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

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Introduction

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 by 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 nanoMIL-89 as potential drug carriers in the cardiovascular system.

In vitro

Methodology

Results

Conclusion

- nanoMIL-89 have no toxic effects on PAECs and PASMCs.
- nanoMIL-89 have anti-inflammatory effects as it significantly decreased the release of CXCL8 from PAECs and PASMCs.
- Confocal and TEM images showed high cellular uptake of nanoMIL-89 in PAECs and PASMCs.
- At concentrations ≤30µM, nanoMIL-89 are relatively safe with no significant toxicity effect on Zebrafish embryos development.
- High concentrations (≥100µM) of nanoMIL-89 were observed to delay zebrafish hatching, increase their tail flicking activity at 24hpf and may cause heart deformation which is currently under investigation using cardiac toxicity markers.
- nanoMIL-89 is a promising nanoparticle prototype for drug delivery in the cardiovascular system. Further investigations of MOFs, including diseased models and drug-loaded formulation is required.

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