DESIGNING WHEY PROTEIN-BASED ARCHITECTURES UNDER APPLICATION OF MODERATE ELECTRIC FIELDS

Pereira R. N.[1], Moreira T. C. P.[2], Rodrigues R. M.[1], Teixeira J. A.[1], Cunha R. L.[2] , Vicente A. A.[1*]
avicente@deb.uminho.pt
[1]Centre of Biological Engineering, University of Minho, 4710-057 Braga, Portugal
[2]Department of Food Engineering (DEA), Faculty of Food Engineering (FEA), University of Campinas (UNICAMP); Rua Monteiro Lobato, 80; Campinas-SP; CEP: 13083-862; Brazil

Milk proteins are now at the top of the list of functional super molecules, coupling interesting nutritional and biological properties. These biopolymers offer potential to be designed into structures with discrete morphologies and multi-functionalities. Recently it has been shown that Ohmic Heating (OH) appears as an interesting processing tool to be used on functionalization of important food macromolecules, such as whey proteins. The main goal of this study was to use the unique synergy between electrical and thermal effects of OH to trace and simultaneously interact with the biophysical state of proteins targeting the development of novel food biomaterials. Electric field *in-situ* can control electrostatic interactions of whey proteins during heating, reducing aggregation and maintaining unfolded protein reactive to salt-induced or acid gelation. After a first heating step (at 95 °C for 15 min), and addition of glucono-δ-lactone (GDL), a homogenous and fully-supported acid gel network composed of WPI and casein was obtained. Acid gelation was developed under constant electric field of 20

V/cm until a final pH of 4.6, which allowed to an inherent increase of the incubation temperature - i.e. from 25 to 78 ºC - due to gel development network and change of electrical conductance. With this process casein-whey gels were obtained in less than 2 h with improved water holding capacity (≥30 %) and mechanical properties comparable to gels produced after long ageing times (normally exceeding 24 h). Application of moderate electric fields during gelation process offers a new opportunity to development of whey protein based 3-D supporting architectures with optimized texture and water-holding capacity through a non-invasive monitoring and self- driven heating process.