

199 Heat-induced reactions involving β -lactoglobulin and other milk proteins in milk, whey, and model systems. L. K. Creamer*¹, G. A. Manderson¹, Y-H. Hong², P. Havea¹, Y-H. Cho³, H. Singh⁴, A. Bienvenue⁵, and R. Jimenez-Flores⁵, ¹NZDRI, Palmerston North, New Zealand, ²Chonnam University, Kwanju, Korea, ³Mass. General Hospital, Boston, MA, USA, ⁴IFNHH, Massey University, Palmerston North, NZ, ⁵DPDC, Calpoly, San Luis Obispo, CA, USA.

Heat treatment of milks is an essential step in modern dairy processing and the effects can be far-reaching in terms of product functionality and the heat-induced gelation of whey protein concentrate (WPC) solutions is important in functional food applications. Heating WPC solutions or milk beyond pasteurisation causes some of the individual whey proteins form aggregates and to aggregate with the other whey proteins. Studies using various kinds of two-dimensional polyacrylamide gel electrophoresis (PAGE) analysis as the major tool with simple solutions of pure whey proteins confirmed that β -lactoglobulin (β -Lg) was the most important whey protein in these aggregations. A previously unknown group of intermediates, the non-native β -Lg monomers, was of particular interest and some characteristics of these and other early heat-induced intermediates were determined. The changes in the positions of the disulphide bonds in β -Lg as a consequence of heat treatment were identified from mass spectroscopy-based analyses. \otimes Heated mixtures of α -lactalbumin (α -La) and β -Lg were found to contain 1:1 disulfide-bonded dimers as well as non-native monomers, dimers, trimers, etc. of both α -La and β -Lg. The findings from this and other model systems were then tested in WPC solutions using one- and two-dimensional PAGE. \otimes In heat-treated milk the whey proteins interact to form disulfide bonds with the casein micelles and κ -casein (κ -Cn) is the most significant casein in this reaction and β -Lg was the most important whey protein in this reaction. In a model system, κ -Cn and β -Lg formed 1:1 aggregates as well as large polymeric aggregates. A heat-induced complex of β -Lg and κ -Cn was isolated from a heated mixture of casein micelles and β -Lg by chromatography. Analysis of this complex identified a number of novel disulfide bonds between β -Lg and κ -Cn. \otimes These results have shown that β -Lg is critical to the heat-induced changes in both milk and WPC, and have lead us to re-evaluate the likely mechanism for the initial changes within β -Lg in response to heat-treatment.

Key Words: β -Lactoglobulin - κ -casein complex, Non-native β -lactoglobulin monomers, Heat-induced β -Lg - α -La complex