

Graduate Student Research Poster Competition

Ph.D. DIVISION

Steam Pasteurization for Reducing Bacterial Populations on Freshly Slaughtered Beef.

A.L. Nutsch, R.K. Phebus, M.J. Riemann, D.E. Schafer,
R.C. Wilson, J.D. Leising and C.L. Kastner
Kansas State University
Room 139, Call Hall, Manhattan, KS 66506

The effectiveness of a steam pasteurization process (developed jointly by Frigoscandia Food Processing Systems, Bellevue, WA and Cargill, Wayzata, MN) for reducing bacterial populations on freshly slaughtered beef tissue was evaluated. In laboratory evaluations, steam pasteurization (S), knife trimming (T), water washing (35°C, W), hot water/steam vacuum spot-cleaning (V) and a 2% lactic acid spray (54°C, L) were used individually and in combinations to reduce populations of *Escherichia coli* O157:H7 (rifampicin-resistant), *Salmonella typhimurium* (nalidixic acid-resistant) and *Listeria monocytogenes* Scott A inoculated onto freshly slaughtered beef tissues. The following combinations were evaluated, TW, TWS, WS, VW, VWS, TWLS and VWLS. All combination treatments effectively reduced pathogen populations ($P > 0.05$), by 3.5-5.3 \log_{10} CFU/cm² (initial levels ca. 5.0 \log_{10} CFU/cm²). Individual treatments T, V and S reduced ($P < 0.05$) pathogen populations by 2.5-3.7 \log_{10} CFU/cm². The effectiveness of a large-scale steam pasteurization system was evaluated in a commercial beef slaughter facility. Exposing carcasses to steam pasteurization for 8 d reduced ($P < 0.01$) aerobic plate counts by over 1 log cycle (initial levels of ca. 2.2 log) and reduced ($P < 0.01$) *E. coli* (generic) and coliform levels to virtually undetectable levels. Steam pasteurization is very effective at reducing bacterial contamination on unchilled beef carcasses and could serve as one step in an overall process of reducing the risk of pathogenic bacteria in beef and beef products.

A Comparison of Beef Tallow and Partially Hydrogenated Soybean Oil for Use in Deep-fat Frying Operations.

J.A. Henson and J.R. Romans
South Dakota State University
Box 2170, Dept. Animal & Range Science
Brookings, SD 57007

Three products (french fried potatoes, chicken nuggets and beef fingers) were deep-fat fried in 100% partially hydrogenated soybean oil (SBO), 100% beef tallow (TAL) and a blend of 50% partially hydrogenated soybean oil and 50% beef tallow (50/50) to determine the effects of hydrogenated oils on product color, consumer acceptability, yield, fat and moisture content and fatty acid profile. Frying these products in 50/50 had no adverse effects ($P > .05$) on product color, consumer acceptability, fat and moisture content or cooked yield compared to SBO. Consumer taste panelists preferred ($P < .05$) the flavor and overall acceptability of french fries cooked in SBO over those cooked in TAL. Frying in SBO resulted in higher ($P < .05$) cooking yields in all three products. Frying french fries, chicken nuggets and beef fingers in SBO raised ($P < .05$) the total trans fatty acid content and lowered ($P < .05$) the cis/trans fatty acid ratio of the final products. The greatest impact was on the trans 18:1 fatty acid content ($P < .05$). Frying these products in SBO, 50/50 or TAL had no effect ($P > .05$) on the total cis fatty acid content of the fried products. Beef tallow had less ($P < .05$) total trans fatty acids than 50/50 or SBO.

Key Words: Tallow, Hydrogenated, Cis/trans

Pork Carcass Composition Derived from Neural Network Systems' Analysis of Electromagnetic Scans.

E.P. Berg, B.E. Engel and J.C. Forrest
Purdue University
Department of Animal Sciences - Smith Hall
West Lafayette, IN 47907-1151

An advanced computer logic system (NETS 3.0) was used to decipher electromagnetic (EM) scans in lieu of traditional linear regression for estimation of pork carcass composition. Fifty EM scans of pork carcasses were obtained online (pre-rigor) at a swine slaughter facility. The scans were reduced to a composite size that contained 80 phase absorption points. Right sides were cut into wholesale parts and dissected into fat, lean and bone to obtain total carcass and primal cut lean. A typical neural network consists of an input layer containing information to trigger a desired response in the output layer. A network will contain at least one hidden layer which does not directly relate to either the input or output layers but serves to direct an input to its appropriate output. For this study, the input later consisted of 81 nodes which included the EM scan curve (80 points) and warm carcass weight. The hidden layer had 42 nodes and the output layer possessed one node, representing separate outputs of ham, loin, or shoulder lean mass. The hidden layer connected to the output of total lean contained 50 nodes. Thirty-five scans are used for training of the network. Training examines how each input/output (I/O) pair is mapped and implements changes in the network when errors are found. The new network was then tested with 15 previously unseen I/O pairs. Separate neural networks were developed for the estimation of dissected total carcass, ham, loin and shoulder lean. The NETS configuration improved on linear regression equations for estimation of total carcass lean by 33 kilograms; ham lean by .303 kilograms; loin lean by .011 kilograms and shoulder lean by .169 kilograms. The results of the study show that advanced computer logic systems can improve upon traditional linear regression equations for prediction of pork carcass composition. Neural networks may be especially advantageous for assessment of primal cut composition from EM scans of whole carcasses.

Key Words: Pork, Neural networks, Carcass composition, TOBEC

Cryoprotectant Effects of Corn Maltodextrins and Corn Syrup Solids in Mechanically Deboned Pork.

G. Prabhu and J.G. Sebranek
Iowa State University
214 Meat Lab, Ames, IA 50011

Meat and meat products are commonly preserved by freezing because there is relatively little deterioration in product quality even after prolonged storage. Muscle proteins express their functionality most effectively when the salt-soluble proteins are fully extracted. This can be measured by gel forming ability, water-holding capacity and protein solubility. Carbohydrates have been shown to be effective for protecting proteins from denaturing effects of freezing and frozen storage. The objective of this study was to investigate the effects of maltodextrins and corn syrup solids on the freeze-thaw stability and quality characteristics of mechanically deboned pork under frozen storage.

Mechanically deboned pork was blended with maltodextrins and corn syrup solids (5, 10 and 20 DE) at 2 levels (4% and 8%) and frozen using 2 different freezing methods (blast vs. slow). The samples are evaluated for color, thaw drip, amount of extracted salt-soluble proteins, gel strength and emulsion capacity after 0, 2, 60, 120, 180 and 240 days of frozen storage.

Proteins were destabilized during freezing and frozen storage as reflected by decreases in protein solubility, gel strength and emulsifying capacity. Freeze-induced protein denaturation was reduced effectively at 10 DE maltodextrin and 20 DE corn syrup solids used at the 8% level and less effectively when used at the 4% level. The 5 DE maltodextrin used at the 4% level adversely affected salt soluble protein extractability after 240 days of frozen storage.