ABSTRACTS

SENSORY EVALUATION AND TEMPERATURE ABUSE STUDY OF “AMERIPURE” PROCESSED OYSTER

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“AmeriPure” process has proven to be effective in reducing the health risk associated with *Vibrio vulnificus* in the shellstock oyster to undetectable level and maintain the microbial quality of oysters following the AmeriPure process. Oysters were evaluated by a taste panel consisting of 10 LSU students and faculty. The sensory attributes evaluated included shape, off odor, off flavor, good oyster flavor, texture and overall acceptability. Both control and AmeriPure processed oysters by two different packaging methods were evaluated in three replicates from September to December, 1955.

“AmeriPure” process significantly slowed the rate of the production of off odor and off flavor in oysters during ice storage when compared to the control samples. In addition, the “AmeriPure” process slowed oysters shrinkage while enhancing good oyster flavor. The results of this sensory evaluation showed that “AmeriPure” process didn't significantly alter the sensory quality of oyster and extended the shelf life of processed oyster at least 7 days the control sample.

At all stages of post process, storage, transportation and “point of sale”, oysters may be subjected to temperature abuse. This temperature abuse study analyzed the microbial quality of the “AmeriPure” processed oysters which were exposed to ambient temperature of 22 ± 2°C for up to 24 hours. The microbiological analyses showed no recovery of *Vibrio vulnificus* after 24 hours of temperature abuse. However, other aerobic bacteria showed a rapid growth after 10 hours of exposure and oysters were considered spoiled by 24 hours of exposure.
MICROBIAL LOAD AND PROFILE OF CHANNEL CATFISH FILLETS

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Channel catfish (*Ictalurus punctatus*) fillets harvested in the fall of 1995 were processed by five different ways; manual deheaded-maulaul fillet/skin-chill-fillet (mDmF/SCF), manual dehead-automatic fillet not chilled (MdaF/UC), automatic dehead-automatic fillet/dehead-chill-fillet (aDaF/DCF), manual dehead-automatic fillet/eviscerate-chill-fillet (mDaF/ECF), and automatic dehead-automatic fillet/trim-chill-pack (aDaF/TCP). They were examined for microbial profile, psychrotropic (PPC) and total coliform (TCC) counts. The predominant bacteria genotypes found in larger proportions in product filleted and trimmed prior to chilling or packed not chilled isolated from all process flows were Acinetobacter (10.64%), Flavobacterium (8.51%), and Pseudomonas (7.09%). Staphylococcus (6.38%) were predominant in products filleted before skinned. However, there was no significant difference (P>0.05) among five different processing procedures on PPC and TCC in fillets.

MICROBIAL LOADS IN CATFISH PROCESS MACHINERY, PRODUCTS AND ENVIRONMENT DURING ONE DAY OPERATIONS

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Aerobic (APC), psychrotrophic (PPC), and total coliform (TCC) counts were determined in three different channel catfish operations. About 60 different sampling points per operation were monitored hourly for one day (8 hours). Product from manual and automatic filleting lines, breading and marinating line, machinery and conveyor belts, and environmental points were sampled. APC of fish skin and viscera were 2.8-5.0 log CFU/cm² and 3.0-7.1 log CFU/g, respectively. TCC for the same were 2.0-3.0 and 2.0-5.4 log CFU/cm². These are thought to be the points of highest microbial load. Dressed fish AFP were 3.0-5.8, nuggets had 3.0-4.8, fillets had 3.3-6.5, and breaded nuggets had 3.0 log CFU/cm². Conveyor belts had APC ranging from 3.0-7.4 and TCC from 1.8 to 3.8 log CFU/cm². Holding vat water, filleters's knife, trimming board, and phosphate mix were found to have high APC, PPC and TCC. Cleaning, sanitation, and rapid cooling/chilling of products were found to be the main sources of contamination, in addition to fish skin and viscera.
STORAGE CHARACTERISTICS OF PASTEURIZED BLUE CRAB MEAT AND CRYOGENICALLY AND BLAST FROZEN CRAB MEAT HELD IN VACUUM AND MODIFIED ATMOSPHERE PACKAGES

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Cryogenic and blast freezing of special blue crab meat held in improved packaging materials were investigated. The experimental packages were: (1) vacuum packaged Cryovac boil-in-bags, (2) DynoPack trays, and (3) DynoPack trays with a nitrogen atmosphere. Packaged meat was either frozen in a commercial CO₂ tunnel (-54°C) or in a commercial blast freezer (-19°C). Crab meat pasteurized in steel-tin cans served as the control. Frozen crab meat was transferred from the blast freezer to a walk-in freezer and held at -12°C for ten months. Pasteurized meat was kept on ice in a walk-in cooler. The following analyses were completed at 1, 2, 4, 6, 8, 10, 12, and 15 months of storage: headspace O₂ and CO₂, NH₃, pH, aerobic plate counts, percent moisture, and Hunter L, a, b color values. A six-member trained panel developed sensory appearance, odor, taste, texture, color, general appearance, and texture attributes.

The following conclusions were drawn from the study: (1) freezing crab meat produces less bluing than pasteurizing crab meat, (2) although pasteurized crab meat is bluer than frozen meat, it has a whiter component than frozen meat, (3) the sensory panel found no consistent textural differences between frozen and pasteurized meat, (4) aerobic plate counts correlated well with storage time for pasteurized meat, but not frozen meat, (5) the microbiological shelf life of crab meat pasteurized according to National Blue Crab Industry Association Guidelines was exceeded after 12 months of refrigerated storage, (6) frozen shelf life was maintained through 15 months, (7) CO₂ freezing at -54°C did not significantly improve crab meat quality attributes when compared to blast freezing at -19°C, and (8) properly frozen and stored blue crab meat may provide a commercial alternative to hot water pasteurization.
PHYSICOCHEMICAL AND SENSORY CHANGES IN FROZEN HYBRID-STRIPED BASS FILLETS

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Hybrid-striped bass, HSB (Morons saxatilis x Morone chrysops), were treated by a single glaze, double glaze (water), dipped in erythorobic acid, and in Tenox 2OA®. They were stored at -18°C for five months and analyzed for carbonyls, 2-Thiobarbituric acid reactive substances (TBARs), Hunter color, and sensory ratings. Carbonyls were lower in fillets treated with antioxidants as compared to glazed fillets, over frozen storage. TSARs of raw and cooked products did not exceed 1.50 for all treatments. Sensory flavor ratings ranged from two to over four, but were not influenced by treatment. Hunter 'L' values were apparently higher in Tanox 2OA® treated fillets while 'a' values were lower. There was little difference in fatty acid profiles between raw and baked fillets. Data shows that HSB frozen fillets are very stable for five months of frozen storage regardless of glaze or antioxidant treatment.

CRYOPROTECTIVE MECHANISM OF MALTODEXTRIN IN FROZEN SURIMI

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We investigated the cryoprotective properties of maltodextrins in surimi, and additionally sought to determine whether high molecular-weight carbohydrates differ in their cryoprotective mechanism from low molecular-weight compounds. A range of maltodextrins (DE 4-25) were added to Alaska Pollock surimi at 8% and tested against sucrose and sucrose/sorbitol controls. The surimi was quick frozen, then later equilibrated to storage temperatures of -20°C, -14°C and -81°C at 6 months intervals. Additionally these samples were subjected to freeze/thaw cycling. Protein quality at time of sampling was determined by measuring CA^2+ATPase activity. Surface tension of maltodextrin solution was also measured.

Cryoprotectancy of the maltodextrin exhibited a slight decline in the remaining enzyme activity as MW of the cryoprotectant increased, an effect that was more pronounced at the higher storage temperature. In contrast, for samples subjected to F/T cycling the residual activity was reduced as the MW of the cryoprotectants increased. This evidence supports a dual mechanism for cryoprotection by carbohydrates based on their molecular weight. Lower MW maltodextrins enhance surface tension of the solutions and they may cryoprotect by the same mechanism (preferential exclusion) as sucrose. Higher MW maltodextrins were significantly effective cryoprotectants at storage temperatures near or below their respective Tg' values but ineffective protectants in F/T cycling and they did not increase the surface tension.
PRODUCTION AND CHARACTERISTICS OF FLAVORING FROM SQUID BY-PRODUCT HYDROLYSATE

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An orthogonal array at $L_4(2^3)$ was used to determine an optimal condition for the production of flavoring from cooked or uncooked squid by-products by enzymatic hydrolysis and spray drying using Flavorzyme and Protamex (Novo Nordisk Blochem). The most favorable flavor profile was obtained from uncooked squid after 6 hr hydrolysis at 50°C followed by 2 hr maturation. Addition of spray-dried flavoring increased the taste intensity of surimi-based squid analog. Predominant free amino acids liberated during hydrolysis were arginine, leucine, alanine, lysine, glutamic acid, and glycine, which are believed to contribute to the squid flavor.

STATUS OF THE CUBAN SEAFOOD INDUSTRY AND IMPLICATIONS FOR FLORIDA OF RENEWED TRADE

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The Cuban commercial fishing industry existed primarily as an artisanal fishery until the late 1950s. Following the Revolution and the subsequent US embargo, the Cuban commercial fishing industry expanded in capacity and technological sophistication through Soviet subsidization. This led to the development of a large distant-water fleet and a revitalized nearshore fleet. With the cessation of Soviet subsidization in 1991, however, the Cuban commercial fishing industry is undergoing radical changes in capacity utilization and management structure. Foreign investment is being encouraged as a means to finance the renovation of existing processing facilities. Current production is focusing on high-value species, which are being retained in greater volumes within the domestic market. However, renewed trade with the US would allow significant quantities to enter the Florida seafood market, with differential impacts to the Florida harvesting and processing sectors.
HACCP IMPLICATIONS OF MICROBIAL LEVELS IN SEAFOOD BATTER OPERATIONS

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Batter operations were monitored during full-scale production of breaded raw fish portions, breaded raw butterfly, and breaded precooked popcorn shrimp. Microbial loads in fish batter were APC 5.53\% \times 10^4 CFU/g and coliform 4.0 \times 10^2 CFU/g. Microbial loads in fish batters were APC 6.97 \times 10^2 CFU/g and \textit{S. aureus} 6.62 \times 10^1 CFU/g. Microbial loads in popcorn shrimp batter were slightly higher with APC 9.85 \times 10^3 CFU/g, coliform 5.93 \times 10^2 CFU/g, \textit{E. coli} 8.61 \times 10^1 CFU/g, and \textit{S. aureus} 3.48 \times 10^2 CFU/g. The implications of these data in relation to the significance of time and temperature abuse and monitoring requirements under the U.S. mandatory HACCP inspection program will be discussed.

IMPORTANT CONSIDERATIONS FOR THE QUALITY AND WORKMANSHIP OF SEAFOOD PRODUCTS

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There is a tremendous increase in focus on HACCP within the seafood industry. Many people within the industry are involved in conducting training classes on getting trained. Others are involved in the purchase of new or additional equipment and services that will assist them in establishing critical limits, monitoring and verification. All of this is important and essential to minimize the risk of chemical, biological and physical hazards and contamination in seafood products for human consumption.

It is also important for us to not forget about those factors and product characteristics that affect the eating quality, aesthetics and performance of the product by the end user. Product texture, flavor, uniformity of size, neatness of cut, proper trimming and odor, are a few of the characteristics that impact seafood quality and sales.
SEAOOD QUALITY AND SAFETY MANAGEMENT SYSTEMS IN RETAIL SEAFOOD DEPARTMENTS

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The current state of product quality, shrinkage and safety management programs was studies in retail seafood departments. Eleven stores from four major U.S. retail chains in the South and Mid-Atlantic were audited for three days each. Among the parameters documented were 1) product handling methods. Selected stores also received a microbiological audit of environmental surfaces or products. Laboratory studies were conducted to determine the effect of display methods on product weight loss and seafood salad shelf-life (sensory, APC). Results indicate that seafood department facilities and equipment are generally adequate and properly controlled. However, procedures related to sanitation, cooking and management of ice-only display cases were highly variable. APCs of fresh flounder fillets were high (x=10^7 cfu/g). No pathogens were isolated from ready-to-eat products. Shrinkage rates were product specific. Product quality and potential safety were most frequently compromised by cross-contamination events related to a lack of chain-wide operating procedures. A model SOP is proposed for in-store cooking.

DESIGNING STANDARD OPERATING PROCEDURES FOR FULL SERVICE RETAIL SEAFOOD DEPARTMENTS IN SUPERMARKETS

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Grocers have added features which provide shoppers with many of the conveniences found in food service establishments. These include: full service, more emphasis on perishables, and more refrigerated, ready-to-eat items which are prepared on site. Most full service seafood departments also embody these features.

Such additions have resulted in more complex retail operations. This suggests the need for experienced, technically proficient labor pool. However, success in food retailing depends upon cost control. Therefore, technical competence is generally traded off for the cost savings that part time positions provide. Unfortunately, maximize shelf while minimizing product safety threats.

While the goals necessary to minimize shrinkage and compromised product safety are common knowledge, translating them into operational procedures has been a difficult undertaking for the food retailing community. This project explored root causes for quality and safety errors, and built research-based Standard Operating Procedures which are effective, simple, and time efficient to implement by the current labor force.
QUICK TIPS FOR FOOD HANDLERS

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-- No abstract submitted --

PRELIMINARY OBSERVATIONS ON A HAPLOSPORIDAN PARASITE
IN THE CATARINA SCALLOP ARGOPECTEN CIRCULARIS
HARVESTED FROM BAJA CALIFORNIA SUR, MEXICO

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The Mexican bay scallop Argopacten circularis, commonly referred to as the Catarina scallop, is a subtropical species commercially harvested around the Peninsula de Baja California in bays along the Northwest Golfo de California and the Pacific coast. The scallops are hand harvested and shucked at the harvesting sight, retaining only the adductor muscle. The shucked meats are iced on trucks, transported fresh to the U.S. and distributed by the importer either fresh or frozen. Upon evaluating a large volume of frozen Catarina scallop meats, an estimated 1-2% of the meats were macroscopically observed to have brown or black cysts with intermuscular orientation both on the meat surface and embedded deep within the meat. The scallop meats affected either had all brown spots, or all black spots, with only a few meats observed to possess both. The cysts differed in that the brownish cysts had soft cyst walls each containing puss-like degenerative tissue, while the black cysts possessed somewhat hardened, fibrous cyst walls and contained numerous parasitic protozoan spores. Upon analyzing morphological characteristics of the spores utilizing histological (H&E staining), and SEM and TEM techniques, the spore were preliminarily identified as Urosporidium ssp. within the Phylum Haplosporidia. The spores were observed to be grouped within numerous membrane-bound sporocysts within each cyst. Major spore morphological characteristics include a mostly spherical spore (average diameter 7.75 microns, n=9) possessing an internal flap or lingula for closure of the spore orifice, and a highly flexible, singularly appearing extension (tail) averaging 39.6 microns in length (n=9) extending in a posterior direction in relation to the spore orifice. The tail is observed to be made up of numerous long extensions of the spore wall, which intertwine in a twisting arrangement as they extend distally.

The presence of this parasite may or may not be of commercial importance. Urosporidium crescents, the hyperparasite of the parasitic microphalli fluke found in blue crab muscle, has indirectly been of some commercial significance along the US east and Gulf Coasts.
AUTOMATION OF QUALITY EVALUATION OF SALMON:  
A PRELIMINARY STUDY

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Current inspection of salmon quality relies on sensory evaluation by inspectors who evaluate the fish for visual, smell and texture attributes. This procedure is subjective, prone to error, time consuming, difficult to relate to others, and to quantify. This study used a combination of machine vision analysis and electronic nose technology to correlate objective attributes of salmon to sensory evaluations from a panel.

Atlantic salmon (Salmo salar) fillets from Chile was obtained fresh, within 48 hrs of harvest. The fish were stored at 35, 45 and 55°F for up to 10 days. Samples were also stored in variable temperature environments. Each day, an image of the flesh and the skin sides were captured, and the fish were analyzed by Neotronics electronic nose. Six replicates were performed per analysis. A sensory panel also evaluated the fish for visual and smell attributes. It was found that two colors could be correlated with storage time and sensory grade. Predictive equations of color change with time were also developed. These results could be used to develop methodologies to assist in the objective and repeatable quality evaluation of salmon.
COOKING OF TIGER SHRIMP: MODELING QUALITY AND SAFETY

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The quality of thermally processed shrimp is determined by microbiological and textural attributes. Yield loss is another important factor. These attributes are related to the product's thermal history and temperature distribution. Since it is impossible to monitor the temperature at all points in the shrimp, a mathematical model was developed for the prediction of its temperature distribution during cooking and cooling. Three sizes of tiger shrimp (large, 16-20/lb; medium, 41-50/lb; small, 50-60/lb) were cooked in water at 75, 85, 95 and 100°C for different periods. Cooling was done in iced water, or in ziploc bags in iced water, to observe effects of cooling methods on the yield loss and texture parameters. After each treatment, the yield loss and changes in texture parameters were measured. For large tiger shrimp, percent yield loss was 10% when cooked at 75°C for 5.6 min, and 25% at 100°C for 2.6 minutes. Safety was determined by selecting Vibrio cholera as the target microorganism. A 6 log cycle reduction at the slowest heating point of shrimp was achieved for all tests. Texture profile analysis parameters were measured using an Instron Machine, and the sensory parameters of toughness, juiciness, rubberiness and overall acceptability were determined by taste panel tests. Correlation of these parameters was accomplished.

The mathematical model can predict the effect of cooking and cooling on the yield loss and shrinkage, on texture, and on the desired safety of the shrimp. This tool can be used to optimize the cooking parameters of tiger shrimp.
FLORIDA'S APPROACH TO THE INTERIM CONTROL PLAN (ICP) FOR REDUCING THE RISK OF VIBRIO VULNIFICUS INFECTION AND THE USE OF TIME-TEMPERATURE RECORDERS AND INTEGRATOR

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As a response to the consistent number of Vibrio vulnificus (V.v.) infection cases in the United States the Interstate Shellfish Sanitation Conference (ISSC) has adopted an Interim Control Plan (ICP) (August 25, 1995). This ICP has the objective of retarding the growth in numbers of V.v. in Gulf of Mexico Oysters (Crassostrea virginica) to be consumed raw on the half-shell. The ICP classifies the harvesting periods into four levels depending on the water temperature with each level having a specific time-temperature matrix intended to limit V.v. densities after harvesting.

The State of Florida, as of May 1996, adopted the matrix in order to be consistent with the ISSC in the prevention of V.v. infection. Even though all shellstock harvested from Florida’s waters already complies with the matrix the FL Department of Environmental Protection has agreed to cooperate in the validation of this time-temperature regime. Starting the month of November and continuing throughout a period of 12 months samples will be collected and analyzed for V.v. bacteria. This study will compare the matrix handled product against a non matrix product. In addition the State of Florida has joined forces with the University of Florida as well as with two companies producing time-temperature integrators and recorders to help follow the product regime through harvest and production. The intent is to investigate the utility of a series of time-temperature integrators (VITSAB’s) that can be activated on site and change colors progressively to indicate the time the oyster must be placed into a mechanically refrigerated room. The recorders or electronic data loggers (TempTales - Sensitech) will monitor actual time-temperature consequence during all handling and storage.

Florida is a major player in shellstock production and must always be on the cutting edge looking for better and safer ways to process the oysters to assure confidence to the consumers.
THE EFFECTS OF SODIUM LACTATE ON COLD SMOKED SALMON IN TERMS OF BACTERIAL REDUCTION, INCLUDING LISTERIA MONOCYTOGENES

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Cold smoked salmon has been documented to contain a variety of pathogenic bacteria and viruses (Noah, 1991; Jemmi, 1990; Weagant, 1988). In recent years, the smoked salmon industry has received a great deal of attention due to L. monocytogenes contamination. This pathogen has been associated with several outbreaks in North America and Europe (Bille, 1988: Buchanan, 1989; Fleming 1985). Listeriosis occurs mainly in pregnant women, their unborn children, and immunodeficient individuals (Fleming 1985). The United States Food and Drug Administration has adopted a “zero tolerance” policy for L. monocytogenes. This emerging foodborne pathogen has been isolated in raw and ready-to-eat fishery products (Buchanan 1989). Jemmi (1990, 1994), and Fuchs (1994) isolated L. monocytogenes from wholesale and retail smoked salmon products in 24.0, 30.8 and 8.6 percent of analyzed samples, respectively. Little data is available on the incidence and behavior of L. monocytogenes during preparation, processing and storage of smoked salmon.

Fresh raw salmon fillets were subjected to different treatments of sodium lactate (NaL) during brining and subsequently analyzed microbiologically and chemically. Salmon fillets were brined for 18 hrs or 7 days with the addition on various concentrations of NaL (0.0, 1.24, and 2.48%). This investigation also addressed the effects of a topical 5.0% sodium lactate wash on fillets inoculated with a genetically engineered bioluminescent L. monocytogenes. The salmon fillets were stored under vacuum in low oxygen permeable packaging at -10 ± 1°C and enumerated for L. monocytogenes and total aerobic microorganisms at specific intervals up to 30 days. In addition, pH, water activity, and sensory characteristics in processed smoked salmon were also examined.

Results from this study indicate that sodium lactate was limited in its’ ability to inhibit or delay the growth of either naturally occurring or artificially inoculated salmon with L. monocytogenes during both the brining and/or cold smoking process. However, the antimicrobial effects of the NaL were very effective on total aerobic plate counts. A 5.0% NaL was also proven to be effective in reducing aerobic microflora in both the brining and cold smoked salmon. Sodium lactate had no affect on pH, a_w or color of the cold smoked salmon vacuum packaged and stored at -10°C for 30 days. The taste and texture of NaL treated fillets were reported to be more desirable than those of the control group.