Research shows how Pulsed Light can play a part in processing milk safely and efficiently

Overview

In a Pennsylvania State University study, researchers measured the inactivation of Staphylococcus aureus in milk and milk foam using Pulsed UV Light treatment and surface response modeling. The study used a XENON Corporation Pulsed Light system to carry out the experiments.

The researchers aimed to explore the effectiveness of Pulsed UV Light treatment in eliminating *Staphylococcus aureus* bacteria from milk and milk foam samples. They applied Pulsed UV Light to contaminated samples, taking into account parameters such as UV light intensity and treatment time. Data analysis from these experiments using surface response modeling shows how different factors can impact bacterial inactivation.

The study found that implementing Pulsed UV Light treatment in the dairy industry could lead to improved food safety by reducing the risk of bacterial contamination in milk and its derived products.

Markets/Applications

- Dairy Industry: Ensure products are free from harmful bacteria, enhancing consumer confidence and reducing the risk of foodborne illnesses.
- Food Safety: Pulsed UV Light treatment could be applicable to other food products beyond milk and milk foam.
- Compliance: Demonstrate robust safety measures to satisfy regulatory bodies as well as the general public. Regulatory bodies could consider incorporating this technology into their guidelines and standards.

Highlights

- Pulsed UV Light was effective for the inactivation of *Staphylococcus aureus* (ATCC 25923) in milk and milk foam.
- Complete inactivation was obtained at various combinations of distances, sample volume, and treatment time.
- The study suggests that Pulsed UV Light can be a potential alternative to conventional thermal pasteurization, reducing energy demand, capital and operational costs, while retaining the sensory qualities of the milk.

"There is always a need to investigate alternative milk pasteurization technologies, which may reduce energy demand, capital and operational costs."

The information in this report was prepared by XENON and does not contain the complete research conducted by *Demirci* et al. A full version of the research paper is available at https://elibrary.asabe.org/abstract.asp?aid=25380

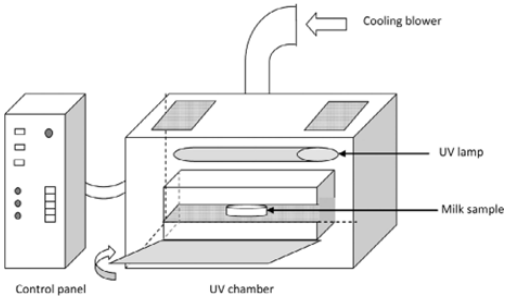
Summary of Research

Inactivation of Staphylococcus Aureus in Milk and Milk Foam by Pulsed UV Light Treatment and Surface Response Modeling

Original research by Ali Demirci, Ph.D., and Kathiravan Krishnamurthy

Objective: Investigate the effectiveness of Pulsed UV Light to inactivate *Staphylococcus aureus* in milk and milk foam under various conditions.

Methodology: Researchers conducted the study using milk samples placed in sterile aluminum containers inside a sterilization chamber. The samples were positioned at three different distances from the quartz window of the chamber. The effect of Pulsed UV Light on milk foam was also evaluated by varying the distance of the milk foam from the quartz window, treatment time, and its weight. The maximum treatment time was determined based on the physical effect it had on milk, with 180 seconds being the longest treatment time that did not induce significant physical changes. Three replications were performed for each combination.



Microbiological analysis was performed immediately after Pulsed UV Light treatment to count surviving populations of *S. aureus*. Milk temperature during the treatment was monitored using K-type thermocouples, and the data were stored using a data-logger. The energy available at different tray levels of the pulsed UV-light system was measured using a radiometer. A Box-Behnken surface response method was utilized for the experimental design, and Minitab statistical software was used to design the experiments. The effects of sample volume or weight, treatment time, and distance from the light source were investigated for milk and milk foam, with statistical significance tested using the surface response method.

Results & Conclusions: The study showed that pulsed UV-light can be effectively used for the inactivation of *S. aureus* in milk. Reductions varied from 0.16 to 8.55 log10 CFU/mL. A surface response model was developed and validated successfully, demonstrating the complete inactivation of *S. aureus* after 180 seconds of treatment time in two cases. Pulsed UV-light was also effective in inactivating *S. aureus* in milk foam. The study's positive results suggest that further research is warranted to find optimum conditions for the inactivation of *S. aureus* for continuous-flow conditions to represent commercial cases.

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