant predictor of all included domains of perceived negative impact of SPU, including sleep at night, learning in class, study time, academic performance, physical and mental health, and social activity. After adjustment for significant variables, students with no SPA had increased odds of having higher current GPA category by 2.04 times (1.05, 3.95) than students with SPA. The characteristics of students did not vary significantly according to survey completion method. The sensitivity analyses showed similar findings between the predictors and the outcome variables in all analyses. Therefore, our sensitivity analyses suggest that our findings are unlikely to have been affected by selection bias, response bias, or social acceptability bias. **Conclusion:** SPA is highly prevalent among QU students. SPA or longer duration of SPU have negative impact on academic performance, psychological distress, and perceived physical and mental health, and social activity.

Keywords: Smartphone; Addiction; College students; Academic performance; Health

For citation: Ashour R., Elashie S., Alkeilani B., Shraim M., "Smartphone addiction among", Qatar University students: a cross-sectional study", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0203

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The Critical Care Medicine Research: A Systematic Review

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Abstract

Objectives: The cost-effectiveness terminology is a common term used in the critical care medicine research. A systematic review analysis was conducted to study the patterns of the use and misuse of the cost-effectiveness terminology in the critical care medicine literature between 1998 and 2018. **Methods:** A search in the inCite journal citation report was done to identify all the critical care medicine journals. An independednt search done to identify all the articles between 1980 to 2018 that claimed in their abstracts/article to perform a cost-effectiveness analysis (CEA). Eligible articles were included and analyzed using x2-test. The articles were categorized into four different levels based on the appropriateness of CEA terminology use. The analysis performed to assess the association between the appropriateness of CEA terminology and the journal impact factor (IF), author background, and the publication year (5-year time points). **Results:** Out of 7,835 articles in targeted subject category, 76 met the inclusion criteria, but 50 of them were analyzed. Of these 50 articles, 32 (64.0%) met the appropriate criterion of CEA terminology use. 71.4% of articles published in journals with IF: 3.0 - 21.4 were appropriately using CEA term compared to 54.5% studies that are published in journals with IF: 0.4 - 2.8. Of these articles, which are appropriately use CEA terminology, 56.2% of the articles have at least one author with health economics expertise. **Conclusion and recommendation:** The preliminary data suggest that there is an association between the level of appropriateness and journal impact factor and the author health-economic background authorship. However, we did not demonstrate changes in the level of appropriateness with time. Decision-makers, authors, and editors should pay better attention in seeking ways to monitor the appropriate use of “cost-effectiveness” terminology. More future studies should be done in this context.

Keywords: Literature search; Data collection; Statistical analysis

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Validation of FFQ against Food Records for Vitamin D in Qatar Population

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Abstract

Background: Measurement of Vitamin D nutritional status through dietary assessment is a cost effective method. The food frequency questionnaire (FFQ) is usually validated against food records (FR). There is no Vitamin D specific FFQ for Qatar population Objective: The objective of this study was to develop a Vitamin D centric FFQ and validate FFQ against 3-day FR for Qatar population. **Methodology:** A quantitative FFQ based on Vitamin D containing foods consumed in Qatar was developed. Vitamin D content of foods were gathered from food labels and food composition tables from the USDA. A Vitamin D content database was developed for this study purpose. Dietary intakes using FFQ and 3-day FR were collected from 62 participants. Vitamin D intakes from FFQ and 3-day FR were validated with quartile comparison and Bland-Altman (BA) tests. **Results:** BA plot showed an agreement between FFQ and 3-day FR Vitamin D intakes. BA index was 3.23%, which is <5%, a commonly used standard for validation. Quartile correlation showed ≈73% of the subjects were within 1 quartile difference. **Conclusion:** In conclusion, an agreement was found between Vitamin D intakes from FFQ and 3-day FR. This indicates that the FFQ can be used as a valid dietary method to assess Vitamin D status in Qatar's population.

Keywords: FFQ; Food Records; Vitamin D; Food frequency questionnaire; Dietary assessment; Qatar

For citation: Abudhaa R., Othman H., Zewein M., Ganji v., "Validation of FFQ Against Food Records for Vitamin D in Qatar Population", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0206

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Serum Magnesium and Cognitive Function among Qatari Adult

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Abstract

Background: Previous studies found that low levels of magnesium can increase the risk of several diseases including cardiovascular diseases, diabetes, and hypertension which are associated with cognitive dysfunction. **Objective:** Examine the association between serum magnesium and cognitive function among Qatari adults. In addition to assessing the interaction relation between low serum magnesium, hypertension, and diabetes in relation to cognitive function. **Methods:** Data from 1000 Qatari participants aged ≥20 years attending the Qatar Biobank Study were analyzed. Serum magnesium was measured by an automated calorimetric method and suboptimal magnesium was characterized by <0.85 mmol/L. Cognitive function was measured by a computer-based selfadministered test focusing on mean reaction time (MRT). Multivariable linear regression and logistic regression were used. **Results:** The prevalence of suboptimal magnesium was 57.1%. Across the quartiles of serum magnesium from high to low, the regression coefficients (95% CI) for MRT were 0, -17.79, -18.27, and -31.93 (95%CI 2.38–3.05), respectively (p for trend <0.033). The presence of hypertension and diabetes significantly increased the MRT along with a wide range of low serum magnesium. Women with diabetes or hypertension were affected the greatest by low magnesium levels. **Conclusion:** There was a positive association between serum magnesium and cognitive function. Low magnesium levels were associated with a longer MRT.

Keywords: Serum magnesium; Mean reaction time; Cognition; Qatar Biobank

For citation: alghazali K., eltayeb s., musleh a., Al-Abdi T., shi z., "Serum Magnesium and Cognitive Function Among Qatari Adult", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0207

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Predictive Power of Body Visceral Adiposity Index, Body Adiposity Index and Body Mass Index for Type 2 Diabetes in Qatari Population

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Abstract

Background: The prevalence of type 2 diabetes (T2D) has increased recently in Qatar. Body mass index (BMI) is a predictor of T2D in many populations. However, BMI is based on height and weight measurements and not on body adiposity. Therefore, the utility of BMI for predicting the risk of T2D has been questioned, and visceral adiposity (VAI) appears to be a better predictor of T2D. **Objective:** This study is aimed to assess the relative effectiveness of visceral adiposity index (VAI) and body adiposity index (BAI), in comparison with body mass index (BMI), for T2D among Qatari adults. **Methodology:** A random sample of 1103 adult Qatari nationals over 20 years old were included in this study; this data was obtained from the Qatar National Biobank. We performed a multivariate logistic regression to examine the association between VAI, BAI, BMI, and T2D, and computed zscores for VAI, BAI and BMI. **Results:** VAI z-scores showed the strongest association with the risk of T2D (OR, 1.44; 95% CI: 1.24–1.68) compared with the z-scores for BAI (OR, 1.15; 95% CI: 0.93–1.43) and BMI (OR, 1.33; 95% CI: 1.11–1.59). Subgroup analyses indicated that the association was stronger between VAI and T2D in Qatari women than in men. **Conclusion:** VAI was a strong and independent predictor of T2D among the Qatari adult population. Therefore, VAI could be a useful tool for predicting the risk of T2D among Qatari adults.

Keywords: Body adiposity index; Body mass index; Qatar Biobank; Type 2 diabetes; Visceral adiposity index

For citation: alkhalaqi A., Alnaimi F., Qassmi R., Bawadi h., "Predictive Power of Body Visceral Adiposity Index, Body Adiposity Index and Body Mass Index for Type 2 Diabetes in Qatari Population", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0208

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Muscle Strength and Glycaemic Control among Patients with Type 2 Diabetes

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Abstract

Background: The prevalence of diabetes has been rising sharply since 1980, reaching 422 million cases worldwide in 2014. Physical activity and handgrip strength may be associated with good glycaemic control among patients with diabetes **Objective:** We tested the association between handgrip strength and glycemic control in type 2 diabetes patients, from National Health and Nutritional Examination Survey NHANES 2011-2014 and the contribution of the study covariates to this association. **Hypothesis:** Muscle strength is positively associated with glycemic control in type two diabetes. **Methodology:** This cross-sectional study examined the association between handgrip strength and glycaemic control among patients with diabetes. Data on 1058 participants aged 40 and older were collected from the NHANES. Muscle strength was assessed using a handgrip dynamometer, and blood samples were obtained to observe the glycaemic control values. Height, body weight, physical activity, insulin use, smoking status, alcohol use, participant demographics, and income-to-poverty ratio were all considered in the study. **Results:** logistic regression analysis was used to assess the association between handgrip strength and poor glycaemic control among participants with diabetes. Three models were used, each model adjusted to include different variables. OR values revealed no association between handgrip strength and glycaemic control. However, model 2, which was adjusted for sedentary activity, income-to-poverty ratio, education, and smoking, shows a trend towards an association. Patients in quartile 4 of handgrip had 0.59 odds of poor glycaemic control, OR = 0.59 (95% CI: 0.34–1.02). However, in model 3 this effect was diluted when further adjusted for insulin use, OR = 0.81 (95% CI: 0.47–1.38). Further analysis was performed to examine the mean decline in handgrip strength among non-insulin and insulin users. Non-insulin users, both men and women, have higher handgrip strength as compared to insulin users. **Conclusion:** There was no association found between handgrip and glycaemic control among patients with diabetes.

Keywords: Muscle strength; Glycemic control; Type 2 DM

For citation: abduhijleh h., alalwani j., alkhatib d., bawadi h., "Muscle Strength and Glycaemic Control among Patients with Type 2 Diabetes", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0209

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Determination of Ocps and Pops Residues in Local Produce in Qatar and their Health Implications

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Abstract

In this study, a total of 49 samples of fruits and vegetables (dates, leafy vegetables and fruiting vegetables) produced locally in the farms in Qatar and 42 samples of soil and water from these farms were analyzed using Gas chromatography-electron capture detector (GC/ECD), and Gas chromatography-mass spectrometry (GC-MS) to detect residual levels of organochlorine pesticides (OCPs). The levels of OCPs of all samples were below the MRLs. The correlation analysis results showed that water and soil could be a potential source of the contamination of a-BHC, b-BHC, heptachlor, g-chlordane and endrin in the fruit and vegetable samples. In this study, a risk assessment analysis was also performed to estimate daily intake of OCPs by Qatari population. The risk assessment study revealed that the intake of the studied OCPs posed no risk to human health due to their levels of intake below MRLs.

Keywords: OCPs; POPS; Residues; Qatar

For citation: dahir h., mohamed a., alsaeedi s., elobeid t., "Determination of OCPs and POPs residues in local produce in Qatar and their health implications", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0210

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Investigating the Cardiac effects of New Generation Anti-Diabetic Drug Empagliflozin using Zebrafish Embryo Model

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Abstract

Type 2 diabetes mellitus (T2DM) affects >16% of adults in Qatar. Newly emerging class of anti-diabetic drugs focused on SGLT inhibition were observed to reduce CVDs risks in diabetic patients. Up to date, the mechanism contributing to the CV benefits remains unrevealed. Zebrafish embryos were treated with Aristolochic Acid to induce heart failure then treated with Empagliflozin to determine its beneficial effect. Furthermore the expression of SGLT1 & 2 were determined in the hearts of zebrafish. SGLT2 was expressed more then SGLT1 in the heart and whole embryo. Empa significantly improved the zebrafish embryo'scardiachealthafterinductionofheartfailure.

Keywords: T2DM; SGLT; CVDs.

For citation: Alkawari F., Ali W., Benslimane F., Yalcin H., "Investigating the Cardiac Effects of New Generation Anti-Diabetic Drug EmpagliflozinUsing Zebrafish Embryo Model", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0211

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The Expression of Bile Acid Receptor TGR5 in Adipose Tissue in Diet-Induced Obese Mice

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Abstract

Bile acids are significant physiological factors for digestion, solubilization, absorption, toxic metabolites and xenobiotics. In addition, bile acids are responsible of signal transduction as well as metabolic regulation that activate several receptors such as farnesoid X receptor (FXR) and the membrane G-protein receptor 5 (TGR5). Activation of TGR5 by bile acids is associated with prevention of obesity as well as ameliorating the resistance to insulin via increasing energy expenditure. The objective of this research is to investigate TGR5 gene expression level in different fat depots including visceral or epididymal adipose tissue (eWAT), brown adipose tissue and inguinal adipose tissue (iWAT) and to study the response of TGR5 gene expression to the antiobesity treatment (SFN). Three groups of male CD1 mice were used in this study; lean group fed with SCD, DIO mice on HFD and DIO obese mice treated with anti-obesity treatment. Body weight (BW) and phenotype data were evaluated by weekly including blood samples for analysis of glucose, insulin, leptin, triglycerides (TG). Total RNA was extracted from different fat depots and RT-PCR profiler array technology was used to in order to assess the mRNA expression of TGR5 and leptin. There was significant downregulation of TGR5 gene expression level in obese (DIO) mice and remarkable upregulation of TGR5 gene expression after successful weight loss in DIO mice treated with SFN in time dependent manner at 1 weeks and 4 weeks of ip applications. In conclusion, obesity is associated with decrease in expression of TGR5 in different fat depots and treatment with anti-obesity drug (Sulforaphane) causes stepwise upregulation of TGR5 gene expression in epididymal white adipose tissue parallel stepwise decrease in body weight. Increase of expression of TGR5 in DIO mice in eWAT is accompanied by improvement in glucose homeostasis and insulin action.

Keywords: Bile Acids; Farnesoid X receptor; Membrane G-protein receptor 5

For citation: Ahmed S., Rizk N., "The expression of bile acid Receptor TGR5 in Adipose Tissue in Diet-induced obesity mice", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0212

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The Profile of Hepatic Gene Expression of Glucose Metabolism in Mice on High Fat Diet

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Abstract

Obesity is a growing problem worldwide, and recent data indicated that 20% of the populations would be obese. Obesity arises as a multifactorial disease caused by inherited traits that interact with lifestyle factors such as diet and physical activity. The liver plays an essential role in the gluco-regulation via regulating glucose, lipid and protein metabolism. The process of glucose metabolism is controlled by a range of molecular mechanisms and genes which affect the metabolism of the liver during intake of high fat diet (HFD). The objective of this research is to investigate the profile of hepatic gene expression of glucose metabolism in mice on HFD treated with leptin (5 mg/kg BW Ip injection). Ten wild type CD1 mice fed on HFD is used for this study, where groups are control (vehicle - leptin) and test group (vehicle + leptin). Body weight (BW) was measured, and blood chemistry, insulin and leptin were measured at the end of the experiments. Total RNA was isolated from the liver tissue, and RTPCR profiler array technology was used to evaluate the mRNA expression of 84 essential genes of hepatic glucose metabolism. The data of the BW and blood chemistry are not significantly different between the two groups. Leptin treatment enhanced the metabolic pathways and the candidate genes of the different metabolic pathway; glycogen metabolism such as Gys1, Gys2 and Pygm, pentose phosphate shunt such as Rpia and suppressed the glycolysis such as Aldob, and TCA cycle such as Mdh1b. In conclusion, this study has shown that leptin could affect the profile of the hepatic mouse genes of glucose metabolism in the early stages of HFD to induce obesity.

Keywords: Gene expression; Metabolism; Obesity

For citation: Elfadl R., Rizk N., Fadel A., ElGamal A., "The Profile of Hepatic Gene Expression of Glucose Metabolism in Mice on High Fat Diet", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0213

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Hepatic Gene Expression Profile of Lipid Metabolism of Obese Mice after treatment with Anti-obesity Drug

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Abstract

Obesity is a global disorder with multifactorial causes. The liver plays a vital role in fat metabolism. Disorder of hepatic fat metabolism is associated with obesity and causes fatty liver. High fat diet intake (HFD) to mice causes the development of dietinduced obesity (DIO). The study aimed to detect the effects of anti-obesity drugs (sulforaphane; SFN and leptin) on hepatic gene expression of fat metabolism in mice that were fed HFD during an early time of DIO. Twenty wild types (WT) CD1 male mice aged ten weeks were fed a high fat diet. The mice were treated with vehicle; Veh (control group), and SFN, then each group is treated with leptin or saline. Four groups of treatment were: control group (vehicle + saline), Group 2 (vehicle + leptin), group 3 (SFN + saline), and group 4 (SFN + leptin). Body weight and food intake were monitored during the treatment period. Following the treatments of leptin 24 hour, fasting blood samples and liver tissue was collected, and Total RNA was extracted then used to assess the gene expression of 84 genes involved in hepatic fat metabolism using RT-PCR profiler array technique. Leptin treatment upregulated fatty acid betaoxidation (Acsbg2, Acsm4) and fatty acyl-CoA biosynthesis (Acot6, Acsl6), and down-regulated is fatty acid transport (Slc27a2). SFN upregulated acylCoA hydrolase (Acot3) and long chain fatty acid activation for lipids synthesis and beta oxidation (Acsl1). Leptin + SFN upregulated fatty acid beta oxidation (Acad11, Acam) and acyl-CoA hydrolase (Acot3, Acot7), and downregulated fatty acid elongation (Acot2). As a result, treatment of both SFN and leptin has more profound effects on ameliorating pathways involved in hepatic lipogenesis and TG accumulation and lipid profile of TG and TC than other types of intervention. We conclude that early intervention of obesity pa could ameliorate the metabolic changes of fat metabolism in liver as observed in WT mice on HFD in response to anti-obesity treatment.

Keywords: Gene expression; Lipid; Obese

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Effect of Hyperglycemia on eNOS function in EPCs

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Abstract

Type 2 diabetes mullites (T2DM) results in different cardiovascular complications. The main cause of these complications is endothelial dysfunction, which affects the endothelium physiologically and pathologically. The chronic hyperglycemia introduced by T2DM impacts the pivotal enzyme endothelial nitric oxide synthase (eNOS) in terms of phosphorylation and dimerization, which initiates oxidative stress and reduces the bioavailability of the vasodilator nitric oxide. To overcome endothelial dysfunction, endothelial progenitor cells (EPCs) contribute to vascular repair due to their regenerative characteristics. The effects of hyperglycemia on EPCs are understudied. Thus, this study aims to investigate the effects of hyperglycemia on the eNOS/Akt signaling pathway and reactive oxygen species (ROS) formation. Cells were treated with normal glucose (NG, 5.5mM) and high glucose (HG, 25mM) media for 3 & 6 days, and the effect on eNOS and Akt phosphorylation were assessed using western blot. ROS was assessed using CellROX stain following 1 and 3 days of treatment. Results showed that both acute and chronic hyperglycemia showed a trend towards decrease in phosphorylation of eNOS and Akt. In addition, ROS formation was increased following 24hr compared to NG. Further investigations are needed to enhance the capability of BOECs to serve as therapeutic tools in T2DM.

Keywords: Endothelial nitric oxide synthase (Enos); Reactive oxygen species (ROS); Endothelial progenitor cells (Epcs); Blood outgrowth endothelial cells (Boecs); Endothelial dysfunction

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Effect of Hyperglycemia on Epcs Function and Regenerative Ability

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Abstract

Diabetes induced hyperglycemia increases the risk of cardiovascular complications as it impacts vascular endothelial cells causing vascular dysfunction. Endothelial progenitor cells (EPCs) have been suggested to participate in the repair of vascular endothelial cells once they are impacted by hyperglycemia in diabetic patients. This research aims to test the EPC subtype blood outgrowth endothelial cells (BOECs) and their ability to survive and function under chronic hyperglycemic conditions. For that, we studied BOECs viability, response to shear stress, angiogenesis ability, and barrier function under normoglycemic (5.5mM) and hyperglycemic (25mM) conditions. The results have shown significant effects of chronic hyperglycemic conditions on cell proliferation ($n=3$, $p<0.05$), and migration ($n=3$, $p<0.05$) which were decreased when compared to control. Cells responses to shear stress were not affected under these conditions. There was a trend towards an increase in permeability as indicated by barrier function assays. The decrease in those endothelial cell functions might impact the repair mechanisms needed in diabetic patients to protect from vascular complications. Further investigations are required to establish therapeutic targets to improve EPCs repair function.

Keywords: Hyperglicemia; Epcs; Boecs; Endothelial dysfunction

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Investigating the Cardiac Effects of Sildenafil loaded Nanoparticles on Heart Failure using the Zebrafish Embryo Model

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Abstract

Background: Cardiovascular diseases (CVDs) are the first cause of death worldwide. Vasolidator agents are used to relax cardiac muscle, but their extremely short half-lifes limit their effectiveness. Sildenafil is such an agent used to relax the blood vessels muscles and increase the blood flow. The conventional drug can lead to serious problems in patients duo to the systematic drug delivery. Use of Nanomedicine potentially can enhance delivery of this agent while reducing the systematic effect of the drug. **Aim**: The purpose of the research is to examine the effectiveness sildenafil loaded nanoparticles in rescuing heart failure using zebrafish embryo model. **Methods:** There will be five experimental groups. The zebrafish will be treated with Aristolochic Acid (AA) at 24 hour per fertilization (hpf) to create the heart injury group. The treatment groups will be heart injury followed by a dose of either Sildenafil or Sildenafil loaded nanoparticles at 36 hpf. Two control groups will be the negative control (exposed to egg water) and vehicle control (exposed to the Dimethylsulfoxide (DMSO)).To evaluate the drug effects on embryo, toxicity assessment (Survival rate, tail flicking and hatching rate), cardiotoxicity assessment and gene expression of heart injury marker via RT-PCR will be conducted. **Results:** Preliminary findings demonstrate, loading Sildenafil to nanoparticles enhances its effectiveness dramatically. The experiments are ongoing to confirm the results. **Conclusion**: Nanomedicine is a powerful approach to enhance cardiovascular therapy. Vasodilator drugs in particular will benefit from this improvement as demonstrated with our findings.

Keywords: Nanomedicine; Zebrafish; Cardiovascular diseases; Sildenafil; Vasolidator

For citation: Moussa H.A.M.L., Mahgoub G.S.A., AlBadr M.A.H.I., Yalcin H.C., "Investigating the cardiac effects of Sildenafil loaded nanoparticles on heart failure using the Zebrafish Embryo Model.", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0217

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Toxicity Assessment of Treated Sewage Effluent using the Zebrafish Embryo Model

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Abstract

Background: In a context of tremendous economic value, the management and protection of water resources in Qatar has long been a significant issue as part of the global wastewater management plan. The process is based on several stages of treatment in order to deliver high-quality effluent standard. Treated sewage effluent (TSE) can potentially be used for agriculture in Qatar and it should be biologically evaluated before releasing it to the environment. TSE water can be further filtered with techniques that include reverse osmosis, forward osmosis, and nanofiltration. **Aim:** This project aims to assess the toxicity of differently treated sewage effluent water on the environement using the zebrafish model. Our approach will also be relevant to the assessment of the water quality for agriculture use. **Methods:** Zebrafish embryos were cultured in different effluent water samples filtered with different techniques. Toxicicity of water was assessed via multiple assasys including: survival rate, tail flicking, and hatching rate. Cardiotoxicity assessment was performed via blood velocity, cardiac output and vessels diameter measurement in major vessels, as well as gene expression for heart failure markers of ANP and BNP by PCR. **Results:** Samples filtered via Reverse osmosis and nano-filtration resulted in most toxicity. Total dissolved solvent (TDS) measurements were also highest in those samples, suggesting these filteration techniques may result in release of toxic compounds to effluent water. Toxicity assessment is currently ongoing to confirm the findindgs. **Conclusion:** Utilization of TSE for environmental and agricultural purposes will have an economical value in the nation. It is critically important to determine the most efficient and less toxic ways of water filteration. Zebrafish is a practical model that can be used to assess water toxicity. This project aims to examine toxicity of effluent water filteration techniques using the zebrafish model.

Keywords: Zebrafish; Sewage effluent; Filtration; Toxicity; Osmosis

For citation: Nasser F.A., Nasir H.N., Zakaria Z.Z, Yalcin H., "Toxicity assessment of treated sewage effluent using the zebrafish embryo model", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0218

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Relationship between Eating Patterns and Body Composition among Young Females in Qatar

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Abstract

The prevalence of obesity has been increased in Qatar, with the transition from healthy to unhealthy dietary habits. Behavioral factors that are associated with obesity are, long-term imbalanced energy intake, high screen time, skipping breakfast and physical inactivity. Changes in body composition and percent body fat (PBF) increase the risk of non-communicable disease. This study is the first study conducted in Qatar to investigate the relationship between dietary patterns and body composition among young females at Qatar University. This cross-sectional study consisted of 766 healthy female students Qatari and non-Qatari aged from 18-26 years randomly selected from different colleges at Qatar University. A validate questionnaire was used in order to collect data about healthy and unhealthy dietary patterns. Anthropometric measurements involved body weight, height, waist-to-height ratio (WHtR), waist circumference (WC), body mass index (BMI) and body composition using "Seca285", "Seca203" and "InbodyBiospace 720". Dietary patterns were identified by using factor loading. Linear regression was used to estimate confidence intervals and regression coefficient. More than half of the participants had a normal weight (65.1%), whereas 22.8 % and 12.0% were overweight and obese, respectively. Fat mass, BMI and PBF were slightly increased with age, but there was no significant difference. Factor analysis identified two dietary patterns: unhealthy patterns and healthy patterns. The frequent intake of vegetables and fruits was significant among high PBF female students (p=0.045 and p=0.001, respectively). The frequent intake of fast food was higher for overweight female students but there was no significant difference (p=0.289), whereas, the frequent intake of sweetened beverages was associated with higher significant rate of normal weight among female students (p = 0.009). No significant relation was found between dietary patterns, BMI and PBF. In conclusion, body composition is not significantly associated with healthy and unhealthy eating patterns among young females.

Keywords: Eating patterns; Body composition; Obesity

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Dietary Patterns and Glycemic Control among Qatari Adults with Type 2 Diabetes

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Abstract

Background: No studies assess the effect of dietary pattern on glycemic control among Qatari adults with T2DM. **Objective:** To assess the association between dietary patterns, and glycemic control among Qatari adults with T2DM. **Method:** Data from 1000 adults with known diabetes attending the Qatar Biobank Study were analyzed. Poor glycemic control was defined as HbA1c ≥7.0%. Dietary pattern was constructed using factor analysis based on habitual food intake data assessed by a food frequency questionnaire. Logistic regression was used to assess the association between dietary patterns and poor glycemic control. The following covariates were considered: education, age, gender, smoking, BMI and medication. All analyses were conducted using STATA15. **Results:** The odds ratio for poor glycemic control was 0.86 (95%CI 0.68-1.08) in men, 0.76(95%CI 0.61-0.95) in women. For men without diabetes medication, fast food pattern was positively but traditional pattern was inversely associated with poor glycemic control 2.35(95%CI 1.13-4.87) (p=0.021) and 0.49 (95%CI 0.22-1.07) (p=0.075) respectively. And among younger participants, the use of insulin was higher than older participants as it was 77 (SD 30.8%). **Conclusion:** Fast food pattern was inversely associated with glycemic control, which is most likely linked to medication use. In men who were not under diabetes medication, fast food pattern was associated with poor glycemic control.

Keywords: Glycemic control; Type 2 DM; Dietary patterns

For citation: Alaradi A., Ouagueni A., Khatib R., Bawadi H., "Dietary Patterns and Glycemic Control Among Qatari Adults with Type 2 Diabetes", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0220

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Association between Sleep Duration, Food Consumption Patterns and Obesity among Adolescents in Qatar

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Abstract

Background: Recent research suggests that sleep duration contributes towards developing unhealthy dietary habits, which can lead to obesity. Further study in this field can provide a new direction in addressing this epidemic. **Objective:** To examine the association between sleep duration, food consumption pattern, and obesity in adolescents in Qatar. **Hypothesis:** Sleep duration and unhealthy dietary pattern may be positively correlated to obesity. **Methods:** This is a cross-sectional, descriptive and analytical study including 1161 adolescents aged 14-19 years from a representative sample of independent secondary schools in the state of Qatar. Validated questionnaire was used to collect data on sleep duration and frequency of intake of foods. Sleep duration was classified as short (< 6 hrs), sufficient (7-8 hrs) and long (> 9 hrs). Anthropometric indicators included body weight, height and waist circumference (WC) that were measured using standardized procedures. General obesity was defined according to International Obesity Task Force (IOTF) ageand gender-specific body mass index (BMI) reference values. Agespecific cutoff values for WC were used to define abdominal obesity. Factor loading matrix was used to categorize healthy and unhealthy foods. The association between the study variables was assessed using multiple regression analysis. **Results:** The mean frequency of food consumption was lower for students of shorter sleep duration regardless of the day of the week. Students who reported long sleep duration had higher mean frequency of consumption of unhealthy food (fast food, French fries, cakes/donuts, candy/chocolates, sugar-sweetened beverages). Females showed an unhealthier eating pattern as compared to males. Multiple regression analysis revealed that as the WC and BMI increased, consumption of healthy eating pattern decreased by 25% and 10 % respectively ($p<0.001$) **Conclusion:** Lack of sufficient sleep and decreased consumption of healthy foods have an association with increased risk of being obese among adolescents.

Keywords: Food consumption; Sleep duration; Obesity; Adolescents; Qatar

For citation: Mohammed S., Meer N., Sheikh S., Kerkadi A., "Association Between Sleep Duration, Food Consumption Patterns and Obesity Among Adolescents in Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0221

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The Relationship between Cyberbullying, Cyber-victimization and Depression among Qatar University Students

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Abstract

Background: Cyberbullying is a modern form of bullying that could be practiced electronically or on the internet. It is related to different mental health issues such as depression, which can affect both the cyberbully and the victim. Although a few studies have been conducted regarding the prevalence of cyberbullying and cyber-victimization among the younger generation in Qatar, no studies have been conducted among the young adult age group despite studies showing that they are also prone to cyberbullying. **Methods:** This is a cross-sectional study to investigate the prevalence and the relationship between cyberbullying, cyber-victimization, and depression among Qatar University students. A self-administered close-ended electronic questionnaire was used to assess student's cyberbullying/cyber-victimization behaviors and depression symptoms. The Revised Cyberbullying Inventory scale (RCBI-II) and Patient Health questionnaire-9(PHQ-9) were used. A total of 836 students participated in the study. Pearson Chi-Square test and binary logistic regression were utilized to analyze the data. **Results:** Overall results indicated that the majority of students have been involved in at least one of the cyberbullying experiences as follows: (6.8% cyberbullies, 29.2% cyber-victims, 35.8% both cyberbullies and cyber-victims, 28.2% not involved in either). Approximately 50% of the students scored a ten or higher on the PHQ9 test indicating symptoms of depression. Moreover, significant associations were found between cyberbullying experiences and gender ($p=0.03$), depression and gender ($p= 0.046$), and between cyberbullying experiences and depression ($p<0.001$). **Conclusion:** Our findings indicate that among Qatar University students, cyberbullying and cyber-victimization are prevalent behaviors that could be associated with the high reported rates of depression symptoms.

Keywords: Cyberbullying; Depression; Mental health

For citation: AlAhmed A., Makki H., AlRajeh S., Alsayed H.D., "The Relationship between Cyberbullying, Cyber-victimization and Depression among", Qatar University Students", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0222

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The use of Drosophila Melanogaster as a Model Organism to study the effect of Innate Immunity on Metabolism

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Abstract

Apart from its traditional role in disease control, recent body of evidence has implicated a role of the immune system in regulating metabolic homeostasis. Owing to the importance of this "immune-metabolic alignment" in dictating a state of health or disease, a proper mechanistic understanding of this alignment is crucial in opening up for promising therapeutic approaches against a broad range of chronic, metabolic, and inflammatory disorders like obesity, diabetes, and inflammatory bowel syndrome. In this project, we addressed the role of the Janus kinase/signal transducer and activator of transcription (JAK/STAT) innate immune pathway in regulating different metabolic parameters using the Drosophila melanogaster (DM) fruit fly model organism. Mutant JAK/STAT pathway flies with a systemic knockdown of either Domeless (Dome) [domeG0282], the receptor that activates JAK/STAT signaling, or the signal-transducer and activator of transcription protein at 92E (Stat92E) [stat92EEY10528], were used. The results of the study revealed that blocking JAK/STAT signaling alters the metabolic profile of mutant flies. Both domeG0282 and stat92EEY10528 mutants had an increase in body weight, lipid deprivation from their fat body (lipid storage organ in flies), irregular accumulation of lipid droplets in the gut, systemic elevation of glucose and triglyceride levels, and differential down-regulation in the relative gene expression of different peptide hormones (Tachykinin, Allatostatin C, and Diuretic hormone 31) known to regulate metabolic homeostasis in flies. Because the JAK/STAT pathway is evolutionary conserved between invertebrates and vertebrates, our potential findings in the fruit fly serves as a platform for further immune-metabolic translational studies in more complex mammalian systems including humans.

Keywords: Innate Immunity; Metabolism; JAK/STAT pathway, Drosophila melanogaster

For citation: Mohbeddin A., Ahmed N.H., Kamareddine L., "The use of Drosophila Melanogaster as a Model Organism to study the effect of Innate Immunity on Metabolism", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0224

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Vitamin D is associated with Improved Lung Function But Not with Asthma, Emphysema and Bronchitis

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Abstract

Background: Hypovitaminosis D has been linked to several non-bone related diseases. Relation between serum 25-hydroxyvitamin D [25(OH)] and lung function and lung diseases has received less attention. **Methods:** Data from 3 National Health and Nutrition Examination Survey (NHANES) cycles, 2007-2012 were used. The sample size was 11983. Lung function markers such as forced vital capacity (FVC)and forced expiratory volume in 1 second (FEV1) were collected with Spirometry. Relation between serum 25(OH)D and lung function makers was assessed by the multivariate regression. Relation between serum 25(OH)D and prevalence of asthma, emphysema, and chronic bronchitis were assessed with multivariate-adjusted logistic regression. **Results:** Serum 25(OH)D was significantly associated with FVC and FEV1 ($P < 0.001$). When data were stratified based on sex and smoking status, we found similar associations between serum 25(OH)D and lung function markers. No relation was found between serum 25(OH)D and prevalence of asthma, chronic bronchitis, and emphysema. **Conclusions:** Serum 25(OH)D is significantly associated with improved lung function markers. Controlled studies are needed to determine if improved serum 25(OH)D will improve the lung function in adults.

Keywords: FEV1; FVC; NHANES; National Health and Nutrition Examination Survey; Vitamin D

For citation: Alobahi A., Yusuf S., Dookhy Z., Ganji V., "Vitamin D is associated with improved lung function but not with asthma, emphysema and bronchitis", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0225

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Qatar National Vision 2030

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Abstract

Introduction: The United Nations launched the Sustainable Development Goals in 2015. One of these goals describes achieving a Universal Health Coverage by 2030. This signifies workforce planning in healthcare professions (United Nations, 2015). The International Pharmaceutical Federation (FIP) published reports about pharmacy workforce planning in several countries. However, data about Qatar was not included in these reports. In 2017, FIP developed a transformational roadmap of pharmaceutical workforce and education. One component of the roadmap is the Pharmaceutical Workforce Development Goals (PWDGs) (International Pharmaceutical Federation, 2016). This research aims to conduct a self-assessment of the pharmaceutical workforce and education in Qatar in relation to the FIP's PWDGs. This will be followed by prioritization of the identified gaps and recommendation of measures to address them. **Methods:** Three rounds of conventional Delphi technique (Hasson et al., 2000) are conducted with expert panels in the College of Pharmacy at Qatar University and the Ministry of Public Health, utilizing the FIP's self-assessment survey. Content analysis is used to analyse and prioritize the identified gaps. **Results:** The lack of competency framework (PWDG5), workforce data (PWDG12), and workforce policy formation (PWDG13) are the three major gaps in the provision of pharmaceutical workforce and pharmacy education in Qatar, influencing other PWDGs. These gaps need to be addressed by the formation of Qatari Pharmaceutical Association through which academic, practice, and policymaking sectors can work together in developing a health workforce intelligence system. **Conclusion:** The results indicated that PWDGs are interrelated and a gap in one goal can negatively influence others (Bruno et al., 2018). Results and recommendations of this research will facilitate the implementation of strategic plans across leading pharmacy sectors to meet health needs in Qatar and achieve the third pillar of the Qatar National Vision 2030 "A Healthy Population: Physically and Mentally" (General Secretariat for Development, 2008).

Keywords: Qatar National Vision 2030; Pwdgs; Pharmacy practice

For citation: Ibrahim M., Mukhalalati B., Alalawneh M., Awaisu A., "Qatar National Vision 2030", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0226

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Glucose and Transferrin Liganded PLGA Nanoparticles Internalization in Non-Small Lung Cancer Cells

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Abstract

Introduction: Recently, after a decade of confusing results, several studies pointed out that overexpression of GLUT1 (glucose transporter 1) is a biomarker of worse prognosis in NSCLC. Nonetheless, the presence of transferrin (Tf receptor), which is overexpressed in most cancer tissues and most lung cancers as well, in NSCLC is also an indicator of very poor prognosis. Therefore, these ligands can be used for active targeting of lung cancer cells and improved efficacy of internalization of cancer therapy using nanomedicines. **Objectives:** Having the background, the main goal of the project was the assessment of the influence of the glucose and transferrin ligands on the efficacy of internalization of the designed (i) glucose decorated PLGA (poly lactic-co-glycolic acid) nanoparticles (Glu-PLGA NPs) and (ii) transferrin decorated PLGA nanoparticles (Tf-PLGA NPs) in comparison to (iii) non-liganded PLGA NPs using a A549 lung cancer cells. **Methods:** Glu-PLGA NPs, Tf-PLGA NPs and PLGA NP - fluorescently labelled), were designed using a sonication assisted nanoprecipitation method. Further, physicochemical properties characterization (particle size analysis, zeta potential, FTIR analysis, DSC analysis), cytotoxicity evaluation using MTT test, and cell internalization studies of DTAF labelled NPs using fluorimetry in A549 NSCLC cell line were performed. **Results:** The results pointed to a significantly improved internalization rate of the liganded compared to PLGA NPs. Glu-PLGA NPs showed higher internalization rate compared to Tf-PLGA and PLGA NPs, in the serum-supplemented and serum-free medium even at normal levels of glucose in the cell growth medium. **Conclusion:** The developed nanocarriers offer unique advantages of enhanced targetability, improved cell internalization and decreased toxicity, which makes them promising solution for current therapeutic limitations.

Keywords: NSCLC; Nanomedicines; Cancer targeting; MTT; Internalization studies

For citation: Benammar S., Mraiche F., Mariam J.J., Gorachinova K., "Glucose and transferrin liganded PLGA nanoparticles internalization in non-small cell lung cancer cells", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0227

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The Cardiovascular benefits of Empagliflozin, a Sodium Glucose Cotransporter Inhibitor: Is NHE1 a viable target?

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Abstract

Empagliflozin (EMPA), an SGLT2 inhibitor (with a low affinity for SGLT1) has attracted much attention due to a recent clinical trial, the Empagliflozin, Cardiovascular Outcomes, and Mortality in Type 2 Diabetes (EMPA-REG OUTCOME). In this trial, treatment with EMPA over 2.6 years decreased cardiovascular vascular events (14% reduction). Whether EMPA induces cardioprotection, independent of diabetes remains unclear. A previous report has demonstrated that EMPA inhibited NHE1 activity, which led to a reduction in intracellular sodium and calcium. In our study, we examine the cellular interplay between NHE1 and SGLT1/SGLT2 in a non-diabetic in vitro model.

We characterized H9c2 cardiomyoblasts stimulated with Angiotensin II (ANG II) 100nM in the presence and absence of EMPA (500nM) and measured cardiomyocyte hypertrophy and the expression of NHE1 and SGLT1/2. Stimulation of H9c2 cardiomyoblasts with ANG II (100nM) resulted in cardiomyocyte hypertrophy, an effect that was regressed in the presence of EMPA (500nM). No changes in SGLT2 and NHE1 protein expression were detected in H9c2 cardiomyoblasts. However, stimulation with ANG II in the presence of EMPA reduced the expression of SGLT1. We demonstrate that the inhibition of SGLT using EMPA following stimulation with ANG II, a hypertrophic stimulator of cardiomyocyte hypertrophy and NHE1, regressed the hypertrophic response of H9c2 cardiomyoblasts and SGLT1 protein expression. The inhibition of SGLT1 protein expression may be contributing to the anti-hypertrophic effect of EMPA. Whether EMPA reduces NHE1 activity remains to be elucidated.

Keywords: NHE1 activity; EMPA; SGLT2; SGLT1

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Cultural Competence in the Eyes of Health Cluster Faculty Members at Qatar University: Perception and Application-a Mixed Methods study

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Abstract

Background: Globalization impacts several aspects of life including education. Medical education in Qatar is progressing and developing by the effort of multicultural teams that ensure the emergence of future healthcare providers that are patient-centered, well educated and well knowledgeable. Although having this multicultural teaching can be beneficial in some area, it can represent a challenge. This study aims to investigate the perception of Medical colleges' faculty members at Qatar University (QU) about the impact of this diversity on the health education in specific and Qatar's cultures and values in general. **Methods:** A mixed-methods design was followed, where two types of data were collected in a parallel manner; quantitative and qualitative data. A survey link (Quantitative) was sent to the health clusters faculty members at QU. The questions in the survey were based on a validated tool known as ''Multicultural Teaching Competence Scale''. A focus group was conducted with the faculty members to access in depth their perception. **Results:** The total score of Multicultural Teaching Competence of all the participants was between 39 and 77 (The maximum in the tool is 80 and the minimum is 16), which is divided into total score of Multicultural Teaching Competence Skill of all the participants, where the higher score was 48 and the lowest score was 19 (The maximum is 60 and the minimum is 10), and total score of Multicultural Teaching knowledge, where the higher score was 30 and the lowest was 9 (The maximum is 36 and the minimum 9). The focus group was transcribed and divided into themes based on the interview with faculty members. **Conclusion:** In conclusion, both the qualitative and quantitative data showed a positive behavior toward the multicultural teaching. Therefore, this study shows that the faculty members in health cluster colleges at Qatar University are generally knowledgeable and skilled in relation to the multicultural teaching.

Keywords: Cultural competence; Multicultural teaching; Multicultural teaching competence scale

For citation: Ahmed, Aicha A. Mohamed, "Cultural Competence in The Eyes of Health Cluster Faculty Members at", Qatar University: Perception and Application-A Mixed Methods Study", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0229

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Induction of Glyoxalase 1 to prevent Methylglyoxal-Induced Insulin Resistance in Cardiomyocytes

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Abstract

Background: Type 2 Diabetes mellitus is characterized by hyperglycemia and insulin resistance. Methylglyoxal (MG) a highly reactive dicarbonyl compound is also increased in diabetes. MG is detoxified by glyoxalase 1 (Glo-1) enzyme using reduced glutathione (GSH) as a co-factor. MG has been shown to have deleterious effects on cardiovascular cells and impairs insulin signaling. Insulin resistance is associated with diabetic cardiomyopathy. Trans-resveratrol (tRES) and Hesperetin (HES) combination has been shown to increase Glo-1 and improve insulin signaling in obese patients. **Aim(s):** The aim of this study is to investigate whether tRES-HES combination prevents MG-induced cardiac insulin resistance and the underlying mechanisms in cardiomyocytes in culture. **Methodology:** (H9C2) rat cardiomyocytes were treated with MG (100 µM) for 24 hours in the presence or absence of tRES-HES (10 µM). Glo-1 activity was determined by the formation of S-D lactoylglutathione; protein expression of P-Akt and P-GSK3b was determined using Western blot. In some experiments, cells were stimulated with insulin (100 nM) for 10 minutes to test insulin sensitivity. **Results:** MG reduced Glo-1 activity by ~25%, blunted insulin-induced phosphorylation of Akt and Gsk3b and increased the expression of beta-myosin heavy chain by ~50% (a marker of cardiac dysfunction) significantly ($P<0.05$) compared to untreated control group of cells. Co-administration of tRES-HES combination restored Glo1 activity, maintained insulin-induced phosphorylation of Akt and GSK3b and prevented the increase in beta myosin heavy chain significantly ($P<0.05$). **Conclusion:** Induction of Glo1 prevents MG-induced cardiac insulin resistance and the increase in marker of cardiac dysfunction. This strategy could be helpful in preventing cardiovascular complications associated with diabetes.

Keywords: Insulin resistance; Cardiovascular complications; Glyoxalase; Methylglyoxal; Diabetes

For citation: Aldali S.H., Sankaralingam S., "Induction of Glyoxalase 1 to prevent Methylglyoxal-Induced Insulin Resistance in Cardiomyocytes", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0230

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An Online Module to Evaluate the Validity of an Algorithm to assess the Risk for Drug-Induced Qtc Prolongation in the Psychiatric Population

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Abstract

Introduction: QTc interval prolongation leads to serious complications making it a concern for all clinicians. Assessing the risk of QTc interval prolongation, especially in the psychiatric population, can be challenging for pharmacists due to the complexity of regimens in this population and the difficulty in retrieving the needed information for the risk assessment. Guidelines and protocols for QTc prolongation risk assessment may vary among clinicians and few algorithms exist that address the prevention, management or monitoring of drug-induced QTc prolongation in the psychiatric population. Hence, there is a need for a validated comprehensive algorithm that helps clinicians in with the assessment of the risk of QTc prolongation. **Aim:** The study aims to pilot an educational module that guides experts through an algorithm for the assessment, management and monitoring of drug-induced QTc prolongation in the psychiatric population. **Methods:** This study involved developing an online education module using Articulate Presenter® to introduce a comprehensive literature-based algorithm to subject-matter experts. The orientation was followed by an anonymous, self-administered survey with quantitative and qualitative components to assess the content validity of the QTc Prolongation Algorithm. **Results:** Feedback from the first pilot test with faculty members indicated that the module's interface was crowded. The module was updated accordingly. The results from the second pilot test with cardiologists were that the module provided a thorough explanation of the algorithm steps and rationale. Furthermore, some cardiologists commented that the algorithm was time consuming, however, most supported the implementation of the algorithm saying that it is easy to use, systematic, step-based and would be helpful if implemented. **Conclusion/Future directions:** The results show that the module was helpful in introducing cardiologists to the algorithm and that the implementation of the algorithm after minor alterations can prove to be useful as a tool for risk assessment of QTc prolongation.

Keywords: QTc prolongation; QTc prolonging medication; Psychiatric population

For citation: Qubaiah I.A., Elamin W.A., Mahmoud D.E., Homs S.A., Tawfik E.S., Zolezzi M., Elhakim A., "An online module to evaluate the validity of an algorithm to assess the risk for drug-induced QTc prolongation in the psychiatric population", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0231

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Population, Health & Wellness
(Undergraduate Students)

An Investigation into the Prevalence of Behavioral and Environmental Determinants of Cataract

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Abstract

Accounting for 51% of legal blindness in the world and 27% in Qatar, cataract remains the most prevelant cause of visual imapairments. Cataract involves the clouding of the eye lens, which reduces the light that reaches the retina and ultimately reduces vision. There are existing medical procedures for cataract, however these are deemed invasive and unaffordable. Scientists and public specialists agree that preventing cataract formation is the key to allevating worl blindness levels.

Our objectives are:

-To determine factors that inrease risk of developing cataract.
-To discover the link between day-to-day activities of individuals in earlier life and the development of catarct in later life.
-To compile a list of ways to prevent formation of cataract.

Keywords: Cataract; Environment; Behavior; Risks

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Cyber-Physical Industrial Control System Testbed: A Cyber-Security Solution

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Abstract

In this project, the hybrid testbed architecture is selected for the development of ICS testbed where the Tennessee Eastman (TE) plant is simulated inside PC and the remaining components are implemented using real industrial hardware. TE plant is selected as the industrial process for the developed cybersecur ity testbed due to the following reasons. First, the TE modTheel is a well-known chemical process plant used in control systems research and it dynamics is well understood. Second, it should be properly cont rolled otherwise small disturbance will drive the system toward an unsafe and unstable operat ion. The inherent unstable open-loop property of the TE process model presents a real-world scenario in which a cyberattack could represent a real risk to human safety, environmental safety, and economic viability. Third, the process is complex, coupled and nonlinear, and has many degrees of freedom by which to control and perturb the dynamics of the process.

Keywords: Cyber-physical systems; Cyber attack; Industrial control system; Testbed

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Submarine Cables, the Internet Backbone, and the Trade in Services

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Abstract

Submarine cables are undersea digital bridges that allow ideas and information to move across space. Submarine cables are expensive infrastructure investments and their high costs raise the question about their economic returns, especially in developing countries. Specifically, It is not known what laying submarine cables means for services trade, which depends heavily on exchanging ideas and information. Using a novel data set for connecting the world countries by submarine cables, this study considers the variation in the number of submarine cables as well as the timing of connection to identify the effects of submarine cables. To deal with endogeneity, two novel instruments are developed. The results confirm that submarine cables stimulate services trade in some sectors. Benefits to developing countries are higher where more sectors expand their services trade and no sectors lose. This suggests a catch-up effect and higher gains from laying submarine cables in developing countries.

Keywords: Services trade; Submarine cables; Internet; Globalization; Economic diversification

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Face Recognition and Summarization for Surveillance Video Sequences

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Abstract

Face recognition and video summarization represent challenging tasks for several computer vision applications including video surveillance, criminal investigations, and sports applications. For long videos, it is difficult to search within a video for a specific action and/or person. Usually, human action recognition approaches presented in the literature deal with videos that contain only a single person, and they are able to recognize his action. This paper proposes an effective approach to multiple human action detection, recognition, and summarization. The multiple action detection extracts human bodies' silhouette then generates a specific sequence for each one of them using motion detection and tracking method. Each of the extracted sequences is then divided into shots that represent homogeneous actions in the sequence using the similarity between each pair frames. Using the histogram of the oriented gradient (HOG) of the temporal difference map (TDMap) of the frames of each shot, we recognize the action by performing a comparison between the generated HOG and the existed HOGs in the training phase which represents all the HOGs of many actions using a set of videos for training.

Keywords: Face recognition; Deep learning; Action recognition

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Impact of Countdown Ground LED Lights on Traffic Flow Efficiency at Signalized Intersections: A Driving Simulator study

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Abstract

Unnecessary stopping at signalized intersections during yellow interval reduces traffic flow efficiency. The aim of this driving simulator study was to investigate the impact of an advanced countdown system on traffic flow efficiency during yellow interval at signalized intersections. The experiment was conducted using a driving simulator at Qatar Transportation and Traffic Safety Centre, Qatar University. Sixty-seven volunteers with a valid Qatari driving license participated in the study. Three signalized intersections for three scenarios were designed with the north bound of the Corniche road in the city of Doha as the real-life reference context. The control scenario was an untreated typical signalized intersection (default) with the signal order of green-yellow-red. The signal order was changed to green-flashing green-yellow-red in the condition with 3 seconds advanced flashing. In the third scenario, green LED lights were used as an advanced countdown system and was compared with a default traffic signal with order green-yellow-red and a flashing green traffic signal with order green-flashing green-yellow-red. The LED lights were installed over a 100 m stretch of the road surface with spacing of 5m. More specifically, these ground lights were integrated in the pavement marking strips indicating lane division and edge lines. Light units were flashed green, 3 seconds prior to the yellow interval, and then turned off one by one in sequential order towards the intersection at a predetermined speed. The system was aimed at providing advanced information and visualizing the inter-green period by means of a countdown system as a way to improve traffic flow efficiency. Study results showed that compared to the other two scenarios, drivers' utilized the yellow interval in a better way in the scenario with green LED lights. Furthermore, results from binary logistic regression showed that probability of crossing the intersection was 30 and 2.6 times higher in the scenario with green LED lights compared to the flashing green and control scenarios, respectively. Regarding the red light running occurrences, there was no significant differences between the scenarios. Taking into account the results from this study, we recommend jurisdictions to further evaluate G-LED as a potentially effective treatment for increasing traffic flow efficiency during the inter-green period at signalized intersections.

Keywords: Traffic flow efficiency; Signalized intersection; Countdown system; Option zone

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Effectiveness of the Pedestrian Detection Strategies and Pavement Markings: A Driving Simulator study

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Abstract

Pedestrians are the most vulnerable group in the traffic and accounts for about 40,000 deaths each year worldwide. One of the main reasons is that drivers usually do not yield to pedestrian, which creates serious conflicts between vehicles and pedestrians. The objective of this driving simulator study is to assess the effectiveness of detection based strategies and compare them with the untreated midblock marked crosswalk and pavement markings with pedestrian encircled. The detection based conditions include flashing LED lights placed before the crosswalk and animation based variable message sign VMS. Each condition was designed with a yield/stop controlled marked crosswalk. All the conditions were tested for two situations i.e. pedestrian present and pedestrian absent. Data from 62 drivers having a valid Qatari driving license was considered for analyses. The results showed that drivers yielding rate increased up to 98.3% in the detection-based strategies (i.e. VMS and LED) compared to the pavement marking condition (i.e. 91%) and the untreated control condition (i.e. 88.7%). Regarding the vehicle-pedestrian conflicts, results revealed that serious and slight conflicts were significantly reduced in the VMS and LED conditions compared to the other conditions (i.e. Control and pavement markings). Furthermore, the detection-based strategies were helpful in motivating drivers to reduce their traveling speed while approaching the pedestrian crosswalks. Based on the results from this study, the detection-based strategies (i.e. LED and VMS conditions) are recommended for policy makers as potentially effective treatments to improve safety at midblock yield/stop controlled crosswalks.

Keywords: Mid block crosswalk; Pedestrian safety; Pedestrian detection based system

For citation: Hussain Q., Alhajyaseen W.K.M., Pirdavani A., Brijs K., Shaaban K., Brijs T., "Effectiveness of the pedestrian detection strategies and pavement markings: A driving simulator study", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0237

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Mega Events and Crowd Evacuation at Tourist Attractions: A Case Study of Souq Waqif using Pedestride® Crowd Simulation Tool

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Abstract

Evacuating individuals at large gathering places can be achieved safely and efficiently through the detailed understanding of crowd dynamics within a certain location. Souq Waqif is a major tourist attraction in Qatar that is expected to see a sever increase in the number of visitors throughout the FIFA World Cup 2022 period. Due to the complexity of running evacuation drills in public areas, crowd simulation software are commonly used to assess crowd management and control strategies at such locations. The present study is aimed at gauging crowd dynamics in Souq Waqif during both normal and emergency evacuation using Pedestride® Crowd Simulation tool. The tool has been developed at Melbourne University, and was validated and calibrated using empirical data collected through real-world observations as well as controlled experiments. The study demonstrated that at increased demands and during emergency evacuation, crowds are likely to take similar routes what leads to a much higher flows towards certain exits. Moreover, the results showed that increasing visitors demands could raise the maximum crowd density to unsafe level of 6 person per square meter at specific gates and junctions. In order to mitigate unfavorable situations such as stampeding in the course of an emergency, dynamic exit signs are proposed to direct crowds to nearest and least occupied exits.

Keywords: Crowd dynamics; Crowd safety; Emergency evacuation; Mega-events

For citation: Abdelaal A., Dias C., Sarvi M., Alhajyaseen W., Tarlochan F., "Mega Events and Crowd Evacuation at Tourist Attractions: A Case Study of Souq Waqif using Pedestride® Crowd Simulation Tool", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0238

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Investigating the use of a Lecture Capture System within Pharmacy Education: Lessons from an Internationally Accredited Undergraduate Pharmacy Program

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Abstract

Introduction: Video lecture capture has been introduced to support students learning and assist with grasping difficult concepts. A variety of benefits is offered through the Echo360 system introduced at our institution nearly a decade ago. **Methods:** We evaluated lecture capture viewings for professional undergraduate pharmacy courses in the Fall and Spring semesters over three academic years and analyzed data for one cohort of students. Each course within the pharmacy program was analyzed and viewing figures downloaded through the Echo360 management system. The average number of views per lecture, per semester was summarized. **Results:** Junior students viewed lecture capture most frequently with the number of views highest at the beginning of the academic year. Year 1 students had the highest percentage of courses viewed by a number equal to or higher than students enrolled (9 occurrences out of 16 or 56%), followed by year 2 students (9 occurrences out of 21 or 43%), and finally year 3 students (3 occurrences out of 11 or 27%). Longitudinal data was also gathered for the Class of 2020 over three academic years. **Conclusion/future directions:** Further quantitative and qualitative studies are warranted to fully grasp the motivations for use, attitudes and perceptions towards the system. To ensure optimal use of the system by both students and faculty for a multitude of learning and teaching styles and methods, professional development sessions for students and faculty can be implemented to display the advantages of the lecture capture system and maximize the benefits from its availability. This study has now been published.

Keywords: Lecture capture; Technology-enhanced learning; Higher education; Pharmacy

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AI-powered Motion Interaction for 3D Cultural Heritage

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Abstract

Museums and cultural institutions, in general, are in a constant challenge of adding more value to their collections. The attractiveness of assets is practically tightly related to their value obeying the offer and demand law. New digital visualization technologies are found to give more excitements, especially to the younger generation as it is proven by multiple studies. Nowadays, museums around the world are currently trying to promote their collections through new multimedia and digital technologies such as 3D modeling, Virtual Reality (VR), Augmented Reality (AR), serious games, etc. However, the difficulty and the resources required to implement such technologies present a real challenge. Through this poster, we propose a 3D acquisition and visualization framework aiming mostly at increasing the value of cultural collections. This framework preserves cost-effectiveness and time constraints while still introducing new ways of visualization and interaction with high-quality 3D models of cultural objects. Our framework leverages a new acquisition setup to simplify the visual capturing process by using consumer-level hardware. The acquired images are enhanced using frame interpolation and super-resolution. A photogrammetry tool is then used to generate the asset 3D model. This model is displayed in a screen attached to the leap motion controller, which allows hand interaction without having to deal with sophisticated controllers or headgear allowing almost natural interaction.

Keywords: Digital heritage; Cultural heritage; Motion Interaction; Leap motion controller; Machine learning

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Crowd Density Estimation for Crowd Management at Event Entrance

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Abstract

Crowd management is an essential task to ensure the safety and smoothness of any events. Using the novel technologies including surveillance cameras, communication technics between security agents, the control of the crowd has become easier. However, the sue of these technics is still not perfectly effective. This paper presents an approach for managing the crowd at the entrance of event (festival, stadium...) using surveillance cameras. Using cameras and some panels in each entrance, the crowd density is extracted and illustrated in each panel. So, before reaching any gate, the people can see the available and the not crowded gate to reach the target. The proposed technique helps not just in smoothing the motion of the crowd but also minimize the crowdity and abnormal behaviors of the people.

Keywords: Crowd management; Video processing; CNN

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NMR Spectroscopy Database and Searching System

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Abstract

NMR spectroscopy is the most important analytical technology for organic compounds and plays key role for the chemical characterizations and identifications in chemistry, pharmacy, materials science, environment, biology, and many related fields. In most cases, a NMR spectrum is compared with the known spectra to check if the sample contains a known chemical or is a new product. However, the current comparison process relayed on human beings and waste a lot of time and efforts. A new database and searching system is thus in need.

Keywords: NMR; Database; Search; Screening; Identification

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Improved Road Safety at Work Zones using Advanced Traveler Information Systems

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Abstract

Work zones are road sections where road construction or maintenance activities take place. These work zones usually have different alignment and furniture than the original road and thus temporary lower speeds are adopted at these locations. However, drivers usually face difficulty in adopting the new speed limit and maneuvering safely due to the change in alignment. Therefore, work zones are commonly considered as hazardous locations with higher crash rates and severities as reported in the literature. This study aims to investigate the effectiveness of a variable message signs (VMSs) based system for work zone advance warning area. The proposed system aims at enhancing driver adaptation of the reduced speed limit, encourage early lane changing maneuvers and improve the cooperative driving behavior in the pre-work zone road section. The study was conducted using a driving simulator at the College of Engineering of Qatar University. Seventy volunteers holding a valid Qatari passenger car driving license participated in this study. In the simulator experiment, we have two scenarios (control and treatment). The control scenario was designed based on the Qatar Work Zone Traffic Management Guide (QWZTMG), where the length of the advance warning area is 1000 m. Meanwhile, the treatment scenario contains six newly designed variable message signs where two of them were animation-based. The VMSs were placed at the same locations of the static signs in the control scenario. Both scenarios were tested for two situations. In the first situation, the participants were asked to drive on the left lane while in the second situation, they were instructed to drive on the second lane. The study results showed that the proposed system was effective in motivating drivers to reduce their traveling speed in advance. Compared to the control scenario, drivers' mean speed was significantly 6.3 and 11.1 kph lower in the VMS scenario in the first and second situations, respectively. Furthermore, the VMS scenario encouraged early lane changing maneuvers. In the VMS scenario, drivers changed their lanes in advance by 150 m compared to the control scenario. In addition, the proposed system was effective in motivating drivers to keep larger headways with the frontal merging vehicle. Taking into account the results from this study, we recommend the proposed VMS based system as a potentially effective treatment to improve traffic safety at work zones.

Keywords: Work zone; Driving simulator; Work zone management; Driving behavior

For citation: Almallah M.S., Hussain Q., Alhajyaseen W.K.M., Brijs T., "Improved Road Safety at Work Zones Using Advanced Traveler Information Systems", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0243

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IEEE 802.11 based Medium Access Design for Wireless IoT-Blockchain Networks

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Abstract

Communication is a very basic essence of the blockchain network and must be carefully planned while integrating with IoT, where an extremely large number of devices are interconnected. In this work, blockchain nodes are assumed to use wireless channels to communicate among themselves and other elements of the IoT setup. These communications can be in unicast and broadcast manner where transmission latency and throughput are significant metrics that might jeopardize the overall system. This work is proposing a Medium Access Control (MAC) mechanism addressing these performance metrics and best suitable for wireless IoT-Blockchain system. The proposed MAC protocol is based on the widely used IEEE 802.11 protocol, Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA) basic access.

Keywords: IoT; Blockchain; MAC design; IEEE 802.11

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SafeDrive: A Reliable and Secure Distributed Cloud Storage

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Abstract

SafeDrive is an efficient, reliable, and secure multi-cloudfile storage system that keeps data safe and accessible even if you do not fully trust the service provider, whose systems can be compromised or become unavailable. SafeDrive relies on distributed storage on multiple clouds and employs fast techniques for tolerating multiple service outages. Data remain seamlessly accessible as long as m-out-of-n clouds are available. With SafeDrive, data and access credentials never exist in an unencrypted form outside the client's machine.

Keywords: Cloud; Privacy; Security; Reliability

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Private Function Evaluation Using Intel's SGX

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Abstract

Private Function Evaluation (PFE) is the problem of evaluating one party's private data using a private function owned by another party. Several techniques were presented to tackle PFE by running universal circuits in secure multi-party computation and more recently by hiding the circuit's topology and the gate's functionalities. These solutions however, are not efficient enough for practical use; hence there remains a need for more efficient techniques. This work looks at utilizing the Intel Software Guard Extensions platform (SGX) to provide a more practical solution for PFE while the privacy of the data and the function are both kept protected. Our solution carefully avoids the pitfalls of side channel attacks on SGX. We present solutions for two different scenarios: the first is with the function's owner having SGX enabled and the other is with a third party
(other than data owner and function owner) having SGX. Our results show a clear expected advantage in term of time consumption for the first case over the second. Investigating the slowdown in the second case lead to the garbling time, which constitutes more than 60% of the consumed time. Both solutions clearly outperform Fairplay PF in our tests.

Keywords: SGX; Enclave; Cyber security; Remote attestation

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The use of Artificial Intelligence for the Detection of Covert Channels attacks in New Generation Internet Protocol IPv6

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Abstract

Being instrumental to the Qatar National Vision 2030 activities and following up with "achieving security, stability and maintaining public safety" objectives, the present paper aims to safeguard the information and monitor internet communications in the region effectively. The increased dependence on internet-based technologies in all facets of life challenges the government and policymakers with the need for an effective shield mechanism against passive and active security violations. The present paper adopted an artificial intelligence-based solution for detecting suspicious communications. Further, a dataset created which was generated by simulating a number of attacks and normal communications was used for both training and testing the model. The proposed model produces an accuracy of 100% with a score of 1 for precision, recall, and F1 score. The project forward is a novel, efficient approach for detecting covert channels and suspicious communication.

Keywords: Network security; Artificial intelligence; Convolutional neural network; Covert channel

For citation: AlSenaid F.R., "The Use of Artificial Intelligence for The Detection Covert Channels Attacks in New Generation Internet Protocol IPv6", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0247

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RF Based Anti-Drone System

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Abstract

The anti-drone system blocks drones from entering a protected area. The aim of this project is to design a drone detection mechanism using the RF control signal exchanged between the drone and its remote controller. The system generates a high-power jamming signal transmitted over the same carrier frequency and band of the detected drone (project supports only 2.4 GHz band) and directed towards the drone location in order to disconnect it from its controller causing safe landing or return to home mechanisms to triggered.

Keywords: RF; Detection; Drones; Jamming

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(Undergraduate Students)

Drones for Agriculture

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Abstract

Taking measurements for agriculture purposes is a challenge that this project tackles. A UAV and some sensors are being used to monitor a big field. The target of this project is to design a fully autonomous system that covers the area of planted land. The system collects information and sends what is collected directly to the base station. Furthermore, the design is divided into two parts: plane design and ground design. The plane design includes a temperature sensor, a CO2 sensor, a NoIR camera, a regular camera and a 4G dongle. The ground design, however, has one soil moisture sensor, one H_2S sensor and a GSM module. The plane takes a trip around the field to record real time data and transmits, while the on-ground black box sends data to the base station. Finally, data is analysed, and reports are sent to the base station and the mobile application created for this cause. The plane has carried tests in the airport in Al-Khor city. The tests were to make sure the UAV flies properly and they were successful.

Keywords: Drones; Surveillance; Agriculture

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Virtual Reality Module Depicting Catheter-Associated Urinary Tract Infection as Educational Tool to Reduce Antibiotic Resistant Hospital-Acquired Bacterial Infections

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Abstract

Introduction: Virtual reality (VR) and augmented reality (AR) are used as simulation models in student-patient interactive medical education and shown to enhance learning outcomes. The rise in global burden of infectious diseases and antibiotic resistance world-wide prompt immediate action to combat this emerging threat. Catheter associated urinary infections (CAUTI) are the leading cause of hospital-acquired infections. The aim of this research is to develop a virtual reality (VR) based educational tool depicting the process of CAUTI caused by antibiotic resistant bacteria. The VR-CAUTI module is designed to provide insights to health care providers and community which help in reducing the burden of antibiotic resistant infections. **Material and methods:** The VR-CAUTI module is designed using tools including Blender, Cinema4D and Unity to create a scientifically accurate first-person interactive movie. The users are launched inside a human bladder that needs to be drained. They can witness the insertion of a medical catheter into the bladder to drain the urine. Bacteria adhere to the catheter to establish colonization and infection. An interaction between antibiotic molecules and bacteria in the biofilm is observed later. After designing the 3D models, a highlight of the interaction between models, taken from the storyboard, is used to determine the necessary animation. Moreover, dialogue that facilitates the understanding of infections and antibiotic resistance is recorded. This is followed by the assembly of the module on Unity, and enrichments such as lights and orientation. **Results and conclusion:** This VR-CAUTI module is the proof-of-concept for designing detailed VR based scientifically very accurate medical simulation that could be used in medical education to maximize learning outcomes. VR based modules that have the potential to transform and revolutionize learning experience and render medical education compatible with the IoT in the current 4th industrial revolution.

Keywords: Virtual reality; Urinary tract infection; Antibiotic resistance; Biofilm

For citation: Mekki Y.M., Mekki M.M., Hamammi M., Zughaier S., "Virtual Reality Module Depicting Catheter-Associated Urinary Tract Infection as Educational Tool to Reduce Antibiotic Resistant Hospital-Acquired Bacterial Infections", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0250

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How to Attack a Disconnected Computer

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Abstract

This poster presents how a disconnected computer, that has no network access, can be attacked to retrieve data. Air-gapped devices are thought to be an impenetrable setup because the device is disconnected from the network and cannot be reached by an attacker. Therefore, an infected air-gapped computer cannot affect others around it preventing any potential information leaks. People believe/assume that leaking information from an air-gapped machine is impossible. This research effort invalidates this assumption by exploring possible covert channels to get data from victim machines. We take advantage of a hidden acoustic channel that employs the computer speakers and a tiny audio recording device to communicate sensitive data over inaudible near-ultrasonic signals. Data stored on this device can then be processed and displayed as useful information on the attacker's computer. Hacking methods and the search for new system exploits are being continuously developed and new techniques to obtain data unlawfully are on the rise. Therefore, this work alerts organizations regarding potential threats that they typically ignore by assuming that air-gapped systems are safe. In the past, security researchers have not devoted sufficient time and effort to innovate counter measures for such niche but capable attacks. Spreading awareness is one of the main objectives of this project. This is done by demonstrating that data can be stolen from an 'air-gapped' computer, by using methods that people neglect to consider when coming up with plans to protect their computers from attackers. An experiment, such as this, will hopefully push the security field researchers and developers to explore the uncommon methods of unlawful data acquisition and their prevention.

Keywords: Air-gapped; Covert; Near-ultrasonic

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Arabic Language Topics in Al Arab Qatari Newspaper: A Study in Journalistic Treatment Patterns

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Abstract

The purpose of this research is to explore the patterns of journalistic treatments for issues of Arab Language in Al Arab Qatari newspaper during the year of 2017. It also seeks to understand the degree to which this journalistic behavior enhances Qatar National identity. The importance of this research, which is funded by Qatar National Research Fund, No. UREP21-095-5-009 is to test the relationship between journalistic practices in relation to coverage of Arabic language issues and national identity. As interdisciplinary research combining Arabic language and journalism studies, its data were gathered by students of Arabic and Mass Communication Departments. The study adopted the descriptive and analytical approach to explore a sample of 841 publications that covered 10 linguistic forms including folk literature, translation, sermon, thought, novel, narration, poetry, story, drama and others as well as 6 editorial forms including investigative report, news report, dialogue, news, article, feature story and others. We analyze both the editorial content and the layout treatment. The results showed a statistical significance in the use of different editorial forms to demonstrate the Arabic language topics in Al Arab Qatari newspaper as well as the use of different layout techniques such as positioning, size, headline style and the accompanying visual elements. Future studies can compare the influence of different journalistic practices on national identity.

Keywords: Journalistic arts; Press production; Press publishing; Media influence; Qatari identity

For citation: Elkilany S.A., "Arabic language topics in Al Arab Qatari newspaper: a study in journalistic treatment patterns", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0252

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Fertility Transitions: Implications for Future Demographic Trends in Qatar

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Abstract

Introduction: In Qatar, while most of the country's demographic situations have been widely studied, much less attention has been paid to the determinants of Qatari women's socio-demographic characteristics and the prevalence of family planning methods. This raises the following question: How, and to what extent, do population dynamics that stratify national populations by age; sex; marital status; and level of education, income, and employment contribute to the declining of fertility rate and cause mortality differentials in Qatar. **Materials and methods:** Data from a 2018 fertility survey project with a random sample of 607 Qatari households, collected via personal interviews using a questionnaire and a computer assisted personal interview, by the Social and Economic Survey Research Institute at Qatar University, was examined based on a multi-dimensional model. The data were analyzed using logistic and Poisson regression techniques. **Results:** The data show that Qatari women's total fertility rate is 3.2, with women in the 20–29 age group having the highest fertility rates. Evaluating the effects of women's educational attainment and employment status revealed no significant factors influencing the age-specific fertility rate of Qatari women. In addition, the results indicate that the most common contraceptive method currently used among Qatari women is pills (29%), and their use is more prevalent among older Qatari women who have had more children than among younger Qatari women with fewer children. **Conclusion/ future direction:** The paper provides comprehensive policy recommendations for increasing the reproductive rate in Qatar by providing supporting programs to increase the total fertility rate and childbearing rates among Qatari women. It also promotes the provision of high-quality family planning services.

Keywords: Fertility; Contraception; Demographic; Women employment

For citation: Lari N., AlRakeb N., AlEmadi N., Ashi S., "Fertility Transitions: Implications for Future Demographic Trends in Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0253

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Factors Influencing Reading News on the Mobile Devices in Qatar in Light of Augmented Reality (AR) & Virtual Reality (VR)

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Abstract

Purpose: The purpose of this study is to examine and better understand the factors influencing reading news on the mobile devices in Qatar from the viewpoint of intention to adopt augmented reality (AR) and virtual reality (VR).
Design/methodology/approach: A large convenience sample of 699 respondents from Qatar was surveyed. Using SPSS, the researcher employed the Kaisers-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartless test of sphericity to establish the construct validity of the instrument. The four extracted and rotated dimensions were found to be reliable and valid. **Main findings:** Findings from multiple regression analysis have confirmed two out of six hypotheses. Two independent variables (1) nationality and (2) interest in using AR & VR are significant in predicting the use of mobile devices to follow regional and international news in Qatar from the viewpoint of intention to adopt augmented reality (AR) and virtual reality (VR). **Implications:** Implications of this study are two folds. Hypotheses that are partially supported, suggest an urgent need for further research to uncover the various modes afforded by the smart digital society in Qatar. More proactive approach from decision and policy makers in Qatar's newspaper printing industry is needed to benefit from the digitalization of international news. **Novelty:** This article empirically correlates two fields of business research: the digital copy of the real world and reading international news. This piece of research has been published in May 2020 at the scopus indexed International Journal of Advanced Research in Engineering and Technology (IJARET).

Keywords: Augmented reality (AR); Virtual reality (VR); News; Qatar

For citation: Charbaji R., "Factors Influencing Reading News on the Mobile Devices in Qatar in Light of Augmented Reality (AR) & Virtual Reality (VR)", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0254

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A Structural Equation Model of Perceived University Image in Qatar: A Students' Perspective

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Abstract

The aim of this research is to examine the factors that influence student perceptions of the image of Qatar's national university, Qatar University. The study builds on relevant scholarship on perceptions of organizational image and explores institutional image perceptions in the state of Qatar. Based on data collected from a sample of 1427 students in Qatar, this study uses factor analysis in order to identify the variables that influence students' perceptions of Qatar University. The findings of this study indicate that the way students perceive Qatar University is determined by four main factors: Quality of education, comparability of educational standards, the facilities and extracurricular activities provided, and graduates' employability. The paper concludes with recommendations for institutional policy and future research. This piece of research has been published in August 2020 at the scopus indexed International Journal of Management (IJM).

Keywords: Educational standards; University image; Employability; Facilities and extracurricular activities

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Welfare Index of Migrant Workers: The Case of Qatar

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Abstract

In December 2010, Qatar won the rights to host the 2022 FIFA World Cup. The announcement came with increasing pressure from international human rights organizations, media and other groups for Qatar to reform its labor laws, which governs the lives and working conditions of foreign workers in the country. Although Qatar continues to develop and implement major reforms to its labor laws, until now there was no one unique tool based on survey data to evaluate the impact of the government's policies on guest workers. The objective of this paper is to present the Qatar Guest Workers' Welfare Index (GWWI), a multi-dimensional comprehensive tool based on survey data of migrant workers developed by the Social and Economic Survey Research Institute (SESRI). In addition to assessing and tracking the welfare of this population, the objective of the index is to identify areas of improvement to guide policy formulation.

Keywords: GWWI; Labor law; Migrant workers; Index

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Creating a Nation through Heritage: Emiratization of the Coffee Pot (Dallah)

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Abstract

Coffee plays a significant role in today's Arab culture, and it has long been considered one of the main aspects of Arab history, culture, heritage, and hospitality. It has even been recognized by UNESCO, which added Arabic coffee to its Intangible Cultural Heritage List following the application by several Gulf countries. This study explores the nation-building process of the United Arab Emirates (UAE) through its heritage, with specific reference to the coffee pot (*dallah*). The UAE forms its national identity (the Emirati identity) by deriving it from a broader identity (that is, being Arab) and defining it to a regional identity (*Khaleeji*). Moving from a regional to a national identity is intended to unite the seven emirates under one standard identity, but at the same time contain common characteristic features and solidarity with Khaleej and other Arabs. Slight differences to strengthen the desired national (Emirati) identity and differentiate the UAE from the neighbors will be enough in creating national heritage. This study examines how the UAE attempts to create its own heritage, one that is common among its seven emirates, to unite them under one identity. The coffee pot, however, has common features with other Arab and Khaleeji countries, as can be clearly seen from the map. Meanwhile, the process is still in progress, and to date, no consensus has been achieved.

Keywords: Coffee pots; Dallah; Nation building project

For citation: Baycar H., "Creating a Nation through Heritage: Emiratization of the Coffee Pot (Dallah)", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0257

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The Role of Corporate Social Responsibility in Restoring Green Concepts: Qataris Response to Social Media Campaigns

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Abstract

This research focuses on consumer behavior in Qatar and the individual social responsibility in support of environment. The research also describes the role of social media and CSR in promoting awareness campaigns and how effective they are in changing conceptions and behavior. This is measured by focusing on standards, emotions and actions of individuals and how they are affected by CSR campaigns launched by corporations and public sectors.The study measures the uses and impact of new media technology such as mobile applications and social media in achieving the environment pillar of Qatar vision 2030 in addition to designing effective CSR campaign. The Trans theoretical Model of behavior change, by Prochaska and DiClemente (1983) will be examined through a quantitative analysis on social media users.

Keywords: CSR; Qatar; Social media

For citation: HASSAN R., "The Role of Corporate Social Responsibility in Restoring Green Concepts: Qataris Response to Social Media Campaigns.", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0258

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Cultivating Curiosity by Integrating Art in Science through Photography

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Abstract

Arts-integrated science is a tantalizing educational approach that captures the attention of scientific learners through the lighter side of science. This study highlights the findings of a school-based applied research study conducted to develop public school students' curiosity and their aesthetic qualities by exploring scientific knowledge by using photography. This study incorporated photography as a learning aid in STEAM workshops for 386 high school students, including 220 males and 166 females from 19 schools, and tested methods for enhancing the curiosity or interest of students to explore the workshop context more deeply. The analysis of our methods discusses the results using pre- and post-method questionnaires and the evaluations of 816 scientific images captured by the students. The key aim of this research involves cultivating curiosity in students as they analyse captured images, which results in positive outcomes, such as increased engagement in scientific workshops, thereby inspiring them to more thoroughly explore the science behind each image.

Keywords: Curiosity; Photography; Informal learning

For citation: Althani N., Siby N., Nabhan F., Ali R., "Cultivating Curiosity by integrating art in science through photography", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0259

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Innovative Tool to Educate High School Students through Research Based Learning

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Abstract

The need for enhanced engagement of school students for better behavioral outcomes in line with scientific learning and acquisition of science process skills have continually incited educators to strategize innovative teaching approaches. Meanwhile, innovations and research from the scientific community has consistently been prioritized, demanding highly skilled STEM labor in the global market, henceforth challenging educators to brace the next generation with high proficiency in STEM fields. The research study focuses on an out of school approach that caters to the industrial demands in STEM workforce, henceforth acquainting the high school students with research methodology for improving their technical efficiency and intellectual capacity in problem solving and critical thinking. The study program was conducted on 208 students from public schools in Qatar, who participated in 68 research projects, each project being engaged by a group students during a period of 2 months at Qatar University research laboratories. The performance of participants were analyzed by mixed methods implementing both quantitative data based on questionnaires and qualitative data based on feedback interviews from research mentors, schoolteachers and the participant students. The results of the program yielded positive outcomes from the stakeholders as the school students gained competences exhibited by under-graduate or graduate students like research self-efficacy, research skills and aspirations for scientific careers, accomplishing the objectives of the program. This study program henceforth was successful in bridging the gap between high school and university, as the participant students had an advantage in confidence over their peers in university laboratories and technical writing assignments.

Keywords: Science education; Research-based learning; High school students; Research efficacy; Scientific competencies

For citation: Althani N., Bhadra J., Siby N., Elhawary E., Saad A., "Innovative tool to educate high school students through research based learning", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0260

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Choice and Expenditure: A Double Hurdle Model of Private Tutoring in Qatar

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Abstract

To shed light on the demand for private tutoring, this paper presents new evidence for the case of Qatar. The household demand for private tutoring is estimated using the double hurdle model using a sample of 1226 participants from the 2012 Qatar Education Survey. Using statistical model selection criterion, the Cragg model is preferred overall to establish the demand for private tutoring in Qatar. The findings show that nationality of parents, mother's educational background, the grade the student attends, and the type of school attended pose a significant influence on the likelihood of using private tutoring and the amount. These findings suggest that without monitoring, access to high quality education will be unequal. In particular, students from well-off families will benefit the most from additional hours of education and build an advantage that could eventually lead to the creation of an unequal society.

Keywords: Double hurdle; Economics; Education; Private tutoring; Qatar

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EFL Teachers' Phonological Awareness Beliefs and Practices: Help or Prevent EFL Children Developing Reading

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Abstract

Families, schools and stakeholders long for developing good readers (Ponitz & Rimm-Kaufman, 2011) and would do all it takes to save young children from becoming illiterate or low achievers (Anthony & Farncis, 2005; Share & Stanovich, 1995; Snowling, 1998). Since the landmark study of Moats (1994), a flow of research has targeted teacher education advocating for teachers being competent in PA (Carlisle, Kelcey, Rowan, & Phelps, 2011; Kennedy, 2013; Washburn et al., 2017). EFL teachers' proficiency seems to contribute to the reading difficulties that early graders encounter.

This paper investigates the knowledge, beliefs, practices and awareness in phonological awareness (PA) of twohundred and ten ramdonly selected EFL in-service teachers and then examines the impact of teachers' experiences, qualifications, and gender on shaping teachers' instruction. The researchers used a four-section survey to collect teachers' demographic information, perceived and actual knowledge of phonological awareness and classroom practices related to PA, phonics, and syllabication. The results reported teachers as moderate level in the beliefs, practice and awareness of PA. In terms of teachers' knowledge in PA, however, results showed teachers lacking the basics in teaching reading.

This study adds to the body of literature and sheds light on the status quo of EFL in-service teachers' competency and brings to the attention of every stakeholder the critical role EFL teachers play in helping EFL children become readers. Although the results point towards teachers as possible cause behind children's low-literacy level, this study raises important questions for further investigations, and implications for EFL teacher education and preparation are highlighted.

Keywords: EFL; In-service teachers; Deficits; Reading; Phonological awareness

For citation: Alshaboul Y.M., "EFL Teachers' Phonological Awareness Beliefs and Practices: Help or Prevent EFL Children Developing Reading", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0262

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Prayer-related Physical Activities for Cardiovascular Health

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Abstract

Introduction: Muslims are obligated to pray 5 times daily. Each prayer is a number of rakaa completed with a set of physical movements, preferably in the neighborhood masjid. The vascular effects of religious-related physical activities (RRPA) are not known, despite the well-known cardiovascular benefits of regular physical activity. Therefore, the current study examines the relationships of RRPA with vascular measures. **Methodology:** Arterial and venous indices at rest and after 5 of arterial occlusion were examined in 192 healthy participants (age: 19-85 years) using strain gauge plethysmography. The participants' RRPA were collected in a 1-to-1 interview, including prayer (PN) and rakaa number (RN) performed, distance (DW) and time (TW) required to walk to the masjid, and the daily (DA) and weekly (WA) attendance to the masjid. **Results:** Resting blood flow correlated significantly with DW, TW, DA, and WA (r=0.2-0.4; p<0.01). Resting vascular resistance correlated with DW, TW, DA, and WA (r=-0.14-0.2; p<0.05). Resting venous capacitance correlated with DW, TW, DA, and WA (r=0.14-0.17; p<0.05). Resting outflow correlated with DW, TW, DA, and WA (r=0.15-0.2; p<0.05). Occlusion blood flow correlated with DW (r=0.17; p=0.02). Occlusion outflow correlated with DW and DA (r=0.16-0.17; p<0.05). Additionally, arterial and venous indices were greater (p<0.05) in the participants regularly prayed in the masjid. **Discussion:** The results confirm the importance of physical activities for the circulatory system. Uniquely, the data shows that RRPA might contribute to the maintenance of vascular function.

Keywords: Islam religion; Vascular function; Blood flow; Physical activity

For citation: Alomari M.A., Shqair D.M., Alawneh K., Khabour O.F., Nazzal M.E., Sadaqah M.A., "Prayer-Related Physical Activities for Cardiovascular Health", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0263

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Celebrating Culture - Literary Communities of Practice in Doha

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Abstract

Our paper focuses on the role of arts and culture in Doha. More specifically, we examine literary circles in Doha (both Arab and English speaking) and regard them as 'communities of practice.' According to Etienne Wenger, communities of practice are "groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly." Moreover, such communities are seen as promoting innovation, developing social capital, facilitating and spreading knowledge within a group, and spreading existing knowledge. Recently, there has been a surge of active literary communities presenting their creative work in both English and Arabic attracting a variety of audiences and fans. For instance, young authors such as Kumam Al Maadeed, Eissa Abdullah, Buthaina Al-Janahi and Abdullah Fakhro not only have a huge online following, but they also have a significant fan base attending their events throughout the city. Besides these communities, there are also numerous organizations with which these celebrity authors are associated such as Qalam Hebr, Qatari Forum for Authors, and Outspoken Doha – we argue that such organizations can also be regarded as communities of practice. Our contention is that these ever-growing communities provide a performative space in which poets, singers, authors and artists can experiment with the fluidity of their assigned identities, cultures and traditions.

Keywords: Literary communities; Identity; Performativity; Creativity

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University of the Future:
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Social Change and Identity
(Faculty and Postdoc)

The Problems Facing Students of College of Education at Qatar University: A Path to Academic Accreditation

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Abstract

This study aimed to reveal the most important problems facing students of the College of Education from their point of view and its relationship to some variables. The study used two tools: the first is the open interview (focus group), and the second is a questionnaire designed by the researcher. It contained 65 items distributed on six axes: costs and assignments, tests, academic professor, academic registration and guidance, the content of study materials, and finally the classrooms have been verified as being truthful and consistent. The results showed that the problems related to the classroom were the most prominent facing students, while the problems related to the academic professor were the least important from their point of view. The order of importance of the problems varied according to the specialization taught by female students, and by the different program registered with it, as well as by the different status of the female student, whether she was a full-time student or on the job. Faculty of Education has to ensure that the students are progressing and achieving high performance during the program with the less problems they face. If students do not meet these criteria/expectations, measures need to be taken to support them and help them improve their skills, knowledge, dispositions and achievement. If students do not meet standards, the College might not get full accreditation, and will have an Area For Improvement. This means that the College has to take other measures to improve students' achievement to receive full accreditation.

Keywords: Problem; Academic; Accreditation; Qatar; University

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Social Change and Identity
(Faculty and Postdoc)

Consumer Behavior in Grocery Shopping: Qatari Community during the GCC Blockade

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Abstract

While Qatar had the highest GDP in the world in 2016, it faced the dilemma of a blockade in June 2017. This had a direct effect on the Qatari community who united and showed clear signs of patriotism. Consumers turned from the blockade countries' food products to products that were local or those that came from supporting countries. This blockade was seen as an economic opportunity for local brands as well as many international brands since 40% of the food that was previously available came from blockading countries (IISS, 2017). With this, many new brands entered the market and soon prospered. This research aims to compare the changes in the grocery shopping consumer behavior of the Qatari community at the start of the blockade and more than two years later. An Arabic language online survey is conducted on a non-probability-snowball sample of 194 respondents in 2017 and is repeated on a sample of 189 respondents in 2020. Results show that the subjective norm the Qatari community's consumers have towards grocery products continues to be associated with the political positions of the countries of production. They also show that the most successful marketing technique used by grocery brands is "patriotism." Moreover, they show that the Qatari community has become more focused on learning the properties and competitive advantages of the products. Conclusions show that the Qatari community has remained consistent with giving priority to buying groceries that support the country and its allies throughout the blockade. They also show that the consumers have become more aware in comparing available products and making educated buying decisions. Further research should be conducted to examine the changes in attitude and consumer behavior after the blockade is lifted.

Keywords: Consumer behavior; Subjective norms; Advertising techniques; Qatar blockade

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Social Change and Identity
(Faculty and Postdoc)

Path Analytic Investigation of the Intention to adopt E-Government Services through Mobile Applications in Qatar (TAM revisited)

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Abstract

The aim of this research is to examine the factors that affect user's intention to use e-government services through mobile applications in Qatar. Based on valid responses from 1,340 adults out of a representative sample size of 7200 (response rate=18.6%) in Qatar aged 18 to 77 years old, this study uses factor analysis and structural equation model to identify the variables that influence users' intention to adopt mobile applications in Qatar. Findings of this study indicate that factors affecting the intention to adopt e-government services through mobile applications are: awareness, perceived trust, perceived ease of use and perceived usefulness of mobile applications. The present study supports the hypothesis through the findings that perceived usefulness and perceived ease of use leads to mobile application of e-government adoption. The present study adds a relevant and a novel contribution to the field of technology acceptance by encompassing the TAM theory to smartphone applications. The paper concludes with recommendations for institutional policy and future research. This article has been published in June 2020 at the Scopus Indexed International Journal of Advanced Research in Engineering and Technology (IJARET).

Keywords: E-government; TAM; Factor analysis; Qatar

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Social Change and Identity
(Faculty and Postdoc)

From Sports To Science: Designing Sports Products to Experience Science and Engineering

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Abstract

Sports can have a substantial impact on fostering cognitive and non-cognitive skills in youth leading to higher productivity. Its potential to integrate within diverse academic subjects makes it an ideal choice to attract high school students to grasp the emphasis of STEM fields and careers. In the midst of gradual educational reformations in Qatar, a novel sports driven STEM program was launched to derive the competencies in the secondary students and enhance their STEM literacy and aspirations. Sports, being an intrinsic motivator favored by the Qatari students, instigating active participation and inspiration, is integrated to the innovative learning approach, thereby acknowledging the relevance of science to real world applications. The 248 participants from 15 secondary schools actively engaged in the program comprising sports product based scientific workshops and an engineering design challenge, bridging the gap between science and sports. Results implicating the active involvement of the students, manifesting the quintessential 21st century skills in engineering products, were drawn out from mixed methods. Quantitative statistical analysis of pre-post surveys, review of sports products and the substantiating observations of the facilitators successfully validate the application of diverse dispositions in the program. Student attitudes towards STEM fields and careers apparently augmented by virtue of the program outcomes is also interpreted from the analysis.

Keywords: Sports; STEM; Science learning

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Social Change and Identity
(Graduate Students)

The effect of teaching science and mathematics in Arabic on the level of students' performance in Qatari schools

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Abstract

The interest in education is the cornerstone of the civilized growth of the State of Qatar, because of its great impact on preparing the human resources that the nation needs for its progress in various fields, in order to achieve the Qatar National Vision 2030. In 2003, the State of Qatar launched an ambitious initiative to develop public education known as “Education for a New Era”. A bilingual system that started with teaching Math and Science subjects, so that both Arabic and English are used in the educational process, followed by a decision to teach the two subjects in Arabic in all government schools. Therefore, this research aims to focus on the performance in government schools in the country, which shows the rates of student achievement in specific educational stages and in specific subjects, where the improvement of achievement in government school students in basic subjects (Arabic, English, Mathematics and Science) in the three educational stages, is considered to be one of the objectives of the Ministry of Education and Higher Education to realize the Qatar National Vision 2030, and accordingly the Ministry of Education and Higher Education sets and develops many strategies, procedures and decisions with the aim of achieving this goal.

Keywords: Teaching; Language; Arabic; Performance

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(Graduate Students)

واقع التعاون بين أسر ذوي الإعاقة السمعية مع الاختصاصي النفسي في التربية الخاصة

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ملخص

هدفت الدراسة إلى معرفة واقع التعاون بين أسر ذوي الإعاقة السمعية والاختصاصي النفسي في التربية الخاصة، إلى جانب معرفة مدى الفروق النسبية لدى أفراد العينة، وترتيب مبادئ الشراكة لدى الاختصاصي النفسي وأسر ذوي الإعاقة السمعية، كما هدفت إلى معرفة مدى الرضا عن مبدأ حقوق الأسرة، لدى أسر الطلاب من ذوي الإعاقة السمعية.

تكونت عينة الدراسة من (10) أسر ممن لديهم أطفال من ذوي الإعاقة السمعية، تتراوح أعمارهم ما بين (11-18 سنة)، حيث شملت العينة (5) من الآباء، و(5) من الأمهات، وأيضًا ضمت العينة اختصاصيًا نفسيًا في مجال التربية الخاصة. تتبع هذه الدراسة المنهج الكمي والكيفي للإجابة عن تساؤلات الدراسة، كما استخدمت الباحثة أدوات القياس التالية: استبيان لمقياس التعاون لخليفة (2018) الذي يضم 46 سؤالاً، إلى جانب استخدام الباحثة المقابلة المقننة من إعداد (خليفة، 2018)، التي أجريت على الاختصاصي النفسي في مجال التربية الخاصة. كما استخدمت الباحثة استمارة البيانات الأولية المعدة من قبل (خليفة، 2018) المتعلقة ببيانات أسر ذوي الإعاقة السمعية وتتضمن المعلومات التالية: الجنس، الجنسية، العمر، الوظيفة، المستوى العلمي، مستوى الدخل، الحالة الاجتماعية، عدد الأبناء، وعدد الأبناء الذين لديهم إعاقة، بالإضافة إلى احتوائها معلومات تخص الطالب من ذوي الإعاقة السمعية كمستوى الإعاقة، العمر، المركز التعليمي، ترتيبه في الأسرة، ولادته، وعمره عند تشخيصه بالإعاقة.

أشارت النتائج إلى أن مبدأ التواصل جاء في الترتيب الأول لاستجابات أفراد العينة بنسبة 89%، مع وجود توافق لهذا الاتجاه لدى أسر الطلاب من ذوي الإعاقة السمعية والاختصاصي النفسي في مجال التربية الخاصة، اما النسبة الأدنى فكانت لمبدأ الاحترام بنسبة تبلغ 56%، بالإضافة إلى إظهار النتائج وجود تباين بين متوسطات درجات أسر ذوي الإعاقة السمعية في مقياس التعاون وحقوق الأسرة. ومن ناحية تقييم المقابلة للاختصاصي النفسي في مجال التربية الخاصة فقد أشارت إلى ارتفاع النسبة في جميع متغيرات الدراسة، مما يشير إلى الفهم العميق للمبادئ السبعة للشراكة.

كلمات مفتاحية: الشراكة، الإعاقة السمعية، التربية الخاصة، أسر ذوي الإعاقة، الاختصاصي النفسي

للاقتباس: المقبل، عبير حمود، "واقع التعاون بين أسر ذوي الإعاقة السمعية مع الاختصاصي النفسي في التربية الخاصة"، **المنتدى والمعرض البحثي السنوي لجامعة قطر** *(QUARFE 2020)*، الدوحة، 28 أكتوبر 2020،
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The Perceptions of the Special Education Teacher and Families of Children with Disabilities about Cooperative Partnership

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Abstract

This study aimed to identify the perceptions of the special education teacher and families of children with disabilities about cooperative partnership in the primary stage, specifically in the age group from 6 to 11 years, in order to contribute to providing a vision that can be relied upon in facing the challenges and obstacles that prevent cooperative partnership between families of children, people with disabilities and a special education teacher. The study followed the quantitative and qualitative approach to its relevance to the nature of the study. The study sample consisted of a teacher specializing in the field of special education and eight families from the families of students with disabilities in one of the integration elementary schools for girls affiliated to the Ministry of Education and Higher Education in Qatar. In collecting the data, the researcher used the cooperation and interview scale prepared by Batoul Khalifa 2017. The results of the study found that there are statistically significant differences between the order of the principles of cooperative partnership of the special education teacher and the families of students with disabilities in relation to the principle of family rights and social media. As the overall principles of cooperative partnership of the special education teacher achieved the final percentages, while the results of the principle of family rights and social media among the families of students with disabilities ranged between 33% and 36%. The study also found the relationship of the perceptions of families of students with disabilities about communicating with the educational level of the family, as university and secondary education occupied 44%, compared to only 12% for the average educational level, and the principle of communication among the families of students with disabilities reached 80%.

Keywords: Family; Cooperative partnership; Communication; Professionalism; Defense of children's rights

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(Graduate Students)

أسباب تدني نتائج طلبة الصف الرابع في الاختبارات الدولية (TIMSS) في مدارس دولة قطر من وجهة نظر معلميهم

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ملخص

في الوقت الحالي أولى المجتمع اهتمامًا كبيرًا بموضوع اختبارات قياس الأداء الدولية، مثل اختبارات التيمز؛ فعملية التقييم أو القياس تعد من أهم العمليات التي تحتاجها كل دولة. والتي تعنى بتجميع البيانات والإحصاءات؛ لتكون بمنزلة مؤشر لاتجاه سير العملية التعليمية، وبالتالي تحديد مواطن الخلل. ليأتي دور عملية التقويم؛ لتعديل وتصحيح أي اعوجاج بدوره يؤثر على الطلبة وتحصيلهم الدراسي. وقد سعت هذه الدراسة إلى الكشف عن الأسباب التي أدت إلى ضعف أداء طلبة الصف الرابع في الاختبارات الدولية "التيمز" في مدارس دولة قطر، وخصوصًا تلك المتعلقة باستراتيجيات التدريس والتقويم وتطوير المحتوى العلمي للكتب الدراسية. استندت هذه الدراسة في جمع البيانات إلى المنهج الوصفي حيث جُمعت البيانات عن طريق توزيع استبانة على 40 معلم ومعلمة للصف الرابع في تخصصي العلوم والرياضيات في المدارس الابتدائية.

كشفت نتائج تحليل البيانات عن مجموعة من الأسباب التي أدت إلى ضعف أداء الطلبة في الاختبار الدولي التميز منها؛ ضعف الطلبة في مهارة القراءة؛ مما أثر سلبًا على مستوى التحصيل، وزخم المحتوى العلمي في الكتب الدراسية الذي يحد من قدرة المعلمين على تدريب الطلبة على نوعية الأسئلة في الاختبارات الدولية، بالإضافة إلى تبني المعلمين والمعلمات لاستراتيجيات تدريس تقليدية لا تنمّي مهارة حل المشكلات والتفكير الناقد لدى الطلبة، وقلة وعي أولياء الأمور بأهمية الاختبارات الدولية. كما أرجع معلمو ومعلمات الصف الرابع أسباب التدني إلى ضعف في مرحلة تأسيس الطلبة في الصفوف الثلاثة الأولى؛ حيث ينبغي أن يتعلم الطلبة في تلك المرحلة المفاهيم الرياضية الأساسية التي تُبنى عليها المفاهيم الرياضية في الصفوف اللاحقة. وتوصلت الدراسة إلى أهمية معالجة تلك الأسباب للارتقاء بالعملية التعليمية ككل. وقامت الدراسة بتقديم مجموعة من التوصيات والاقتراحات التي ستسهم في تجاوز تلك الظاهرة وتخطي معظم الأسباب التي أسفرت عنها.

الكلمات المفتاحية: تدني مستوى التحصيل الدراسي، الاختبارات الدولية، TIMSS

للاقتباس: الخولي، مروة والشوال، هناء. "أسباب تدني نتائج طلبة الصف الرابع في الاختبارات الدولية (TIMSS) في مدارس دولة قطر من وجهة نظر معلميهم"، **المنتدى والمعرض البحثي السنوي لجامعة قطر** *(QUARFE 2020)*، الدوحة، 28 أكتوبر 2020،
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التواصل وتنمية الأداء الأكاديمي للطلبة من ذوي الإعاقة: تجارب معلّمي وآباء الأطفال من ذوي الإعاقة

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ملخص

هدفت هذه الدراسة للتعرف إلى مدى فاعلية التواصل والعلاقة التعاونية بين اختصاصيي التربية الخاصة في المدرسة وأسرة الطفل من ذوي الإعاقة على الأداء الأكاديمي للطفل، والكشف عن مدى التزام المؤسسة التعليمية بالمبادئ السبعة الأساسية للشراكة والتعاون بين المدرسة وأسر الطلبة من ذوي الإعاقة، ومعرفة مدى رضى أسر الطلبة عن الخدمات المقدمة لأبنائهم من ذوي الإعاقة.

اتبعت الباحثة منهج البحث العلمي المختلط النوعي والكيفي للإجابة عن تساؤلات الدراسة. حيثُ استخدمت مقياس التعاون لخليفة (2017)، ومقياس المقابلة المقننة مع أحد اختصاصيي التربية الخاصة. كما تكونت عينة الدراسة من عشرة من آباء وأمهات الأطفال ذوي الإعاقة الملتحقين بمدرسة دخان الابتدائية الإعدادية الثانوية المستقلة للبنات بدولة قطر.

وقد أظهرت نتائج الدراسة وجود تباين بين متوسطات درجات الإجابة في مقياس الأسرة لمقياس الدفاع عن حقوق الطفل من ذوي الإعاقة، الذي بلغت نسبته حوالي 55% وهي الأقل من بين المقاييس الأخرى، وتجدر الإشارة إلى أن متوسط درجات اختصاصيي التربية الخاصة تميل إلى الارتفاع في معظم متغيرات الدراسة.

الكلمات المفتاحية: الطلبة ذوي الإعاقة ;التواصل ;الأداء الأكاديمي

للاقتباس: الشهراني، شوق مسفر. "التواصل وتنمية الأداء الأكاديمي للطلبة من ذوي الإعاقة: تجارب معلّمي وآباء الأطفال من ذوي الإعاقة"، **المنتدى والمعرض البحثي السنوي لجامعة قطر** *(QUARFE 2020)*، الدوحة، 28 أكتوبر 2020، https://doi.org/10.29117/quarfe.2020.0273

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Social Change and Identity
(Graduate Students)

The Quality of Cooperation between families of people with disabilities and Education Specialists through the Social Media

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Abstract

This study is aimed to identify the stages of cooperation between families of people with disabilities and education specialists and the importance of social media in supporting this cooperation and parental participation in the school and civil society institutions, in addition to knowing the dimensions of this participation and its effectiveness in special education programs and educational institutions, including teachers and specialists. Also, others who work in the field of special education. The study followed the quantitative and qualitative approach. The researcher used the two measures of cooperation, acceptance and parental rejection of Khalifa (2007). The researcher used the quantitative and qualitative method to answer the study questions. The study sample consisted of ten parents who have a child with a dependency. The results of the analysis of the parental participation questionnaire showed that the principle of family rights ranked first with a rate of 94.8%, and the highest percentage of responses from the sample members to this variable was 100%, while the lowest percentage of responses was 80%. The defense of the rights of the child comes in second place with a rate of 94.4%, while the principle of commitment is ranked third by a rate of 91%, and the principle of equality came in the fourth rank with a slight difference of 90.5%, and the principle of communication comes in the fifth order with a rate of 90%. Social communication, it ranked sixth by 90%, the principle of respect comes in seventh with a rate of 85%, then the principle of professional competence came in eighth place with a rate of 82%, and finally trust comes in ninth and last place with a rate of 81.5%. Whereas the specialist's answers to the interview questions indicated the importance of using social media in the process of parental participation in education, which was in agreement with the responses of the families of the disabled, while the specialist's responses agreed with the families 'responses on the importance of the principle of positive communication with the families of the disabled, and building positive relationships with them. Which will lead to building the principle of mutual trust, as the responses of the specialist indicated that it fully applies the values of parental partnership at a rate of 100% for each value, which did not agree with the responses of the families of students with disabilities.

Keywords: Education specialists; Disabilities; Partnership; Cooperation; Social Media

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Social Change and Identity
(Graduate Students)

درجة امتلاك معلمي التربية الإسلامية للكفايات التعليمية في المدارس الابتدائية في دولة قطر

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ملخص

هدفت هذه الدارسة للتعرف إلى درجة امتلاك معلمي التربية الإسلامية للكفايات التعليمية في المدارس الابتدائية بدولة قطر، كما هدفت التعرف إلى الفروق في درجة امتلاك معلمي التربية الإسلامية الكفايات التعليمية في المدارس الابتدائية بدولة قطر تبعا لمتغيرات (الجنس، الخبرة، المدرسة). تكون مجتمع الدارسة من معلمي 598) معلما ومعلمة، أما عينة الدارسة تكونت من (1776 ومعلمات التربية الإسلامية في دولة قطر.

استخدمت الباحثة الحزمة الإحصائية Spss، وتم استخدام المنهج الوصفي، وتم تطبيق الدارسة في الفصل الدراسي الثاني للعام الدراسي 2019-2020؛ لتحليل البيانات. أظهرت نتائج الدارسة أن درجة امتلاك معلمي التربية الإسلامية للكفايات المعرفية المرتبطة في مناهج التربية الإسلامية الحديثة بدولة قطر جاءت متدنية على كافة مجالات الدارسة، وأظهرت النتائج بأنه لا توجد فروق ذات دلالة إحصائية لدرجة امتلاك معلمي التربية الإسلامية للكفايات المعرفية المرتبطة في مناهج التربية الإسلامية الحديثة بدولة قطر تبعا لمتغيرات (الجنس) وكانت هناك فروق ذات دلالة إحصائية في متغير المدرسة ولصالح المدارس الخاصة ولصالح كفاية المهارات الحياتية، وكذلك فما فوق في كفاية 10وجود فروق ذات دلالة إحصائية في متغير الخبرة لصالح المدرسين والمدرسات ذوي الخبرة التكنولوجية، وفي ضوء نتائج الدارسة أوصت الباحثة مراجعة مناهج التربية الإسلامية في مدارس دولة قطر بما يتضمن الكفايات التعليمية، ينصح بعقد ورشات عمل في الكفايات التعليمية وإجراء دارسات مشابهة على بعض جوانب منهاج التربية الإسلامية في دولة قطر، وتفعيل موجهي التربية الإسلامية المعلمين في الميدان بتطبيق الكفايات التعليمية دولة قطر.
الكلمات الدالة: مناهج التربية الإسلامية، الكفايات المعرفية.

الكلمات المفتاحية: معلم التربية الإسلاية، الكفايات التعليمية، مدارس قطر

للاقتباس: اليربوعي، شيخة جابر. "درجة امتلاك معلمي التربية الإسلامية للكفايات التعليمية في المدارس الابتدائية في دولة قطر"، **المنتدى والمعرض البحثي السنوي لجامعة قطر** *(QUARFE 2020)*، الدوحة، 28 أكتوبر 2020،
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University of the Future:
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درجة وعي معلمي المدارس الحكومية في دولة قطر للتعليم المتمايز في تعلم الطلبة

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ملخص

هدفت هذه الدراسة للتعرف إلى مدى وعي معلمي المدارس الحكومية في قطر بالتعليم المتمايز وأهميته في تعلم الطلبة. وقد قامت الطالبة باستخدم المنهج الكمي الوصفي، وذلك من خلال استخدام الاستبانة كأداة لجمع البيانات، حيث وزعت الاستبانة على عينة الدراسة المكونة من (86) معلمًا ومعلمة بمختلف المراحل العمرية تم اختيارهم بسهولة الوصول إليهم من المجتمع الأصلي والمتمثل في جميع معلمي ومعلمات المدارس الحكومية في قطر. وقد أظهرت نتائج الدراسة أن درجة الوعي لدى المعلمين كبيرة بمتوسط بلغ (4.1) وبنسبة مقدارها (79.9%).

وفي ضوء نتائج الدراسة أوصت الباحثة بضرورة إدراج مدخل التعليم المتمايز في كليات التربية وتدريب طلاب الكلية على كيفية تطبيقه، وأهمية توعية المعلمين في الميدان بأهمية التعليم المتمايز في التدريس وضرورة إجراء المزيد من الدراسات للوقوف على واقع تطبيق التعليم المتمايز ومتطلبات ومعوقات تنفيذه من قبل المعلمين.

الكلمات المفتاحية: التعليم المتمايز، وعي المعلمين، تحصيل

للاقتباس: العــزايزة، منار. "درجة وعي معلمي المدارس الحكومية في دولة قطر للتعليم المتمايز في تعلم الطلبة"، **المنتدى والمعرض البحثي السنوي لجامعة قطر** *(QUARFE 2020)*، الدوحة، 28 أكتوبر 2020،
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وجهة نظر معلمي العلوم في دولة قطر نحو توجه (STEM) كبرنامج تدريسي في المدارس الحكومية.

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ملخص

يهدف هذا البحث التعرف على وجهة نظر معلمي العلوم في دولة قطر نحو توجه (STEM)؛ ليكون برنامجًا تدريسيًّا في المدارس الحكومية، وقامت الباحثة باتباع المنهج الكمي الوصفي من أجل إجراء تأكد الباحثين من صدقها وثباتها، بما يساعد في تمثل مجتمع الدراسة وتفسير نتائجها. تمثلت أداة البحث في استبانة مكونة من (16) فقرة، صُممت من قبل العنزي والجبر (2017)، تكون مجتمع الدراسة من جميع معلمي ومعلمات العلوم لجميع المراحل الدراسية في دولة قطر، وبلغت عينة الدراسة 121 معلمًا ومعلمة. وبعد عرض النتائج وتفسيرها توصلت الباحثة إلى أن للمعلمين وجهة نظر إيجابية تجاه برنامج (STEM). وبناء على هذه النتيجة أوصت الباحثة ببعض الأمور منها تقديم ورش للمعلمين وتوعيتهم ببرنامج (STEM).

الكلمات المفتاحية: علوم، منهج، تعليم، STEM

للاقتباس: عاشور، أريج مسعود. "وجهة نظر معلمي العلوم في دولة قطر نحو توجه (STEM) كبرنامج تدريسي في المدارس الحكومية"، **المنتدى والمعرض البحثي السنوي لجامعة قطر** *(QUARFE 2020)*، الدوحة، 28 أكتوبر 2020،
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Social Change and Identity
(Graduate Students)

Science Teachers' Beliefs about Teaching and Learning Implementing Inquiery-based Learning – A Case in Qatar Government Primary Schools

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Abstract

The current study investigates the beliefs held by science teachers on constructivism and a traditional approach in Qatar government primary schools. More specifically, it aims to investigate the challenges that science teachers experience during inquiry-based learning implementation. A web-based survey was conducted in order to collect data from grades 4 to 6 science teachers. A total of 112 science teachers responded and completed the survey on a voluntary basis. The results indicate that science teachers hold a higher beliefs in constructivism than traditional approach. A T-test and ANOVA analysis have showed that there is no significant differences between the beliefs of science teachers' and their gender, level of education, and years of teaching experience. In addition, science teachers faced challenges in lesson planning, assessment, and teacher support.

Keywords: Scientific inquiry; Beliefs; Constructivism

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Social Change and Identity
(Undergraduate Students)

The McGurk Effect in Qatari Arabic: Influences of Lexicality and Consonant Position

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Abstract

The McGurk effect is a psycholinguistic phenomenon where an illusion is made by dubbing an auditory element of one sound on a visual element of another sound, which leads to hearing a third sound. The phenomenon demonstrates how the perception of speech does not depend on audio inputs only. Rather, it shows how seeing the shape of the mouth while producing a certain sound can influence what we hear. Thus, it proves the interaction of both vision and auditory parameters in understanding language. In addition, what is known as "**lexicality** – the property of a word being real or not" influences speech perception. People, unconsciously, tend to alter nonwords to real words. For example, if one said "shtrength" instead of "strength", a listener would alter and understand it as "strength". For the purpose of the research, these two phenomena were combined. In this study, we test how effective is the McGurk effect on the Qatari Arabic dialect, which has not been investigated before. The data used were 24 minimal pairs of real and fake words with the substitution of the phonemes: /b/ and /g/ at three different positions: first, middle, final. Videos were made by dubbing audio recordings of the sound /b/ into video recordings of the sound /g/ in order to test if this creates an illusion of the sound /d/. We ran the experiment on 25 native Qatari female students, they had to sit on a computer with headphones on, watch and hear clearly what the person on the video is saying, and then they had to preform two tasks: first, lexical decision task: decide if the word is real or fake. Second, sound discrimination task: choose what sound did they hear. In general, the participants captured audio (which means they heard /b/) were only 16% of target trials, while visual capture occurred (which means they heard /g/) 45%, and the McGurk fusion (which means they heard /d/) happened on 39%. Interestingly, perceiving McGurk fusion was gradually less common at later consonants positions. A significant effect of lexicality was also found, as fusion was more likely to occur if the results of the fusion was a real word.

Keywords: McGurk; Lexicality; Qatari Arabic; Audiovisual

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Covid-19 Research
(Faculty and Postdoc)

Within-Host Diversity of SARS-Cov-2 in COVID-19 Patients with Variable Disease Severities

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Abstract

Background: The ongoing pandemic of SARS-COV-2 has already infected more than eight million people worldwide. The majority of COVID-19 patients are either asymptomatic or have mild symptoms. Yet, about 15% of the cases experience severe complications and require intensive care. Factors determining disease severity are not yet fully characterized. **Aim:** Here, we investigated the within-host virus diversity in COVID-19 patients with different clinical manifestations. **Methods:** We compared SARS-COV-2 genetic diversity in 19 mild and 27 severe cases. Viral RNA was extracted from nasopharyngeal samples and sequenced using Illumina MiSeq platform. This was followed by deep-sequencing analyses of SARS-CoV-2 genomes at both consensus and sub-consensus sequence levels. **Results**: Consensus sequences of all viruses were very similar, showing more than 99·8% sequence identity regardless of the disease severity. However, the sub-consensus analysis revealed significant differences in within-host diversity between mild and severe cases. Patients with severe symptoms exhibited a significantly (p-value 0.001) higher number of variants in coding and non-coding regions compared to mild cases. Analysis also revealed higher prevalence of some variants among severe cases. Most importantly, severe cases exhibited significantly higher within-host diversity (mean= 13) compared to mild cases (mean=6). Further, higher within-host diversity was observed in patients above the age of 60 compared to the younger age group. **Conclusion:** These observations provided evidence that within-host diversity might play a role in the development of severe disease outcomes in COVID-19 patients; however, further investigations is required to elucidate this association.

Keywords: SARS-Cov-2; COVID-19 severity; Nonsynonymous mutations; Virus quasispecies; Within-host diversity

For citation: Khatib H. A., Benslimane F. M., Bashir I., AlThani A. A, Yassine H. M., "Within-host diversity of SARS-CoV-2 in COVID-19 patients with variable disease severities",", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0280

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Covid-19 Research
(Faculty and Postdoc)

Virtual Screening of Anti-Viral Drugs and Natural Compounds for Potential Inhibition of the Novel SARS-Cov-2 Spike Receptor-Binding Domain

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Abstract

Background: The spike (S) protein of SARS-CoV-2 harbors the receptor-binding domain (RBD) that mediates the virus's entry to host cells. The aim of this study was to identify novel inhibitors that target the RBD domain of S-protein through computational screening of chemical and natural compounds. **Method:** The S protein was modelled from the recently resolved and the previously described SARS-CoV protein structures. CLC Drug Discovery was used to computationally screen for potential inhibitory effects of currently prescribed drugs (n= 22) anti-viral natural drugs (n=100), natural compounds (n= 35032). QSAR was also performed. **Results:** Among currently precribed drugs to treat SARS-CoV2, hydroxychloroquine and favipiravir were identified as the best binders with an average of 4H-bonds, the binding affinity (BA): -36.66 kcal·mol−1, and interaction energy (IE): -6.63 kcal·mol−1. After the evaluation of anti-viral compounds, fosamprenavir and abacavir showed effective binding of 5H-bonds, with average BA: -18.75 kcal·mol−1, and IE: -3.57 kcal·mol−1. Furthermore, screening of 100 natural anti-viral compounds predicted potential binding modes of glycyrrhizin, nepritin, punicalagin, EGCG, and theaflavin (average BA: -49.88 kcal·mol−1, and IE: -4.35 kcal·mol−1). Additionally, the study reports 25 natural compounds that showed effective binding with an improved average BA: 51.46 kcal·mol−1. **Conclusion:** Using computational screening, we identified potential SARSCoV-2 spike inhibitors that bind to the RBD region.

Keywords: Virtual screening; Molecular docking; Anti-viral drugs; Computational docking; SARSCoV- 2

For citation: Mathew S. M., Benslimane F., Althani A. A., Yassine H. M., "Virtual screening of anti-viral drugs and natural compounds for potential inhibition of the novel SARS-CoV-2 spike receptor-binding domain", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0281

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Covid-19 Research
(Faculty and Postdoc)

Gender and Trust in Government Modify: The association between Mental Health and Stringency of Public Health Measures to reduce COVID-19

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Abstract

Introduction: Trust in government to take care of its citizens may affect mental health outcomes such as anxiety and depression, particularly as measures become more stringent. The study aimed to investigate the associations between stringency of COVID-19 social distancing policies and mental health outcomes, and the moderating effects of trust in government and gender. **Methods:** The study consisted of secondary analysis of publicly available cross sectional data from a global online survey COVID-19 survey conducted between 20 March and 7 April 2020. There were 106,497 adult participants (18 years of age and over) from 58 countries. The main outcome measures were indices for depression and worries. The exposure measure was the stringency index. The effect modifier measures were gender and trust in government. Multivariable regression was conducted to determine the three-way interaction between the exposure, modifier and outcome measures, adjusting for age, income and education. **Results:** The median age of participants (56.4% women) was 37 years. Women had higher worries and depression than men. The proportion of people trusting (44%) and distrusting (45%) the government was almost the same. Among those who strongly trusted the government, an increase in policy stringency was associated with an increase in worries. Among men who distrusted the government, an increase in policy stringency was associated with an increase in depression, but in distrusting women there was an inversed U-shaped association between policy stringency and both worries and depression. Once policies exceeded the 50-point mark on the stringency index, women benefited from the most stringent policies, yet men did not, particularly men who strongly trust or distrust the government. **Conclusion:** As the stringency of public health measures increases, so too do depression and worries. For safe and effective public health measures, governments should develop strategies to increase trust in their actions.

Keywords: COVID-19; Trust; Government; Public health policy; Mental health

For citation: OHara L., Abdul R.H., Shi Z., "Gender and trust in government modify the association between mental health and stringency of public health measures to reduce COVID-19", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0282

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Covid-19 Research
(Faculty and Postdoc)

Covid 19 Pandemic: Impacts and Future Implications on Personal Travel Behavior in the State of Qatar

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Abstract

In December 2019, a novel and contagious coronavirus also known as Covid-19 outbroke in Wuhan, China. In response to the virus, many countries implemented strict travel restrictions and lockdowns to hold back the spread of the Covid-19. The measures to contain it have brought dramatic changes in individual lifestyles, daily activities and travel behavior. This study focuses on the impacts on individual travel behavior including work/education, shopping and out-of-home physical activities in the state of Qatar. In addition, the study also presents individuals' expectations and preferences regarding future travel activities. The Qatar Transportation and Traffic Safety Center, QTTSC conducted a questionnaire survey investigate the impacts of Covid-19 on individuals' travel behavior. The questionnaire survey included questions regarding individuals' travel activities for work/education, shopping, out-of-home workouts, before and during Covid-19 and the individual preferences and expectation for changes in their daily travel-activity in the future. After removal of the incomplete entries and outliers, the analyses were done including 404 respondents residing in Qatar for whom 63% were males while 36% were females. The results showed that there were drastic drops for all the activity types. Around 73% of the respondents started work-from-home or online education. The results also revealed that more than 20% of the respondents who were traveling in a group before the Covid-19 pandemic chose to travel alone during the Covid-19 crisis. Most of them were traveling with family before the Covid-19 outbreak. The results for individual expectations and preference revealed that highly educated respondents will prefer to continue work-from-home or bulk shopping. Young and/or Western people prefer to rely more on online shopping. The findings from this study could be very useful for policymakers and other relevant authorities to construct flexible work/education/business policies. This could help them to effectively respond to any future outbreaks and to smartly utilize the available resources of the transport system during post-pandemic and new-normal times.

Keywords: Travel behavior; Coronavirus; Transportation

For citation: Alhajyaseen W., Hussain Q., Kharbeche M., Dias C., "COVID 19 PANDEMIC: IMPACTS AND FUTURE IMPLICATIONS ON PERSONAL TRAVEL BEHAVIOR IN THE STATE OF QATAR", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0283

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University of the Future:
Re-Imagining Research and Higher Education

Covid-19 Research
(Faculty and Postdoc)

COVID-19 Personal Protection Equipment (PPE): A Potential Source of Microplastic Pollution in the State of Qatar

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Abstract

Coronavirus disease 2019 (COVID-19) has become a global pandemic. The personal protection equipment (PPE), especially medical face masks and N95 filtering face piece respirators (FFRs) are typically worn by people at home/office/working place/outside to protect from infection. Thus, the increase in consumption of facemasks and FFRs across Qatar has given rise to a new environmental challenge, adding to the vast plastic waste in the environment. Our team has already established the baseline levels of marine litter (ML) including plastic waste along the west coast of Qatar based on November 2019 ML survey (Veerasingam et al., 2020a). To study the impact of COVID-19 on ML, we have conducted another survey along the west coast of Qatar in July 2020. The distribution of PPE is higher on the southern part of west coast of Qatar than the northern part. Attenuated total reflectance - Fourier transform infrared (ATR-FTIR) spectroscopy was used to characterize the polymer types of surgical facemasks, N95 FFRs and gloves. Polypropylene (PP) and polyamide (PA) were the abundant polymer types of PPEs. This study confirmed that the PPE could be a potential source for microplastic contaminant in the environment, especially if the present situation continues. Therefore, proper waste removal measures have to be followed.

Keywords: COVID-19; Personal protection equipment; Microplastics; FTIR; Qatar

For citation: Veerasingam S., AlKhayat J., Vethamony P., "COVID-19 personal protection equipment (PPE): A potential source of microplastic pollution in the State of Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0284

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Covid-19 Research
(Faculty and Postdoc)

Laboratory Animal Research Centre (Larc) "A Specific Pathogen Free Rodent Facility" - Covid – 19 Pandemic Response Plan

Muralitharan Shanmugakonar, Vijay Kanth Govindharajan, Kavitha Varadharajan, Hamda Al-Naemi

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Abstract

Laboratory Animal Research Centre (LARC) has developed an early emergency operational plan for COVID-19 pandemic situation. Biosafety and biosecurity measures were planned and implemented ahead of time to check the functional requirement to prevent the infection. Identified necessary support for IT, transport, procurement, finance, admin and research to make the operations remotely and successfully.

Keywords: Covid-19; Biosafety; LARC; Response plan

For citation: Shanmugakonar M., Govindharajan V.K., Varadharajan K., AlNaemi H., "Laboratory Animal Research Centre (Larc) "A Specific Pathogen Free Rodent Facility" - Covid – 19 Pandemic Response Plan", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0285

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Perceptions of who is in the Healthcare Team? A Content Analysis of Social Media Posts during COVID-19 Pandemic

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Abstract

Social media posts can be used to explore public perceptions of interprofessional teams and healthcare professionals. The aim of this study was to use social listening technique to explore unfiltered public perceptions of the professionals involved in healthcare teams during the COVID-19 pandemic, in a naturalistic online setting, and to elaborate on the emotional reactions in response to an online social media post. A cross-sectional retrospective review of comments on a specific social media post was conducted between 15 March and 28 April 2020 using summative content analysis. One image that was widely circulated on social media platforms with two questions: 'Who society thinks works at hospital? versus who really works at hospitals?' was selected. Three platforms were searched, Facebook®, Twitter®, and LinkedIn®. Only publicly available posts were included. Out of the initial 40 posts identified, 21 posts, which had 1759 comments, were analysed and 1576 were included for coding. Of the emerging nine themes, perceptions of who is in the team was the largest (40.5%, n = 639), followed by agreement (23.1%, n = 364) and feeling excluded (16.2%, n = 255). Of emotional expressions, 42.1% were positive and 57.9% negative. The most frequent emotions were frustration (54.4%, n = 857) followed by gratitude (16.3%, n = 257) and relief (15.9%, n = 250). The post brought considerable attention to the role of the interprofessional team and generated many feelings of frustration and exclusion. For this reason, the response to this social media post is very important and not to be overlooked. Healthcare professionals need to work together to strengthen their presence as an interprofessional team, united to deliver safe effective quality care for patients. The current COVID-19 pandemic and the media attention should be taken as an opportunity by the interprofessional community to work together to combat negative media stereotypes. Further research is warranted on public perceptions of the healthcare team.

Keywords: Interprofessional collaboration; Social media; Content analysis; COVID-19; Healthcare team

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Qatar - Longitudinal Assessment of Mental Health in Pandemics (Q-LAMP)

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Abstract

Aims: Q-LAMP aims to identify risk factors and resilience factors for symptoms of psychiatric illness during the pandemic. Study strengths include the 1-year longitudinal design and the use of standardized instruments already available in English and Arabic. The results will increase understanding of the impact of the pandemic on mental health for better support of the population during the pandemic and in future epidemics. Until an effective vaccine is available or herd immunity is achieved, countries are likely to encounter repeated 'waves' of infection. The identification of at-risk groups for mental illness will inform the planning and delivery of individualized treatment including primary prevention. **Methodology:** Longitudinal online survey; SMS-based recruitment and social media platforms advertisements e.g. Facebook, Instagram; Online consent; Completion time for questionnaires: approx. 20 to 30 minute; Baseline questionnaire with follow up at 3, 6, 9 and 12 months; Study completion date: Sept. 2021. **Inclusion criteria:** Currently living in Qatar; Qatari residents: citizens and expatriates; Age 18 years; read Arabic or English (questionnaire and consent form available in both languages). **Instruments:** Sociodemographic questionnaire including personal and family experience of COVID-19 infection; Standard instruments to assess psychiatric morbidity including depression, anxiety and PTSD; research team-designed instruments to assess social impact of pandemic; standard questionnaires to assess resilience, personality, loneliness, religious beliefs and social networks. **Results:** The analysis was based on 181 observations. Approximately, 3.5% of the sample was from the sms-recruitment method. The sample of completed surveys consisted of 65.0% females and 35.0% males. Qatari respondents comprised 27.0% of the total sample, while 52% of the sample were married, 25% had Grade 12 or lower level of educational attainment, and 46.0% were unemployed. Covid-19 appears to have affected different aspects of people's lives from personal health to living arrangements, employment, and health of family and friends. Approximately, 41% to 55% of those who responded to the survey perceived changes in their stress levels, mental health, and loneliness to be worse than before the pandemic. Additionally, the wide-availability of information about the pandemic on the internet and social media was perceived as source of pandemic-related worries among members of the public. **Conclusion:** The continued provision of mental health service and educational campaigns about effective stress and mental health management is warranted.

Keywords: Depression; Anxiety; Postraumatic stress; Psychiatric epidemiology; Longitudinal

For citation: Khaled S., Haddad P., Abdulla M., Bellaj T., Marzouki Y., Hasan Y., Kaabi I, Petcu C., Bader L., Amro I, Assi M., Kadkhodaei E., Hamadi A., AlThani M., "Woodruff P., "Qatar - Longitudinal Assessment of Mental Health in Pandemics (Q-LAMP)", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0287

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Evaluation of Reverse Transcription-Loop-Mediated Isothermal Amplification (RT-LAMP) for detecting SARS-Cov-2 in Clinical, Environmental and Animal Samples

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Abstract

Background: First described 20 years ago by Notomi et al. (1999), the loop-mediated isothermal amplification (LAMP) assay is robust, rapid and straightforward, yet retains high sensitivity and specificity. These features have seen the LAMP assay and the inclusion of a reverse transcriptase (RT-LAMP) implemented for a broad range of molecular diagnostic applications extending from infectious diseases, including detection of the original SARS-CoV-1 virus. The advantages of RT-LAMP include using different reagents than RT-qPCR, the potential for direct processing of samples without the need for prior RNA extraction and an extremely rapid turn-around time. Several groups have now described different RT-LAMP assays for detection of SARS-CoV-2 RNA. Therefore, the aim of this study is to assess the feasibility, sensitivity and effectiveness of LAMP technique in detecting SARS-CoV-2 in different type of samples. **Method:** New England Biolabs (NEB) LAMP master mixes were used. Six set of primers specific to SARS-CoV-2 were obtained from IDT. The reaction mix consisting of LAMP master mix, primer working solution and a sample was incubated at 65^0C and results were collected after 30 mins. **Results:** In just 30 mins, we were able to detect the virus without any prior sample processing. Our primers were able to detect up to 100 copies of the viruses, which is comparable to the RT-PCR that we currently use in our lab. The primers were tested against all other coronavirus and they have shown 100% specificity to the novel SARS-CoV-2 virus. Both the florescent and calorimetric master mixes were able to detect the virus in all tested samples: clinical, animal and environmental. **Conclusion:** LAMP is a fast reliable technique that could be used as a quick screening method for the detection of SARS-CoV-2 in different settings and using different collection medium.

Keywords: LAMP; COVID19; SARS-CoV-2; Detection; RT_PCR

For citation: Benslimane F. M., AlJamal O., Boughattas S., AlThani A. A., Yassine H.M., "Evaluation of reverse transcription-loop-mediated isothermal amplification (RT-LAMP) for detecting SARS-CoV-2 in clinical, environmental and animal samples.", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0288

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Nanopore Sequencing SARS-CoV-2 Genome in Qatar

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Abstract

Background: The current pandemic, COVID-19, is cause by an RNA Coronavirus that was recently identified as SARS-CoV-2. RNA viruses tend to have a high mutation rate; the rate is around a million times greater than that of their hosts. The mutagenic potential of the virus depends on many factors, including the fidelity of nucleic acid-replicating viral enzymes, such as SARS-CoV-2 RNA dependent RNA polymerase (RdRp). The rate of mutation drives viral evolution and genome variability, consequently allowing viruses to escape the immunity of the host and develop resistance to drugs. Therefore, the characterization of SARS-CoV-2 variants might lead to implement better therapeutics treatments, vaccines design and identify new diagnostics approaches. **Aim:** The aim of this study was to establish a fast sequencing method to identify SARS-CoV-2 mutations in Qatar. This will help to assess if there are new viral variants that are spreading in country. **Methods:** RNA was isolated from samples collected from Qatar COVID-19 positive patients. The Artic Network V3 primer scheme and Oxford Nanopore ligation sequencing kit were used to prepare the sequencing libraries. Libraries were loaded on to R9.4.1 flow cells and ran on a GridION. Bioinformatics analysis was done following the Artic Network SARA-CoV-2 bioinformatics tools. **Results:** Genome coverage of sequenced samples was >80% and the depth was average at 200x. The coverage was highly dependable on sample viral load; samples of CT value lower than 30 resulted in better sequence coverage. The sequenced genomes were deposited in GISAID and were mainly clustering with genomes deposited from the UK. Sequences were compared to Illumina and sanger sequences and they showed compatible results. **Conclusion:** The use of ONT to sequence SARA-CoV-2 is a quick, affordable, and reliable technique to determine viral mutation. Using this technique, the first sequences from Qatar were deposited in to GISAID. Up to date, 700 genomes have been sequenced from Qatari samples.

Keywords: COVID19; SARS_CoV-2; Sequencing; Nanopore; Genomics

For citation: Benslimane F. M., AlKhatib H., Albatesh D., AlJamal O., Boughattas S., Althani, A. A.,Yassine H. M., "Nanopore Sequencing SARS-CoV-2 genome in Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0289

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Smart Technologies Driven approaches to tackle COVID-19 Pandemic

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Abstract

The emergence of Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2) had led to a global outbreak of Coronavirus Disease-2019 (COVID-19) and raised an international public health issue. To mitigate the infection and bring the sustainability in current pandemic situation, the healthcare system and governments are doing exceptional work. Globally, the implementation of technologies in healthcare systems and diverse government policies has proven to be effective in tackling COVID-19. The rapid technological swift during the pandemic and its role in assisting the fight against corona virus is phenomenal. Various technologies like robotics, drone, artificial intelligence (AI), data communication, mask, and smart sensors, etc. has synergistically helped in mitigating the effect of COVID-19. The poster represents the outlook of these technologies in terms of strategies and framework in which they have been applied for assisting various sectors like the health system, industries, government, and public, etc.

Keywords: Sensors; IOT; Drones; Disinfection

For citation: MAURYA M. R., Sadasivuni K. K., AlMaadeed S. A. S., "A Smart Technologies Driven Approaches to Tackle COVID-19 Pandemic", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0290

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Vulnerabilities of the SARS-Cov-2 Virus to Proteotoxicity – Opportunity for Repurposed Chemotherapy of COVID-19 Infection

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Abstract

The global pandemic of COVID-19 disease caused by infection with the SARS-CoV-2 Coronavirus**,** has produced an urgent requirement and search for improved treatments whilst effective vaccines are developed. A strategy for improved drug therapy is to increase levels of endogenous reactive metabolites for selective toxicity to SARS-CoV-2 by preferential damage to the viral proteome. Key reactive metabolites producing major quantitative damage to the proteome in physiological systems are: Reactive oxygen species (ROS) and the reactive glycating agent methylglyoxal (MG); cysteine residues and arginine residues are their most susceptible targets, respectively. From sequenced-based prediction of the SARS-CoV-2 proteome, we found 0.8-fold enrichment or depletion of cysteine residues in functional domains of the viral proteome; whereas there was a 4.6-fold enrichment of arginine residues, suggesting SARS-CoV-2 is resistant to oxidative agents and sensitive to MG. We examined activated arginine residues in functional domain with predicted low pKa by neighboring group interaction in the SARS-CoV-2. We found 25 such arginine residues, including 2 in the spike protein and 10 in the nucleoprotein. These sites were partially conserved in related *coronaviridae****: SARS-COV and MERS.*** We also screened and identified drugs, which increase cellular MG concentration to virucidal levels and found two antitumor drugs with historical antiviral activity, doxorubicin and paclitaxel were the best candidate for repurposing. Our findings provide evidence of potential vulnerability of SARS-CoV-2 to inactivation by MG and a scientific rationale for repurposing of doxorubicin and paclitaxel for treatment of COVID-19 disease, providing efficacy and adequate therapeutic index may be established.

Keywords: COVID-19; Coronavirus; Methylglyoxal; Glyoxalase; Doxorubicin

For citation: Rabbani N., Thornalley P.J., AlMotawa M., Xue M., "Vulnerabilities of the SARS-CoV-2 virus to proteotoxicity – opportunity for repurposed chemotherapy of COVID-19 infection", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0291

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Seroprevalence of SARS-Cov2 in Qatar: A Longitudinal Epidemiological study

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Abstract

In Qatar, the first COVID-19 cases were reported on the 29th of February 2020, and the numbers increased dramatically within few months. Primary Health Care Corporation in collaboration with Qatar University's Biomedical Research Centre initiated a three-phase longitudinal epidemiological study to obtain precise estimates of point and period prevalence by age, gender and nationality. The first phase of the study is done and included 2084 individuals. The results showed that the overall prevalence was 11.1%. However, the point prevalence and the period prevalence of SARS-CoV2 was 1.6 and 9.5 % resp. IgG prevalence was higher amongst 18-39-year old (10 %) and ≥ 60 (11.9 %), and higher in males (11.6 %) compared with females (6.2 %), and higher incidences were reported among Highest amongst North African (10.9 %) and Southern Asian (15.1 %) nationalities.

Keywords: COVID-19; Seroprevalence; SARS-CoV-2; Qatar

For citation: Shurrab F., AlJighefee H., Younes S., AlSadeq D., Althani A., Yassine H., Syed M., AlNuami A., Qotba H., Nasrallah G., "Seroprevalence of SARS-CoV2 in Qatar: a longitudinal epidemiological study", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0292

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Sleeping Habits during COVID-19 Induced Confinement

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Abstract

The COVID-19 pandemic has impacted daily life activity, lifestyle, and well-being. Sleep was shown to be affected by many physical and psychological factors such as quality of life, psychological wellbeing, and levels of physical activity. In the current study, changes in sleep quality during COVID-19-induced confinement among adults was investigated. Subsequently, the current study examined sleep changes during COVID-19 using social media venues among adults in Jordan. A total of 1846 participants were recruited in the study, of which >92% reported a variety of confinement procedures such as self-quarantine, physical distancing, banning of public events, school closure, and lockdown. Additionally, the majority of the participants (53.1%-59.4%) reported an increase in most of the sleep parameters except a decrease (49.1% of the participants) in daytime sleep. Age and obesity seemed to contribute to the changes in sleeping hours while age contributed to sleep disturbance. Moreover, change in daytime sleeping was related to age, gender, and job type while the change in nighttime sleeping hours was associated with age, obesity, and job type. In conclusion, multiple factors, namely, age, gender, income, and job type, seemed to play a role in sleep quality during COVID-19-induced confinement. The majority of the participants experienced an increase in sleep disturbance, nighttime sleeping, sleeping hours as well as a reduction in daytime sleeping. Thus, intervention programs and strategies are warranted to further improve sleep among adults during the current and future disease-induced confinement.

Keywords: COVID-19; Sleep; Social behavior; Lifestyle

For citation: Alomari M., Khabour O., Alzoubi K., Darabseh M. Z., "Sleeping Habits during COVID-19 Induced Confinement", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0293

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COVID-19 Lung Infection Segmentation

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Abstract

The novelty of the COVID-19 Disease and the speed of spread, that created a colossal chaos, and impulse in the worldwide researchers to exploit all resources and capabilities to understand and analyze characteristics of the Coronavirus in terms of spread and virus incubation time. For that, the existing medical features like CT and X-ray images are used. For example, CT-scan images can be used for the detection of lung infection. But the challenges of these features such as the quality of the image and infection characteristics limit the effectiveness of these features. Using artificial intelligence (AI) tools and computer vision algorithms, the accuracy of detection can be more accurate and can help to overcome these issues. This poster proposes a multi-task deep-learning-based method for lung infection segmentation using CT-scan image.

Keywords: COVID-19, Lung infection segmentation; Deep learning; Encoder-decoder network; CNN

For citation: Elharrouss O., Subramanian N., Almaadeed N., AlMaadeed S., "COVID-19 Lung Infection Segmentation", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0294

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Designing a Quick Fix Shutter for Auto-Disinfecting Scan Glass Surface in Biometric Scanners

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Abstract

Fingerprint scanners are significant devices in professional life, and its contamination can be potential sources of COVID-19 transmission. Manual disinfection of the fingerprint scanner after every single use is time consuming and even can adversely affect its electronics/functioning. Thus, with an aim to prevent the spread of infectious disease by cross contamination and implement the safe use of fingerprint scanner, we have developed a smart quick fix technology for automatic disinfection of finger print scanner glass after every single use. The smart portable top mount assembly uses two different disinfecting methods that ensures higher degree of disinfection. The disinfection is based on the simultaneous ultraviolet (UV) and heat treatment for a specific short time, and required to kill all the viruses on the scan glass surface. Moreover, developing this disinfecting technology with a universal design that can be fitted to any finger print scanner irrespective to its size makes it a novel idea.

Keywords: Fingerprint; Scanner; Cleaning

For citation: Ponnamma D., Houkan M.T., Mourya M.R., Al-Thani N., "Designing a quick fix shutter for auto-disinfecting scan glass surface in biometric scanners", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0295

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Impact of COVID-19 on Food Behavior and Consumption in Qatar

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Abstract

The Government of Qatar took strong containment measures to prevent the spread of COVID-19 with restrictions on daily living such as social distancing and the closing of businesses and schools. While these measures are essential to stop the virus spreading, several voices came to warn of their potential disruptive impact on the agri-food system. Therefore, this paper investigates the immediate impacts of COVID-19 on Qatari consumer awareness, attitudes, and behaviors related to food consumption. The study is based on an online survey in Qatar using a structured questionnaire that was administered in the Arabic language through the Survey Monkey platform from 24 May until 14 June 2020. The results reveal clear changes in the way consumers are eating, shopping, and interacting with food. Indeed, the survey results suggested (i) a shift toward healthier diets; (ii) an increase in the consumption of domestic products due to food safety concerns; (iii) a change in the modality of acquiring food (with a surge in online grocery shopping); (iv) an increase in culinary capabilities; and (v) the absence of panic buying and food stockpiling in Qatar. The results are expected to inform current emergency plans as well as long-term food-related strategies in Qatar.

Keywords: COVID-19; Food behavior; Food consumption; Diets; Qatar

For citation: Ben Hassen T., El Bilali H., Allahyari M.S., "Impact of COVID-19 on Food Behavior and Consumption in Qatar", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0296

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Smart System to Monitor Social-Distancing During the Covid-19 Pandemic

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Abstract

We introduce a smart system to track and maintain real-time physical distance between people and to warn people over any deviation from the prescribed distances. Social-distancing is an effective way of slowing infectious disease spread. People are advised to reduce their contacts with each other, thus reducing the chances of transmitting the disease through physical or near contact. We proposed a system to automate the task of tracking social distance using video surveillance and sensors. The system can be used to detect moving objects and measure distance between people. The system collected sensor environmental information for commercial, industrial and governmental purposes. Furthermore we are using drown to detect crowded area. The accuracy of detection using sensors can be helpful when it combined with the camera for computer vision task in terms of visualization using camera and rebuses of detection using sensor. Both camera and sensor gauge the environment to detect moving objects simultaneously.

Keywords: COVID-19; Deep learning; Imaging; Prediction; Face recognition

For citation: Elharrouss O., AlMaadeed N., Abualsaud K., Mahmoud A., Khattab T., AlMaadeed S., AlAli A., "Smart System to Monitor Social-Distancing During the Covid-19 Pandemic", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0297

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Host Genetic Variants Potentially Associated with SARS-Cov-2: A Multi-Population Analysis

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Abstract

Background: Clinical outcomes of Coronavirus Disease 2019 (COVID-19), caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) showed enormous inter-individual and inter-population differences, possibly due to host genetics differences. Earlier studies identified single nucleotide polymorphisms (SNPs) associated with SARS-CoV-1 in Eastern Asian (EAS) populations. In this report, we aimed at exploring the frequency of a set of genetic polymorphisms that could affect SARS-CoV-2 susceptibility or severity, including those that were previously associated with SARS-CoV-1. **Methods:** We extracted the list of SNPs that could potentially modulate SARS-CoV-2 from the genome wide association studies (GWAS) on SARS-CoV-1 and other viruses. We also collected the expression data of these SNPs from the expression quantitative trait loci (eQTLs) databases. Sequences from Qatar Genome Programme (QGP, n=6,054) and 1000Genome project were used to calculate and compare allelic frequencies (AF). **Results:** A total of 74 SNPs, located in 10 genes: *ICAM3*, *IFN-γ*, *CCL2*, *CCL5*, *AHSG*, *MBL*, *Furin*, *TMPRSS2*, *IL4*, and *CD209* promoter, were identified. Analysis of Qatari genomes revealed significantly lower AF of risk variants linked to SARS-CoV-1 severity (*CCL2*, *MBL*, *CCL5*, *AHSG*, and *IL4*) compared to that of 1000Genome and/or the EAS population (up to 25-fold change). Conversely, SNPs in *TMPRSS2*, *IFN-γ*, *ICAM3*, and *Furin* were more common among Qataris (average 2-fold change). Inter-population analysis showed that the distribution of risk alleles among Europeans differs substantially from Africans and EASs. Remarkably, Africans seem to carry extremely lower frequencies of SARS-CoV-1 susceptibility alleles, reaching to 32-fold decrease compared to other populations. **Conclusion:** Multiple genetic variants, which could potentially modulate SARS-CoV-2 infection, are significantly variable between populations, with the lowest frequency observed among Africans. Our results highlight the importance of exploring population genetics to understand and predict COVID-19 outcomes. Indeed, further studies are needed to validate these findings as well as to identify new genetic determinants linked to SARS-CoV-2.

Keywords: COVID-19; SARS-CoV-2; Host genetics; Susceptibility; SNPs

For citation: Smatti M. K., AlSarraj Y., Albagha O., Yassin H.M., "Host genetic variants potentially associated with SARS-CoV-2: A multi-population analysis", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0298

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Developing a Sustainable Performance Measurement Framework for the Hospitality Industry: An Empirical Study with Implications for the COVID-19 Pandemic

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Abstract

Performance management research in the hospitality industry remains stagnant despite prevalence of multi-dimensional performance metrics. This study, thus, contributes to the hospitality industry and sustainability literature through developing a semi-hierarchical sustainability balanced scorecard scale considering the COVID-19 impact on the hospitality industry. As the Indian travel and tourism industry ranks in the bottom 20%-40% on health and hygiene and environment sustainability, this research study's setting, India, holds particular importance. Upon analyzing 200 questionnaires and five in-depth interviews from 4- and 5- star hotels in India through three-stage multi-method design of scale development, we proposed a scale of 21 indicators factored into six perspectives. A post hoc analysis added a new health and safety perspective to consider the impact of COVID-19 pandemic on the hospitality industry and its endeavor to explore a road to recovery by stressing employee and tourist health and well-being. Implications from the study findings are also discussed.

Keywords: Coronavirus Disease 2019 (COVID-19); Performance measurement; Scale development; Sustainability balanced scorecard; Hotel performance

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تأثير تنوع الجينوم الفيروسي والخلايا المضيفة على كوفيد-19 وتطورات حول لقاح كورونا وكيفية علاجه

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ملخص

بعد مرور حوالي نصف عام على انتشار جائحة كورونا (كوفيد-19)، لا يزال العالم ينتظر تحقيق تقدم ملحوظ على مستوى التوصل إلى لقاح وعلاج للمرض. ولكن الإنجازات العلمية الشاملة التي تراعي الجوانب الأخلاقية عادة ما تستغرق وقتًا طويلاً. ومع ذلك، فإن السباق لتطوير لقاح يُعد فريدًا وغير مسبوق تدعمه استثمارات عالمية تُقدر بمليارات الدولارات. في دراسة منشورة، يتناول خبراء معهد قطر لبحوث الطب الحيوي أحدث التطورات المتعلقة بتجارب اللقاحات الحالية، وعقار ديكساميثازون المعاد استخدامه بغرض علاج كوفيد-19.

يتكوّن الجينوم البشري بأكمله من 6.4 مليار من النوكليوتيدات، وهي وحدات أساسية تشكل بناء الحمض النووي الريبوزي، ويُعبر عنها بالأحرف "A" و"T" و"C" و"G". بالمقارنة، فإن جينوم فيروس كورونا المرتبط بالمتلازمة التنفسية الحادة الوخيمة النوع 2 (سارس-كوف-2) يُعتبر أصغر بكثير، حيث يحتوي على 0,29 فقط من النوكليوتيدات. في هذا الإطار، يناقش خبراء من معهد قطر لبحوث الطب الحيوي كيف يمكن أن يحدد التباين في الخلايا البشرية المضيفة، وتسلسل الجينوم الفيروسي، مدى خطورة وشدة الإصابة بفيروس كورونا (كوفيد-19).

الكلمات المفتاحية: الجينوم، لقاح، كورونا

للاقتباس: كتانه، محمد خيري. "أثير تنوع الجينوم الفيروسي والخلايا المضيفة على كوفيد-19 وتطورات حول لقاح كورونا وكيفية علاجه"، **المنتدى والمعرض البحثي السنوي لجامعة قطر** *(QUARFE 2020)*، الدوحة، 28 أكتوبر 2020، https://doi.org/10.29117/quarfe.2020.0300

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Electronic Ventilator for COVID-19 Patient treatment

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Abstract

In response to expected shortages of ventilators caused by COVID-19 pandemic, globally many organizations and institutes have developed low cost and high rate production ventilators. Many of these ventilators are mechanical type and pneumatic type which are easy to produce but do not have all the necessary control parameters and their options as per the patient requirements. Furthermore, their failure rate is very high and computer interfacing and control is difficult. To address all the drawbacks of the available ventilator, power electronic motor drive based digitally controlled ventilator is designed, developed and tested in the Qatar University Laboratory. It consists of semiconductor switches based inverter driven by the microcontroller to run the BLDC (brushless direct current) motor. All the parameters such as pressure, rate of flow and volume required is successfully tuned and trained to the microcontroller. As per the patient requirement, it can deliver the required amount of the oxygen into the patient's body and similarly removes the exhaling air from inside. As all the control process is happening by the microcontroller, all the safety, sound and valves can be easily integrated to reduce the risk for the patient. Minimal number of access control buttons are provided to use the developed ventilator so that it can be easily used by all kinds of hospital nurses.

Keywords: Ventilator; Motor drive; Inverter; Digital control; Covid-19

For citation: Meraj M., Iqbal A.,MAEmadi N., Bhimireddy P., Muhammad E.H.C., "Electronic Ventilator for COVID19 Patient Treatment", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0301

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COVID-19 Preventive Measures & their Impact on Traffic Demand & Safety

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Abstract

COVID-19 has affected the mobility of people significantly due to movement restrictions imposed by government authorities to control the spread of the pandemic. The staged movement restrictions that have been implemented by the government authorities to curb the spread of the disease included the closure of educational institutions and adopt online-based education, restrict commercial activities, and reducing the number of employees at the workplace. This paper presents the impact of these mitigation policies on the traffic volumes, the number of traffic violations, and the number of crashes in the State of Qatar. The hourly distribution of traffic volume showed similar trends before and after the implementation of these policies. Overall, the total traffic decreased by 30% compared to baseline conditions for all selected intersections as well as the Central Business District (CBD) screenline after the implementation of all measures. From the safety perspective, the total traffic violations decreased by 73% in April and May when the restrictions due to all three policies were imposed. During the same time, a decrease of 42% to 54%, 20% to 54%, and around 36% was observed for traffic crashes involving deaths, major loss, and minor damages respectively. Similarly, the total traffic crashes declined by 37% when complete restrictions were in place and COVID-19 was in peak stage. The results of this study will help policymakers and planners to plan/manage the traffic operations in the future during any emergencies. The results can be applied also while managing traffic during the post-Covid era, special and mega-events for temporary traffic management based on real-life data.

Keywords: COVID-19; Mobility impact; Pandemic preventive measures; Traffic safety

For citation: Mohammad, A. A., Muley D., Ghanim, M. S., Kharbeche M. B. M., "COVID-19 Preventive Measures Impact on Traffic Demand & Safety", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0302

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Solar based 3D Printed Protective Mask Imprinted with Extracted Oil and UV Light to Kill Coronavirus

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Abstract

This paper throws light on the fabrication of 3D printed reusable user-friendly protective mask that protects from COVID-19 virus by trapping the virus and killing it using UV light. We found new technology to trap and kill COVID-19 virus using natural oil trapping and UV light, respectively. Benefits of using this mask is that along with disinfecting the inhaled air, it can remove the suffocation problem of patients/persons. The technology will reduce the amount of wastes caused by mask disposal. We have used the renewable (solar) sources to run this 3D printed mask.

Keywords: 3D printing; Virus trapping; UV disinfection; Flow rate; Renewable source

For citation: Paramparambath S., Houkan M., Hussein Haggagy S.G., Sadasivuni K.K., "Solar based 3D Printed Protective Mask Imprinted with Extracted Oil and UV Light to Kill Corona Virus", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0303

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Secure eHealth: A Secure eHealth System to Detect COVID using Image Steganography

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Abstract

COVID-19 is a pandemic which has spread to all parts of the world. Detection of COVID infection is crucial to prevent the spread further. Contactless healthcare systems are essential which can be implemented with Cloud computing. Privacy and security of the medical image data transferred through untrusted channels cannot be ensured. The main aim is to secure the medical details when transferring them from the end device to the cloud and vice versa using image steganography. The medical lung images are masked under a normal and natural cover images.

Keywords: Image steganography; Secure Ehealth; Deep learning; Cloud computing

For citation: Subramanian N., Elharrouss O., AlMaadeed S., "Secure eHealth: A Secure eHealth System to Detect COVID Using Image Steganography"", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0304

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Intelligent Monitoring System for Crowd Monitoring and Social Distancing with Mask Control

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Abstract

Due to the current COVID situation, there's a huge need for crowd control as well as efficient social distancing. Security cameras are everywhere but personnel to monitor it are few. In this project, we use crowd counting and detection along with social distancing monitoring which would enable efficient social distancing and control of the crowd intelligently. The lightening of the cumbersome task of the security professionals to monitor and analyze the crowd is done here making smart decisions on their behalf. In addition, masks are essential instruments to prevent a Corona infection; they are essentials for every individual in a crowd. In this project non-facemask wearing people can be detected at public places and an alert send for that particular individual which further helps control COVID infections. Intelligent system achieved by these two tasks will enable informed decision-making, efficient remote monitoring of crowd, proper social distancing and thus achieving safety at essential infrastructures like transport stations, schools, malls, airports, playground, hospitals etc. where tracking multiple cameras at the same time would be a hassle for security professionals. In this project, we propose a deep learning approach to accurately detect crowd above a certain restriction and make sure the individuals abide by wearing masks and social distancing effectively.

Keywords: COVID; Social distancing; Crowd; Masks; Deep learning

For citation: AlMadeed S., elharrouss O., Ottakath N., "Intelligent monitoring system for crowd monitoring and social distancing with mask control", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0305

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Validation of Selected Commercial Serological Assays for Diagnosis of COVID-19

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Abstract

As researchers around the globe rush to put the available antibody tests to use, concerns have been raised about their precision. This study aimed to evaluate and compare the performance of selected commercial & automated serological assays that are widely used in different clinical settings in Qatar. We validated the performance of five commercial IgG and IgM ELISA kits, three fully automated immunoassays, and two commercial rapid tests. The sensitivity of all assays was compared to RT-PCR and a surrogate virus neutralization test (sVNT). In addition, cross-reactivity was investigated. Among the evaluated kits, Lionex IgG assay demonstrated the best performance (~88% sensitivity and ~99 specificity). All automated assays showed an excellent correlation with the neutralization test with an overall agreement of 93.6-98.5%. The rapid assays demonstrated a very good performance in detecting IgG antibodies (86.0-88.0% sensitivity and 98.0-100% specificity).

Keywords: Serology; COVID-19; Diagnosis

For citation: Younes S., AlJighefee H., Shurrab F., AlSadeq D., Yassine H., Althani A., Marei R., Alhussain H., Nasrallah G., "Validation of Selected Commercial Serological Assays for Diagnosis of COVID-19", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0306

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التعاون الدولي لمواجهة الأزمة الكارثية "فيروس كورونا"

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ملخص

إن التعاون الدولي في مواجهة الأزمات والكوارث قائم على أساس التزام أخلاقي بين الدول، إلا أنه في حيز التنفيذ توجد قواعد قانونية ينبغي مراعاتها، تتمثل في الأهداف المرجوة من التعاون لمواجهة الأزمات والكوارث، وفي المبادئ الأساسية التي يجب مراعاتها وأن يتم التعامل بمقتضاها للحد من انتشار الآثار المترتبة على الأزمات والكوارث؛ بغية تحقيق الصالح العام للبشرية ككل. في الوقت الراهن تتكاثف الجهود من قبل جميع المنظمات الدولية في العالم مع منظمات المجتمع المدني والحكومات والخبراء في مواجهة تحدٍ يشكل تهديدًا لحياة البشرية، يتمثل في انتشار فيروس كورونا الآخذ في الانتشار؛ ليصبح جائحة دولية وفقًا لتقارير منظمة الصحة العالمية، والذي يعد أزمة كارثية، بدأ في مدينة ووهان الصينية في الأول من ديسمبر 2019، ثم انتشر في معظم دول العالم وأصبح وباءً ثم جائحة دولية بعد ثلاثة شهور من انتشاره في الصين.

تتمحور هذه الدراسة حول التعرف إلى أهم مبادئ التعاون الدولي في مواجهة الأزمات والكوارث والآليات المتبعة في مواجهته، من خلال التعرض لأهم وأبرز الآليات المتعلقة بمواجهته وتخفيف آثاره من قبل أبرز المنظمات الإقليمية والدولية، مع عقد مقارنة بين الآليات القائمة على أساس التعاون الدولي، التي يفترض أن يتم اتخاذها من قبل المجتمع الدولي، وبين ما هو قائم الآن.

وانتهت هذه الدراسة إلى أنه يوجد قصور في التعاون الدولي لمواجهة الأزمة الكارثية (أزمة كورونا) بين الدول، كذلك يوجد بعض القصور في الأدوار المفترضة من قبل بعض المنظمات الدولية.

الكلمات المفتاحية: التعاون الدولي، الأزمة الكارثية، المنظمات الدولية، المسؤولية الدولية، أزمة كورونا، كوفيد-19

للاقتباس: الدوسري، غادة عيسى. "التعاون الدولي لمواجهة الأزمة الكارثية - فيروس كورونا"، **المنتدى والمعرض البحثي السنوي لجامعة قطر** *(QUARFE 2020)*، الدوحة، 28 أكتوبر 2020، https://doi.org/10.29117/quarfe.2020.0307

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A Meta-Review of Meta-Analyses and an Updated Meta-Analysis on the Efficacy of Chloroquine and Hydroxychloroquine in treating COVID-19 Infection

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Abstract

Objective: To synthesize the findings presented in systematic reviews and meta-analyses as well as to update the evidence using a meta-analysis in evaluating the efficacy and safety of CQ and HCQ with or without Azithromycin for the treatment of COVID-19 infection. **Methods:** The design of this meta-review followed the preferred reporting items for overviews of systematic reviews including harms checklist (PRIO-harms). A comprehensive search included several electronic databases in identifying all systematic reviews and meta-analyses as well as experimental studies which investigated the efficacy and safety of CQ, HCQ with or without antibiotics as COVID-19 treatment. Findings from the systematic reviews and meta-analyses were reported using a structured summary including tables and forest plots. The updated meta-analyses of experimental studies was carried out using the distributional assumption-free quality effects model. Risk of bias was assessed using the assessing the methodological quality of systematic reviews (AMSTAR) tool for reviews and the methodological standard for epidemiological research (MASTER) scale for the experimental studies. The main outcome for both the meta-review and the updated meta-analyses was mortality. Secondary outcomes included transfer to the intensive care unit (ICU) or mechanical ventilation, worsening of illness, viral clearance and the occurrence of adverse events. **Results:** A total of 13 reviews with 40 primary studies comprising 113,000 participants were included. Most of the primary studies were observational (n=27) and the rest were experimental studies. Two meta-analyses reported a high risk of mortality with similar ORs of 2.5 for HCQ with Azithromycin. However, four other meta-analyses reported contradictory results with two reporting a high risk of mortality and the other two reporting no significant association between HCQ with mortality. Most reviews reported that HCQ with or without Azithromycin had no significant effect on virological cure, disease exacerbation or the risk of transfer to the ICU, need for intubation or mechanical ventilation. After exclusion of studies that did not meet the eligibility criteria, the updated meta-analysis contained eight experimental studies (7 RCTs and 1 quasiexperimental trial), with a total of 5279 participants of whom 1856 were on either CQ/HCQ or combined with Azithromycin. CQ/HCQ with or without Azithromycin was significantly associated with a higher risk of adverse events. HCQ was not effective in reducing mortality transfer to the ICU, intubation or need for mechanical ventilation virological cure (RR 1.0, 95%CI 0.9-1.2, I^2 =55%, n=5 studies) nor disease exacerbation (RR 1.2, 95%CI 0.3-5.0, I^2=29%, n=3 studies). **Conclusion:** There is conclusive evidence that CQ and HCQ, with or without Azithromycin are not effective in treating COVID-19 or its exacerbation.

Keywords: COVID19; Hydroxychloroquine; Chloroquine; Efficacy; Mortality

For citation: Musa O. A.H., Hindy G., AlWattary N., Badran S.M., Matizanadzo J. T., Emara M. M., Thalib L., D. Suhail A.R., "A meta-review of meta-analyses and an updated meta-analysis on the efficacy of chloroquine and hydroxychloroquine in treating COVID19 infection", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0308

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Pharmacy Student Leaders' Perspectives on the Impact of COVID-19 on their Learning: SWOC Analysis

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Abstract

The COVID-19 pandemic has caused disruptions in many aspects of life across the globe including education provision. This pandemic led to major and rapid restructuring of curricula and assessments as student suddenly moved to unfamiliar learning environment. Active involvement of students in the education process and curricula reform is encouraged. This paper aimed to explore pharmacy student leaders' perspectives related to their learning during COVID-19 pandemic in terms of strengths, weakness, opportunities, challenges and recommendations to move forward. A meeting with pharmacy student leaders was convened. Each student leader individually reflected on their experiences using a structured SWOC (Strengths, Weaknesses, Opportunities, Challenges) framework which was then used to guide discussion. Each student then rated anonymously the importance and the probability of the themes to come up with overall score. Online learning came with both negative and positive aspects from the students' point of view. Despite the efforts that were made by the college and students to adapt to the new educational system, there were drawbacks that affected the quality of the education. Pharmacy programs need to implement strategies within their programs about disaster preparedness and build student resilience and wellbeing.

Keywords: COVID-19; Online learning; Pharmacy student; Pharmacy education; SWOC analyses

For citation: AlNaimi H.A.N., Elkattan B., Mohammed H., Shafei L., Elshazly M., El-Awaisi A., "Pharmacy Student Leaders' Perspectives on the Impact of COVID-19 on their Learning: SWOC Analysis", *Qatar University Annual Research Forum and Exhibition (QUARFE 2020)*, Doha, 28 October 2020, DOI: https://doi.org/10.29117/quarfe.2020.0309

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Physical and Sedentary Activity during COVID-19-induced Confinement

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Abstract

Coronavirus Disease 19 (COVID19) has compelled implementing confinement measures across the globe. These measures can potentially lead to many changes in lifestyle. However, no studies examined the effect of COVID-19-induced confinement on physical (PA) and sedentary (SA) activity. Therefore, the current study surveyed changes in PA and SA during April and May of 2020. The participants of the study were 1844. Among the participants who were regularly involved in PA, the majority (41.8-42.2%) of the participants reported a "decrease" (p<0.05) in walking, jogging, and sports while the majority (46.3-53.1%) reported a "no change" (p<0.05) in swimming, cycling, and weightlifting. With regards to the SA, most of the participants reported an "increase" in watching TV (72.3%), using electronics (82.7%), and logging to social media (81.9%). Additionally, gender, job type, obesity, and being worried to contract the disease are associated (p<0.05) with changes in PA while age, gender, obesity, job type and income are related (p<0.05) to changes in SA. In conclusion, the results might enhance our knowledge about the impact of COVID-19 on lifestyle, particularly PA and SA. Subsequently, it can also be used to establish strategies to enhance engagement in activities during the current and future pandemics.

Keywords: COVID-19; Physical activities; Sedentary activities; Lifestyle

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Changes in Dietary Habits and Eating Behaviors during COVID-19 Induced Confinement

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Abstract

The purpose of this study was to evaluate the dietary habits (DH) and eating behaviors (EB) among adults during COVID-19-induced confinement. For this purpose, an online survey designed to assess the change in DH and EB during April and May of 2020 was distributed using various social media platforms. A total of 1844 participants aged 18-72 years completed the survey. The results outlined an increase (42.5-61.8%) in most of the DH and EB examined in the current study in the majority of the participants. Among these changes, increased (p<0.05) prevalence of fruit and vegetable, immune boosters, water, and hot beverage consumption as well as decreased (p<0.05) eating in restaurants and fatty food consumption, suggest a positive change. Conversely, a greater (p<0.05) percentage of the participants reported an increase in high-calorie food consumption and late night eating indicating a risky behavior for obesity and subsequent chronic complications. Additionally, age, gender, obesity, education, income, and job type seem to contribute (p<0.05) to the changes in DH and EB. Overall, COVID-19-induced confinement seems to compel adults to adopt a specific DH and EB. Though most of these changes were positive, some were negative. The study provides crucial information to design subpopulation recommendations and developmental programs for adults under such conditions.

Keywords: COVID-19; Dietary habits; Eating behaviors

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