Southern Counties Materials, Minerals & Mining Society

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Polymers in Nanomedicine

27 October 2022 | 13:00 – 14:30 (GMT)

Chemical metrology to support QC and QA procedures of polymeric nanomedicine

Chair: **Dr. Yiwen Pei MRSC CCHEM**

National Physical Laboratory, UK

Knowledge of chemistry and structure of polymeric drug carriers is of great importance to the control of the performance and stability of nanomedicine which influence their biological fate. However, this information is often assumed rather than measured. In this talk, I will demonstrate the use of quantitative chemical analysis to reveal the internal chemical distribution of particles and how this work supports QC and QA of polymeric nanomedicine.

The effects of ice annealing on reconstitution of a nanoparticle lyophile formulation

Dr. Richard A Storey

AstraZeneca Pharmaceuticals, Macclesfield, UK

Lyophilisation can offer stability benefits to formulations due to the ability to store at temperate conditions. However, for more complex formulations excipients are required which, due to the high solids content, can have slow reconstitution. This was the case with a recent nanoparticle formulation where, due to poor breakup of the lyophile cake, reconstitution took around an hour. This duration would be challenging for use in a clinic. It was also observed that there was wide variability in the porosity of the solids in the vials. Process optimisation, with annealing, utilising micro-CT imaging has improved the porosity of the solids and ensured good homogeneity across all the vials and reduced the reconstitution time to two minutes.

Analytical methods for measuring the encapsulation efficiency of polymeric nanoparticles

Dr. Sara Marques

University of Porto, Portugal

Accurate estimations of the amount of drug associated with nanoparticles (encapsulation efficiency, EE) are required during formulation development to establish dose-response effects and to evaluate manufacture reproducibility. Precise EE measurements rely on the efficient separation of the free drug from the drug-loaded nanoparticles (NPs) prior to a quantification step commonly achieved by HPLC. Separative procedures ensuring the maintenance of NPs properties must be implemented, to avoid estimation errors due to NPs alterations (e.g., leakage, adsorption, disruption) or free drug precipitation events. In this talk, the impact of NPs material and of drug properties on the conditions to separate drug-loaded polymeric NPs from free drug by ultrafiltration will be discussed. The use of an alternative size-based exclusion strategy under HPLC to separate NPs from free drug for EE and concentration measurements will be also covered.

Polymeric materials for mRNA vaccine delivery

Dr. Pratik Gurnani

University of Nottingham, UK

The COVID-19 pandemic has accelerated the clinical application of mRNA-based vaccines, notably from Moderna (SpikeVax) and Pfizer-BioNTech (Comirnaty). In my talk I will cover our recent research into developing new highly active polymer materials for mRNA vaccine delivery and discuss how materials design is imperative for performance within these applications.

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