

# Safety of Nanomaterials for Bioengineering/Pharmaceutical Applications

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Nanomaterials have increasingly been used for a wide variety of applications as diverse as electronics, energy storage, automobile, cosmetics, and tissue engineering. In addition, due to their unique optical, electrical, and thermal properties as well as their deep tissue penetration, nanomaterials have been explored for various *in vivo* biomedical and pharmaceutical applications such as drug delivery, tumor targeting, vaccine delivery, and magnetic resonance imaging. Despite their great therapeutic potential, their actual use *in vivo* has been limited largely due to their safety concern as some of the commonly used nanomaterials have been shown to pose significant health risks, especially after a long-term use or exposure. This presentation will address this safety concern, examine key properties of nanomaterials that contribute to their toxicity and pathogenicity, and identify key barriers that prevent their safe and effective use. Further, we will discuss FDA regulation of nanomaterials and address some of the critical knowledge gaps necessary for safety evaluations and approval of nanomaterials. Finally, we will examine selection criteria for bio-applicable nanomaterials and explore innovative safe-by-design strategies that could be used to improve the safety of nanomaterials.

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