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Stephane Pezenec, Cécile Le Floch-Fouéré, Said Bouhallab, Yann Desfougeres, Valérie Lechevalier-Datin, Thomas Croguennec, Anne Renault, Arnaud Saint-Jalmes, Françoise Nau, Gilles Paboeuf, et al.

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***Vers un contrôle des propriétés macroscopiques des milieux dispersés
par les propriétés associatives des protéines alimentaires***

***Striking associative properties of food proteins: a switch to control bulk
properties of dispersed media***

S. Beaufils, S. Bouhallab, F. Nau, V. Lechevalier, C. Le Floch-Fouéré, S. Pezennec

Institut de Physique de Rennes, UMR-CNRS 6251, 263 avenue du Général Leclerc, Campus de
Beaulieu, 35042 Rennes cedex

UMR1253, INRA, Agrocampus-Ouest, Science et Technologie du Lait et de l'œuf, 35042 Rennes
cedex

Many food proteins as egg white or milk protein show tensioactive properties. This means that one region of the protein has affinity for polar environment and another region of the protein prefers an apolar environment. For that reason, these proteins tend to adsorb to amphiphilic-hydrophobic interfaces such as air-water interface of bubble surface in case of foams or oil-water interface of droplets surfaces in case of emulsions. In both cases, food proteins act as stabilizers of the dispersed medium. In addition, and in contrast with small-molecular weight surfactants, proteins can also self-associate and form an interfacial film with viscoelastic properties, which also contributes to stabilization.

However, their tensioactive properties confer to food proteins striking associative properties that this presentation will illustrate following three ideas:

The mixture of two proteins as components of a dispersed medium can lead to enhanced bulk properties compared to the case where each protein is alone, even if one protein is in very small amount in the mixture. **This property offers the possibility to modulate bulk properties of a mixture using one protein as an additive.** The case of foaming properties of ovalbumine-lysozyme will illustrate this idea. We have shown (1,2) that the interaction between proteins preferentially takes place at the air-water interface and that the interfacial adsorbed film is stratified, the most tensioactive protein being adsorbed first.

The association of two proteins can lead to the formation of monodisperse microspheres, the ratio of each protein in the microsphere depending on the charge ratio. This property is illustrated by the case of the mixture alpha-lactalbumine/lysozyme (3). **We have shown that the first steps of these bulk associative properties are revealed by the interfacial properties of these proteins.**

The last part of this presentation shows how very slight modifications of a protein, hardly detectable with standard bulk characterisation tools, can lead to drastic changes in foaming and interfacial properties. The case of dry-heated lysozyme will be exposed, for which we have

shown (4) that a modification of one unique aminoacid greatly affects the interfacial properties of the protein and consequently greatly enhance the bulk properties of the foam. **It evidences that small changes on a protein can act as a swich relative to the bulk properties of the dispersed media stabilized with this protein.**

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- (3) M. Nigen, T. Croguennec, D. Renard, S. Bouhallab. Temperature Affects the Supramolecular Structures Resulting from α -Lactalbumin-Lysozyme Interaction. *Biochemistry* (2007), 46, 1248-1255
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