LSU AgCenter Research & Extension
Sea Grant Louisiana State University

Seafood NET News

Louisiana Seafood Resources Spring 2000

New Look For Seafood Processor News

The Seafood Industry is Changing!!

Michael W. Moody

The seafood industry is important to Louisiana. Not only does it contribute to the state s economy, but it is an essential part of Louisiana culture. We have festivals that celebrate seafoods. We have traditional seafood boils and dinners at home with friends and family. We eat out more frequently and order seafood. There s no question about it. We love our crawfish, shrimp, oysters, finfish, alligators and all the other seafoods from around the state. At the same time, the seafood industry is facing greater challenges today than ever before. To be competitive in the future will require change and education. Many of these challenges are the result of increasing concerns about food safety issues, new technology, waste disposal and limited resources.

One of our most important charges here at the LSU AgCenter is to help you meet those challenges. We can provide information to help you become knowledgeable in areas and topics important to you. We can provide training that will help you meet complex regulatory requirements.

We hope this newsletter will be a value source of information and a means by which you can communicate with us about specific needs or requirements. You can find us on the Web at www.agctr.lsu.edu/seafood or you can contact me directly at (225) 578-2366 or email me at: mmoody@agctr.lsu.edu . Our mailing address is: Department of Food Science, 111 Food Science Bldg., Baton Rouge, LA 70803-4200.

As many of you know, I am now the newly appointed head of the Department of Food Science, and my time available for working directly with you has been reduced. That is not to say that our attention to your needs has been reduced. Dr. Vor Suvanich is now available on a full-time basis to provide extension support. Dr. Suvanich is extremely knowledgeable in the area of seafood technology and processing. She can be reached at vsuvanich@agct.lsu.edu .

We hope you enjoy this newsletter. Please let us know how we can be of better assistance to you.

HACCP and SCP Training

We have conducted HACCP training since 1996, and more than 1,000 students have successfully completed the training. We will continue to provide the

training but on a reduced schedule. We will teach the course twice a year (summer and winter) and only in Baton Rouge at the Baton Rouge campus. Our next HACCP course is May 9-11. For registration information, please go to our Web page http://www.agctr.lsu.edu/seafood/HACCP_Training_Schedule.htm or contact Vor directly for a registration form.

As a result of our HACCP training, seafood processors have indicated a need for more detailed training in the principles of sanitation and on methods that will help them better comply with the Sanitation Standard Operating Procedures (SSOP) of the HACCP regulations. Unlike HACCP, SSOP training is not required, but it will help you understand plant sanitation and give you ideas about how you might improve procedures in your plant. For example, do you know what sanitizing products are available for use? In what concentration should they be used? Is the quality of water used to sanitize important? What sanitation practices are recommended for employees?
The purpose of this one-day course is to answer these and many other questions on sanitation. In addition, the course will help you to prepare your required SSOP records. This course was prepared by the National Seafood Alliance and has been approved by FDA. The course will be offered on Tuesday, May 8 in Baton Rouge. You may register on our web site at: http://www.agctr.lsu.edu/seafood/SCP_Training_Schedule.htm or contact Vor using e-mail or telephone for a registration form. You must preregister for the course. All participants will receive a training manual and a certificate of course completion from the Association of Food and Drug Officials. Register early!

As a special note, Dr. Robert J. Price from the University of California at Davis will be a special guest lecturer at both the HACCP training and the SSOP training. Dr. Price has nearly 30 years of working with the seafood industry not only in California but around the nation. You must preregister for the course. All participants will receive a training manual and a certificate of course completion from the Association of Food and Drug Officials. Register early!

Mid-Course Correction of FDA s Seafood HACCP Program!

Vor. Suvanich

In response to the newly released report from the General Accounting Office (GAO) on evaluating serious weaknesses of FDA s seafood HACCP program, FDA has instituted a Mid-Course Correction initiative to focus on seafood products what represent the Highest Risk to consumers. A high risk process is one that (a) must control pathogens; (b) must control histamine; or (c) has not a HACCP plan. FDA will respond by performing more frequent inspections of noncompliant firms; conduct more extensive laboratory testing for pathogens and histamine; and initiate enforcement action where appropriate.
Do you have a HACCP plan for every seafood product that you process? Are your HACCP plans annually updated? You should be very particularly concerned if you process either cook-ready-to-eat seafood products, such as crawfish tail-meat, crab meat, and shrimp, or ready-to-serve value-added products that contain seafoods. Full document of the FDA s Seafood HACCP Program: Mid-Course Correction is at http://www.cfsan.fda.gov

Understand *Listeria monocytogenes*!! in Seafood

Robert J. Price
Seafood Product Specialist, University of California at Davis, CA

L. monocytogenes is a bacterium, which is widespread in nature and has been isolated from soil, vegetation, marine sediments and water. In the early 1900s, *L. monocytogenes* was recognized as a bacterium that caused illness in farm animals. More recently, it has been identified as the cause of listeriosis in humans. Most healthy individuals are either unaffected by *L.*

monocytogenes or experience only mild flu-like symptoms. Victims of severe listeriosis are usually immunocompromised. Those at highest risk include: cancer patients, individuals taking drugs that affect the body's immune system, alcoholics, pregnant women, persons with low stomach acidity and individuals with AIDS. Severe listeriosis can cause meningitis, abortions, septicemia and a number of other maladies, some of which may lead to death.

L. monocytogenes is a remarkable tough organism. It resists heat, salt, nitrite and acidity much better than many organisms. The bacteria survive on cold surfaces and also can multiply *slowly* at 24ºF, defeating one traditional food safety defense– refrigeration. (Refrigeration at 40ºF or below stops the multiplication of many other food-borne bacteria. Refrigeration does not kill most bacteria.) Commercial freezer temperatures of 0ºF, however, will stop *L. monocytogenes* from multiplying.

The greatest threat of listeriosis is from ready-to-eat products that do not require further cooking at home. *L. monocytogenes* in raw food that will be cooked before consumption is less of a concern to the food industry since the bacteria are killed during cooking. *L. monocytogenes* has been isolated from raw fish,cooked crabs, raw and cooked shrimp, raw lobster, surimi and smoked fish.

L. monocytogenes in food is either known or suspected to have caused four reported outbreaks of listeriosis in North America in the past decade. According to information gathered in its surveillance projects conducted in the 1980's, the Centers for Disease Control and Prevention (CDC) projects about 1,850 cases of human listeriosis occur annually. Surveillance data also indicate that about 425 deaths occur each year in the U.S. About 5 percent of the 9,000 food poisoning deaths each year are due to listeriosis.

The U.S. Food and Drug Administration (FDA) will not accept *any* detectable *L. monocytogenes* on cooked, ready-to-eat seafood. This is called "zero tolerance" for the bacteria. FDA can hold or detain products at the food processing plant, request a voluntary recall of the product or seize products through court order if necessary. Recent recalls for *Listeria* in seafood products have included smoked fish products and white fish salad. *Listeria* has also been found in cooked shrimp, cooked crab meat, and smoked fish and shellfish.

Controlling *Listeria* In The Plant

Thorough cooking will destroy *L. monocytogenes* on foods. Thoroughly cooking seafood and preventing cross-contamination once the seafood is cooked will prevent hazards from *L. monocytogenes*. Since the infective dose of *L. monocytogenes* is thought to be small, time/temperature abuse of food products may not be necessary to result in illness. FDA has identified the Hazard Analysis and Critical Control Point (HACCP) system and Sanitation Standard Operating Procedures (SSOPs) as the most effective strategies for controlling the presence of *L. monocytogenes* on seafood products. In addition to encouraging adoption of these strategies by all who handle food, FDA is working with industry to design strong HACCP and SSOP programs.

In a HACCP program, points at which food risks are more likely to be introduced are identified, and interventions are introduced where control is possible to reduce the potential for consumption of unsafe products. For instance, insufficient cooking may allow the survival of pathogenic bacteria and present a hazard. Therefore, FDA requires adequate cooking temperatures to destroy the bacteria. SSOP programs help prevent the processing environment from becoming a source of *L. monocytogenes*. Areas of concern in food processing plants include plant design and layout, equipment design, process control, personnel practices, cleaning and sanitizing procedures, and verification of pathogen control.

RAPID HISTAMINE TEST KIT IT S YOUR OWN CHOICE.

Claver E. Bundac (Biomedix, Tel. 909-3960244)

Histamine or imidazole-ethylamine (MW=111) is produced by the decarboxylation of histidine, an amino acid present in proteins, which make up the fish tissues. This conversion of histidine to histamine is made possible by an enzyme called histidine decarboxylase, which is produced by certain bacteria (*Hafnia alvei*, *Klebsiella* spp., *E. coli*, *Clostridium* spp., *Lactobacillus* spp., and *Enterobacter* spp.) as a by-product of their growth process. Recent studies also have incriminated *Photobacterium phosphoreum* and *Photobacterium histaminum* in the production of histamine. These last two bacteria present a new problem in preventing histamine production for both are capable of tolerating high salt concentrations and both have the ability to grow at low temperatures.

These bacteria are normally present in the intestines, gills and surface slime of a fish. The types of bacteria being harbored by a fish depend significantly on the species of the fish, the geographical location that it inhabits (influencing the water temperature and the microorganisms present in the water), season of capture, conditions existing on the boat which catches and transports the fish and finally the fashion by which the fish is handled during processing and distribution.

The rapid and uncontrolled growth of these bacteria in a live fish in its natural habitat is prevented by factors inherent to the fish (immune system of the fish, normal body temperature, a balanced fish micro-flora, etc.) and by the existing environmental factors (water temperature, water composition, etc.), which have an inhibiting effect on the bacteria. This well-balanced state is the fish s natural mechanism, which prevents it from being overwhelmed by the bacteria. As effective as it is, this state of micro floral equilibrium can be readily shattered by anything that alters the above-mentioned factors.

This disturbance of the equilibrium is what takes place during and after capture of the fish. The struggle of the fish during capture elevates its body temperature causing the histamine producing bacteria to grow rapidly, and upon death, the fish s immune system shuts down completely, further accelerating bacterial growth rate within the fish tissues. As a by-product of this rapid growth process, these bacteria start producing the enzyme histidine decarboxylase, depositing it directly into the fish tissues. Upon contact, this enzyme will start digesting the histidine component of the fish tissues, converting it to histamine.

Once the enzyme histidine decarboxylase is formed, it can continuously produce histamine even in the absence of bacterial growth, since once produced, it relies on a chemical reaction rather than a microbiological process to exert its effect. This enzyme remains active at or near refrigeration temperatures presenting the prospect of continued histamine production at these temperatures.

Freezing inactivates the bacteria and stops the effect of the enzyme already deposited in the fish tissues, but does not destroy the histamine which has already been formed in the fish. However, the enzyme is believed to remain more stable than the bacteria at frozen state and will be rapidly reactivated after thawing.

Cooking eradicates both the bacteria and the enzyme deposited in the fish tissues. However, the histamine which was already present in the fish tissues before cooking remains stable in the cooked fish and cannot be eliminated by heat (including retorting) or freezing. Therefore, any additional histamine production on a cooked fish may only take place if it were to be re-contaminated with the enzyme producing bacteria after cooking. In view of all these, it becomes apparent that histamine production is most likely to occur in raw, unfrozen fish. This is due to the fact that bacterial growth rate is more rapid at high-abuse temperatures (70 F or 21.1 C) than at moderate-abuse temperatures (45 F or 7.2 C). Histamine is more commonly the result of high temperature spoilage than of long-term,

relatively low temperature spoilage. It is therefore the combination of temperatures conducive to bacterial growth and the actual presence of the enzyme-producing bacteria in the fish that determines the prospect of histamine production. A situation having one without the other will therefore not result to histamine production. This explains why the mere evidence of spoilage is not a guarantee that histamine is present since other bacteria that are not capable of producing the enzyme that is needed to produce histamine may cause spoilage.

On the other hand, a fish, which carries the enzyme-producing bacteria, may be rapidly saturated with histamine upon its exposure to temperature abuse. However, high levels of histamine may be produced in the fish way before any sign of spoilage becomes apparent. If the same fish were to be frozen at this point, you have a fish that looks fresh, but is at the same time loaded with histamine. This shows an important point in understanding the fact that there is no indisputable relationship between the degree of freshness and the amount of histamine in the fish.

The members of the Scombridae family of fish (tuna family) contain high levels of free histidine in their muscle tissues, making them a ripe source of histamine. Due to this, members of this family of fish are more commonly implicated in cases of histamine poisoning (hence the phrase Scombroid poisoning). Other species that are commonly implicated in histamine poisoning are mahi-mahi, blue fish, mackerel, bonito, anchovies, yellow tail, sardines, scads, marlin, herring and jack.

Quality control measures designed to minimize the scombrotoxic fish occurrence. The determination of histamine levels in the range of 10 to 200 ppm (parts per million). Good quality fish contain less than 10 ppm histamine, a level of 30 ppm indicates significant deterioration, and 50 ppm is considered to be definite decomposition evidence (Compliance Policy Guideline # 540.525, *Federal Register*, 1995). The maximum allowable histamine level in fish and fish products is 50 ppm, which is the same as 50 mg per kg or 5 mg per 100 g.

Commercial Rapid Histamine Test Kits

The limitations of the laboratory-based methods have led to the need for routinely rapid testing histamine for industry. Several companies have produced test kits, which have been advertised as cheap, simple, rapid, and capable of providing accurate results. Commercially available test kits marketed to determine histamine in fresh, frozen and canned fish are normally classified as qualitative, quantitative, or semi-quantitative in the range of one to 500 ppm. Most of them are based on an enzyme-linked immunosorbent assay (ELISA) that measures the direct competition between the histamine to be assayed and enzyme-labeled histamine conjugates. Another type is based on a chemical colorimetric analysis. Those commercial test kits marketed as screening tests for histamine are *HistaQuant* (quantitative) and *HistaMeter* (semi-quantitative) from Biomedix, Diamond Bar, CA; *Histamarine Enzyme Immunoassay Kit* from Immunotech (Coulter, OPA, Locka, FL); *K1-HTM* (quantitative) and *K3-HTM* (qualitative) from Immuno-diagnostic Reagents (IDR), Vista, CA; *ALERT®* and *Veratox histamine kits* from Neogen, Lansing, MI; *RIDASCREEN* from R-Biopharm, Marshall, MI; *Transia Tube Histamine* from GENE-TRAK Systems, Hopkinton, MA, and *Histamine ELISA* from Immuno Biological Laboratories, Hamburg, Germany. The performance of each test kit in determining histamine at or near the 50 ppm is particularly important. Accuracy of the determination is very important since there is a possibility of false accepted and false rejected, particularly around the 50 ppm level. The reliable test kits should provide their information for accurately measure very low values of histamine, values near 50 ppm histamine, and very high values of histamine.