|  |
| --- |
| **An Ultrasmall-in-Nano Construct with Coating Dependent Declustering Kinetics** |
| Ryan D. Mellor, Andreas G. Schätzlein, Ijeoma F. Uchegbu |
| UCL School of Pharmacy, Pharmaceutics, UK |
| **Background:** Gold nanoparticles (AuNPs) are used experimentally for non-invasive in vivo Raman monitoring because they show a strong absorbance in the phototherapeutic window (650–850 nm), a feature that is accompanied by a particle size in excess of 100 nm. However, these AuNPs cannot be used systemically as they are likely to persist in mammalian systems and resist excretion as they are above the kidney filtration threshold of ~5.5 nm. Raman Nano Theranostic (RaNT) constructs aim to address these issues by clustering excretable ultrasmall AuNPs (sub-5 nm) to a size range where the particle’s optical properties become tuned for non-invasive in vivo detection and monitoring. The ability to decluster is essential to ensure that particles do not persist. |
| **Methods:** Ultrasmall-in-nano constructs were prepared using a labile dithiol linker. Constructs were then encapsulated in a chitosan derived polymer (GCPQ) with varying levels of hydrophobic (palmitoyl, ‘P’) and hydrophilic (quaternary ammonium, ‘Q’) modifications. Stability of constructs was monitored by UV-Vis and DLS. |
| **Results:** RaNT constructs were demonstrated to have long-term stability profiles which are dependent on the properties of the polymeric coating. Higher levels of modification on the polymer appear to favour construct declustering while less modified polymer coatings produce more stable constructs. |
| **Conclusions:** This study demonstrates that the previously reported RaNT constructs can have tunable declustering kinetics by varying the levels of modification on the polymer coating without changing the core construct. This demonstrates that constructs can be designed to be more or less stable as required to strike the right balance between stability during storage and instability for in vivo excretion. |