UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
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Analytical Metrology for Quantifying Drug Release Profiles from Nanotechnology-Enabled Medical Products

NIST NRC Postdoctoral Fellowship Solicitation

The use and application of vectors such as liposomes, nanocrystals and/or emulsions for the delivery of nucleic acid, protein and/or small molecule therapeutics in nanotechnology-enabled drug products has steadily and rapidly increased over the last 2 decades.[1] However, corresponding development of robust and reproducible *in vitro* assays for evaluating the critical quality attributes and/or the biological responses of these nano-enabled drug products in biorelevant media has not kept pace with the development of new drug products nor with the evolution of generic drug products.[2,3] Specifically, *in vitro* assays focused on the quantitative assessment and molecular-scale characterization of free drug released from vector encapsulated drug are of prime importance for quality assessments and regulatory approval of drug products. Pharmaceutical manufacturers typically use *in vitro* assays on new encapsulations to assess drug availability, to monitor quality control and/or to fulfill regulatory requirements. Current versions of *in vitro* drug release assays are generally time consuming, complex and non-standardized. There exists a critical need to develop *in vitro* assays that are robust and reproducible. This research opportunity entails the design, development and controlled evaluation of *in vitro* drug release assays that are capable of accurate temporal measurement of free, protein-bound and vector-encapsulated drug fractions in nano-enabled drug products. Assay development efforts should focus on the incorporation of a robust and optimized experimental design aimed at assessing the sources of variability, repeatability and reproducibility of the assay. Assay measurements should incorporate the use of process controls, rigorous statistical analysis techniques and assay robustness evaluations appropriate for the design of interlaboratory studies.

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Keywords: drug delivery; drug product; drug release; exosomes; *in vitro* assays, liposomes; measurement assurance; medical; method development; nanomedicine; nanotechnology; pharmaceutical.

References

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