# STRUCTURAL CHARACTERIZATION AND RELEASE PROFILE OF OMEGA-3 FATTY-ACIDS ENCAPSULATED IN NANOEMULSIONS

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Omega-3 (ω-3) fatty-acids are functional compounds with various benefits such as reduction of cardiovascular diseases. However, these fatty acids degrade quickly, present low water solubility and an unpleasant aroma, which make essential their encapsulation. The encapsulation (e.g. nanoemulsion production) process can change structural properties, which can affect the behavior of the system when applied to food matrices and within the gastrointestinal tract.
The objective of this work was to characterize oil-in-water bio-based nanoemulsions with ω-3 using lactoferrin as a natural emulsifier, when submitted to different drying processes.
Nanoemulsions were produced using high-pressure homogenization (5 cycles, 20,000 psi) using 2 % (w/w) lactoferrin and 5 % (w/w) ω-3. Nanoemulsions were dried by nanospray-drying (Nano Spray dryer B-90HP, Buchi) and freeze-drying methods. Physical and morphological properties were evaluated using dynamic light scattering (DLS) and transmission electron microscopy (TEM), respectively. Circular dichroism (CD) and FTIR-ATR were used to assess possible structural and chemical changes after dry treatments. Moreover, ω-3 release profile was studied in ethanol (20 % and 50 % (v/v)) at 25 ºC (simulation of food matrices) and at pH 7.4 and pH 2 at 37 ºC (simulation of different gastrointestinal phases).

DLS results showed that original size (≈170 nm) and zeta-potential (≈+30 mV) of nanoemulsions was not achieved after nanospray-drying process probably caused by protein agglomeration. CD and FTIR-ATR results revealed lactoferrin structural modifications after drying processes as well as a reduction of α-helix and β-sheet content, being this effect more evident on nanospray-drying samples. FTIR-ATR results showed shifts of the amide I and amide II bands in both drying processes samples. At 20 % ethanol, ω-3 began to release after 48h which could allow nanoemulsions incorporation in food products such as ice cream and mayonnaise.

This work provides useful information to design nanoemulsions aiming lipophilic compound encapsulation for food applications.