Short Scientific Report

STSM title: Interfacial and rheo-optical properties of chitin nanocrystal aqueous dispersions and emulsions

Grantee: Maria Tzoumaki (Aristotle University of Thessaloniki, supervisor: Prof. C. Biliaderis)

Host Institution: Wageningen University (E. van der Linden's Food Physics group under Dr E. Scholten's supervision)

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The purpose of the present STSM was to explore further the emulsifying properties of the chitin nanocrystals by studying their interfacial properties. The adsorption kinetics of the nanocrystals to the oil-water interface was assessed and additionally the rheological properties of the formed interfaces were investigated by means of dilatational rheology.

A further one objective of this STSM was to explore the chitin nanocrystal stabilized emulsion behavior under in-vitro conditions simulating lipid digestion in the small intestine. It was found that the chitin nanocrystals, when present at the oil-water interface, have the ability to retard the lipid digestion in comparison to some proteins, like whey protein and casein. This was attributed to the fact that the nanocrystals are strongly adsorbed at the oil-water interface. Bile salts, which are one of the key factors in the lipid digestion process, that aid towards destruction of the respective interfaces, may not be able to displace the nanocrystals from the interface providing a strong mechanical barrier. The relatively higher stability of the chitin nanocrystal stabilized oil-in-water emulsions, compared to the more conventional protein-stabilized emulsions was also confirmed by static light scattering measurements, microscopic observations and zeta-potential measurements.

Another aim of this STSM was to study chitin nanocrystal rheo-optical properties in order to estimate more precisely their size distribution and explore the possible effects of different conditions of preparation in their final size. It was confirmed that their dimensions were similar to those found previously by Transmission Electron Microscopy.

All the above studies assisted to gain a more thorough insight into the underlying mechanism of the chitin nanocrystal emulsion stabilization and the factors that may affect their properties. Furthermore, the results obtained were correlated with the lipolysis results acquired. The data from the above work will be further analyzed in order to explore the potential for publishing them as an article in a well respected journal in the field of food science.

Finally, this STSM gave the opportunity to the participating personnel of, the host and the home institutions, to explore possibilities for further collaboration in the field of food structuring and food physical chemistry. The grantee, also gained a significant experience in working in a multinational and high scientific level research environment, such as Wageningen University, and especially the Food Physics Group.