Why do Fatty Acid Salts Induce Gelation of Ovalbumin?

-The Mechanism for Fatty Acid Salts-Induced Gelation and the Application-

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Summary

We have reported that the mixture of ovalbumin (OVA) and fatty acid salts (FAS) such as sodium caplate or sodium oleate was able to form a transparent gel at room temperature without heating. In this study, we investigated that the relationship between the physicochemical properties and microstructure of the gels, and we studied on the effect of the hydrolysate of nutral lipid on the gelation of OVA. Furthermore, we analyzed the structural changes of OVA by the addition of FAS using circular dichroism (CD) spectrum and Fourier transform ir (FTIR).

When the suitable amount of FAS with different carbon chain lengths was added to OVA, the sodium caplate-induced gel was harder than the sodium-oleate induced gel. When we compared the microstructure, the sodium caplate-induced gel showed finer network but thicker filaments than the sodium oleate-induced gel. That is, sodium oleate-induced gel has larger pores in the network. It is obvious that physicochemical properties of the gel are closely associated with the microstructure. Furthermore the mixture of sodium oleate and glycerol which is hydrolysate of olive oil also induced gelation of OVA and improved the water-holding ability and transparency of the gel similar to FAS.

The spectrum of OVA in far-UV area was slightly changed by the addition of 2% FAS. The data in the far-UV indicates that secondary structure of OVA is basically maintained even after the addition of 2% FAS. However, in the near-UV area, the spectra showed great differences by the addition of 2% FAS, indicating that the tertiary structure was completely collapsed under the condition. It's suggests that the protein by the addition of FAS changed into molten-globule state.

Although FTIR showed that a decrease of α-helix and an increase of β-sheet were also observed on the formation of FAS-induced gel, the amounts of their changes were less than those of heat induced gel containg FAS. It suggested that although the mechanism for formation of FAS-induced gel is similar to that of heat-induced gel containg FAS, formation of FAS-induced gel is induced by milder denaturation of the protein.