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The ability of physiological variables to modulate nanomaterial behavior is an emerging concern for nano-based drug delivery techniques

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Colloidal gold nanoparticles (AuNPs) are being increasingly utilized in biomedical applications, such as drug/gene delivery and bio-imaging techniques. However, the effectiveness of these procedures is highly dependent upon sustained, strong interactions between AuNPs and the surrounding environment; referred to as the nano-bio interface. Recently, it has been established that this interface is reliant on the formation of a protein-NP complex. The protein corona surrounding NPs is dynamic by nature and is dependent upon numerous factors including the environmental composition and specific physicochemical properties of the particles. However, little is currently known about how physiological variables, such as fluid flow and biological fluids outside of blood, modulate the protein-NP complex and subsequent particokinetics. We demonstrated that the addition of shear stress, introduced through dynamic fluid movement within the cellular system, severely disrupted the AuNP protein corona, resulting in an altered nano-bio interface and AuNP deposition efficiency. As drug/gene delivery requires high AuNP delivery to a target, this loss of NP transport potential highlights a current limitation within the field. Moreover, circulating NPs have a strong likelihood of encountering multiple physiological environments, such as interstitial and lysosomal fluids; of which the influence on the nano-bio interface has yet to be explored. We determined that when dispersed in these biological fluids, both the protein corona and the deposited AuNP dose was altered; as a function of original surface chemistry. Given these results, it was clear that physiologically variables should be accounted for during design and evaluation of nano-based drug delivery systems.

Biography

Kristen K Comfort has obtained her PhD in Chemical Engineering from North Carolina State University and completed her Post-doctoral studies as a National Research Council Fellow with the Air Force Research Laboratories at Wright Patterson Air Force Base. She is currently an Assistant Professor of Chemical Engineering and is serving as the Director of the graduate Bio-Engineering program. Her research focus is on the evaluation of nanomaterial behavior and subsequent biological responses in enhanced *in vitro* environments; an area in which she currently has over 15 publications, many of which are in high impact journals.

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