



Contribution ID : 25

Type : Oral

Structures of biliary micelles during solubilisation of lipids mimicking the digestion products of human and bovine milk

Wednesday, 24 November 2021 11:20 (15)

Milk is our sole source of nutrition for the first six months of life and milk lipids carry fat-soluble nutrients through the gut as well as providing most of the energy we consume with milk. The digestion and absorption of lipids, predominantly triglycerides, and entrained nutrients is therefore important for survival and growth. Milk triglycerides are regarded amongst the most chemically complex mixtures, their composition is species-dependent and determines the mixture of fatty acids and monoglycerides that form during their digestion. Most lipid digestion takes place in the small intestines where bile salts mixed with phospholipids in the intestinal fluids form a colloidal sink into which the poorly-soluble digestion products can partition and be absorbed at the intestinal walls. This work describes attempts to simulate how the structures of biliary micelles change when they absorb milk digestion products under intestinal conditions. Mixtures of fatty acids and monoglycerides were prepared to mimic the digestion products of human and bovine milk. The chemical complexity of the mixtures was varied by including between four and eight different lipid chain types in the digestion product mixtures. The effect of pH on micelle structure was also studied within the range of pH 6.4-7.7, consistent with the increase in pH along the intestinal tract. The structural differences when these complex lipid mixtures were solubilised by bile salt/phospholipid micelles were identified using the SAXS/WAXS beamline at the ANSTO Australian Synchrotron. The lipid composition was found to be a primary driver of micelle shape and size, with pH having a secondary affect in reducing aggregate formation at higher pH.

Level of Expertise

Expert

Presenter Gender

Man

Pronouns

He/Him

Which facility did you use for your research

Australian Synchrotron

Students Only - Are you interested in AINSE student funding

Do you wish to take part in the Student Poster Slam

Condition of submission

Yes

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Session Classification : Biomedicine, Life science & Food Science

Track Classification : Biomedicine, Life science & Food Science