

Exploring the Biological Behavior and Fate of Nanomedicines by Advanced Light Source Analytical Techniques

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Exploration of the biological behavior and fate of nanoparticles, as affected by the nanomaterial–biology (nano–bio) interaction, has become progressively critical for guiding the rational design and optimization of nanomedicines to minimize adverse effects, support clinical translation, and aid in evaluation by regulatory agencies. Because of the complexity of the biological environment and the dynamic variations in the bioactivity of nanomedicines, in situ, label-free analysis of the transport and transformation of nanomedicines has remained a challenge. Recent improvements in optics, detectors, and light sources have allowed the expansion of advanced light source (ALS) analytical technologies to dig into the underexplored behavior and fate of nanomedicines in vivo. In this talk, we focus on several selected ALS analytical technologies, including imaging and spectroscopy, and provide an overview of the emerging opportunities for their applications in the exploration of the biological behavior and fate of nanomedicines. We also discuss the challenges and limitations faced by current approaches and tools and the expectations for the future development of advanced light sources and technologies. Improved ALS imaging and spectroscopy techniques will accelerate a profound understanding of the biological behavior of new nanomedicines. Such advancements are expected to inspire new insights into nanomedicine research and promote the development of ALS capabilities and methods more suitable for nanomedicine evaluation with the goal of clinical translation.

References

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