The production of an infant formula with a minimally processed route impacts its nutritional, physiological and sensorial qualities

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Many infants receive infant formulas (IFs), the most nutritionally adequate substitute to human milk. However, health effects still differ between these two foods. IF production requires multiple unit operations, particularly heat treatments leading among others to protein denaturation/aggregation. Recently, a minimal processing route (low heat load) allowed the semi-industrial production of a bacteriologically safe IF, with a high content of native proteins and stable over time. The objective of the present study was to evaluate its organoleptic, nutritional and physiological properties as compared with a high heat load IF.

Two complete powdered IFs were produced from microfiltered bovine milk and whey protein concentrate, with no heat treatment (T-) or successive ones (T+++), resulting in a protein denaturation extent of 4.4±0.4% and 60.0±0.1%, respectively. Their organoleptic properties were determined by aroma analysis (gas chromatography / mass spectrometry) and sensory evaluation in human adults (n =50). The digestive deconstruction of IFs was followed through i*n vitro* dynamic digestion. The true protein digestibility and the impact on intestinal homeostasis and microbiota were determined in young rats (n = 6-8).

The organoleptic quality of the IFs significantly differed (triangular test, $p<0.0001$), with a higher aroma compound concentration in T- than in T+++. The IFs presented a different microstructure, leading to larger aggregates for T- during its *in vitro* gastric digestion. T- had a higher *in vivo* true protein digestibility than T+++ (96.6±5.4% vs. 91.9±5.4%, p-value=0.09) such as for plasma amino acid concentration 1-hour postprandially (p-value<0.001). T- increased dietary intake and weight gain, decreased the caecal ammonium content, and modified the caecal microbiota species in rats.

This study demonstrated that the minimally processed IF (T-) had different organoleptic, nutritional and physiological properties, including an enhanced protein bioavailability. Such innovative IF may be a further step towards human milk biomimetics.

Quote : It is feasible to produce a native and safe infant formula with **a minimally processed route.** At the conference, I will present how this impacts its organoleptic, nutritional and physiological properties.