Mathematical Modelling of Freezing Process for Bread Dough

By **Mr. Turkay Kondakci**
FST PhD student; B.Eng. degree from Istanbul Technical University, Turkey

Abstract

It is essential to understand and quantify the mechanisms of heat transfer between the food and the heat transfer medium during freezing. Freezing process for bread dough shows non-linear dynamics during phase change stage. Hence, mathematical modelling of freezing may improve the understanding of the freezing process and help to overcome the issues of dough quality during freezing.

This research was aimed to develop mathematical models of freezing process for bread dough. A two dimensional hemispherical model has been used to represent the shape of bread dough. Experimental tests were conducted with different freezing conditions including -20, -30 and -40 oC in a blast freezer. The temperature profiles of dough during freezing process were measured for the center, middle and under-surface of dough samples with three different air velocities including 2.5, 5 and 7.5 m/s.

The heat transfer model produced a good agreement with the experimental data, resulting in a high coefficient of determination (R2) and a low root mean square error (RMSE). Therefore, it has been confirmed that the model has a good performance and can be used to predict temperature profiles in the dough during freezing process. In-depth understanding of dough freezing mechanism and integration with a control system can bring new prospects to enhance the quality of frozen dough.

All are welcome !

Date: 7th March 2014, Friday
Time: 12 to 1 pm
Venue: Seminar Room S14-06-19

Optimization of Real-time PCR Method Combined with Immunomagnetic Separation for Rapid Detection of *Salmonella* Typhimurium

By **Ms. Zheng Qianwang**
FST PhD student; B.Sc. in Biological Science from Sun Yat-Sen University, China

Abstract

Global duck meat production is dominated by Asia and it is showed to be a reservoir for Salmonella Typhimurium. An effective enrichment broth for the recovery of Salmonella Typhimurium on raw duck wings and an alternative rapid detection method combining real-time PCR and immunomagnetic separation (IMS) were investigated in this study. Healthy or heat-injured S. Typhimurium was inoculated on raw duck wings and nine broths were evaluated by four growth parameters. Immunocapture was optimized and three Taqman primers (Sal, invA and ttr) were evaluated to optimize the real-time PCR protocol.

Most of enrichment broths recovered S. Typhimurium by more than 6 log CFU/ml, except the 85%-injured cells in One-Broth Salmonella (OB)reaching above 7 log CFU/ml. Under optimal IMS conditions (30 min reaction and 3 min separation), 85 and 64 % of Salmonella were captured from pure culture and food suspensions. The optimized PCR-IMS method was significantly ($P = 0.0011$) better to detect healthy Salmonella after 7-h enrichment than PCR method alone, however there was no significant ($P > 0.05$) difference between two methods with longer enrichment time (14 h). The diagnostic accuracy of PCR-IMS was shown to be 97.5% through the validation study.

This study suggests that OB may be a suitable enrichment broth for the Salmonella detection and the optimized PCR-IMS method could provide a sensitive, specific and rapid detection for Salmonella.