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# Hierarchical structure of mucin within the gastrointestinal tract and its interaction with dietary components

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The adherent mucus layer is a vital component of the body's epithelial surfaces. Mucus assembly is characterised by the presence of multiple levels of mucin structure at different length scales. This gives mucus its unique set of rheological and barrier properties that enable it to establish an effective physical and selective diffusion barrier as well as to hydrate the underlying epithelium. The rheological and structural characteristics of intestinal mucin, the functional component of the mucus layer and their interaction with cell wall components, that are liked with a number of health benefits are investigated. Biochemically well characterised porcine intestinal mucin has been utilised as a model for human mucins to characterise their viscoelasticity, structure and dynamics as a function of concentration, pH and $Ca^{2+}$. The mesoscopic forces that mediate mucin were investigated using reducing, chaotropic and chelating agent agents. The rheological and structural characteristics of mucin were investigated using a combination of particle tracking microrheology, narrow gap oscillatory shear and high shear rheometry, and confocal microscopy. In this work, the complex rheological properties of the gelling mucus preparation are in a striking contrast with that of extensively purified mucin. The role and importance of non-mucin components have been elaborated, and the contribution to such interactions as hydrogen bonding, $Ca^{2+}$-mediated links, and disulfide bonds has been evaluated. These bulk viscoelastic values are dominated by the elastic moduli, while the microrheological response is less dominant. We compare the ability of soluble dietary fibers and plant cell walls to alter the rheological and diffusion properties of purified intestinal mucin. Altering the organisation of mucus as a result of interactions with food components such as plant cell walls and soluble dietary fiber will provide new insights into the ways in which these nutritional components affect the barrier properties of mucus, and provide a possible underpinning mechanism contributing to their health promoting properties.

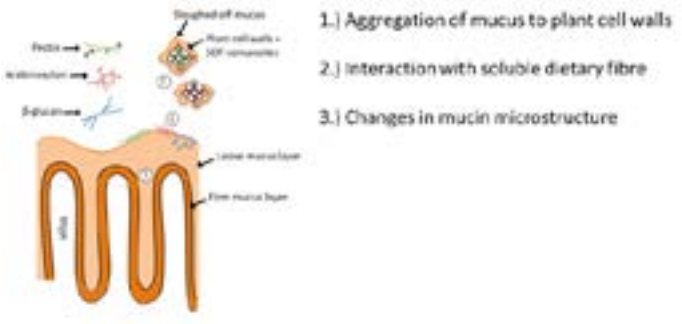


**Figure 1:** Possible pathways of interaction of SDF-containing food particles with the mucus layer. (1) binding of sloughed-off mucus to plant cell walls within lumen; (2) interaction of mucus with solubilised dietary fibre polysaccharides; (3) changes in the microstructure within the mucus layer

## Biography

Oliver Meldrum obtained a Bachelor of Science (Hons.) at the Australian National University and is currently undertaking a PhD at the University of Queensland. His major research interest concern is understanding the structure and rheology of mucus that lines the internal surfaces of the body and a focus on what food structure and food components are able to modify the physical and selective barrier properties of intestinal mucus.

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