W61 Effects of refrigeration and calcium on whey protein aggregation. M. R. Costa*[1,2], G. Brisson[1], M. L. Gigante[2], P. S. Tong[1], and R. Jiménez-Flores[1], [1]*California Polytechnic State University*, *San Luis Obispo*, [2]*State University of Campinas*, *Campinas, Brazil*.

Aggregation of whey proteins in 5% protein solution was studied using a laser diffraction particle size analyzer. Two whey protein concentrate powders (WPC80) with similar composition were evaluated: WPC1 was produced by traditional commercial procedures, and for WPC2 the liquid whey protein concentrate (LWPC, obtained by ultrafiltration) was refrigerated (4°C, overnight) prior being spray-dried. We studied the effects of refrigeration, adding calcium (50mM $CaCl_2$) to each of the WPC solutions, and heating (50°C/8min). Our results show that WPC1 solutions did not have particles larger than 6μm initially. However, calcium addition produced large aggregates (10-60μm diameter) that became the main volumetric fraction (78.6±0.2%). Aggregation was independent of heating, and the formed aggregates did not change after either heating or overnight refrigeration. In the WPC2 solutions, calcium addition did not have the same pronounced impact on aggregate formation as in the WPC1 solutions. The main volumetric fraction in the calcium-added solutions switched from particles smaller than 2μm to particles between 2 and 10μm diameter (54.5±0.8%) only after heating. However, after overnight refrigeration these largest aggregates were partially disrupted into the smallest particles, which returned as the main volumetric fraction (58.6±0.7%). The addition of β-mercaptoethanol (0.1%) had no particle size distribution effect over the solutions, while the presence of urea (4M) changed the turbid solutions immediately to clearer ones. This suggests the contribution of non-covalent interactions to aggregates formation. In addition to the noticeable large aggregate formation, our results show that refrigerating the LWPC prior spray-drying reduced the proteins susceptibility to $CaCl_2$-induced aggregation in the reconstituted WPC. The aggregates formed in this solution after calcium addition were not too big and reversible by refrigeration, indicating they were held together by hydrophobic interactions. In contrast, the $CaCl_2$-induced aggregates from WPC manufactured without the refrigerating step were much larger and formed irreversible aggregates.

Key Words: Whey Protein Concentrate, Whey Protein Aggregation, Particle Size Distribution