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Sea Grant
Florida

# PROJECT RECORD FORM

SG-SID-No.: _____
Specialist: _____
SG Class: _____

INSTITUTION: Florida Sea Grant College Program
ICODE: 1200
TITLE: Verification of Science Based Controls for Safe Use of Vacuum and Modified Atmosphere (V/MA) Packaging of Seafood
PROJECT NUMBER: R/LR-Q-22
PROJECT STATUS: 2
REVISION DATE: 03/04/03
INITIATION DATE: 02/01/02
COMPLETION DATE: 01/31/04

SUB PROGRAM: Seafood Quality

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S.G. FUNDS: 74,954
LAST YEAR S SG FUNDS: 75,007
PASS-THROUGH FUNDS:
MATCHING FUNDS: 37,455
LAST YEAR S MATCH FUNDS: 37,961
LAST YEAR S PASS-THROUGH:
RELATED PROJECTS:
PARENT PROJECTS:
SEA GRANT CLASSIFICATION: 52
KEYWORDS: Vacuum, Packaging, Seafood, Florida, *Clostridium botulinum*

OBJECTIVES:

1. To determine the best ‘smart labels’ that cost-effectively monitor V/MA packaged seafood product quality and safety through integration of exposure time and temperature.
2. To develop gas permeability model to direct the selection of packaging films that reduce seafood safety risks while providing the essential benefits for product quality and preferred packaging.
3. To determine the combinations to ‘smart labels’ and packaging film permeability that are best suited for various V/MA packaging methods, i.e., vacuum bagged vs. MAP case-ready trays.

METHODOLOGY:
Utilizing lab trials and actual commercial applications, a selection of 'smart labels' will be screened for ability, reliability and cost to monitor the integration of product exposure times and temperatures while gas permeability models will be determined to better direct film applications. All work will culminate in a National Seafood Packaging Conference.

RATIONALE:
Utilization of reduced–oxygen packaging by either vacuum or modified atmosphere packaging (V/MA) for seafood continues to expand despite warnings of potential toxicity due to *Clostridium botulinum* type E. HACCP mandates require monitoring controls to prevent this seafood safety hazard, but controls are lack. 'Smart labels' for time-temperature integration and packaging film permeability offer control options that must be verified. Unbiased, scientific based controls can avert regulatory- industry confrontation and restore product values and buyer confidence.

PROJECT RESULTS:

Objective 1. To determine the best 'smart labels' that cost-effectively monitor V/MA packaged seafood product quality and safety through integration of exposure time and temperature.

Objective 1 has been completed relative to all current 'smart labels' available in the market. Further objective work will be conducted if new smart labels become available during project year two.

A. Time temperature integrators (TTI's) available through Cox Technologies (VITSABS) have been proven to be reliable and practical 'smart labels' through laboratory and commercial trials with fresh and frozen/thawed seafood in various packaging schemes and processing operations. Additional 'smart labels' have been identified and described.

Objective 2. To develop gas permeability model to direct the selection of packaging films that reduce seafood safety risks while providing the essential benefits for product quality and preferred packaging.

Objective 2 is partially completed (50%) and remains in progress.

A. Laboratory trials including variables for package film surface area, oxygen transmission rates and product-to-package volume ratios are in progress incorporating *Clostridium sporogenes* as a microbial surrogate for *C. botulinum*.

B. Commercial trials are assessing sensory consequences for product shelf-life as influenced by concurrent packaging with permeable and barrier films.

C. Problems Encountered

Additional and more accurate analytical equipment is necessary to monitor consequences for oxygen concentrations in packaging and within actual products. This problem can be resolved with purchase of a new 'fiber optic oxygen monitoring system' (est. cost $15,000). Partial funds ($12,000) to purchase this necessary equipment have been identified in the ABE Department/UF. The second year FL Sea Grant project funds ($3,000) are necessary to supplement the purchase anticipated in early 2003. These supplemental funds are available from within the original proposed budget without compromising the original project

objectives. No additional project funds are required.

Objective 3. To determine the combinations to 'smart labels' and packaging film permeability that are best suited for various V/MA packaging methods, i.e., vacuum bagged vs. MAP case-ready trays.

Objective 3 will commence through project year two.

ACCOMPLISHMENTS:

A. Student Support

Two graduate students (UF/AGE Dept) anticipating completion of MS degrees by fall 2003.

1. Teresa Mendoza; thesis, "Verification of Time Temperature Indicators as Science Based Controls for Safe Use of Vacuum Packaged Seafood."
2. Jayashree Gnanaraj; thesis, "Assessing Film Permeability as Controls for Safe Use of Vacuum Packaged Seafood."

B. Publications

1. Welt, B.A., Sage, D.S., Berger, K.L. 2002/3. Performance specification of time-temperature integrators designed to protect against botulism in refrigerated fresh foods. Journal of Food Science. Accepted publication (expected publication in 2003).

C. Presentations

One abstract/presentation -- Florida Section American Society of Agricultural Engineers. May 8-11, 2002. Key Largo, FL.

Three abstracts/extended abstracts/presentations -- Annual AFT-SST Meeting. October 2002. Orlando, FL.

D. Forums

"Reduced Oxygen Packaging," a special technical session held during the 6$^{th}$ Joint Meeting of Seafood Science & Tech. Soc. of the Americas and the Atlantic Fisheries, Tech. Soc. for "Advancing Seafood Technology for Harvested and Cultured Products," October 11, 2002, Disney World, Orlando, FL (attendees >150 from agencies, commerce and academia).

E. Industry Liaison/Extension Services

Project activities involving over 15 commercial processing firms in Florida, over 30 firms about the nation and importing to USA, plus all pertinent FL State agencies and the U.S. Food and Drug Administration; plus major trade associations (National Fisheries Inst., Assoc. of Food & Drug Officials, and Food Marketing Inst.); plus the established Seafood HACCP Alliance and National Sea Grant Extension network and Seafood Technology position paper.

F. Invention Disclosure/Patents

Invention Disclosure UF #11092 "Venting apparatus for hermetically sealed packages containing fresh foods."

G. Project information is being incorporated in commercial position papers requesting reconsiderations and changes in regulatory mandates and enforcement.

H. Project results are being referenced in pending legal action between commercial firms and regulatory authorities.

I. Projects results are being incorporated in “Guidance Documents for Retail Practices in USA” (Assoc. Food & Drug Officials).

BENEFITS:
This project is providing scientific evidence and extension services to address a current and immediate seafood safety problem due to commercial expansion of a packaging concept (reduced oxygen packaging) that is considered by state and federal authorities to be increasing the risk of potential health hazards in food service, retail and public consumption. It is estimated that at least 25-30% of all seafood commerce in the USA is subject to this controversy. Regulatory actions resulting in stop-sells and adverted markets exceed $1.0 million/year in domestic commerce alone.