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XX 8-06 **SHORT COMMUNICATION: CULTIVATION OF LENTINUS EDODES MYCELIA USING WHEY PERMEATE AS AN ALTERNATIVE GROWTH SUBSTRATE**

B. S. Inglet, M. Song, C. L. Hansen and S. Hwang
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The major objective of this research was to use whey permeate as an alternative growth medium for the cultivation of mycelia of the edible mushroom Lentinus edodes and to find an optimum condition for solid-state cultivation. Response surface analysis was applied to determine the combination of substrate concentration (40 to 60 g of lactose/L), temperature (20 to 30°C), and pH (4 to 6) resulting in a maximal mycelial growth rate. The radial extension rates, estimated by measuring the diameters of growing colonies on the Petri dishes, were used as the growth rate of the mycelia at different conditions. The conditions predicted to maximize the mycelial growth of 6.41 ± 0.47 mm/d were determined to be 40 g of lactose/L, temperature 23.6°C, and pH 5.0. It was concluded that a partial cubic equation could accurately model the response surface of, and predict optimal growth conditions for, L. edodes mycelia using whey permeate because the model prediction agreed with the experimental growth rate, 6.39 ± 0.22 mm/d. The results suggest that whey permeate could be utilized as a growth substrate for the cultivation of mycelia from the edible mushroom L. edodes, enhancing the use of this by-product by the cheese manufacturing industry.

XX 9-06 **USE OF MICROFILTRATION TO IMPROVE FLUID MILK QUALITY**

M. W. Elwell and D. M. Barbano
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The objectives were to determine the growth characteristics of bacteria in commercially pasteurized skim milk as a function of storage temperature; to determine the efficacy of a microfiltration and pasteurization process in reducing the number of total bacteria, spores, and coliforms in skim milk; and to estimate the shelf life of pasteurized microfiltered skim milk as a function of storage temperature. For the first objective, commercially pasteurized skim milk was stored at 0.1, 2.0, 4.2, and 6.1°C. A total bacterial count >20,000 cfu/mL was considered the end of shelf life. Shelf life ranged from 16 d at 6.1°C to 66 d at 0.1°C. Decreasing storage temperature increased lag time and reduced logarithmic growth rate of a mixed microbial population. The increased lag time for the

mixed microbial population at a lower storage temperature was the biggest contributor to longer shelf life. For the second objective, raw skim milk was microfiltered at 50°C using a Tetra Alcross M7 Pilot Plant equipped with a ceramic Membralox membrane (pore diameter of 1.4 μm). The 50°C permeate was pasteurized at 72°C for 15 s, and cooled to 6°C. Bacterial counts of raw skim milk were determined by standard plate count. Bacterial counts of microfiltered and pasteurized microfiltered skim milk were determined using a most probable number method. Across 3 trials, bacterial counts of the raw milk were reduced from 2,400, 3,600, and 1,475 cfu/mL to 0.240, 0.918, and 0.240 cfu/mL, respectively, by microfiltration. Bacterial counts in the pasteurized microfiltered skim milk for the 3 trials were 0.005, 0.008, and 0.005 cfu/mL, respectively, demonstrating an average 5.6 log reduction from the raw count due to the combination of microfiltration and pasteurization. For the third objective, pasteurized microfiltered skim milk was stored at each of 4 temperatures (0.1, 2.0, 4.2, and 6.1°C) and the total bacterial count was determined weekly over a 92-d period. At 6 time points in the study, samples were also analyzed for noncasein nitrogen and the decrease in casein as a percentage of true protein was calculated. After 92 d, 50% of samples stored at 6.1°C and 12% of samples stored at 4.2°C exceeded a total bacterial count of 20,000 cfu/mL. No samples stored at 0.1 or 2.0°C reached a detectable bacterial level during the study. When the bacterial count was <1,000 cfu/mL, shelf life was limited because sufficient proteolysis had occurred at 32 d at 6.1°C, 46 d at 4.2°C, 78 d at 2.0°C, and >92 d at 0.1°C to produce a detectable off-flavor in skim milk produced from a raw milk with a 240,000 somatic cell count.

XX 10-06 USE OF CHITOSAN FOR SELECTIVE REMOVAL OF ß-LACTOGLOBULIN FROM WHEY

E. Casal, A. Montilla, F. J. Moreno, A. Olano and N. Corzo
J. of Dairy Sci. 89(5): 1389. 2006.

A method is described for selective removal of undenatured ß-lactoglobulin from cheese whey based on interactions between whey proteins and chitosan. Whey was previously clarified at pH 4.5 with addition of chitosan (25 mg/100 mL), and selective removal of ß-lactoglobulin was studied in the pH interval 4.6 to 6.5. Addition of chitosan caused selective precipitation of ß-lactoglobulin that increased with pH. The content of ß-lactoglobulin in whey decreased as the amount of chitosan added was increased. At pH 6.2, addition of 1.9 to 3.0 mg/mL of chitosan led to complete removal of ß-lactoglobulin, whereas at least 80% of the rest of whey proteins remained in solution. The production of cheese whey without ß-lactoglobulin could help to expand the applications of dairy by-products in food processing, and to isolate hypoallergenic whey protein concentrates.

XX 11-06 RAPID DETERMINATION OF SWISS CHEESE COMPOSITION BY FOURIER TRANSFORM INFRARED/ATTENUATED TOTAL REFLECTANCE SPECTROSCOPY

L. E. Rodriguez-Saona, N. Koca, W. J. Harper and V. B. Alvarez
J. of Dairy Sci. 89(5): 1407. 2006.

There is a need for rapid and simple techniques that can be used to predict the quality of cheese. The aim of this research was to develop a simple and rapid screening tool for monitoring Swiss cheese composition by using Fourier transform infrared spectroscopy. Twenty Swiss cheese samples from different manufacturers and degree of maturity were evaluated. Direct measurements of Swiss cheese slices (~0.5g) were made using a MIRacle 3-reflection diamond attenuated total reflectance (ATR) accessory. Reference methods for moisture (vacuum oven), protein content (Kjeldahl), and fat (Babcock) were used. Calibration models were developed based on a cross-validated (leave-one-out approach) partial least squares regression. The information-rich infrared spectral range for Swiss cheese samples was from 3,000 to 2,800 cm–1 and 1,800 to 900 cm–1. The performance statistics for cross-validated models gave estimates for standard error of cross-validation of 0.45, 0.25, and 0.21% for moisture, protein, and fat respectively, and correlation coefficients $r > 0.96$. Furthermore, the ATR infrared protocol allowed for the classification of cheeses according to manufacturer and aging based on unique spectral information, especially of carbonyl groups, probably due to their distinctive lipid composition. Attenuated total reflectance infrared spectroscopy allowed for the rapid (~3-min analysis time) and accurate analysis of the composition of Swiss cheese. This technique could contribute to the development of simple and rapid protocols for monitoring complex biochemical changes, and predicting the final quality of the cheese.

XX 12-06 INCREASING YOUR PROFITS WITH EFFECTIVE DRYING

A. Britt
Powder and Bulk Engineering 20(4): 29. 2006.

Plant engineers constantly investigate ways to make their processes run more efficiently to reduce production costs. This is especially true for drying, one of the most energy-intensive unit operations in bulk solids processing. When properly optimized, drying can generate substantial savings. Using conveyor drying examples, this article explains how variable costs can affect a drying operation's efficiency and how you can optimize your drying operation to control these costs and increase your profits. The information can be applied to any type of dryer.

XX 13-06 SURVIVAL OF A FIVE-STRAIN COCKTAIL OF ESCHERICHIA COLI O157:H7 DURING THE 60-DAY AGING PERIOD OF CHEDDAR CHEESE MADE FROM UNPASTEURIZED MILK

J.E. Schlesser, R. Gerdes, S. Ravishankar, K. Madsen, J. Mowbray and A.Y.L. Teo
Journal of Food Protection 69(5): 990. 2006.

The objective was to investigate the adequacy of the 60-day minimum aging to reduce the numbers of viable pathogens and evaluate milk subpasteurization heat treatment as a process to improve the safety of Cheddar cheeses made from unpasteurized milk. Cheddar cheese was made from unpasteurized milk inoculated with 10^1 to 10^5 CFU/ml of a five-strain cocktail of acid-tolerant *Escherichia coli* O157:H7. Samples were collected during the cheese manufacturing process. After pressing, the cheese blocks were packaged into plastic bags, vacuum sealed, and aged at 7°C. After 1 week, the cheese blocks were cut into smaller-size uniform pieces and then vacuum sealed in clear plastic pouches. Samples were plated and enumerated for *E. coli* O157:H7. Populations of *E. coli* O157:H7 increased during the cheese-making operations. Population of *E. coli* O157:H7 in cheese aged for 60 and 120 days at 7°C decreased less than 1 and 2 log, respectively. These studies confirm previous reports that show 60-day aging is inadequate to eliminate *E. coli* O157:H7 during cheese ripening. Subpasteurization heat-treatment runs were conducted at 148°F (64.4°C) for 17.5 s on milk inoculated with *E. coli* O157:H7 at 10^5 CFU/ml. These heat-treatment runs resulted in a 5-log *E. coli* O157: H7 reduction.

XX 14-06 CHANGES IN CONCENTRATION OF AFLATOXIN M1 DURING MANUFACTURE AND STORAGE OF SKIM MILK POWDER

O. Deveci and E. Sezgin
Journal of Food Protection 69(3): 682. 2006.

In this study, skim milk powder was produced from cow's milk contaminated artificially with aflatoxin M_1 (AFM_1) at two different levels, 1.5 and 3.5 ìg/liter (ppb), and the effects of process stages on the AFM_1 contents were investigated. Pasteurization, concentration, and spray drying caused losses of about 16, 40, and 68%, respectively, in AFM_1 content of the milk contaminated with 1.5 ìg/liter AFM_1, and losses of 12, 35, and 59%, respectively, in the milk contaminated with 3.5 ìg/liter AFM_1. These losses were found to be statisticially significant at the level of P 0.01. After 3- and 6-month storage periods, AFM_1 content of the skim milk powder produced from milk with 1.5 ìg/liter AFM_1 decreased by 2 and 5%, respectively, whereas these rates were 2 and 4%, respectively, for the skim milk powders made from milk with 3.5 ìg/liter AFM_1 (after adjustment for sample weight). Changes in AFM_1 content of milk powder samples were found statistically insignificant ($P > 0.05$ and $P > 0.01$) for 3- and 6-month storage periods.

XX 15-06 **INACTIVATION OF MICROORGANISMS IN MILK AND APPLE CIDER TREATED WITH ULTRASOUND**

D.J. D'Amico, T.M. Silk, J. Wu and M. Guo

Journal of Food Protection 69(3): 556. 2006.

Nonthermal technologies are emerging as promising alternatives to heat treatment for food processing. Ultrasound, defined as sound waves with a frequency greater than 20 kHz, has proven bactericidal effects, especially when combined with other microbial-reduction strategies such as mild heating. In this study, ultrasound treatment (sonifier probe at 20 kHz, 100% power level, 150 W acoustic power, 118 W/cm^2 acoustic intensity) with or without the effect of mild heat (57°C) was effective at reducing microbial levels in raw milk, *Listeria monocytogenes* levels inoculated in ultrahigh-temperature milk, and *Escherichia coli* O157:H7 in apple cider. Continuous flow ultrasound treatment combined with mild heat (57°C) for 18 min resulted in a 5-log reduction of *L. monocytogenes* in ultrahigh-temperature milk, a 5-log reduction in total aerobic bacteria in raw milk, and a 6-log reduction in *E. coli* O157:H7 in pasteurized apple cider. Inactivation regressions were second-order polynomials, showing an initial period of rapid inactivation, eventually tailing off. Results indicate that ultrasound technology is a promising processing alternative for the reduction of microorganisms in liquid foods.