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XX 16-06 **EFFECT OF FORMULATION AND MANUFACTURING PARAMETERS ON PROCESS CHEESE FOOD FUNCTIONALITY - I. TRISODIUM CITRATE**

S. K. Garimella Purna, A. Pollard and L. E. Metzger
J. of Dairy Sci. 89(7): 2386. 2006.

The objective was to use a Rapid Visco Analyzer to study the effect of natural cheese age, trisodium citrate (TSC) concentration, and mixing speed on process cheese food (PCF) functionality. In this study 3 replicates of natural cheese were manufactured, and a portion of each cheese was subjected to 6 different PCF manufacturing treatments at 2, 4, 6, 12, and 18 wk of ripening. These treatments were factorial combinations of 3 levels of TSC (i.e., 2.0, 2.5, and 3.0%) and 2 mixing speeds during manufacture (450 and 1,050 rpm). Functional properties of the PCF evaluated included manufacturing properties [apparent viscosity after manufacture (VAM)], unmelted textural properties (firmness), melted cheese flow properties [hot apparent viscosity (HAV)], and cheese thickening during cooling [time at 5000 cP (T5)]. All 4 parameters (VAM, firmness, HAV, and T5) were significantly affected by natural cheese age and mixing speed, whereas VAM, HAV, and T5 were also significantly influenced by the amount of TSC. The VAM and firmness decreased as cheese age increased, whereas T5 values increased as cheese age increased. Similarly, VAM, HAV, and firmness values increased because of the increased mixing speed, whereas T5 values decreased. The age x mixing speed interaction was significant for VAM and firmness. The age x concentration of the TSC interaction term was significant for VAM, whereas the age x age x TSC concentration term was significant for HAV. The results demonstrate that natural cheese age, mixing speed during manufacture, and concentration of TSC have a significant impact on process cheese functionality.

XX 17-06 **SENSORY EVALUATION OF WHEY AND SWEET CREAM BUTTERMILK**

S. Jinjarak, A. Olabi, R. Jiménez-Flores, I. Sodini and J. H. Walker
J. of Dairy Sci. 89(7): 2441. 2006.

The objective was to characterize the sensory attributes of sweet cream buttermilk (CBM) and a nontraditional product, whey buttermilk (WBM). Whey buttermilk results from processing whey cream into butter. The products were evaluated as fresh liquid buttermilk obtained directly from the butter churn, and as reconstituted buttermilk or whey buttermilk powders. Sweet cream buttermilk and WBM were produced either at the Dairy Products Technology Center (experimental samples, n = 2) or provided by the industry (n = 2 from 2 different commercial sources). Nine panelists were trained for

twenty-four 1-h sessions; they then rated samples on a 15-cm line scale in triplicate using descriptive analysis. Data obtained were analyzed using SAS statistical software. Results indicated that WBM had similar sensory characteristics as regular CBM; however, there was a marked color difference between them. Liquid buttermilk was not significantly different from reconstituted buttermilk powder on many attributes. However, WBM was significantly more yellow, more sour, and more astringent than the CBM samples, and it had more cardboard flavor than the commercially produced CBM. Liquid buttermilk was not significantly different from reconstituted buttermilk powder on many attributes. However, some buttermilk types had more cardboard aroma and flavor in their powdered form than in liquid form. Most attributes showed no significant differences across replicates, indicating consistency of rating. Principal component analysis showed that attributes were separated on the 2 principal components based on production site and processing form (fresh vs. reconstituted).

XX 18-06 EFFECTS OF DRIED DAIRY INGREDIENTS ON PHYSICAL AND SENSORY PROPERTIES OF NONFAT YOGURT

M. Isleten and Y. Karagul-Yuceer
J. of Dairy Sci. 89(8): 2865. 2006.

Physical and sensory attributes are important factors that influence food acceptance and choices. In this study, sensory and texture properties of nonfat yogurts made from reconstituted skim milk powder (SMP) fortified with SMP as a control, whey protein isolate (WPI), yogurt texture improver (TI), and sodium caseinate (NaCn) were investigated over a 12-d storage period. Viscosity and syneresis were measured as physical quality parameters. Descriptive sensory analysis was carried out for each sample to determine the profiles of the products. Consumer acceptance testing (n = 143 consumers) was also conducted to measure the acceptability of yogurts; panelists were asked to rank their preference for the different yogurt samples. Differences among physical and sensory attributes of yogurts were defined. Addition of WPI improved the physical properties of yogurts, resulting in the highest viscosity and the lowest syneresis. On the other hand, yogurt with WPI did not have desirable sensory properties. The descriptive panel indicated that yogurt with WPI had the lowest fermented flavor attribute. In general, yogurts fortified with NaCn and TI displayed better physical and sensory properties than did control and WPI-fortified yogurts. Consumer testing showed that yogurts with NaCn and TI were not different from the control with regard to their flavor acceptability. Yogurts fortified with NaCn and TI were the most preferred samples by Turkish consumers.

XX 19-06 PRODUCTION OF INGREDIENT-TYPE CHEDDAR CHEESE WITH ACCELERATED FLAVOR DEVELOPMENT BY ADDITION OF ENZYME-MODIFIED CHEESE POWDER

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J. of Dairy Sci. 89(10): 3749. 2006.

Fast-ripened Cheddar cheeses for ingredient purposes were produced by addition of a

dried enzyme-modified cheese (EMC; 0.25 and 1 g/100 g of milled curd) at the salting stage during a standard Cheddar cheese-making procedure. Populations of starter and nonstarter lactic acid bacteria (NSLAB), levels of proteolysis and lipolysis, volatile analysis, and flavor development (by quantitative descriptive sensory analysis) were monitored over a 6-mo ripening period. Levels of free AA and free fatty acids were elevated in the experimental cheeses on d 1 because of inclusion of the EMC. Counts of NSLAB were also elevated in the experimental cheeses compared with the control cheese from the start of ripening. Levels of free AA were slightly elevated in the experimental cheeses at 1, 2, and 4 mo, but significantly greater accumulations were detected by 6 mo of ripening, with His, Leu, and glutamate reflecting the greatest increases. Levels of long-chain free fatty acids increased up to 2 mo, indicating an initial stimulation of lipolysis, but had decreased by 6 mo, indicating greater catabolism, probably caused by NSLAB and increased starter lysis. Principal component analysis of the volatile compounds showed few differences in the aroma profiles among the cheeses up to 4 mo of ripening, but a large separation of the cheeses supplemented with EMC relative to the control was observed by 6 mo. Sensory analysis of the cheeses with added EMC showed an acceleration of 2 mo in flavor development compared with the control cheese with the addition of 1 g/100 g of EMC developing a flavor profile at 4 mo similar to the control cheese at 6 mo of ripening. However, atypical Cheddar flavors developed on prolonged storage. This study shows the potential of adding EMC during Cheddar production to produce a fast-ripened ingredient-type Cheddar cheese.

XX 20-06 EFFECT OF PROTEIN COMPOSITION ON THE CHEESE-MAKING PROPERTIES OF MILK FROM INDIVIDUAL DAIRY COWS

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J. of Dairy Sci. 89(9): 3296. 2006.

The objective was to evaluate the effect of variations in milk protein composition on milk clotting properties and cheese yield. Milk was collected from 134 dairy cows of Swedish Red and White, Swedish Holstein, and Danish Holstein-Friesian breed at 3 sampling occasions. Concentrations of áS1-, ß-, and κ-casein (CN), α-lactalbumin, and â-lactoglobulin (LG) A and B were determined by reversed phase liquid chromatography. Cows of Swedish breeds were genotyped for genetic variants of â- and κ-CN. Model cheeses were produced from individual skimmed milk samples and the milk clotting properties were evaluated. More than 30% of the samples were poorly coagulating or noncoagulating, resulting in weak or no coagulum, respectively. Poorly and noncoagulating samples were associated with a low concentration of κ-CN and a low proportion of κ-CN in relation to total CN analyzed. Furthermore, the κ-CN concentration was higher in milk from cows with the AB genotype than the AA genotype of κ-CN. The concentrations of áS1-, â-, and κ-CN and of â-LG B were found to be significant for the cheese yield, expressed as grams of cheese per one hundred grams of milk. The ratio of CN to total protein analyzed and the â-LG B concentration positively affected cheese yield, expressed as grams of dry cheese solids per one hundred grams of milk protein, whereas â-LG A had a negative effect. Cheese-making properties could be improved by selecting milk with high

concentrations of áS1-, ß-, and κ-CN, with high κ-CN in relation to total CN and milk that contains â-LG B.

XX 21-06 SENSORY PROPERTIES OF WHEY AND SOY PROTEINS

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J. of Food Sci. 71(6): S447. 2006.

Whey and soy proteins are valuable dried ingredients with applications in numerous foods. Characterization and comparison of the flavor properties of these value-added ingredients are needed to interpret analytical flavor chemistry results and to identify specific ingredient applications and marketing strategies. The goals of this study were to develop a sensory lexicon for whey and soy proteins, and to subsequently identify and compare the descriptive sensory properties of whey and soy proteins. Consumers also filled out a survey to probe their opinions and attitudes to dairy and soy products. Twenty-four descriptive sensory attributes were identified to evaluate appearance, flavor, and texture/mouthfeel of rehydrated proteins. Twenty-two samples (14 whey proteins and 8 soy proteins) were selected for descriptive sensory analysis. Proteins were rehydrated (10% solids, [w/v]) and evaluated in triplicate by a highly trained sensory panel (n = 10) trained to use the developed language. Both whey and soy proteins were differentiated using the identified language ($P < 0.05$). Each protein type displayed sensory variability, but different sensory attributes distinguished whey proteins from soy proteins. Consumers (n = 147) perceived distinct health benefits associated with dairy and soy products, respectively. These results will enhance ongoing research and product development with these nutritional and functional ingredients.

XX 22-06 INTERACTIONS OF MILK PROTEINS AND VOLATILE FLAVOR COMPOUNDS: IMPLICATIONS IN THE DEVELOPMENT OF PROTEIN FOODS

T. Considine, J. Kuhn and H. Singh
J. of Food Sci. 71(5): R72. 2006.

This review encompasses the binding of volatile flavor compounds by milk proteins in aqueous solutions. The presence of proteins in a food matrix can result in a decrease in aroma perception and in an unpleasant aroma profile, because of binding of the desirable flavor compounds to proteins. Hence, various analytical methods used to measure the extent and the type of binding, and the determination of the binding parameters, are evaluated in this review. The binding of various flavor compounds by individual milk proteins is discussed and compared in terms of their binding affinity for flavor compounds. Furthermore, the influence of temperature and ultra-high pressures on the interactions between proteins and flavors is considered in detail. The implications of protein-flavor binding in the development of protein foods are discussed.