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Pulling Milk Lipids Apart and Putting Them Back Together Again –A Self-assembly Approach

Friday, 20 November 2020 10:50 (20 minutes)

Introduction: Digestion of the milk lipids in our intestines yields monoglycerides and fatty acids that self-assemble into a variety of liquid crystalline structures. This self-assembly process is species dependent,[1,2] suggesting an important role for these structures in infant nutrition. Our recent work on the SAXS/WAXS beamline has focussed on studying how the lipid compositions of different milks generates different self-assembled structures both by digesting milk and analysing the by-products and assembling lipid mixtures that replicate the milk of different species from readily available fats and oils.

Methods: Small angle X-ray scattering (SAXS) with in situ lipolysis was used to measure the lipid self-assembly in various types of milk and infant formulae during digestion.[3] The structures observed were correlated with the resulting digestion products using a combination of liquid chromatography coupled to mass spectrometry (LCMS) and principle component analysis (PCA).[4] Lipid mixtures were prepared in the lab by mixing either homotriglycerides or natural fats and oils. These lipid mixtures were dispersed to form milk-like emulsions and their lipid self-assembly during digestion was compared with the milks and infant formulae.

Results & Discussion: This presentation will discuss the lipid liquid crystalline structures formed in a variety of milks and milk-like emulsions during digestion and how they can be mimicked. The lipid self-assembly in cow and human milk was shown to be replicated when the right balance of emulsified lipids was prepared by mixing homotriglycerides or blending milk fat with natural oils.[5] These emulsions provide representative digestive colloid structures through which to analyse the impact of lipid composition on self-assembly and bioactive delivery.

References

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