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Optimization of the oxidative stability and lipid profile of omega-3 enriched infant flours

Mathilde Cancalon, Youna Hemery, Noémie Dormoy, Nathalie Barouh, Erwann Durand, Bruno Baréa, Reine Barbar, Leslie Lhomond, Adrien Reau, Valérie Micard, et al.

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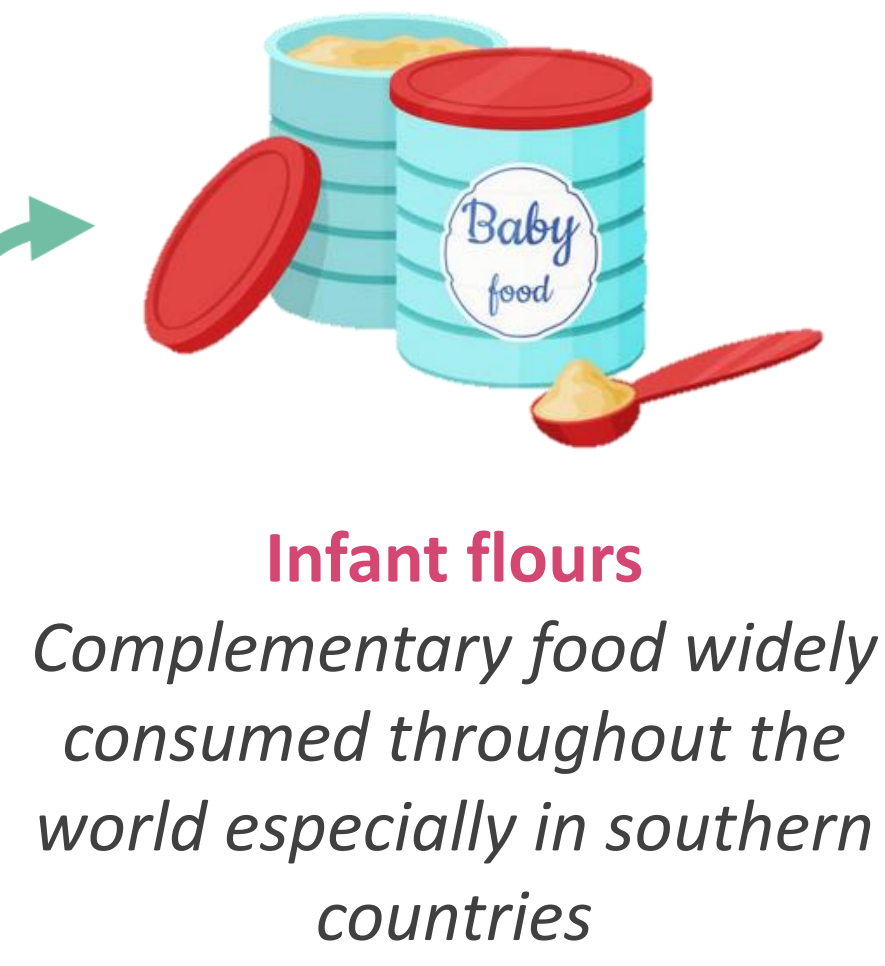
HAL Authorization

Mathilde Cancalon^{a,b,c}, Youna Hemery^{b,d}, Noémie Dormoy^{a,b}, Nathalie Barouh^{a,b}, Erwann Durand^{a,b}, Bruno Baréa^{a,b}, Reine Barbar^c, Leslie Lhomond^c, Adrien Reau^c, Valérie Micard^c, Pierre Villeneuve^{a,b} and Claire Bourlieu Lacanal^{c*}

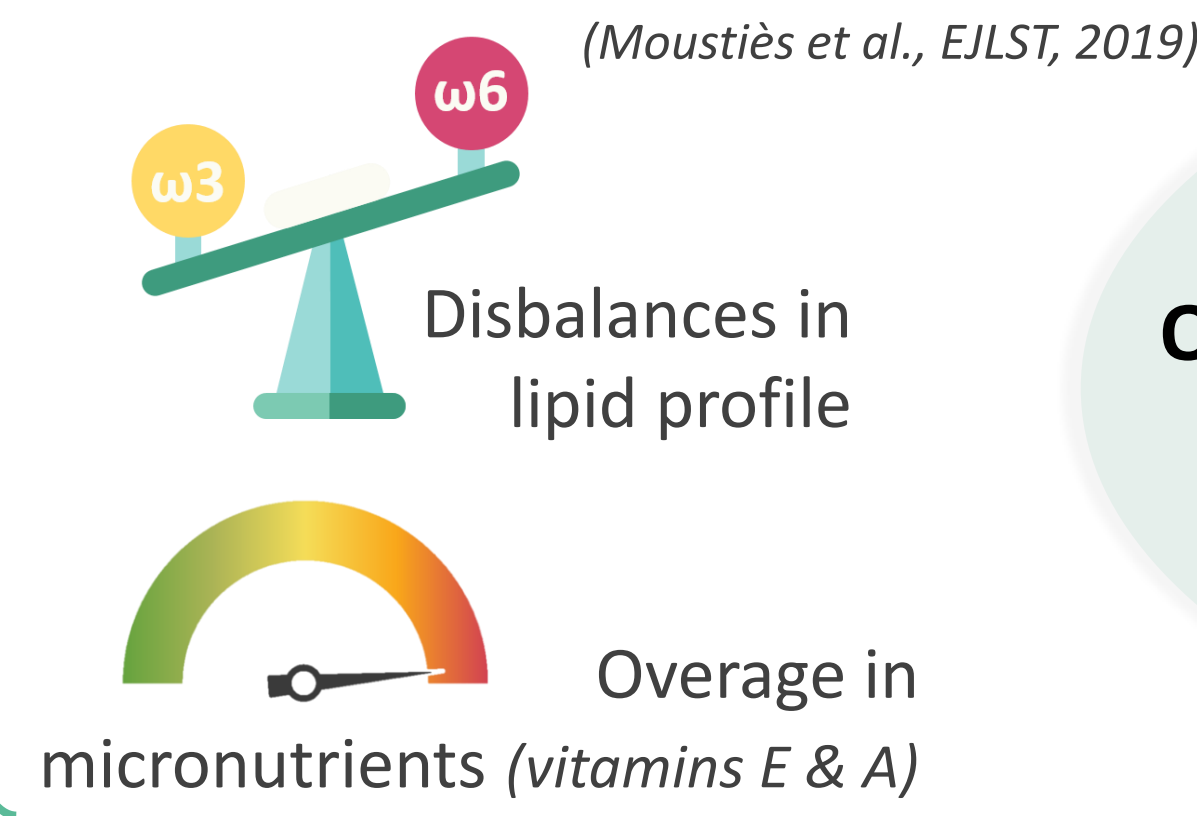
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CONTEXT



MAIN ISSUES

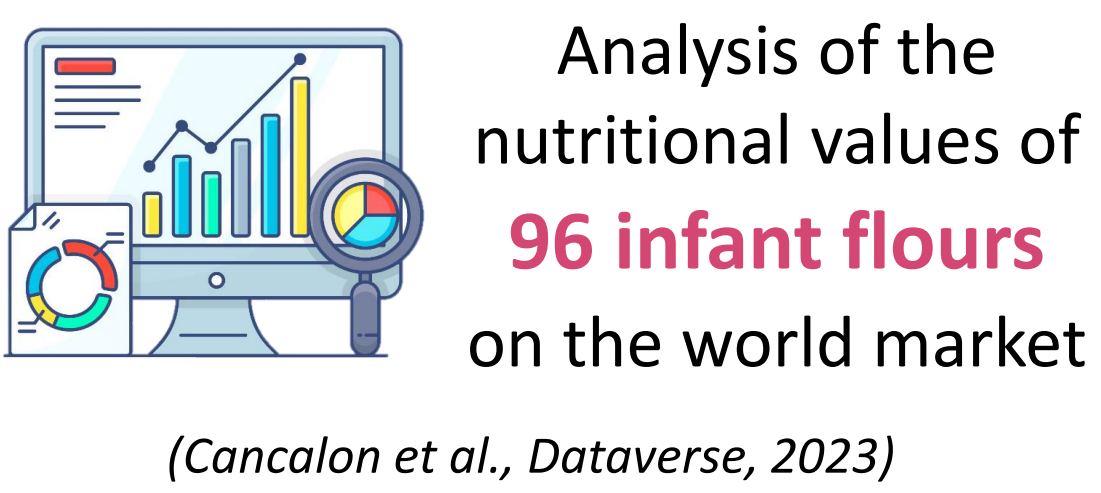


AIM OF THE STUDY

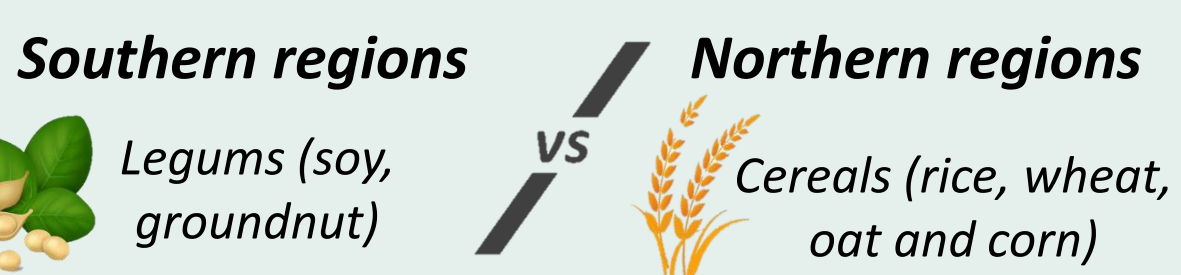
Optimization of omega-3 enriched infant flours formulation in order to improve their lipid profiles and identification of key lipid levers that increase their oxidative stability

EXPERIMENTAL STRATEGY

Infant flours formulation

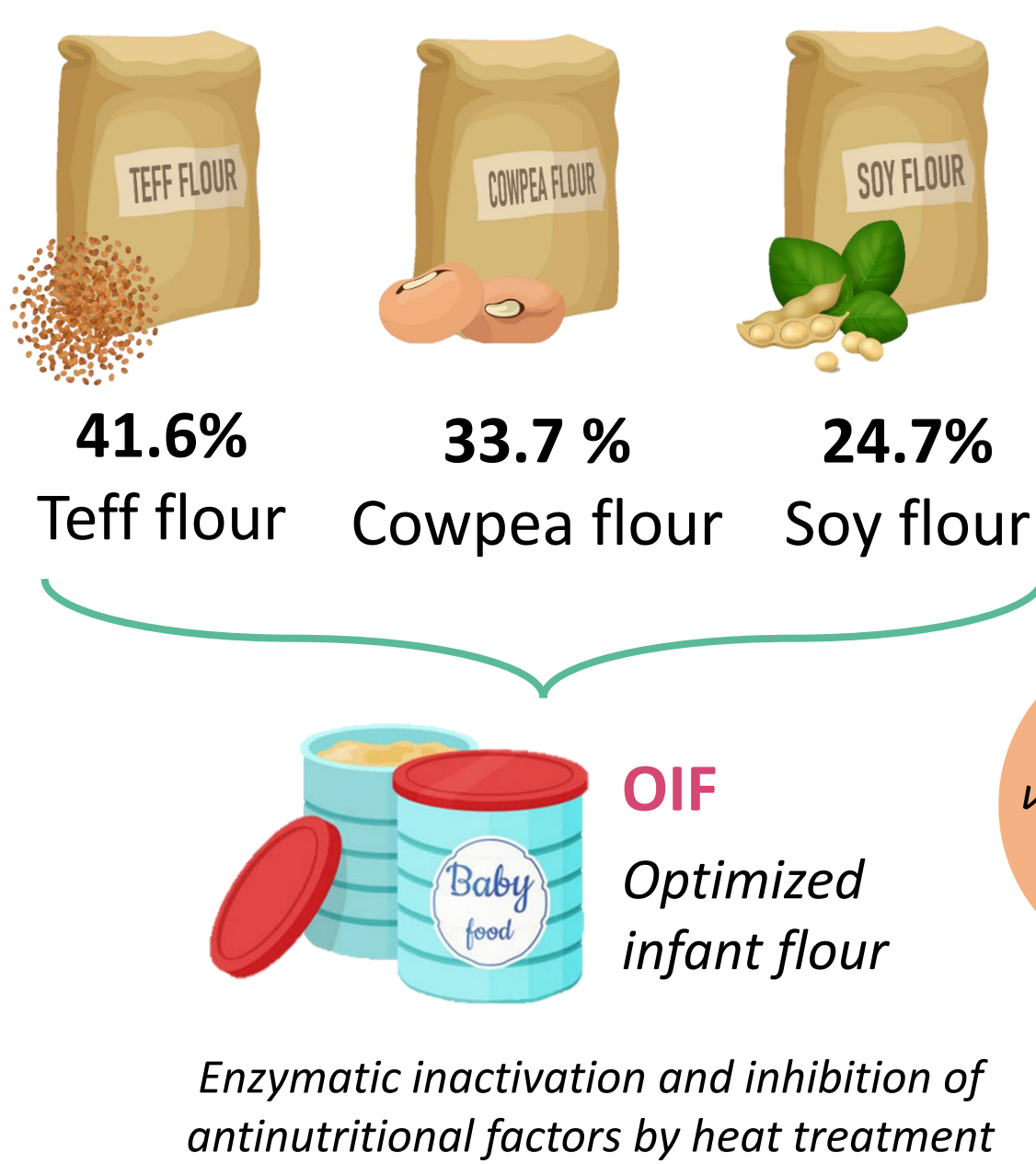


Important heterogeneity of nutritional values

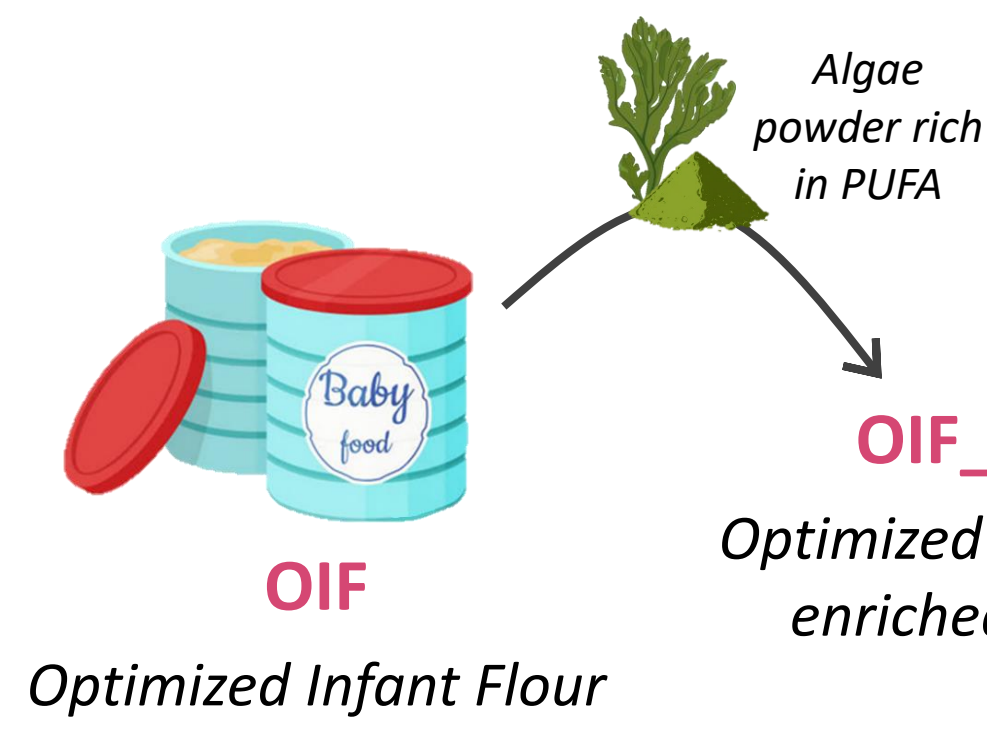


Formulation of the optimized infant flours

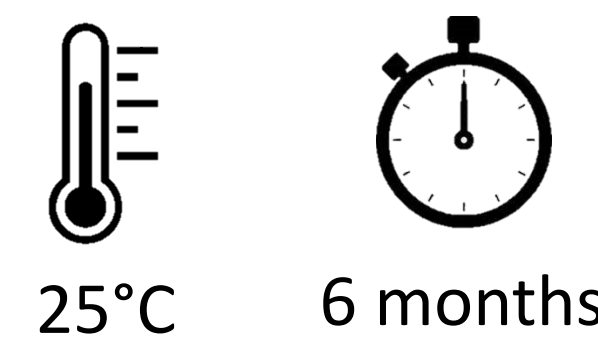
by introducing $\omega 3$ flours sources



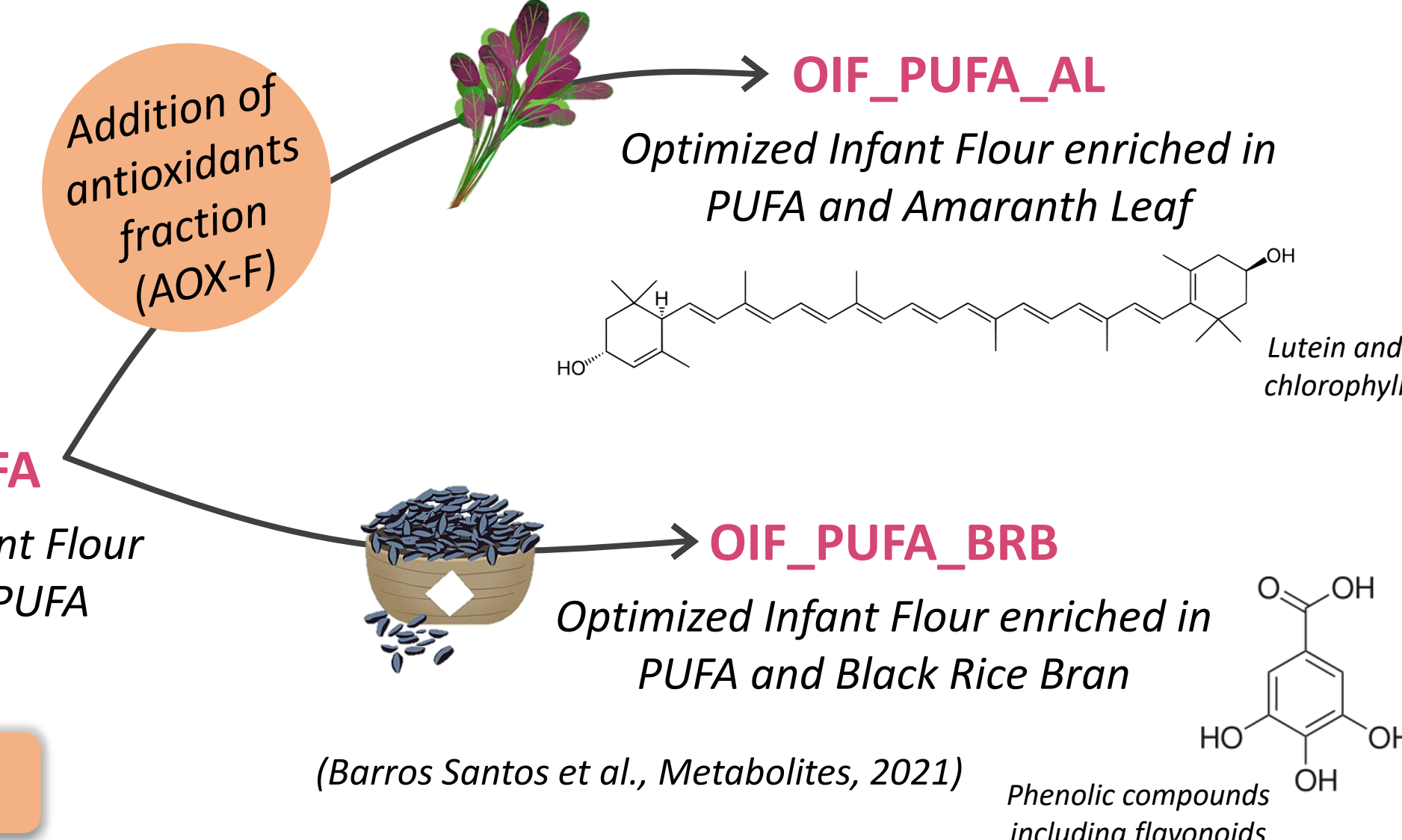
Infant flours preparation



Storage test

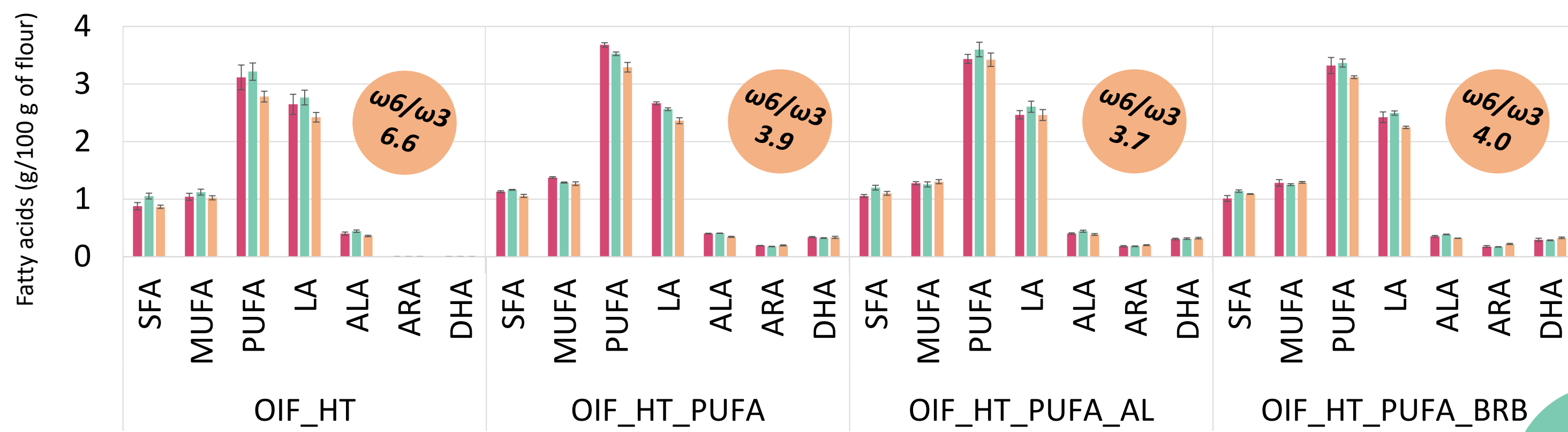


Sampling times



RESULTS

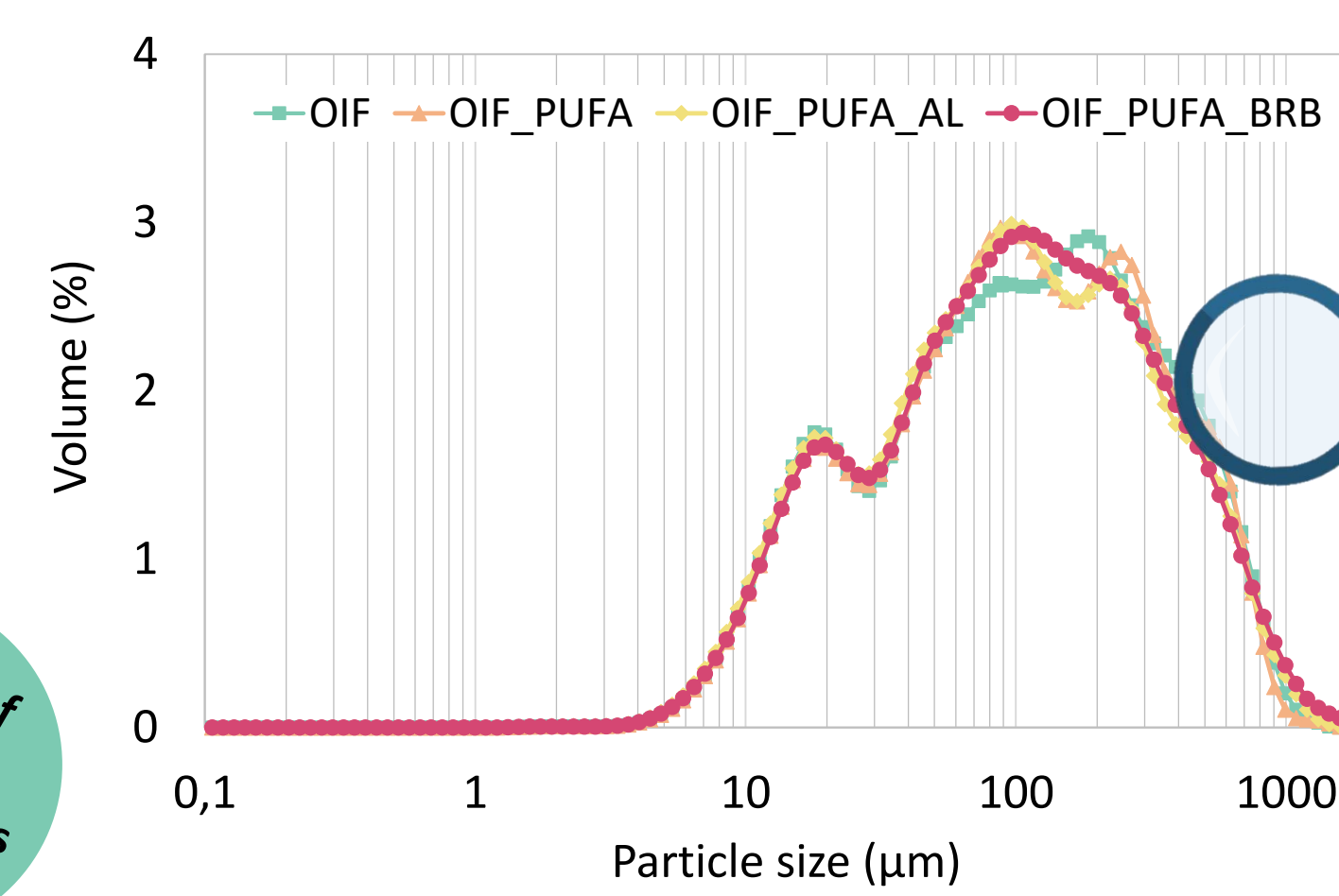
Fatty acid profiles



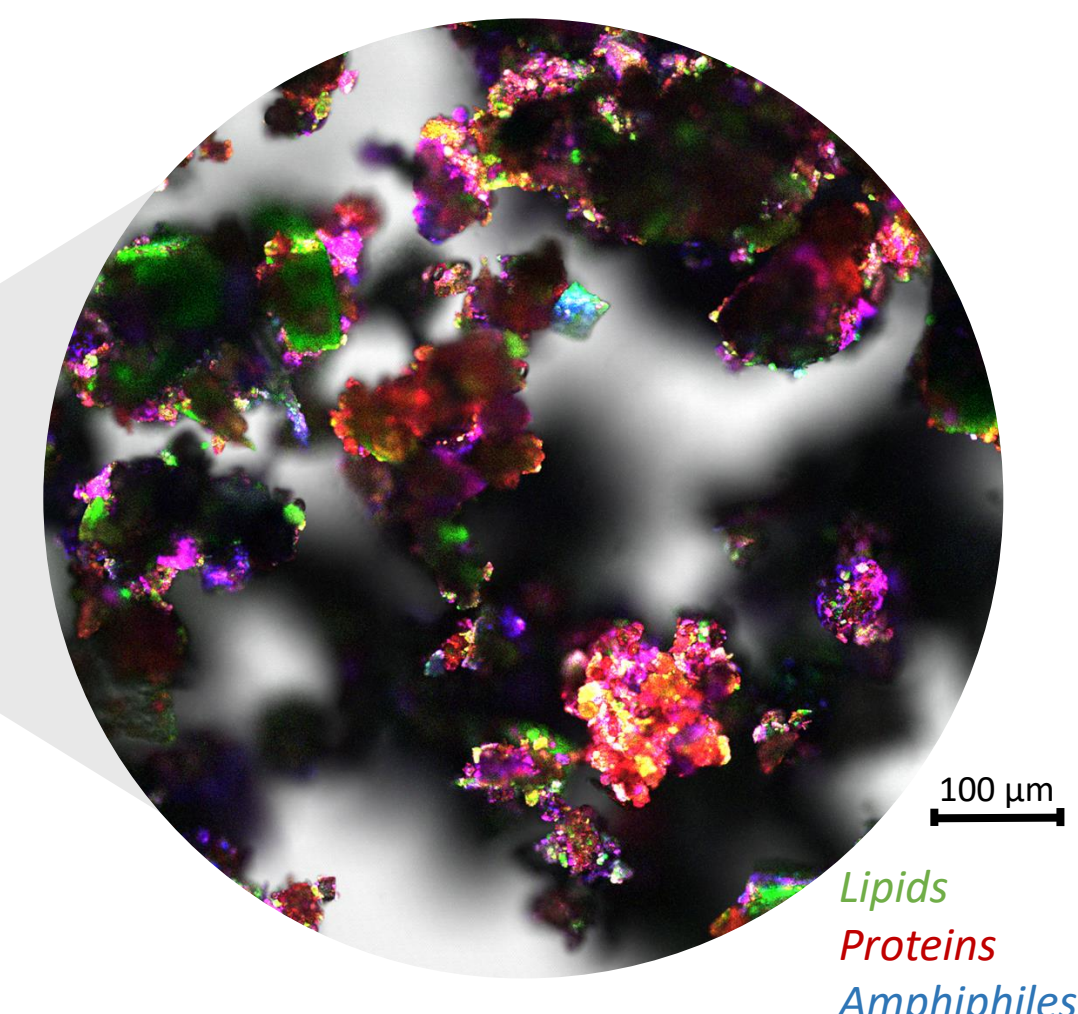
✓ The fatty acid profiles were adapted to the nutritional needs of infants

Physical characterization

Particle size distribution



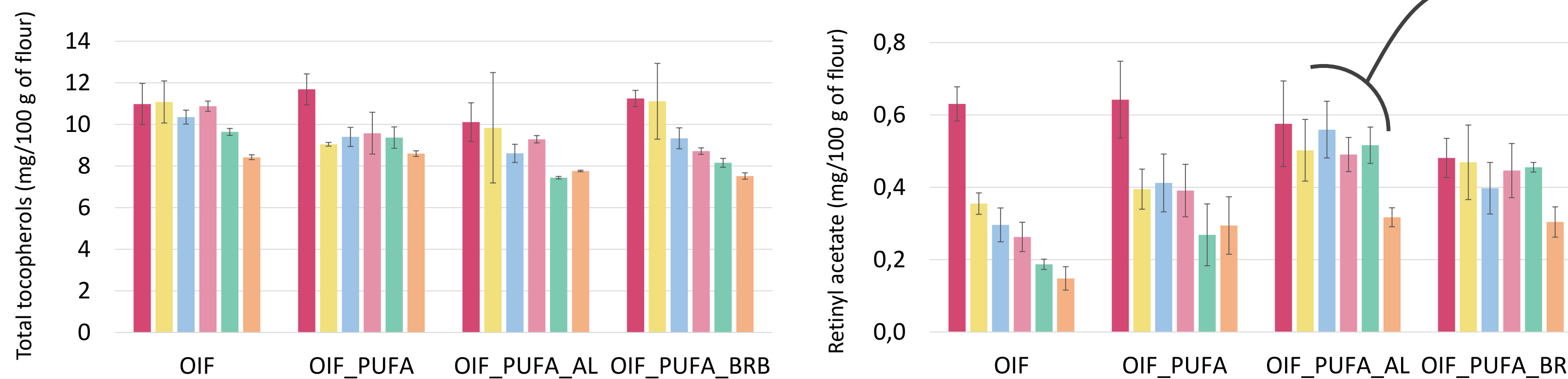
Typical confocal laser scanning microscopy observation



✓ All the infant flours studied showed similar multimodal particle size distribution

Monitoring lipid oxidation rate

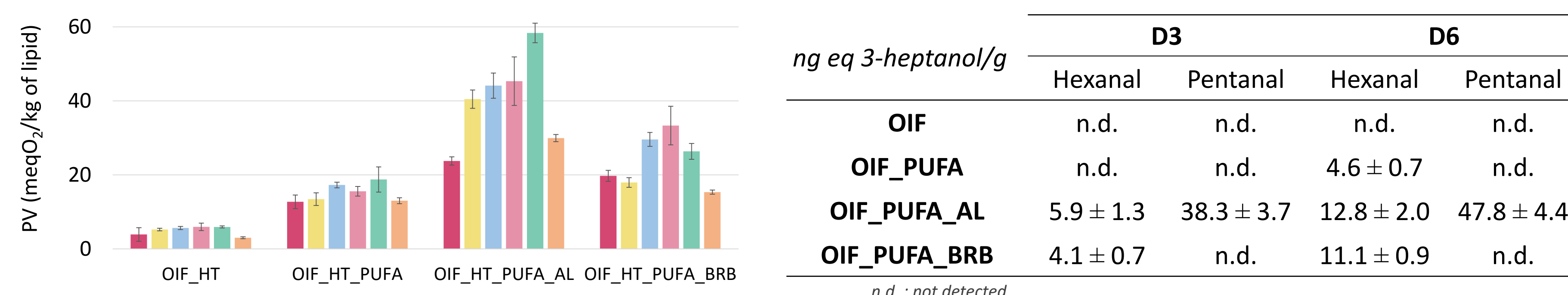
Evolution of total tocopherols and retinyl acetate contents



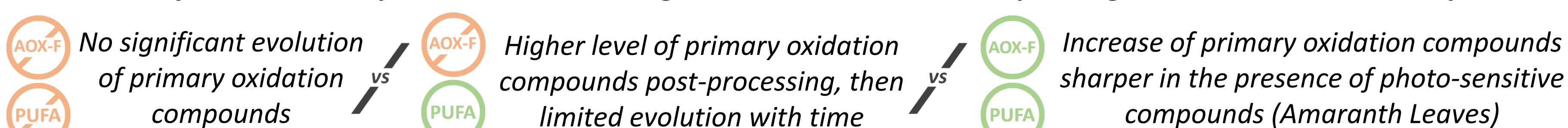
✓ The degradation kinetics of fat-soluble vitamins are dependent on the addition of antioxidants fraction



Evolution of oxidation compounds (peroxide value and volatiles compounds)



✓ Primary oxidation compounds evolved through different mechanisms depending on the added AOX-F composition



Carotenoids and cereal bran act as stabilizing-vitamin A agents
(Van Wayenbergh et al., FRI, 2023)

CONCLUSIONS & PERSPECTIVES

This study showed that OIF had a quite good overall oxidative stability after 6 months of storage and a lipid profile adapted to the nutritional needs of infants with much improved $\omega 6/\omega 3$ ratio compared to commercial products. Depending on the chemical composition of the flours, and in particular their intrinsic antioxidants (AOX-F), different oxidation mechanisms appear to occur, with degradation primarily of vitamin A with a dominant auto-oxidative pathway (without AOX-F) or vitamin E with a dominant photo-oxidative pathway (with AOX-F).

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