FST Lunchtime Seminars

Effect of High-Intensity 405 nm Light Emitting Diode on Inactivation of Foodborne Pathogens

By **Ms. Kim Min-Jeong**

FST PhD student; B. Sc and M. Sc. Degree in Food Science and Technology from Kyungnam University, Republic of Korea

Abstract

The objective of this study was to investigate the antibacterial effect of 405 nm LED on Gram-negative bacteria (Escherichia coli O157:H7, Salmonella Typhimurium, and Shigella sonnei) and Gram-positive bacteria (Bacillus cereus, Listeria monocytogenes, and Staphylococcus aureus) at 4 °C. In addition, its antibacterial mechanism was investigated by determining bacterial membrane and DNA damages. A 10 ml volume of bacterial suspension in phosphate-buffered saline was exposed to 405 nm LED until 486 J/cm2 at 4 °C. Weibull model was used to compare the bacterial susceptibility to 405 nm LED. A sub-lethal injury test with bile salts and/or NaCl as selective agents and a Live/Dead® BacLightTM assay were carried out to investigate the membrane damage as well as a comet assay and DNA ladder were used to examine the DNA damage. Results showed that the illumination of 405 nm LED significantly inactivated 83% of the population of S. sonnei and more than 90% of the population of the other bacteria under refrigeration condition. Also, the comparison of the decimal reduction time (tR values) calculated by the Weibull model demonstrated that S. Typhimurium was identified as the most susceptible strain to the 405 nm LED illumination among pathogens tested. Regardless of bacterial strain, the bacterial sensitivity to NaCl and/or bile salt considerably increased compared to non-illuminated control cells as the exposure dose increased, Furthermore, LIVE/DEAD assay clearly showed that the LED illumination resulted in the loss of bacterial membrane integrity. On the other hand, no DNA fragmentation was observed by comet assay and DNA ladder. Therefore, this study suggests that antibacterial effect of 405 nm LED might be due to physical damage of bacterial membrane rather than DNA damage.

Survival of *Bifidobacterium lactis* in Milk Is Enhanced in the Presence of *Williopsis saturnus var. saturnus.*

By **Mr. Toh Mingzhan**

FST PhD student; Bachelor of Applied Science (Honours) in Food Science and Technology from National University of Singapore

Abstract

The survival of probiotics in cultured milk is strongly governed by storage temperature due to the increase of post acidification at elevated temperatures. While refrigeration is commonly used in prolonging the viability of probiotics in cultured products, maintaining a constant cold chain is costly and could pose a challenge especially in developing countries.

In this study, the survival of Bifidobacterium lactis in fermented milk at 30 °C was monitored in the presence and absence of the yeast Williopsis saturnus var. saturnus. When co-cultured with yeast, the cell counts of three B. lactis strains remained above 106 CFU/mL after six weeks. Other factors such as anaerobic storage, addition of yeast supernatant, yeast viability and initial yeast cell concentration were also examined to gain further insights on the possible mechanisms of survival enhancement. The removal of oxygen did not bring about comparable improvements to probiotic viability as when yeast was added. This implied that the generation of an anaerobic environment by the yeast was unlikely to be responsible for enhancing the survival of B. lactis. Yeast supernatant and inactivated W. saturnus did not bring about improvements in probiotic cell count after six week as well, which suggested that physical contact with viable yeast was necessary for survival enhancement. Similar probiotic cell counts were observed at the end of the study regardless of the initial inoculum of W. saturnus. This could be attributed to the growth of the yeast despite it being non-lactose fermenting as the yeast cell counts reached similar levels by week 5. The findings of this study demonstrate the potential of viable yeast supplementation as a feasible option of extending the shelf life of cultured milk stored under non-refrigerated condition.

Host: Dr. Yuk Hyun-Gyun
Date: 8th October 2014, Wednesday
Time: 1 to 2 pm
Venue: Seminar Room S14-06-20

All ARE WELCOME !