



Impact of Vital Vio's Antimicrobial Lighting Technology on Dairy Processing Microbes and Products

Prepared by Dr. Sara Shelley

HP Hood is an American dairy company based in Massachusetts that produces milk, cottage cheese, sour cream, ice cream, and more. It has 12 manufacturing plants, its own research and development section, and distributes dairy products throughout the United States.

Case Study Abstract

Study Objectives:

Objective I- Test degradation of materials under Vital Vio lighting compared to normal LEDs. Also test the oxidation of finished goods compared between those exposed to Vital Vio Lights and those exposed to normal LEDs.

Objective II- Test efficacy of Vital Vio antimicrobial lighting at killing a variety of microbial species of interest to HP Hood.

Test Parameters

Objective I- Materials and finished goods testing occurred at the Hood R&D facility under Vital Vio demo units with adjustable intensities.

Objective II- Microbial testing occurred in the Vital Vio Microbiology laboratory with the bacteria suspended in liquid cultures and exposed to a variety of light intensities.

Study Conclusions:

Objective I- Testing food processing parts showed no difference between material quality after being exposed to Vital Vio's lights compared to a normal LED light. There was also no acceleration of oxidation of finished goods exposed to Vital Vio lights compared to finished goods exposed to standard LEDs.

Objective II- Of the 11 microbial species tested under Vital Vio's visible light disinfection, all but two showed 90-99% reduction in the number of cells compared to the control cultures.



Vital Vio supplied lighting units for the R&D department of Hood to test the degradation of materials under Vital Vio lighting compared to normal LEDs. Vital Vio also performed microbial laboratory testing at our in-house lab in order to test the efficacy of Vital Vio lighting at killing a variety of microbial species of interest to HP Hood.

Methods:

Objective I- Materials testing occurred at the Hood R & D facility and consisted of exposing a variety of food processing and manufacturing materials to Vital Vio lights and comparing them to materials exposed to normal non-disinfecting LEDs to check for material breakdown. This testing occurred at the HP Hood R & D facility with a demo light provided by Vital Vio that went to at least 1000 lux. Materials were exposed for as long as 7 days and included a variety of gaskets, tubing, wash-down hoses, bottles, and finished packaged products. Finished goods were exposed in a similar fashion.

Objective II- Vital Vio tested a wide range of dairy, spoilage, and pathogenic microbial strains for HP Hood under Vital Vio’s antimicrobial lights and compared the reduction to the same strains tested under normal fluorescent lights. Efficacy testing occurred in the Vital Vio Microbiology Lab. Vital Vio tested 11 microbial species in liquid conditions to test for the efficacy of Vital Vio’s antimicrobial lights in killing the microbes. Testing occurred at 0.75 mW/cm², 1.0 mW/cm², and 3.0 mW/cm². Vital Vio’s lights are designed to emit approximately 0.09 mW/cm² at 750 lux. These experiments were performed at higher intensities for timing purposes and represent results of normal Vital Vio lighting being used for as long as one and a half months. Small samples were taken from the liquid cultures at a variety of time points, plated, and colony counts were obtained for the purposes of calculating the total bacterial concentration in the sample.

Species	Type	Bacterial Reduction
<i>Salmonella typhimurium</i>	Pathogenic	99%
<i>Staphylococcus aureus</i>	Spoilage	99%
<i>Saccharomyces cerevisiae</i>	Yeast	99%
<i>Pseudomonas aeruginosa</i>	Spoilage	99%
<i>Bacillus circulans</i>	Spoilage	90%
<i>Lactococcus lactis</i>	Spoilage	90%
<i>Bacillus cereus</i>	Pathogenic	90%
<i>Streptococcus thermophilus</i>	Dairy	90%
<i>Listeria monocytogenes</i>	Pathogenic	90%
<i>Lactobacillus plantarum</i>	Spoilage	<90%
<i>Lactobacillus bulgaricus</i>	Dairy	None

Table 1. Shows the species tested under Vital Vio lights, their purpose in relation to Hood’s food processing concerns, and the approximate percent reduction of total bacterial count compared to the control.

Results:

Objective I- Testing food processing parts and materials along with packaged finished products showed no difference between material quality after being exposed to Vital Vio’s lights compared to a normal LED light.



Testing of finished goods showed no difference or acceleration of oxidation in finished goods in their packages exposed to Vital Vio technology compared to finished goods exposed to standard non-disinfecting LEDs.

Objective II- Table 1 (above) shows all the species tested, their relevance to Hood, and the average percent reduction compared to the control across all intensities tested.

Of the 11 microbial species tested against Vital Vio's visible light disinfection, all but two showed between 90-99% reductions in bacterial counts compared to the control cultures. The two species that showed less impact from Vital Vio's technology were *L. plantarum* and *L. bulgaricus*. One of these is a dairy bacterium, so the fact that it shows no effect from Vital Vio's technology could be seen as a positive. This may indicate Lactobacillus species are likely to be resistant to this type of technology, but further testing will be needed to confirm this. The rest of the spoilage and pathogenic bacteria tested show high levels of reductions, at 90% or greater. The results of these experiments represent the ability of Vital Vio's technology to play a role in reducing the presence of pathogens and spoilage microbes that are relevant to food and dairy processing.