

Unlocking milk's formula could save lives, say scientists

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(Phys.org) —A new study on the digestion of milk could lead to the development of new formulas for premature babies, weight loss drinks and potentially new drug delivery systems.

Published in the journal *ACS Nano*, the Monash University research shows for the first time detailed insights into the [structure](#) of milk during digestion.

Whilst milk's nutritional values are well known, little research has been

conducted into the detailed structure of milk and how its fats interact with the [digestive system](#) until now.

Funded by the Australian Research Council (ARC), and led by Dr Stefan Salentinig and Professor Ben Boyd from the Monash Institute of Pharmaceutical Sciences (MIPS), the team looked at the nanostructure of milk to find out how its components interact with the human digestive system.

They discovered milk has a highly geometrically ordered structure when being digested.

Dr Salentinig said the research provides a blueprint for the development of new milk products. It could also lead to a new system for [drug delivery](#).

"By unlocking the detailed structure of milk we have the potential to create milk loaded with fat soluble vitamins and brain building molecules for [premature babies](#), or a drink that slows digestion so people feel fuller for longer. We could even harness milk's ability as a 'carrier' to develop new forms of drug delivery," Dr Salentinig said.

By chemically recreating the digestive system in a glass beaker and adding cows' milk, the team found that milk has a unique structure – an emulsion of fats, nutrients and water forms a structure which enhances digestion.

As well as laboratory work at MIPS, the researchers accessed specialist instruments at the Australian Synchrotron to simulate digestion and accelerate the research. Using enzymes present in the body, water was added to [milk fat](#) to break it down, and the Synchrotron's small angle X-ray scattering beam showed that when digested, the by-products of milk become highly organised.

Dr Salentinig said the structure is similar to a sponge, potentially enhancing the absorption of milk's healthy fats.

"We knew about the building blocks of milk and that [milk](#) fat has significant influence on the flavor, texture and nutritional value of all dairy food. But what we didn't know was the structural arrangement of this fat during digestion," he said.

"We found that when the body starts the digestion process, an enzyme called lipase breaks down the fat molecules to form a highly geometrically ordered structure. These small and highly organised components enable fats, vitamins and lipid-soluble drugs to cross cell membranes and get into the circulatory system," Dr Salentinig said.

The next phase of the research will see the team work with nutritionists to better make the link between these new findings and dietary outcomes, and under the ARC funding, utilize these findings to design and test improved medicines.

Provided by Monash University

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