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## **Chemical modifications on dry heated $\alpha$ -lactalbumin**

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Dry heating is commonly used in food and pharmaceutical industries to decontaminate heat-sensitive samples such as egg white or therapeutic protein products. Under these conditions thermal stability of proteins is increased and the changes in protein structure are limited. However, it was noted that the functionalities of the dry heated proteins are changed: for instance lysozyme, a poor foaming agent, gives stable foams after dry heating even if the secondary and tertiary structure of the protein are not affected. This discovery expands the use of dry heat treatment for functionalizing a wide variety of food proteins, even to those that resist wet-heat treatments of decontamination.

A clear picture of dry-heat induced modifications of proteins is necessary especially for those dedicated to the formulation of infant formula. In this study, LC-MS/MS was used to track the chemical modifications on milk proteins as illustrated here with  $\alpha$ -lactalbumin. The samples adjusted to pH 6.5 and water activity  $a_w = 0.23$  were dry heated at 100°C for up to 24 hours. Dry heat treatment traps a fraction of  $\alpha$ -lactalbumin molecules into non-native monomers. These non-native monomers were characterized by the loss of one or two water molecules per  $\alpha$ -lactalbumin molecules. Using tandem mass spectrometric peptide mapping, these chemical modifications were attributed to i- the formation of pyroglutamic acid from the N-terminal glutamic acid and ii- the formation of an internal cyclic imide at position Asp<sub>64</sub>. The structural and functional consequences of these modifications are discussed.

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