

**Title:**

The Milk Protein Corona: A Natural Mechanism Shaping Intestinal Transport and Nutritional Bioavailability

**Session:**

Shaping the Future of Nutrition: Evidence-Driven Science Meets Real-World Impact

**Abstract**

Breast milk is a dynamic biological fluid that extends beyond basic nutrition to actively modulate intestinal physiology and influence nutrient bioavailability. Among its underexplored functions is its ability to shape the interface between ingested particles and the intestinal barrier.

In this work, we investigate the formation of a milk-derived protein corona — a structured layer of adsorbed milk proteins that forms around dietary liposomes and macromolecules upon contact. We demonstrate that this naturally occurring corona alters liposome physicochemical properties and enhances their interaction with the intestinal epithelium.

Using *in vitro* and *ex vivo* intestinal models, we show that exposure to breast milk promotes increased transport across the intestinal barrier, associated with modulation of tight junction dynamics. Importantly, the composition of the milk protein corona varies according to liposome surface properties, suggesting a selective and biologically tuned mechanism that influences intestinal permeability and the absorption of bioactive compounds.

Building on this natural mechanism, we developed a technology platform that harnesses breast milk-derived corona formation to enhance the intestinal delivery of nutrients and bioactive compounds. This approach enables the design of next-generation functional foods alongside advanced nutritional delivery systems, grounded in physiological principles rather than synthetic modification.

By translating an evolved maternal biological strategy into applied food and nutrition technology, this work contributes to shaping the future of precision, biologically inspired nutrition.