

# COLORIMETRY BASED DETECTION OF EXHALED BREATH BIOMARKERS FOR PREDICTING HEART FAILURE

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## Abstract

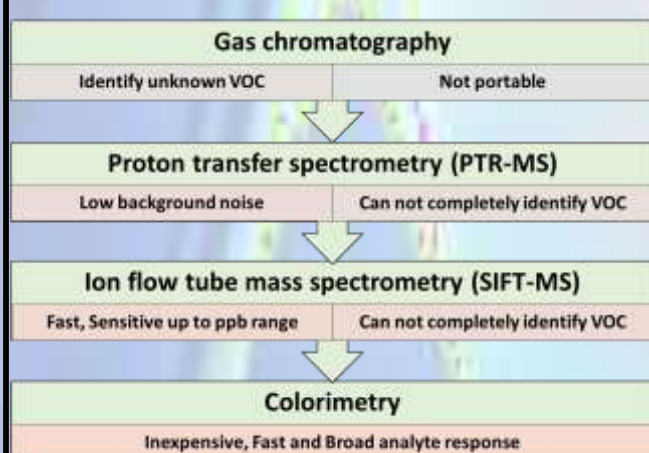
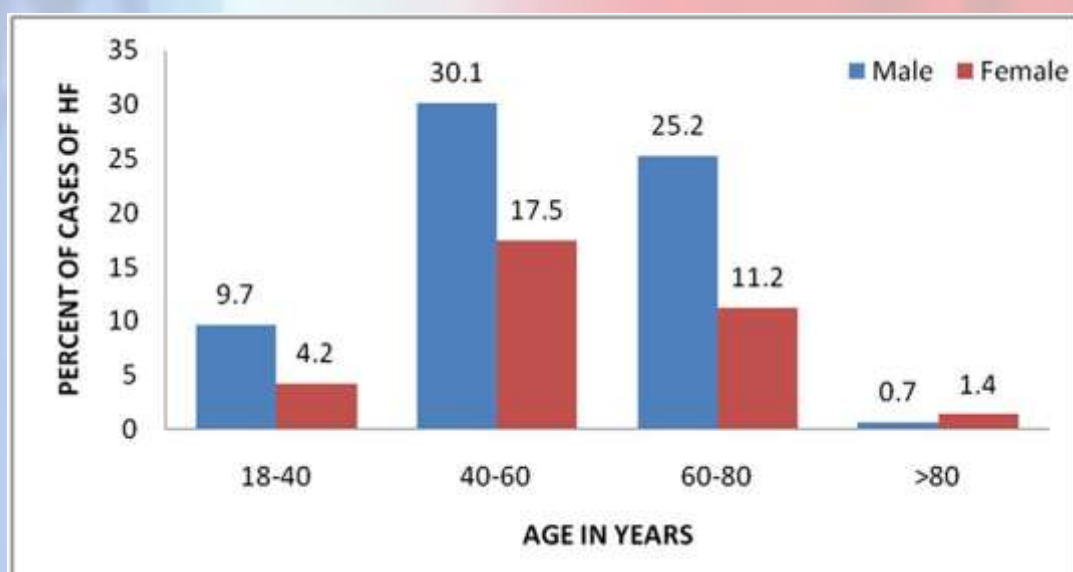
The exhaled breath volatile organic compounds (VOC's) represents a biosignature with the potential to identify and describe heart failure diseases. Exhaled Breath biomarkers-based diagnosis of heart diseases may be easier and earlier detection than other available techniques. So, this is a review of combining both exhaled breath analysis with cost effective colorimetry technology to detect biomarkers for heart failure diseases. We also studied the effectiveness of biomarker trimethyl amine for cardiovascular diseases detection.

**Keywords:** Heart Failure; Biomarker; Colorimetry; Trimethyl Amine

## Introduction

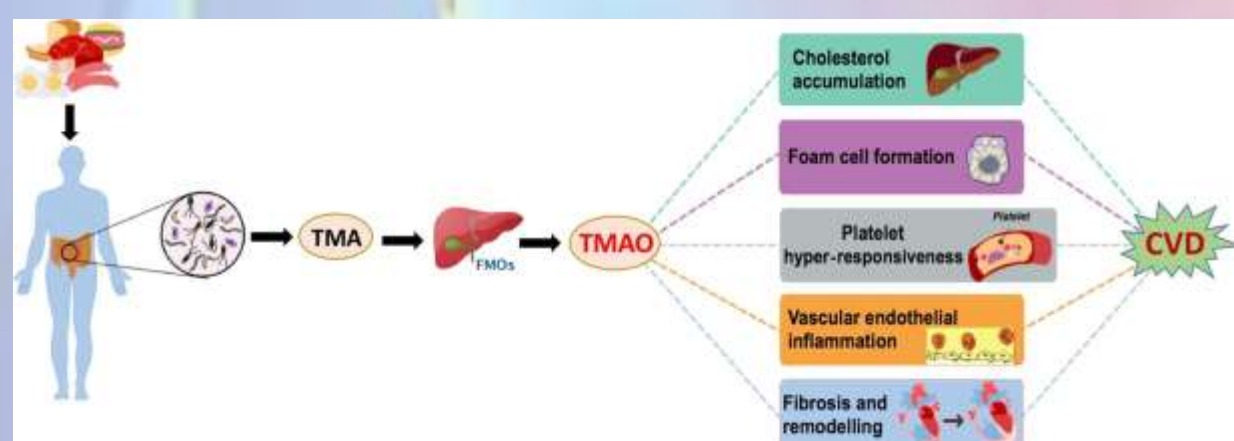
- Current trends are showing a drastic increases in non-infectious diseases (E.g.: cardiovascular disease, diabetes, cancer and chronic respiratory diseases).
- Deaths from cardiovascular diseases have increased almost 30% worldwide
- An affordable and accessible diagnostic tools is needed to detect diseases early and to direct patients
- Breath analysis using biomarkers in the breath for diagnostic measures, is safer than blood samples, less invasive compared to urine samples
- Here, we are reviewing the previous studies and detecting biomarkers (E.g.: TMA) corresponding to the heart disease using colorimetry analysis

## Review



Biomarkers for Heart diseases

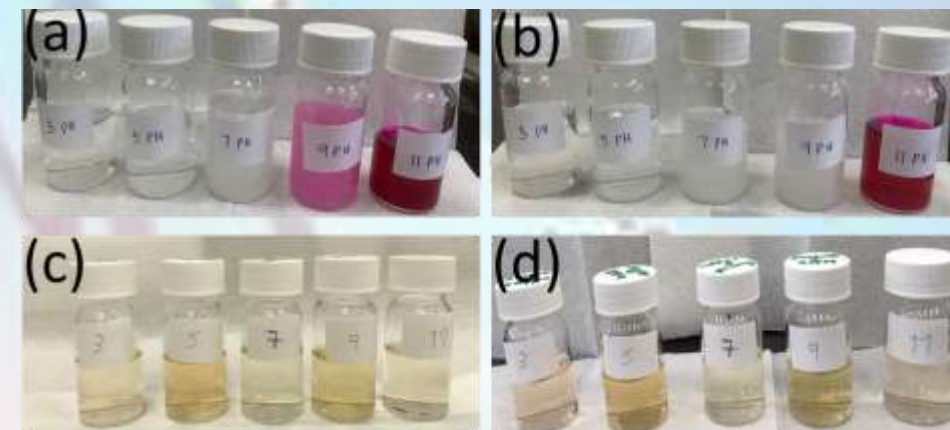
Biomarkers	Diseases
Isoprene	CVD, Cholesterol
Pentane	CVD and many diseases
Trimethylamine	CVD
Hydrocarbons	Heart transplant failures
Acetone	Heart failure
Nitric oxide	Heart failure



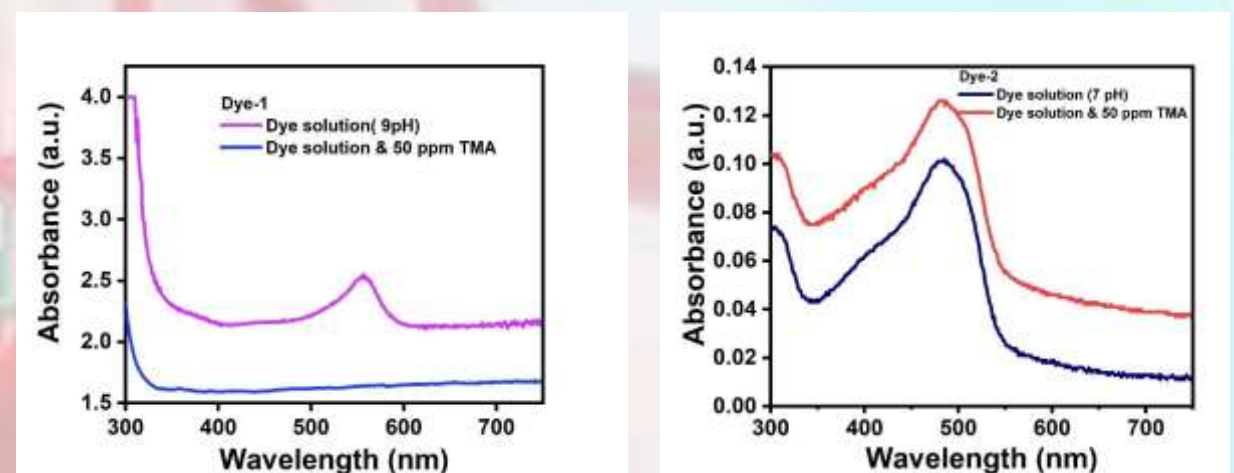
Mechanism of TMA formation which results CVD

## TMA for heart failure detection

- Color change of Dye -1 and Dye-2 after addition of TMA

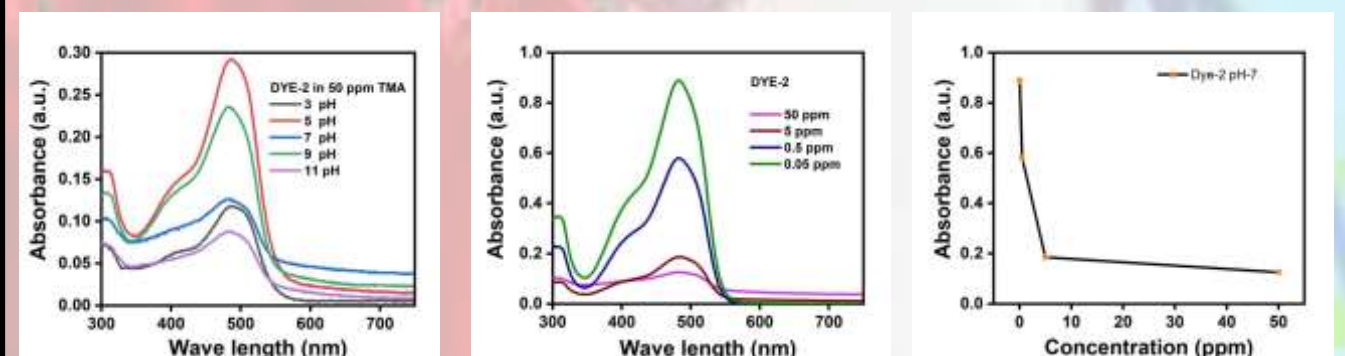


Before adding 50 ppm TMA After adding 50 ppm TMA



UV spectrum of dye solutions before and after adding 50 ppm TMA

- Effect of pH and concentration of TMA on Dye-2 solution



- Dye solutions showed good absorbance at 0.05 ppm compared to other concentrations

## Key Features

- Low cost (Around-1 QAR)
- Simple instruments
- Qualitatively or semi qualitatively identified by the naked eye

## Conclusion

- Colorimetry is an alternative and cost-effective method compared to other techniques to detect biomarkers
- Dye- 1 and Dye -2 can be used for detection of TMA through colorimetry
- This method could be applicable in sensor fabrication for determining heart failure diseases.

## Acknowledgement

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