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The effect on the diffusion of small aqueous soluble molecules based on the interactions with collagen in vitreous humor

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Diffusion of protein-based drugs (e.g. ranibizumab and bevacizumab) in the eye often depends on the viscosity and the mesh size of the vitreous humor. The diffusion speed of molecules within a liquid is inversely proportional to the viscosity, and therefore the molecules diffuse much slower in vitreous humor than in water. The mesh size of the vitreous affects the diffusion of drugs with a large molecular weight due to the role of the network as a physical barrier to the drugs involved. However, little has been studied regarding the interaction (or the binding) between the vitreous components and the drug molecules. The surface charge on the vitreous component that causes the binding with the drug molecules also potentially plays a significant role in the diffusion of the drug molecules. This effect may become very significant particularly in the diffusion of small molecular drugs (e.g. dexamethasone). In this study, the interaction between the small drug molecules and the vitreous components is studied. The interaction being studied is independent of the viscosity (by using homogenized vitreous samples) and the mesh size of the vitreous (small testing molecules). Our results show that the diffusion of the small aqueous soluble molecules is highly interfered by the macromolecules present in the vitreous content when compared with water as the diffusion medium. Our results further suggest that the small molecules probably bind with the collagen, but not the hyaluronate that are present in the vitreous humor.

Biography

Anderson Ho Cheung Shum is an Assistant Professor in Mechanical Engineering at the University of Hong Kong. He received his undergraduate degree from Princeton University and PhD from Harvard University. His research interests include emulsions, micro-fluidics, emulsion-templated materials and soft matter. He received the Early Career Award by the Research Grants Council of Hong Kong. He is an Editorial Board Member in "Scientific Reports" published by the *Nature Publishing Group* and in other journals. He has published ~70 articles and is a reviewer for journals, including "*Nature Nanotechnology*" and "PNAS", and for funding agencies in the United States, Europe and Asia.

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