

## **Spores in dairy products: Characterization and destruction by pulsed light.**

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The USDA has reported an increase in the consumption of nonfat dry milk and skim milk powders due to the opening of international markets for these products. However, the main limitation to international sales is the spore counts in dairy powders. The objective of this study was to examine the characteristics of the spores in California milk powders, and to evaluate the potential quality improvement using pulsed light covering all wavelengths. We designed our experiments around four liquid matrices in which to contain the spores: sterile nanopure water, sterilized whey, non-fat UHT milk, and 2% UHT milk. In addition we tested dry matrices in six commercial skim milk and buttermilk powders. The bacteria used to inoculate these medias include ATCC reference strains (*Geobacillus* spp. and *Paenibacillus* spp.) and a collection of aerobic spore-forming bacteria isolated from California milk powders. These strains were selected because they were considered to be highly heat-resistant after exposure to excessive heat treatments. UV treatments with the Xenon pulsed lamp consisted of four different levels (1 burst, 2 bursts, 3 seconds, and 20 seconds) and included a post 4°C incubation and HTST pasteurization. Protein profiles were obtained for each strain used, and compared before and after treatments.

With pure water we observed a seven logarithmic reduction in spores with two bursts of pulsed UV light. However, cloudy solutions were much less permissive of the lethal action of light. These matrices had the same seven logarithmic reductions but only after 3 seconds. Powders were treated with variable success, and much detriment to the flavor and chemical structure. However, while the same reduction of spore viability was achieved, the powder buttermilk was significantly more resistant to off flavor development.