VALORIZATION OF WHEY PROTEINS BY FORMATION OF FUNCTIONAL NANOSTRUCTURES

Lorenzo Pastrana,
Ourbiolab, Department of Analytical Chemistry and Food Science, University of Vigo, Ourense, Spain.
pastrana@uvigo.es

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Some dairy formulations involve the use of thickener agents or vehicles to improve bioavailability or protect bioactive compunds against degradation during harsh processing conditions. α-Lactalbumin (α-La) contained in cow milk is responsible of some of physical, biological and nutritional characteristics of dairy products. α-La has also self-assembly properties when is partially hydrolyzed by a serine endoprotease resulting in the formation of nanotubes in the presence of a divalent cation.

The presence of nanotubes varies the structure of the α-La solution and different new physical properties (from the increase of viscosity to the formation of transparent solid gels) can be obtained by means of the kinetic control of the nanotube elongation, branching and shape.

In this work we studied the effect of the type of cation (Ca^{2+} and Mn^{2+}) at different molar ratios and the temperature in the nanotubes formation of α-La. The kinetics of nanotubes formation were followed by dynamic light scattering (DLS), reverse phase liquid chromatography (RP-HPLC) and spectrophotometry. Characterization of the structures obtained by image and fractal analysis was also performed.

In general the aggregation in presence of Ca^{2+} was slower than in presence of Mn^{2+} and the gels obtained with Ca^{2+} were weak and sometimes turbid. In contrast the gels obtained with Mn^{2+} were stronger and more transparent. The lag time previous to nanotube elongation was related with both hydrolysis and self-assembly. When the temperature increased the formation of nanotubes was faster and the lag time became shorter. Gels obtained at higher temperatures and higher Mn^{2+} concentration were the strongest and most transparent, which would be optimal to enhance the structure and functionality of foods.