

### **572c High Pressure Thermal Sterilization of Precooked Egg Patties: Factors Affecting Preheating Efficiency**

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The preheating step is a critical control point to assure product safety during high pressure thermal sterilization processing. It is of utmost importance that the initial product temperature achieved during preheating is equal or higher than the pressure chamber to reach the target pressurization temperature. Furthermore, high preheating efficiency is key to diminish loss in quality, especially in large product loads. Preheating efficiency is easily affected by changes in preheating media, dimensions and structure of the product, the product initial temperature, product thermal diffusivity, and the type of utilized packaging material. Knowing the degree in which some of these factors affect the preheating rate in egg-based products can help establishing optimal processing conditions for these products. The purpose of this communication is to report on the effect of product size, packaging material used, and initial product temperature on the preheating efficiency in scrambled egg patties.

Selected commercial scrambled egg patties of individual size (43 g) and institutional ration size (170 g) were vacuum sealed in flexible pouches. Two types of pouches, a polymeric pouch and a metallized pouch were used and in both cases thermocouples were inserted. Temperature profiles were monitored during preheating up to 75°C in: (a) a boiling water bath with steam/air injection and in (b) a water bath equilibrated at 75°C. Preheating rate was also tested at two product initial temperatures 20°C and 60°C. The heating rate index  $f_h$  and heating lag factor  $j_h$ , obtained from the heating curves, were used to express preheating efficiency. A significantly higher preheating rate index  $f_h$  and smaller lag factor  $j_h$ , indicative of higher preheating efficiency, were found when using steam injection in boiling water in both the 43 g and the 170 g patties. Metallized pouches gave significantly lower  $f_h$  in comparison to polymeric plastic pouches due to the higher thickness of the material, which decreased heat transfer rate. The preheating rate also depended on the initial product temperatures in that a higher gradient between sample and water temperature gave higher preheating rate, however, product at higher initial temperature had lower residence time in the preheating chamber.

It was found that processing aids such as steam injection and a higher initial temperature are important to yield a more efficient preheating before high pressure processing. Optimization of preheating conditions in terms of packaging barrier, product temperature, and heating media is essential to shorten processing time, thereby improving the quality of the end product.