The meeting of the Seafood Safety Task Force (SSTF) was called to order at the LDH Bienville Building at 10:05 am.

I. Welcome and Introductions

Senator Fred Mills led the meeting. He explained that SR 159 of the 2023 Regular Session of the Legislature did not create this task force, but rather revitalized the SSTF that was created by law in 2009 (RS 40:5.5.3). He explained that the SSTF met robustly, issued an initial report in May 2010, and was prepared to continue pursuing Louisiana seafood safety and promotion through regularly scheduled meetings. The BP Oil spill in April 2010 derailed the group's efforts and unfortunately they ceased meeting. However, the statutory authority for the group remains in law and should continue to be utilized as an expert panel created within the Louisiana Department of Health to provide advice on matters related to Louisiana seafood safety and promotion.

Christine Peck, Senate Counsel, explained the difference between SR 159 by Senator Mills and HCR 134 by Rep. Kerner. SR 159 urged the Louisiana Department of Health to be more proactive in implementing all of the Louisiana laws already in place, including the revitalization of the statutorily created SSTF. By contrast, HCR 134 created the Imported Seafood Safety Task Force by resolution that is time limited. Ms. Peck further explained that LDH and Senator Mills agreed to combine the efforts of both groups for ease of staffing at LDH and since there was significant overlap in membership and mission, but that Rep. Kerner opposed taking advantage of this efficiency. Ultimately, the SSTF is statutorily created in law and will exist in perpetuity unless and until repealed by the legislature and the HCR 134 task force is not statutorily created and will cease to exist.

The members of the SSTF are as follows:

(1) A member appointed by chairman of the House Committee on Health and Welfare who shall serve as chair of the task force or his designee. **Rep. Larry Bagley**
(2) A member appointed by chairman of the Senate Committee on Health and Welfare or his designee. **Senator Fred Mills**
(3) The commissioner of the Department of Agriculture and Forestry or his designee. **Gene Cavalier**
(4) The chancellor of the Louisiana State University Agricultural Center or his designee. **Evelyn Watts**
(5) A representative of the Louisiana Poison Control Center. **Dr. Mark Ryan**
(6) The secretary of the Louisiana Department of Health or his designee. **Theresa Sokol**
(7) A representative of the United States Food and Drug Administration. **VACANT**
(8) A representative of the Louisiana Farm Bureau Federation. **J.B. Hanks**
(9) The secretary of the Department of Wildlife and Fisheries or his designee. **Patrick Banks**
(10) The secretary of the Department of Environmental Quality or his designee. **Rachael Mathews**
(11) A representative of the Louisiana Restaurant Association. **Will Dubos**
(12) A public health nutritionist. **VACANT**

Kimberly Chauvin, President of the Women's Southern Fisheries Alliance, was invited inadvertently, but proved to be instrumental in the discussion of the SSTF.

Members present and making a quorum at the meeting include Senator Mills, Ms. Watts, Ms. Sokol, Mr. Hanks, Mr. Banks, Ms. Mathews, and Mr. Dubos.

II. Charge to the Task Force

RS 40:5.5.3(A) provides that the task force shall be charged with obtaining all of the following:
(1) Method in which the imported seafood is inspected in Louisiana.
(2) Frequency of inspections of imported seafood.
(3) Substances for which imported seafood are currently being tested.
(4) Results of sampling analysis of potentially harmful substances in imported seafood.

RS 40:5.5.3(A) further provides that the task force shall compile the results of these findings and develop seafood and safety recommendations to be reported to the House Committee on Health and Welfare, the Senate Committee on Health and Welfare, the House Committee on Agriculture, Forestry, Aquaculture, and Rural Development, and the Senate Committee on Agriculture, Forestry, Aquaculture, and Rural Development by March 1, 2010.

The initial and only report issued by the SSTF was shared during the meeting and Senator Mills asked Mike Vidrine to research the status of the recommendations listed in the report. Senator Mills also explained that although the law only requires the SSTF to issue a report by March 1, 2010, that did not terminate the SSTF and that the work product of this group would be to issue another report by December 31, 2023, to outline the continuation of the SSTF. The initial report issued on May 18, 2010, is provided as *Attachment 1*.

A robust discussion by the SSTF ensued with expert input provided by all members. Upon conclusion of the discussion, there emerged five (5) general areas that the SSTF discussed and agreed to continue to pursue in future meetings.

The five (5) points are summarized as follows:

- **Modernization of current laws.** There are several laws already enacted in Louisiana relative to seafood safety that should be updated and modernized to reflect best practices in regulating seafood imported, distributed, and consumed in Louisiana. Those laws are summarized in *Attachment 2* which was shared with the SSTF. Other state laws should be reviewed to see how best to protect Louisiana seafood producers and consumers. California and Texas were specifically mentioned for their proactive laws. Ms. Peck will begin compiling proposed amendments to current laws. Ms. Chauvin will reach out to her association members to see what other states are doing.

- **Broaden the scope of the issue.** The SSTF must consider the impact of all imported seafood including crawfish, shrimp, and fish and must address imports from countries other than just China. Countries including but not limited to Indonesia, India, Taiwan, and Ecuador are importing significant amounts of seafood into Louisiana. Ms. Chauvin and Mr. Hanks discussed this issue at length and will provide additional information to the SSTF.

- **Managing the problem at the ports of entry into Louisiana.** Port shopping is a fundamental problem wherein a shipment of imported seafood is rejected by one port and the container is simply carried around until it is accepted at a different port. More discussion on how to stop port shopping, state and federal jurisdiction at the ports, and ability to seize and destroy product at the ports is required. Sen. Mills will reach out to the congressional delegation to request information from the FDA on port authority and jurisdiction. Mike Vidrine and his attorney David McKay are preparing their assessment of state jurisdiction to share with the SSTF.

- **Testing in an efficient and effective manner.** Testing of imported seafood is fundamentally flawed and can be a waste of money and effort if not done in an efficient and effective manner. Problems discussed include knowing what we are testing for; the importers knowing how to beat the tests by changing the chemicals they expose the seafood to; the scope and cost of the tests; the small percentage of testing currently conducted; the delay in testing and results and the product moving during that time period; product tracing; and only having four commercial seafood inspectors for the entire state. More discussion on this topic is needed. Ms. Watts will discuss with LSU Ag Center leadership any opportunities to have the university participate in this effort in a way more dynamic than just the 2020 report issued by a single graduate student – provided as *Attachment 3*.

- **Mislabeling of products.** In addition to the laws currently in place regarding warning labels and menu disclaimers of imported seafood, the SSTF must discuss products for mass distribution in restaurants and grocery stores being represented as Louisiana specifically or implied, but being from another country. By way of example, Senator Mills said it is not uncommon to find frozen shrimp or crawfish in a grocery store labeled as something like "Boudreaux's Cajun Crawfish" on the front, but the back says product of China, packaged in Louisiana.

Senator Mills led a hearty discussion on the importance of the initial 2010 report recommending a positive marketing campaign for Louisiana seafood. Senator Mills will be working with Commissioner Strain and Lt. Governor Nungesser to revitalize this effort and launch an aggressive campaign to promote Louisiana seafood.

Senator Mills commended the department on implementation of the other substantive requests set forth in SR 159, specifically promulgating rules to make a violation of the laws on restaurant patron notice a critical violation under the Sanitary Code, designated as a class A violation subject to the imposition of a civil fine for noncompliance.

Senator Mills and Mr. Dubos discussed the importance of the state partnering with the La Restaurant Association on the efforts of the SSTF. Mr. Dubos said that obviously his members do not support anything dangerous being served to their restaurant patrons. However, they do assess everything that causes a financial hardship on their members.

Senator Mills stated that he would reach out to the Senate Revenue and Fiscal Affairs staff to identify any taxation options on imported seafood.

The agenda included discussion items for enforcement of current state and federal laws, inspection and testing protocols, promotion of Louisiana seafood, and truth in retail labeling. Senator Mills and the SSTF members agreed that all of these items had been covered throughout the morning.

III. Communications Plan

Senator Mills advised that due to the change in administration with the upcoming governor's election and the anticipated turnover at the state agency level, he would like the SSTF to issue a report by December 31, 2023. Senator Mills further advised that he is term-limited and would not be coming back as a legislator, but that he would stay engaged in this issue since it is so important to him.

IV. Operating Logistics

The law creating the SSTF provides that the member appointed by chairman of the House Committee on Health and Welfare serves as the chair of the task force. Thus, the chairman is Rep. Larry Bagley.

The SSTF members elected Senator Mills to serve as the Vice Chairman. Christine Peck, Senate Counsel, is not a task force member, but agreed to provide the minutes for the meetings and compile the 2023 SSTF report.

The SSTF agreed to meet monthly through December, with the next meeting being on October 27.

Senator Mills made a motion to adjourn at 12:00 pm.

-end-

Attachment 1

Bobby Jindal
GOVERNOR

Alan Levine
SECRETARY

State of Louisiana

Department of Health and Hospitals

Office of the Secretary

May 18, 2010

The Honorable Joel T. Chaisson, II, President
Louisiana State Senate
P.O. Box 94183, Capitol Station
Baton Rouge, LA 70804-9183

The Honorable Jim Tucker, Speaker
Louisiana State House of Representatives
P.O. Box 94062, Capitol Station
Baton Rouge, LA 70804-9062

The Honorable Kay Katz, Chairwoman
House Health and Welfare Committee
Louisiana State House of Representatives
P.O. Box 44486, Capitol Station
Baton Rouge, LA 70804-4486

The Honorable Willie L. Mount, Chairwoman
Senate Health and Welfare Committee
Louisiana State Senate
P.O. Box 94183, Capitol Station
Baton Rouge, LA 70804-9183

The Honorable Andy Anders, Chairman
House Agriculture, Forestry, Aquaculture,
and Rural Development Committee
Louisiana State House of Representatives
P.O. Box 44486, Capitol Station
Baton Rouge, LA 70804-4486

The Honorable Francis Thompson, Chairman
Senate Agriculture, Forestry, Aquaculture,
and Rural Development Committee
Louisiana State Senate
P.O. Box 94183, Capitol Station
Baton Rouge, LA 70804-9183

Dear President Chaisson, Speaker Tucker, and Honorable Chairs:

In response to House Bill No. 551 (HB 551) of the 2009 Regular Session, the Louisiana Department of Health and Hospitals (DHH) submits the enclosed report. HB 551 created the Seafood Safety Task Force within DHH, whose charge was to obtain the method in which imported seafood is inspected in Louisiana, the frequency of inspections of imported seafood, the substances for which imported seafood are currently being tested, and the results of sampling analysis of potentially harmful substances in imported seafood. The bill required the task force to compile the results of these findings and develop seafood and safety recommendations to be reported to the House and Senate Health and Welfare Committees and the House and Senate Agriculture, Forestry, Aquaculture, and Rural Development Committees. R.S. 24:772 also requires that the report be submitted to the President of the Senate and the Speaker of the House.

Dr. Jimmy Guidry, Louisiana's state health officer, is available to discuss the enclosed report and recommendations with you at your convenience. Please contact him at (225) 342-3417 with any questions or comments you may have.

Sincerely,

Alan Levine
Secretary

Enclosures

Cc: The Honorable Members of the House Health and Welfare Committee
The Honorable Members of the Senate Health and Welfare Committee
The Honorable Members of the House Agriculture, Forestry, Aquaculture, and Rural Development Committee
The Honorable Members of the Senate Agriculture, Forestry, Aquaculture, and Rural Development Committee
Representative Fred Mills
David R. Poynter Legislative Research Library

DEPARTMENT OF HEALTH AND HOSPITALS

LOUISIANA SEAFOOD TASK FORCE FINDINGS AND RECOMMENDATIONS

REPORT PREPARED IN RESPONSE TO ACT 330 OF THE 2009 REGULAR SESSION

MAY 2010

Contact:
Louisiana Department of Health and Hospitals
Jimmy Guidry, M.D.
State Health Officer/DHH Medical Director
628 N. 4th Street; P.O. Box 629; Baton Rouge, LA 70821-0629
(225)342-3417

EXECUTIVE SUMMARY

Act 330 of the 2009 Regular Legislative Session was intended to address the Legislature's concerns of serious risks to the public's health from radiation, antibiotics (such as chloramphenicol and fluoroquinolones), chemicals, malachite green, copper salts, and other residues found in Chinese seafood. The overexposure to antibiotics from such seafood may cause serious antibiotic resistance to the consumer.

Act 330 urged and requested the State Health Officer within the Department of Health and Hospitals (DHH) to prepare and promulgate all rules and regulations necessary to ensure that all consumers of imported marine and freshwater seafood products from the People's Republic of China are warned about the potential health risks associated with the consumption of those products; partner with the Louisiana Restaurant Association to employ a marketing campaign that places an emphasis on highlighting the benefits of eating domestic seafood; produce a statement that may be included on labels, placards, menu boards, or other promotional signage that encourages consumers to consume Louisiana seafood and warns of the risks that may be associated with the consumption of Chinese seafood; and with the cooperation and assistance of the Louisiana Retailers Association, the Louisiana Restaurant Association, and other necessary organizations, the State Health Officer, in conjunction with the Louisiana Department of Agriculture and Forestry, shall encourage the display of the signage and other promotional literature.

Act 330 also required the creation of the Seafood Task Force. The Task Force is charged with obtaining **(1)** the method in which the imported seafood is inspected in Louisiana; **(2)** the frequency of inspections of imported seafood; **(3)** the substances for which imported seafood are currently being tested; and**(4)** the results of sampling and analysis of potentially harmful substances in imported seafood. A report of the findings shall be provided to the House Committee on Agriculture, Forestry, Aquaculture, and Rural Development, and the Senate Committee on Agriculture, Forestry, Aquaculture, and Rural Development by March 1, 2010.

The Louisiana Seafood Safety Task Force has made the following recommendations based on an analysis of data and information provided to the Task Force. These recommendations were aimed at the future advancement of Louisiana's seafood industry and the protection of the public's health.

1. The Department's Office of Public Health (OPH) should include portions of "The Fish and Fisheries Products Hazards and Controls Guidance" and CFR 123.12 special requirements for imported products to the Title 51 Sanitary Code, Part IX.

2. DHH is to request additional funding be added to the existing U. S. Food and Drug Administration (USFDA) Federal Inspection Program contracts to collect and analyze random seafood samples, to be tested for evidence of unapproved antibiotics and other drugs and chemicals, such as malachite green, nitrofurans, flouroquinolones, and gentian violet, beginning with federal FY 2010-2011. Sampling will be contingent on additional funding from USFDA.

3. Louisiana Restaurant Association, Louisiana Seafood Promotion and Marketing Board, along with other stakeholders, are to develop a positive marketing campaign for Louisiana seafood.

4. Support and expand the Louisiana Department of Agriculture and Louisiana Seafood Promotion and Marketing Board in the existing promotional campaigns of Louisiana seafood.

5. DHH is to seek funding for a pilot program with the effort of USFDA to further the testing of imported seafood.

The recommendations and findings were compiled by the Task Force. In accordance with the Legislature, the Task Force is composed of the following members:

Representative Fred Mills (Chairman)	A member appointed by the chairman of the House Committee on Health and Welfare
Brad Soileau	A member appointed by the chairman of the Senate Committee on Health and Welfare
Carrie Castille, Ph.D. (Vice Chairman)	Appointed by the commissioner of the Department of Agriculture and Forestry
Lucina Lampila, Ph.D., R.D.	Representative of the Louisiana State University Agricultural Center
Mark Ryan, PharmD	Representative of the Louisiana Poison Control Center
Jimmy Guidry, M.D.	Designee of the secretary of Department of Health and Hospitals
Patricia Schafer	Representative of the United States Food and Drug Administration
Ron Harrell	Representative of the Louisiana Farm Bureau Federation
Lt. Jay Diez	Designee of the secretary of Department of Wildlife and Fisheries
Peggy Hatch	The secretary of the Department of Environmental Quality
Tom Weatherly	Representative of the Louisiana Restaurant Association
Monica McDaniels, M.S., L.D.N., R.D.	Public Health Nutritionist

REPORT TO THE LEGISLATURE

Introduction

Louisiana commercial fishermen have been supplying the United States with seafood for centuries. There is a large variety of Louisiana seafood and the state is the main producer of oysters, shrimp, crab, crawfish and alligator. In 2006, commercial seafood (including freshwater finfish, marine finfish, freshwater shellfish and marine shellfish) brought in approximately $2.4 billion and produced 26,915 jobs for commercial seafood alone for the State..

In the effort to assure safe, wholesome seafood products are available for public consumption, and to maintain levels throughout commerce, Louisiana OPH's Registered Sanitarians permit all seafood facilities. Inspections of permitted facilities are conducted on a quarterly basis and include laboratory analyses for E. coli and fecal coliform contamination on ready-to-eat domestic crawfish and crab meat.

Currently, there are approximately 340 permitted seafood facilities. In FY 2008-2009, a total of 1,742 inspections were conducted by DHH registered sanitarians on these permitted facilities. Of the 340 permitted establishments, 100 of these are inspected by DHH registered sanitarians under a current contract with USFDA known as the Federal Inspection Program.

USFDA has the authority to inspect any seafood facility when deemed necessary. The USFDA inspections are not done on a routine basis and are selected randomly from the DHH database; however, DHH inspects on a routine basis.

This report is in response to Act 330 of the 2009 Regular Session of the Louisiana Legislature, which mandates the creation of the Louisiana Seafood Safety Task Force. Act 330 directs the Task Force to obtain **(1)** the method in which the imported seafood is inspected in Louisiana; **(2)** the frequency of inspections of imported seafood; **(3)** the substances for which imported seafood are currently being tested; and **(4)** the results of sampling the analysis of potentially harmful substances in imported seafood. The Louisiana Seafood Safety Task Force met in August, September and October 2009 and February 2010 to evaluate its charge and develop and report recommendations to the Legislature.

The following information was gathered and analyzed from USFDA and OPH's Sanitarian Services Division.

(1) Method in which the imported seafood is inspected in Louisiana

OPH registered sanitarians of the Commercial Seafood Program issue permits and conduct sanitary inspections of all seafood facilities. The registered sanitarian evaluates and verifies that all seafood products are properly labeled and received from approved sources. The inspection specifically includes noting the country of origin. This ensures the consumers receive safe and wholesome seafood products.

USFDA inspectors conduct physical examinations, which may include laboratory analyses of imported and domestic seafood.

(2) Frequency of inspections of imported seafood
OPH registered sanitarians inspect the permitted facilities quarterly.

According to information provided by the USFDA, approximately 1.5 percent of all imported seafood is physically sampled and/or examined. This is roughly 12,949 lines of imported seafood. Louisiana cannot be compared to the USFDA due to non-testing of imported seafood products; however, funding has been requested as an addendum to the current contract between USFDA and DHH.

USFDA data reveals that 8,973 samples of seafood products imported into Louisiana during the Federal FY 2004-2009 were physically examined and/or laboratory tested.

Of the consignees in the state of Louisiana, USFDA analyzed 68 import seafood samples (consisting of mackerel, non-ictalurus fish, crawfish, shrimp and prawns, whiting, snapper, tilapia, crab and croaker) for micro, decomposition, filth, pesticide, and antibiotics. USFDA tests did not reveal any positive samples.

(3) The substances for which imported seafood are currently being tested
Louisiana OPH currently conducts laboratory analyses for E. coli and fecal coliform contamination on ready-to-eat **domestic** crawfish and crab meat when processing facilities are initially permitted. **It is important to note that imported seafood is not analyzed due to lack of funding.**

The USFDA tests seafood in the following areas: decomposition analysis (to include sensory analysis and chemical analysis for scombrotoxin-forming fish products and indole in shrimp products); antibiotic assay (fluouroquinolones, chloramphenicol, etc.); microbiological analysis; food additive analysis; acidified foods assay; pesticides analysis; and filth analysis. This includes testing for evidence of unapproved antibiotics and other drugs and chemicals, such as malachite green, nitrofurans, flouroquinolones, and gentian violet seafood.

(4) The results of sampling the analysis of potentially harmful substances in imported seafood
For samples collected in FY 2009 by USFDA, 8.7percent were classified as violative.

Imported seafood samples were collected during USFDA FY'09 from the Louisiana ports. The USFDA analyzed 34 imported seafood samples (consisting of mackerel, non-ictalurus fish, crawfish, shrimp and prawns, whiting, snapper, tilapia, crab and croaker) for microorganisms, decomposition, filth, pesticide and antibiotics. FDA tests revealed one sample of shrimp tested positive for antibiotics (chloramphenicol).

The most common violation was decomposition. The second most common violation was for microbiological contaminants, with salmonella being the most prevalent. When positive results are found, regulatory measures, such as import alerts, detention without physical examination and, if necessary, refusal may be taken.

Recommendations

1. OPH should include portions of "The Fish and Fisheries Products Hazards and Controls Guidance" and CFR 123.12 Special Requirements for imported products to the Title 51 Sanitary Code, Part IX.

2. DHH is to request additional funding be added to the existing USFDA Federal Inspection Program contracts to collect and analyze random seafood samples to be tested for evidence of unapproved antibiotics and other drugs and chemicals, such as malachite green, nitrofurans, flouroquinolones, and gentian violet, beginning with federal FY 2010-2011. Sampling will be contingent on additional funding from USFDA.

3. Louisiana Restaurant Association, Louisiana Seafood Promotion and Marketing Board, along with other stakeholders, are to develop a positive marketing campaign for Louisiana seafood.

4. Support and expand the Louisiana Department of Agriculture and Louisiana Seafood Promotion and Marketing Board in the existing promotional campaigns of Louisiana seafood.

5. DHH is to seek funding for a pilot program with the effort of USFDA to further the testing of imported seafood.

Additional information received and utilized by the Louisiana Seafood Task Force:

- "Existing Laws on Labeling in Louisiana," presented by DHH-OPH, Food and Drug Program. The presentation provided information on brand name/identifier, standard of identity, declaration of country of origin, net quantity of contents declaration, responsible party declaration, permit number, method of production and seafood regulations in the state of Louisiana.
- "Marketing Louisiana Seafood," presented by Louisiana Seafood and Marketing Board. The presentation provided information on items in place to promote Louisiana seafood, branding Louisiana products, radio advertisements used to promote Louisiana seafood, international marketing of Louisiana seafood products, and discussed the importance of informing the public on the possible contaminants in imported seafood without hurting the industry.
- FDA's role in receiving, inspecting and sampling imported seafood products.

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United States Food and Drug Administration. (2009). Part 123 Fish And Fishery Products. *2009 21 CFR (FDA: Drugs, general)* (pp. 309-310). Rockville: Government Institutes.

APPENDICES

APPENDIX A: HB 551/Act 330, 2009 Regular Session

ENROLLED

Regular Session, 2009

ACT No. 330

HOUSE BILL NO. 551

BY REPRESENTATIVES MILLS, ABRAMSON, ARMES, AUSTIN BADON, BOBBY BADON, BALDONE, BARRAS, BARROW, BILLIOT, BURFORD, HENRY BURNS, TIM BURNS, BURRELL, CARMODY, CHAMPAGNE, CHANDLER, CHANEY, CORTEZ, CROMER, DIXON, DOERGE, DOVE, EDWARDS, FANNIN, GISCLAIR, MICKEY GUILLORY, GUINN, HARDY, HARRISON, HAZEL, HENDERSON, HILL, HINES, HOFFMANN, HOWARD, HUTTER, GIROD JACKSON, SAM JONES, KATZ, LABRUZZO, LAFONTA, LAMBERT, LANDRY, LEBAS, LIGI, LITTLE, MONICA, MONTOUCET, MORRIS, NORTON, NOWLIN, PERRY, POPE, PUGH, RICHARD, RICHARDSON, ROBIDEAUX, SIMON, GARY SMITH, JANE SMITH, ST. GERMAIN, STIAES, THIBAUT, WADDELL, WILLIAMS, AND WILLMOTT AND SENATORS CHEEK, DORSEY, ERDEY, GUILLORY, HEITMEIER, MOUNT, NEVERS, AND THOMPSON

Prefiled pursuant to Article III, Section 2(A)(4)(b)(i) of the Constitution of Louisiana.

AN ACT

To amend and reenact R.S. 40:4(A)(1)(b) and to enact R.S. 40:5.5.2 and 5.5.3, relative to seafood products; to create a seafood safety campaign regarding the risk of consumption of Chinese seafood; to grant the state health officer rulemaking authority; to encourage the labeling of certain seafood products; to encourage the posting of signs; to create the Seafood Safety Task Force; to provide for the membership of the task force; to provide for the purpose and duties of the task force; and to provide for related matters.

Be it enacted by the Legislature of Louisiana:

Section 1. R.S. 40:4(A)(1)(b) is hereby amended and reenacted and R.S. 40:5.5.2 and 5.5.3 are hereby enacted to read as follows:

§4. Sanitary Code

A. The state health officer acting through the office of public health of the Department of Health and Hospitals shall prepare, promulgate, and enforce rules and regulations embodied within the state's Sanitary Code covering all matters within his jurisdiction as defined and set forth in R.S. 40:5. The promulgation of this Sanitary Code shall be accomplished in strict accordance with the provisions of the

Administrative Procedure Act, and further, in conformity with the following guidelines and directives:

(1)

* * *

(b)(i) Pending the availability of federal funds to implement this Subparagraph, the inspection of seafood conducted pursuant to the Sanitary Code and pursuant to the Department of Agriculture and Forestry's Seafood Inspection Program shall include a recommendation for testing of the environment, including the water source, to the appropriate agency, only when evidence of contamination, adulteration, or spoilage or of any other condition or substance which is or may be injurious to health of humans or animals is indicated. The department shall adopt rules as part of the Sanitary Code and the Department of Agriculture and Forestry shall adopt rules as part of the Seafood Inspection Program.

(ii) Subject to the appropriation of funds by the legislature, the state health officer in conjunction with the Louisiana Department of Agriculture and Forestry shall institute a public safety marketing campaign to warn the public about the risks of consuming seafood from the People's Republic of China deemed to be safe by the Seafood Inspection Program but which nevertheless contains hazardous substances. The campaign shall include a warning label program as more specifically provided for in R.S. 40:5.5.2. The state health officer shall enter into a memorandum of understanding with the Louisiana Department of Agriculture and Forestry to implement this marketing campaign.

(iii) The Louisiana Retailers Association shall work with the Louisiana Department of Agriculture and Forestry, the Louisiana Crawfish Promotion and Research Board, and other respective agencies to develop a voluntary assessment for the implementation of the public safety marketing campaign.

* * *

§5.5.2. Chinese seafood warning label program

A. The legislature finds that serious risks to public health may be posed by radiation, antibiotics, such as chloramphenicol and fluoroquinolones, chemicals,

malachite green, copper salts, and other residues found in Chinese seafood. The overexposure to antibiotics from such seafood may cause serious antibiotic resistance to the consumer. In addition, chemicals such as malachite green are known carcinogens. It is the intent of the legislature to protect the health and welfare of Louisiana consumers from potentially harmful residues in seafood imported from the People's Republic of China that are sold or served in Louisiana. Therefore, the legislature finds that Louisiana consumers have the right to know if seafood imported from the People's Republic of China is being served in a food service establishment or is available for purchase.

B.(1) The state health officer shall prepare and promulgate all rules and regulations necessary to ensure that all consumers of imported marine and freshwater seafood products from the People's Republic of China are warned about the potential health risks associated with the consumption of those products.

(2) The state health officer and the Louisiana Restaurant Association shall employ a marketing campaign that places an emphasis on highlighting the benefits of eating domestic seafood.

C. The state health officer shall produce a statement that may be included on labels, placards, menu boards, or other promotional signage that encourages consumers to consume Louisiana seafood and warns of the risks that may be associated with the consumption of Chinese seafood.

D. With the cooperation and assistance of the Louisiana Retailers Association, the Louisiana Restaurant Association, and other necessary organizations, the state health officer in conjunction with the Louisiana Department of Agriculture and Forestry shall encourage the display of the signage and other promotional literature as provided for in Subsection C of this Section where seafood sales occur.

§5.5.3. Seafood Safety Task Force; creation; purpose

A. Within the Department of Health and Hospitals there is hereby created the Seafood Safety Task Force, hereafter referred to as "task force". The task force shall be charged with obtaining: (1) the method in which the imported seafood is inspected

in Louisiana; (2) the frequency of inspections of imported seafood; (3) the substances for which imported seafood are currently being tested; and (4) the results of sampling analysis of potentially harmful substances in imported seafood. The task force shall compile the results of these findings and develop seafood and safety recommendations to be reported to the House Committee on Health and Welfare, the Senate Committee on Health and Welfare, the House Committee on Agriculture, Forestry, Aquaculture, and Rural Development, and the Senate Committee on Agriculture, Forestry, Aquaculture, and Rural Development by March 1, 2010.

B. The task force shall be composed of the following members:

(1) A member appointed by chairman of the House Committee on Health and Welfare who shall serve as chair of the task force or his designee.

(2) A member appointed by chairman of the Senate Committee on Health and Welfare or his designee.

(3) The commissioner of the Department of Agriculture and Forestry or his designee.

(4) The chancellor of the Louisiana State University Agricultural Center or his designee.

(5) A representative of the Louisiana Poison Control Center.

(6) The secretary of the Department of Health and Hospitals or his designee.

(7) A representative of the United States Food and Drug Administration.

(8) A representative of the Louisiana Farm Bureau Federation.

(9) The secretary of the Department of Wildlife and Fisheries or his designee.

(10) The secretary of the Department of Environmental Quality or his designee.

(11) A representative of the Louisiana Restaurant Association.

(12) A public health nutritionist.

C. The task force shall convene for its first meeting no later than January 15, 2010. At this meeting the members shall elect a vice chairman and other officers as they deem appropriate.

D. The task force shall meet at such times and at places it may designate. Meetings shall be held at the call of the chairman or at the call of a quorum of members upon not less than seven days notice. A majority of a quorum shall be present to transact any business. The members of the task force shall not be compensated for their services on the task force but may seek travel reimbursements from their respective agencies under their respective guidelines. Meetings of the task force shall be subject to laws regarding open meetings, and records of the task force shall be subject to laws regarding public records.

E. The chair of the task force may appoint committees to fulfill the purposes of the task force. The chair of the task force shall appoint the chair of any committee and shall designate the functions and responsibilities of each committee appointed.

Section 2. This Act shall become effective on January 1, 2010.

SPEAKER OF THE HOUSE OF REPRESENTATIVES

PRESIDENT OF THE SENATE

GOVERNOR OF THE STATE OF LOUISIANA

APPROVED: _____

CODING: Words in ~~struck through~~ type are deletions from existing law; words underscored are additions.

Attachment 2

Seafood Safety Task Force **September 27, 2023**
RS 40:5.5.3 **LDH/Baton Rouge**

Seafood Safety Task Force (SSTF)

Statutorily created by Act 330 of 2009.
RS 40:5.5.3
The task force shall be charged with obtaining the following:
(1) Method in which the imported seafood is inspected in Louisiana.
(2) Frequency of inspections of imported seafood.
(3) Substances for which imported seafood are currently being tested.
(4) Results of sampling analysis of potentially harmful substances in imported seafood.

Seafood Safety Laws

(1) Notice to Consumers/Prohibiting Misrepresentation

RS 56:578.14 (ACT 264 of 2008) prohibits an owner or manager of a restaurant that sells imported crawfish or shrimp from misrepresenting to the public, either verbally, on a menu, or on signs displayed on the premises, that the crawfish or shrimp is domestic. Enforced by the district attorney of the district in which the restaurant is located. Penalties for violations are monetary fines between fifty dollars and five hundred dollars.

(2) Public Safety Marketing Campaign

RS 40:4 (ACT 330 of 2009) establishes a public safety marketing campaign to warn the public about the risks of consuming seafood from the People's Republic of China deemed to be safe by the Seafood Inspection Program but which nevertheless contains hazardous substances. The campaign shall include a warning label program as more specifically provided for in **RS 40:5.5.2**. The state health officer shall enter into a memorandum of understanding with the Department of Agriculture and Forestry to implement this marketing campaign. The Louisiana Retailers Association shall work with the Department of Agriculture and Forestry, the Louisiana Crawfish Promotion and Research Board, and other respective agencies to develop a voluntary assessment for the implementation of the public safety marketing campaign.

(3) Warning Label Program

RS 40:5.5.2 (ACT 330 of 2009) provides for a Chinese seafood warning label program and requires the state health officer to take actions to ensure that all consumers of imported marine and freshwater seafood products from the People's Republic of China are warned about the potential health risks associated with the consumption of those products, including a marketing campaign employed by the state health officer and the Louisiana Restaurant Association that places an emphasis on highlighting the benefits of eating domestic seafood and the production of a statement that may be included on labels, placards, menu boards, or other promotional signage to encourage consumers to consume Louisiana seafood and warn of the risks that may be associated with the consumption of Chinese seafood.

(4) Seafood Safety Task Force

RS 40:5.5.3 (ACT 330 of 2009) created, within the Louisiana Department of Health, the Seafood Safety Task Force, which was charged with obtaining: (1) the method in which the imported seafood is inspected in Louisiana; (2) the frequency of inspections of imported seafood; (3) the substances for which imported seafood are currently being tested; and (4) the results of sampling analysis of potentially harmful substances in imported seafood.

(5) Menu Display/Country of Origin

RS 40:5.5.4 (ACT 372 of 2019) requires any food service establishment that sells or provides cooked or prepared crawfish or shrimp that originate outside of the United States to display on all menus the country of origin of the crawfish or shrimp, or denote that the crawfish or shrimp are imported, in letters no smaller than the same size, font, and shade as the product being offered, immediately adjacent to the menu listing of the seafood item being sold or paper-clipped to the menu.

Discussion Points

- SSTF Report Issued May 18, 2012.
- LSU Aquaculture Report Issued 2020.
- Need for updating <u>all</u> current laws regarding seafood safety to modernize, broaden the authority of the SSTF, expand the countries of origin beyond China, and strengthen enforcement?
- Testing proposed by HR 134 Task Force? $50,000 investment? What is being tested and what authority does LDH have to do with the results?
- LDH rule updates to make violations of the country of origin provisions in RS 40:5.5.4 a critical violation subject to civil fines.
- What is the state authority of LDH versus federal authority to regulate imported seafood in Louisiana?
- What are other coastal states doing to protect their domestic industries?
- Next meeting date.

Attachment 3

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Determination of sulfite and antimicrobial residue in imported shrimp to the USA

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ABSTRACT

Incorrect usage of grow out and post-harvest products in shrimp aquaculture can lead to problems such as residue from veterinary drugs and melanosis prevention. These residues can be a serious concern for human health during handling and consumption of the shrimp. In an effort to determine if banned antimicrobial drugs were present in commercial shrimp, imported shrimp from India, Thailand, Indonesia, Vietnam, China, Bangladesh and Ecuador were purchased from retail stores in Baton Rouge, LA, USA and screened for the presence of veterinary drug residues (oxytetracycline, nitrofurantoin, chloramphenicol, fluoroquinolone and malachite green) using ELISA test kits. Additional screening with the Alert sulfite detection kit was used to determine if sulfite residue was over the legal limit of 100 ppm. Screening analysis revealed that samples were positive for nitrofurantoin (70 %), malachite green (5 %), oxytetracycline (7 %), and fluoroquinolone (17 %). No samples contained chloramphenicol residue. Using LC-MSMS validation, one sample tested positive for 60 ppm of oxytetracycline and 4 ppb of ciprofloxacin. Most samples tested positive for sulfite residue (43 %), but were within the US Food and Drug Administration (USFDA) limit (10–100 ppm). However, sulfites were not listed on any of labels of the 51 packages of imported shrimp. These drug residues and sulfites can have negative effects on human health. Results of this study confirm that veterinary drug residue is present in imported shrimp sold in the USA and all labeling rules are not followed.

1. Introduction

Shrimp is one of the world's most popular shellfish. High demand for shrimp leads to intensive farming, which can lead to bacterial disease problems. To prevent bacterial disease and promote growth, antimicrobial drugs are frequently used. Commonly used antimicrobials include cyclines (e.g. oxytetracycline, chlortetracycline,); quinolones (e.g. enrofloxacin, ciprofloxacin); chloramphenicol; malachite green; and nitrofurans (Roque et al., 2001; Soto-Rodríguez et al., 2006). The abuse of antimicrobial drugs creates several detrimental effects including the spread of the drugs to the environment, bacterial antibiotic resistance, and residue present in seafood (Binh et al., 2018). Some antimicrobials are considered harmful (Vass et al., 2008).

The first broad spectrum antibiotic was chloramphenicol (CAP) which was introduced in 1949 and isolated from *Streptomyces venezuelae* (Hanekamp and Bast, 2015). Chloramphenicol was widely used as veterinary drug as well as human antibiotic. CAP can be considered as carcinogenic when exposed to higher doses. The use of CAP is banned in the US, EU, Japan, China, Canada and Australia due to links to a fatal disease, aplastic anemia, and limited evidence of genetic carcinogenicity (Hanekamp and Bast, 2015).

Nitrofurans are a broad spectrum synthetic antimicrobial which include nitrofurantoin (NIT), furaltadon (FTD), furazolidone (FZD) and nitrofurazone (NFZ); all contain a 5 nitrofuran ring. Nitrofuran is used in aquaculture as a growth promoter and for prevention and treatment of bacterial and protozoan disease (Vass et al., 2008). Although nitrofuran has been banned for livestock and aquaculture use since 1995 by EU (European Commission, 1995), it is still used for human therapy. It was also used as a growth promoter in food-producing animals. However, both WHO and the European Union (EU) are unable to assign a maximum residue limit for NIT because of the potential carcinogenic effects of its residues on human health. Because of the rapid excretion of the NIT and their instability in vitro and in vivo, it is impossible to monitor residues of the parent drug nitrofurantoin directly. Instead, 1-aminohydantoin (AHD), the major metabolite of nitrofurantoin, which is stable in tissue, even after months of long-term storage, is

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selected to monitor. The detection limit is 1 ppb, so this is set at the compliance limit in food (Øye et al., 2019).

Malachite green (MG) has a diverse use as a dye but also feed additive, fungicide, parasiticide, bactericides, and antiprotozics (Srivastava et al., 2004; Bilandžić et al., 2012). Since 1933, it was used in aquaculture due to its effectiveness, low cost, and availability (Bilandžić et al., 2012). It is highly cytotoxic in bacterial and mammalian cell, acting as a liver tumor enhancer and responsible for reproductive abnormalities (Bilandžić et al., 2012). Therefore, the use of MG is not authorized.

Quinolones with fluorine atom are known as fluoroquinolones (FQ) and are banned because of the potential harms including cardiac arrhythmia, renal failure, hemolysis, and thrombocytopenia (Stahlmann, 2002). It was used for the treatment of bacterial disease in aquaculture. In the US no FQs are approved for use in shrimp aquaculture (U.S. Food and Drug Administration (USFDA, 2020a).

Oxytetracycline (OTC) is most widely used in aquaculture for treatment of bacterial diseases such as vibriosis and furnuculosis (Reed et al., 2004). However, it can also cause harmful effects, and histological studies indicate that liver damage might be caused by oxytetracycline. No OTC drugs are approved in the US for shrimp aquaculture (U.S. Food and Drug Administration (USFDA, 2020a).

The introduction of chemicals extends beyond the grow out. Melanosis, or black spot, is a quality defect in shrimp and other crustaceans characterized by the discoloration or darkening of the shrimp shell both in wild caught and cultured shrimp that affects marketability (Andrade et al., 2015; Gonçalves and de Oliveira, 2016). The cause of melanosis is polyphenol oxidase enzymes, an endogenous enzyme complex (Andrade et al., 2015) where tyrosinase is the main active enzyme. Melanosis gives an unappetizing appearance in shrimp, but is not harmful to human health (Gonçalves and de Oliveira, 2016). In addition to affecting aesthetics, melanosis also negatively affects the commercial value (Gómez-Guillén et al., 2005) and can result in a significant financial loss due to consumer rejection (Nirmal and Benjakul, 2009). Sodium sulfites or sodium meta-bisulfites are the most widely used inorganic chemicals effective for melanosis control in crustaceans (Nirmal and Benjakul, 2009). Sulfites have been used for decades, and while they are very effective in preventing melanosis, metabisulfite can trigger asthma attacks and allergic reactions (Collins-Williams, 1983). For hypersensitive asthmatics patients, small amount of sulfite can create life threatening conditions. Even contact with sulfites (i.e. during treatment of the shrimp) can be problematic by initiating severe problems such as breathing problem, cyanosis and sometimes death. Due to the potential hazard, the FDA requires that food products exposed to sulfites must include a statement about the presence of sulfites on their labels (U.S. Food and Drug Administration (USFDA, 2001). The label is mandatory if sulfite residue is more than the detectable limit (10 ppm) in shrimp (Rotllant et al., 2002). The FDA has established a regulatory maximum limit of 100 ppm for sulfite residue in shrimp (U.S. Food and Drug Administration (USFDA, 2001). The legal limit varies among countries: in Spain, the sulfite residue limit is 150 ppm, the same as the European regulation (Rotllant et al., 2002); in Australia the limit is 30 ppm (Diei, 1998). Sulfite residue exceeding acceptable limits can occur in shrimp flesh for multiple reasons including excessive sulfite concentrations, longer immersion times, or multiple treatments of sulfite to remove black spots as well as prevent it (Cintra et al., 1999).

As NIT, CAP, MG, FQ, and OTC have been banned in aquaculture in the US, no maximum residual limit (MRL) has set for these in the US (U. S. Food and Drug Administration (USFDA, 2020a); there is a zero tolerance for any residue. Unfortunately, these chemicals and sulfites are still used or overused. The use of antimicrobial drugs is not properly documented and regulated in many exporting countries. The US is a large importer of farmed shrimp, and 90 % of shrimp consumed in the US is imported (Food and Agricultural Organization (FAO, 2019). The top exporters to the US (in order of quantity) are India, Indonesia, Ecuador, Vietnam, China, and Thailand (Food and Agricultural Organization (FAO, 2019). The FDA inspects and rejects shrimp shipments with any trace of antimicrobials or sulfite levels over 100 ppm, but only about 2 percent of imported shrimp are tested by FDA because of budget constraints (Anders and Westra, 2011). Therefore, the objective of this work was to determine if imported shrimp available for sale in local markets in Baton Rouge, LA, US, contained any of these substances. Specific attention was focused on testing for 1) antimicrobials including nitrofuran (NIT), chloramphenicol (CAP), fluoroquinolones (FQ), oxytetracycline (OTC), and malachite green (MG) and 2) sulfite residue.

2. Materials and methods

2.1. Sample source

Farmed, imported shrimp samples were purchased from multiple locations of grocery stores and box stores with grocery departments in Baton Rouge, LA in winter 2016 and spring 2017 (n = 56 samples). As many different types of shrimp (brand, product type, size count, etc.) were purchased as were available. In instances when only one product type was available, different expiration dates were purchased to represent different lots of shrimp. Samples were not evenly distributed by country, as this was an artifact of what was available for purchase. Some shrimp products were processed in the US, but all originated from other countries (Table 1). Packages were checked for sulfite labels, either in the ingredients or listed in the allergen statement. None of the purchased packages indicated sulfite use and none were labeled as sulfite treated, though none proclaimed to be free of sulfite. After purchasing, shrimp samples were stored at −20 °C (Bermúdez-Almada et al., 1999). The experiment was performed in the Louisiana State University's School of Renewable Natural Resources. Due to availability, timing, and quantity restrictions, a total of 51 samples were screened for sulfite residue and 42 samples were screened for antimicrobial residue (Table 1). If screened positive, samples with adequate quantities were sent for verification testing (Table 2).

2.2. Screening for antimicrobial residue

2.2.1. Sample preparation and extraction

Frozen samples were thawed at room temperature for 1 h. To prepare the samples the head and shell of the shrimp were removed and the meat was homogenized to obtain uniformity (Bermúdez-Almada et al., 1999). Individual shrimp from a sample were combined as necessary to create a homogenized sample of adequate weight. ELISA test kits (Bioo Scientific Max Signal® ELISA test kits: Oxytetracycline 1081−01D (OTC); Chloramphenicol 1 step 0.05 ppb 1013−02 (CAP); Nitrofurantoin (AHD) 1070−02 (NIT); FLU 1024−01 (FQ); and MG/LMG 1 step 1019−04A (MG)) were used for antimicrobial drug residue. For Malachite Green screening, this is the approved method and test kit by the US Food Safety and Inspection Service (U.S. Department of Agriculture (USDA, 2016). All test kits used competitive assays. All reagents and solvents were of analytical quality and were mixed to kit specifications provided by BIOO Scientific. Test kits were kept at 5 °C, per manufacturer directions.

For OTC, NIT, and FQ, 1 *g* samples were used and for CAP and MG, 3 *g* and 2 *g* samples were used, respectively. All extractions were done using the ELISA test kit method for shrimp for each of the five tests, individually. While all five extraction methods varied, all were vortexed (Miniroto S56 model Fisher Scientific) with sample buffer or appropriate reagent and centrifuged at 4000 rpm for 5−10 min at RT (Sorvall legend x1 r centrifuge Thermo Scientific). Supernatants were transferred to clean tubes and dried in a water bath with nitrogen gas per kit recommendations. When appropriate, other reagents were added. Samples were then vortexed and centrifuged again. Then, samples were dissolved in the sample extraction or balance buffer (provided with test kit). For each sample, 50−100 µl of supernatant, per test, was saved for the ELISA. Extraction were held at −20 °C until the plates could be run. Each

Table 1
Imported shrimp samples tested for antimicrobial and sulfite residue.

Country of Origin	Sample	Product Type*	Processed in US	Sulfite Testing **	Antimicrobial Testing**
Bangladesh	1	R			X
	1	C, P, D, T		X	X
	2	C, P, D, T	Yes	X	X
China	3	R, T, S		X	X
	4	R,T, S		X	
	5	R,P, D, T	Yes	X	
Ecuador	1	R		X	X
	1	R, EZ, T		X	X
	2	R, P, D, T		X	X
	3	R, S, EZ, T		X	X
	4	R, P, D, T		X	X
	5	R		X	X
	6	R, P, D		X	X
India	7	R, T, S		X	X
	8	R, S, EZ, T		X	X
	9	R, P, D, TO		X	X
	10	R, P, D, TO		X	X
	11	R, P, D, TO		X	X
	12	R, P, D, TO		X	X
	13	R, EZ, S, T		X	
	14	R, P, D, T	Yes	X	
	1	R, S, EZ, T		X	X
	2	R		X	X
Indonesia	3	R		X	X
	4	C, P, D, T		X	X
	5	R, T, S		X	X
	6	R,S, T		X	
	1	R, EZ, T		X	X
	2	R, EZ, T		X	X
	3	R, S, EZ, T	Yes	X	X
	4	R, S, EZ, T	Yes	X	X
	5	R, S, EZ, T		X	X
	6	R, P, D, TO	Yes	X	X
	7	R		X	X
Thailand	8	R, T, S		X	X
	9	R, P, D, TO		X	X
	10	R, P, TO		X	X
	11	R, T, S		X	X
	12	R		X	X
	13	R, P, TO		X	X
	14	R, P, TO		X	
	15	R, P, TO		X	
	16	R, P, D, TO		X	
	1	R, S, EZ, T		X	X
	2	R, S, EZ, T		X	X
	3	R, P, D, TO		X	X
	4	C, P, D, T		X	X
Vietnam	5	R, P, D, TO		X	X
	6	R, P, D, TO		X	X
	7	R, S, EZ, T			X
	8	R, EZ, S		X	
	9	R, P, D, TO		X	
	10	R, P, D, T		X	

* Product type codes: P = peeled; TO = tail off, T = tail on; S = shell on, D = Deveined, EZ = EZ peel, R = raw, C = cooked.
** X = sample was tested.

test kit and shrimp extraction method had a unique detection limit (DL) and dilution factor (DF): OTC DL = 1.5 ppb and DF = 10; CAP DL = 0.025 ppb and DF = 0.5; NIT DL = 0.05 ppb and DF = 2; FQ DL = 0.4 ppb and DF = 10; and MG DL = 0.08 ppb and DF = 1.5.

2.2.2. ELISA

All samples and standards were run in duplicate. The 96 well plates provided were used for the ELISAs. All reagents, wash solutions, antibody solutions, and standards were mixed to kit specifications for each kit immediately prior to loading the plates. The plate was read per kit directions by 450 nm primary filter and/or 630 nm differential filter wavelengths (Bio-Tek Synergy HT Multi-Detection Microplate Reader, VT, USA). Standard curves were constructed using the Bio-Tek program by plotting mean relative absorbance (%) of the standard against the known concentration. Concentrations were measured using the formula provided for each test kit using the standard curve by the Bio-Tek program. Raw absorbance values were analyzed for outliers in the duplicate values. All 42 samples were run in 2017 with proper blanks. For any sample that tested positive for antimicrobial drugs residue, three or four shrimp replicates from the same sample were extracted and run in 2018. Additionally, a solvent control was run.

Table 2
Shrimp samples positive for at least one antimicrobial residue (2018 testing) (X). X were sent for further LC-MSMS analysis if sufficient sample amount was available.

Sample ID	FQ	MG	NIT	CAP	OTC
Bangladesh 1			X		
China 3			X		X
Ecuador 1			X		
India 1	X		X		
India 3			X		
India 5			X		
India 6			X		
India 7			X		
India 10			X		
India 11			X		
India 12			X		
Indonesia 2			X		
Indonesia 3			X		
Indonesia 4			X		
Indonesia 5		X			
Thailand 2	X		X		
Thailand 3	X		X		
Thailand 4	X				
Thailand 5			X		
Thailand 6			X		
Thailand 7			X		
Thailand 8			X		
Thailand 9					X
Thailand 11			X		
Thailand 12	X		X		X
Thailand 13			X		
Vietnam 1			X		
Vietnam 2			X		
Vietnam 3	X		X		
Vietnam 4			X		
Vietnam 5	X		X		
Vietnam 7		X	X		

2.3. Residue analysis

Of the samples that tested positive for one of the drug residues in 2018, 11 were delivered frozen to Eurofins Central Analytical Laboratories, New Orleans, LA (Eurofins). Not all samples that tested positive had enough shrimp left to meet the minimum amount required for testing. A total of 11 samples were sent with a minimum of 100 g per test per sample (Table 2). Eurofins is accredited A2LA ISO/IEC 17025:2005 2993–01. Established and approved FDA methods were used for all validation: FQ by FDA Laboratory Information Bulletin (LIB) 4298 (Turnipseed et al., 2006); NIT metabolites (liquid chromatography/-tandem mass spectrometry (LC-MSMS)) by FDA/ CFSAN (U.S. Food and Drug Administration (USFDA, 2004); OTC (LC-MSMS) by AOAC 995.09 (MacNeil et al., 1996); and MG (total, LC-MSMS) by FDA LIB 4395 (U.S. Department of Agriculture (USDA, 2016). For FQ, NIT, and MG, the testing limit was 1.0 ppb, and for OTC the testing limit was 10 ppb.

As seen in the screening, different shrimp within a package did not always have similar results, but the exact shrimp that was positive in 2018 was used up in that analysis. Other shrimp from the sample package had to be selected.

2.4. Screening for sulfite residue

Frozen shrimp was thawed at 4 °C for 1 h. before starting experiment. From each unique sample (n = 51), 10 replicate shrimp were randomly selected for testing. The head and shell of the shrimp were removed. To determine residue sulfite levels, the Alert Sulfite detection kit (Neogen Corporation #9500) was used. This method is correlated with Monier-Williams AOAC method (Horwitz, 2000). One drop of the activator solution was applied to the whiter thorax area next to the removed head of the shrimp. Next, one drop dye reagent was added to the moistened meat. After one minute, the color change was observed. If the blue dye did not change color, shrimp had sulfite levels below 10 ppm (detection limit). If the blue dye turned violet, shrimp were treated with sulfite, but the sulfite level did not exceed 100 ppm (0–100 ppm). If no color remained from the dye, sulfite level exceeded 100 ppm (>100 ppm). Positive control and negative control shrimp treated with known amounts of bisulfite were also tested to verify the color change with known levels of sulfite exposure. The three-color observations were assigned a score of 1–3, with 1: <10 ppm, 2: 10–100 ppm, and 3: >100 ppm. The scores were averaged for all 10 shrimp and results are reported in mean score ± SD. A sample was considered positive for sulfite if any of the 10 shrimp scored a 2 or 3.

3. Results

3.1. Antimicrobial residue

3.1.1. Oxytetracycline (OTC)

The detection limit for the OTC ELISA was 1.5 ppb in shrimp, and cross reactivity of the antibody with OTC is 100 %. All negative controls tested negative, and all standards were positive (1.5 ppb–4.5 ppb). In 2017, five separate samples screened positive. Therefore, three to four separate shrimp replicates from the original five samples were rerun in 2018. Only 3 samples (7.1 %) screened positive for OTC residue in 2018 (Fig. 1); two of those came from Thailand (15.4 % of Thai samples) and one from China (33.3 % of Chinese samples). Sample Thailand 9 had three replicates tested again. One was below detection, and two were positive. Thailand 12 had four replicates tested in 2018, and all four were positive. China 3 had four replicates tested in 2018, and two were below the detection limit, but the other two were positive (Table 2). Only China 3 samples tested positive by LC-MSMS, and it was 60 ppb. However, the detection limit of the LC-MSMS was 10 ppb so the other two samples, Thailand 9 and 12, might have been below this level or the specific shrimp sent were negative.

3.1.2. Chloramphenicol (CAP)

The detection limit for the CAP ELISA was 0.025 ppb in fish and shrimp. All negative controls tested negative, and all standards were positive (0.05 ppb–4.5 ppb). No shrimp samples were above the test range limit for CAP (0%) (Fig. 1 and Table 2).

3.1.3. Nitrofurantoin (NIT)

The detection limit for the NIT ELISA was 0.05 ppb in fish and shrimp. Specificity or cross reactivity of the antibody with NIT is 100 %. All negative controls tested negative, and all standards were positive (0.5 ppb–6.4 ppb). Almost all samples tested positive in 2017, so all were reanalyzed in 2018 with a solvent control. In 2018 over 70 % of the shrimp samples were still positive for NIT residue over the detection limit with a residue range of 0.4–4.4 ppb (Table 2). In both years, the blank controls were always negative. Shrimp which had NIT residue were imported from Bangladesh (100 % of samples), China (33 %), Ecuador (100 %), India (67 %), Indonesia (60 %), Thailand (77 %), and Vietnam (86 %) (Fig. 1). However, none of the samples sent for further anaylsis tested positive in 2019. Unfortunately, not all samples could be sent for confirmation.

3.1.4. Fluoroquinolone (FQ)

The detection limit for the FQ ELISA rapid method was 0.4 ppb in fish and shrimp. Cross reactivity of the antibody for enrofloxacin, ciprofloxacin, difloxacin, and sarafloxacin is 100 %. All negative controls tested negative, and all standards were positive (0.4 ppb–4.5 ppb). Fluoroquinolone residue was detected in 16.7 % of samples during screening (Table 2). Shrimp detected to have FQ residue were imported from India (8.3 % of samples), Thailand (30.8 % of samples), and

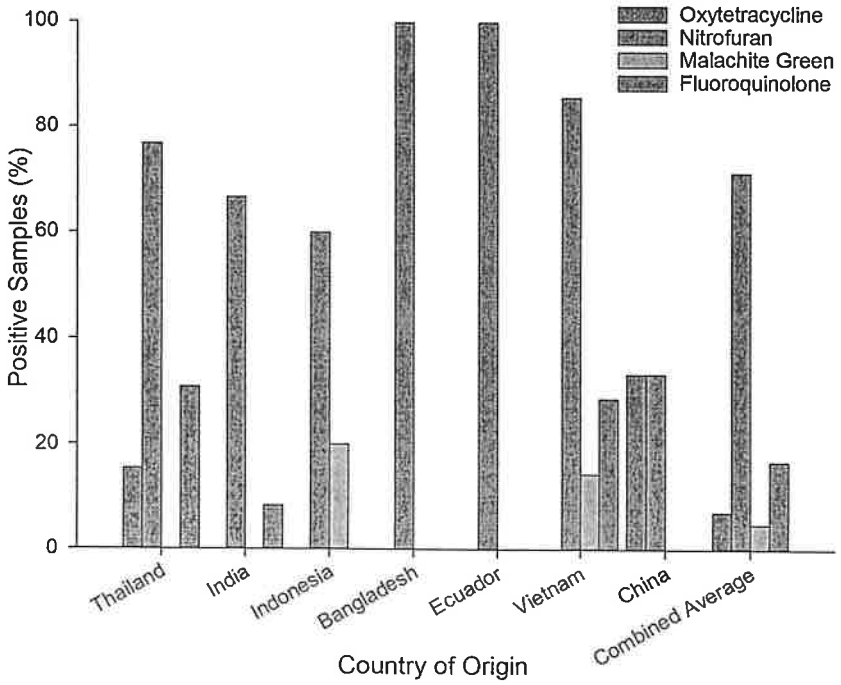

Fig. 1. Imported shrimp positive for antibiotic residue by country. All values are percent of positive samples (individual countries) or averaged percent positive (combined average). No chloramphenicol residue was detected.

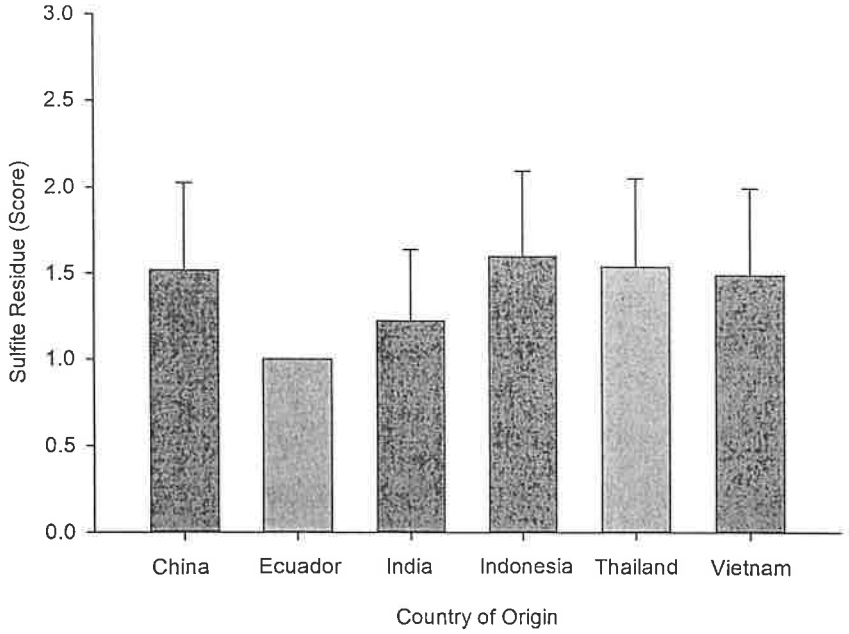

Fig. 2. Average sulfite residue in imported shrimp (Error bars = S.D.; sample n: China = 5, Ecuador = 1, India = 14, Indonesia = 6, Thailand = 16, and Vietnam = 9; 10 shrimp per sample).

Vietnam (28.6 % of samples) (Fig. 1). From the further analysis with LC-MSMS, Thailand 12 had 4 ppb of Ciprofloxacin.

3.1.5. Malachite green (MG)

The detection limit for the malachite green ELISA was 0.08 ppb in fish and shrimp. Cross reactivity of the antibody with MG is 100 %. All negative controls tested negative, and all standards were positive (0.05 ppb–4.5 ppb). In 2017, 15 samples were above or near detection limits, so they were rerun in 2018, including a solvent control and using the high background extraction method. In 2018, MG residue was detected in 2 out of 42 sample (4.8 %) with residue ranges of 1.6 to > 4.5 ppb (Table 2). Only one of the two samples had enough for LC-MSMS analysis, and came back negative. However, that sample was near the threshold for LC-MSMS. The ELISA test is approved for screening by USDA (U.S. Department of Agriculture (USDA, 2016). Shrimp which had malachite green residue were imported from Vietnam and Indonesia.

3.2. Sulfite residue

In order to determine if sulfite abuse (>100 ppm residue level) could be occurring in shrimp imported into the United States and available for retail purchase, 51 samples from 6 different countries were tested (10 shrimp per sample for a total of 510 shrimp). All positive control shrimp treated with bisulfite to manufacturer recommendations scored a 2 (10−100 ppm; n = 30). All negative control shrimp known to be sulfite free scored a 1 (<10 ppm; n = 30). With the exception of Ecuador, each country had shrimp with a sulfite residue between 10−100 ppm. Ecuador had the lowest (1.0 ± 0.0) score and Indonesia had the highest sulfite residue score (1.6 ± 0.4). Of both the raw and cooked shrimp from China (5 samples, total = 50 shrimp), 52 % (26 out of 50) were positive for sulfite residue (score: 1.52 ± 0.5). Of these, 50 % of the shrimp were cooked. Of the shrimp from India, 22.14 % were positive for sulfite residue (score: 1.22 ± 0.4). All the samples from India were raw. One sample from each India, Thailand, and China were processed in the USA, and two of those (India and China) were below the detectable limit for sulfite. The Thai shrimp sample processed in the US tested positive for sulfite residue, but sulfite was not included on the label. Indonesian shrimp samples were both raw (n = 5) and cooked (n = 1), and 60 % tested positive for > 10 ppm sulfite. These shrimp had the highest average score (1.6 ± 0.4) (Fig. 2). Twenty-five percent of the shrimp from Indonesia that tested positive for sulfite were cooked. For shrimp from Thailand (all raw), 53 % were positive for sulfite residue >10 ppm (score: 1.53 ± 0.5). One shrimp in the Thailand samples tested positive for >100 ppm. However, additional shrimp replicates from that sample were run, and no other single shrimp tested positive for sulfite residue >100 ppm. Forty-nine percent of Vietnam shrimp samples (score: 1.48 ± 0.5) were positive for sulfite residue >10 ppm, which included raw and cooked samples. Overall, one shrimp contained more than 100 ppm sulfite residue, 43.5 % of shrimp contained 10−100 ppm, and 56.3 % of shrimp contained less than 10 ppm of sulfite residue.

4. Discussion

4.1. Antimicrobial residue

In this experiment, shrimp from 7 countries: Bangladesh, China, Ecuador, India, Indonesia, Thailand, and Vietnam were tested for five different antimicrobial residues and sulfite residue. Using every unique sample available for retail purchase in 2017, oxytetracycline, nitrofurantoin, fluoroquinolone and malachite green were all detected. These results are not surprising considering in 2017, 43 shrimp lines were rejected for banned antibiotics from Vietnam (12), India (12), China (11), Thailand (7) and Hong Kong (1) (USFDA, 2017). Shrimp have been rejected by FDA every year during the period between 2002–2020 due to the presence of antimicrobial drugs, with the highest rejections occurring in 2015, mostly from Vietnam, India, Thailand, China, Hong Kong, and Bangladesh (U.S. Food and Drug Administration (USFDA, 2020b). With only a small amount of seafood inspected, antimicrobial residue is still a major problem in imported shrimp.

OTC is a widely used antibiotic, and in this study only 3 samples tested positive for OTC, and those shrimp samples were from Thailand and China. In addition to testing positive for OTC, samples from Thailand also tested positive for NIT and FQ. In 2002 and 2003, the European Union detected nitrofuran metabolites in shrimp originating from Thailand (Tittlemier et al., 2007). Some shrimp were imported from India, Thailand, or China but processed in the United States (Table 1). Of these, several samples from Thailand still tested positive for FQ and/or NIT. In our study, shrimp from China were only positive for

NIT drugs, and these findings are similar with previous work. In the first quarter of 2018, 5 shipments were refused out of the 135 of total seafood entry lines where shrimp contained banned antibiotics; those five shipments were all from China (FDA, 2020b). The use of NIT, CAP, and OTC in Chinese aquaculture has also been reported (Liu et al., 2017).

Only one source of shrimp from Bangladesh was found in stores around Baton Rouge, LA. This shrimp sample was positive for NIT. In January and May 2018, Bangladesh shrimp were rejected due to presence of NIT (FDA, 2020b). For future work, it would be useful to try to find more lines of shrimp from Bangladesh.

In our research, NIT and FQ were also present in shrimp from Vietnam and India, though OTC and CAP residue was not found. Thuy and Loan (2011) reported the most commonly used antibiotics in shrimp farming in Vietnam are FQ, OTC, sulfonamides, and diaminopyramidines, and shrimp are regularly checked for antibiotic residue by the authorities in order to try to control antibiotic usage. In Vietnam, antibiotic residues were found in the surrounding environments of shrimp ponds including norfloxacin, oxolinic acid, sulfamethoxazole, and trimethoprim (Thuy and Loan, 2011). CAP was used in shrimp farming in northern Vietnam (Chi et al., 2017), although in the present study chloramphenicol was absent in shrimp originating from Vietnam. Previously fish and shrimp collected from different fish markets of Vietnam were positive for different types of antibiotic residue such as quinolones, sulfonamide, β-lactam, and triemethoprim (Uchida et al., 2016).

4.1.1. Oxytetracycline (OTC)

There was wide variability even within a single sealed package of shrimp testing positive or negative for OTC. The variability within a shrimp sample is likely an indication of shrimp mixing from various aquaculture facilities along the supply chain. While no safe MLR is set in the US, the WHO has set it at 0.2 ppm (World Health Organization (WHO, 2002). So while the shrimp in our study (Screened: >1.5 ppb and LC-MSMS: 60 ppb) should be rejected at US customs, these shrimp would be acceptable under the WHO MRL. However, these shrimp could be a serious concern for consumers who are allergic or sensitive to OTC. These consumers would not expect to encounter OTC in shrimp.

OTC is the most commonly used antibiotic for the treatment of vibriosis and necrotizing hepatopancreatitis in shrimp farms (Wang et al., 2004; Nogueira-Lima et al., 2006). A previous study suggested that OTC residue is not detectable in muscle tissue of *Penaeus chinensis* after 96 h from the administration of OTC mixed feed when concentrations of OTC were 2000 mg kg feed (Wang et al., 2004). The presence of OTC residue in our study indicates that either improper doses of OTC might have been used or withdrawal time was not maintained before harvesting. In addition to overuse of OTC resulting in tissue residue, bacterial resistance to OTC has been reported in shrimp farms in the Philippines where isolated *Vibrio* were highly resistant to OTC (Tendencia and de la Peña, 2001). About 95 % of OTC is passed through the host organism to the surrounding environment (Serrano, 2005), and this could be another route for exposure if shrimp are not directly given OTC. Previous work in Vietnam found OTC residue in shrimp and fish collected from a domestic fish market where all shrimp samples (13 out of 13) and some fish samples (5 out of 15) were positive for tetracycline (Pham et al., 2015). Similarly, in Iran, both raw (100 %) and fried (44 %) rainbow trout were positive for OTC residue, indicating that withdrawal time was not adequately maintained and that frying cannot destroy OTC residue (Sharafati-Chaleshtori et al., 2013).

4.1.2. CAP

While no CAP residue was found in our study, the use of chloramphenicol in shrimp farming in Asia has been reported (Gräslund and Bengtsson, 2001). CAP use is prohibited in many countries including the US, Canada, China, Japan, and Australia; no maximum residual limit is set for CAP (European Commission, 2009; Wongtavatchai et al., 2004). While samples in this study were negative for CAP, it has been found in shrimp samples imported into the USA, and companies from Brazil, China, Indonesia, Malaysia, Venezuela, and Vietnam are under an import alert and subject to detention without physical examination due to the presence of chloramphenicol in previous shipments (U.S. Food and Drug Administration (USFDA, 2017). The lack of detection could be due to adequate withdrawal time before harvesting or increased adherence to the regulations banning CAP.

4.1.3. NIT

Our screening results results indicate that exporting countries are not adhering to the NIT ban. Other studies also found that while use of NIT is banned by the US and EU, shellfish farms in Asia and Latin America still use it (Conti et al., 2015). Vass et al. (2008) found the nitrofuran metabolites furazolidon (AOZ) and nitrofurazone (SEM) in *Penaeus monodon, Macrobrachium rosenbergii,* and *Penaeus vannamei,* with residue ranges of >1 ppb to 150 ppb. The 150 ppb was found in *Penaeus monodon* imported from India (Vass et al., 2008). Many consignments of shrimp and prawns from Bangladesh were rejected by the USFDA and European Commission because of the presence of nitrofuran drugs (Shamsuzzaman and Biswas, 2012). Shrimp shipments from China, India, United Arab Emirates, Malaysia, Canada, and Bangladesh were rejected several times even in 2018, due to presence of nitrofuran (U.S. Food and Drug Administration (USFDA, 2018).

None of our samples sent for further LC-MSMS anaylsis tested positive in 2019. Unfortunately, not all samples could be sent for confirmation as insufficient or no quantities remained. All samples were in storage over 3 years which could affect the metabolites, and previous work has only looked at stability over 100–300 days (Hurtaud-Pessel et al., 2006). Additionally, work has found certified labs to have a range with LC-MSMS of the same sample from 0.1 to 1 ppb (Hurtaud-Pessel et al., 2006). Many of our samples were 1−3 ppb in 2017. Recent work by Øye et al. (2019) had a false-positive for AHD, and they have new recommendations with washing of samples to prevent this. Additional work is needed to understand the level of NIT entering the US food chain through shrimp and to improve the accuracy of testing to ensure false positives do not lead to unnecessary rejections but any NIT contamination is detected and stopped. Nothing remained of the samples with contrary ELISA and LC-MSMS results for further analysis, but additional research focused on detecting NIT is important to protect business interests and human safety.

4.1.4. FQ

The FQ Ciprofloxacin residue was detected in one sample from Thailand at 4 ppb and seven in the ELISA screening. Previous work in Italy found FQ was also detected in the tissue of seabass, gilthead seabream, and fish feed using ELISA kits (Conti et al., 2015) where concentrations of FQ in fish muscle tissue was 3.87 % and in feed 0.68 %. In Vietnam, fish and shrimp samples collected from domestic fish market were also positive for FQ residue with detections by both LC/MS and ELISA methods (Pham et al., 2015).

4.1.5. MG

Similar to our results (4.8 % of samples with residue >1.6 ppb), previous work found malachite green in the tissue of rainbow trout and Atlantic salmon, with fish tissue accumulating persistent amounts of residue from MG (Srivastava et al., 2004). There is no established MRL for MG due to its carcinogenic nature, and in the US, Canada and UK, the use of MG in food production, including aquaculture, is not allowed. In 2017, around 1695 pounds of catfish was recalled by U.S. Department of Agriculture's Food Safety and Inspection Service (FSIS) for public health concern due to MG adulteration (USDA, 2017). The two samples positive for MG (range 1.6 < 4.5 ppb) should not have been allowed into the country.

4.2. Sulfite

Shrimp were purchased from retailers without knowing if they were

treated with any compound to prevent black spot. Many (43 %) tested positive for sulfite residuals, indicating that they had been treated with sulfite, but only one individual shrimp was over the limit of 100 ppm. Some of the imported shrimp did not test above 10 ppm, so this could be due to low treatment dose, short immersion time, storage, rinsing, or time on ice in the process. It is possible that some of these shrimp that tested >10 ppm may have been between 10–100 ppm when they first entered the supply chain, but all would still test safe for consumption (for those without a sulfite-triggered health condition). Of concern for consumption, no package of imported shrimp included sulfite in the label. Sulfite labeling is required if sulfite residue is greater than 10 ppm in shrimp (Rotllant et al., 2002). According to the USFDA (2001), the finished product should contain a declaration about using sulfite agent or the product should not contain detectable levels of sulfite. Importing countries have not adhered to the regulation, and this type of violation can have severe effects on human health. For hypersensitive asthmatic patients, small amount of sulfite can create life threatening conditions.

Hardisson et al. (2002) found the sulfite content in the edible portion of frozen prawn of Spain and shrimp of Venezuela ranged from 12.8–546 ppm and 10.7–380.7 ppm, respectively. The lower ranges are similar to our current results, however only one shrimp from Thailand exceeded the limit of 100 ppm. Sulfite levels in shrimp from Spain had excessive levels between 182–579 ppm (Steinhart at al., 1995). The imported shrimp samples in this project all tested much lower than some previous studies (Rio Utrabo et al., 1994; Armentia et al., 1994).

Besides initial treatment, the storage of the shrimp could also affect residue sulfite levels. In ice storage, residue level is lower because sulfite is soluble in water and leaches into the ice water bath (Finne et al., 1986; Cintra et al., 1999; Gómez-Guillén et al., 2005). Cintra et al. (1999) reported that sulfite residue was high (around 138 ppm) just a few hours after shrimp were caught and treated. Another study found that concentrations reduced by 50 % after 2 days of ice storage (Finne et al., 1986). All of our imported shrimp samples were frozen. It was reported that during freezing and in frozen storage residual sulfite level decreased by 17 % (Finne et al., 1986). Crustaceans washed before storage have lower sulfite residual levels (Gonçalves and de Oliveira, 2016). The imported shrimp were industrially processed, and this could lower sulfite residues in our shrimp. Goncalves and de Olivera (2016) found storage time may also reduce sulfite residue. Additionally, unpeeled or shell-on shrimp contain higher sulfite content compare to peeled shrimp (Finne et al., 1986), and in the current experiment, only the muscle tissue was tested. Many of the shrimp in 10–100 ppm range were purchased cooked; this is a concern because sulfite residue in cooked shrimp is more threatening than when present in raw shrimp as raw shrimp are further washed and processed.

Most domestic shrimp packaging carriers a "may contain sulfite" label, even when the shrimp is known to be sulfite free for consumer safety. The shrimp tested in this study would be safe for most consumers. However, sulfite residue was present and with no warning label, these shrimp products would be a health concern for consumers sensitive to sulfites. For consumers that know they have a health condition triggered by sulfite, they should only purchase shrimp from a known source guaranteed to be sulfite free. However, sulfite residue could be eliminated by shrimp harvesters and producers by using sulfite-free melanosis prevention products that exist on the market such as 4-hexylresorcinol based products (Frankos et al., 1991; Selçuk and Özden, 2017).

5. Conclusion

In Baton Rouge, LA, the majority of imported shrimp available for retail purchase in 2016 and 2017 came from India or Thailand (57 %), compared to the broader US with around 43 % of imported shrimp from India and Thailand (US FDA, 2017). In this research, with NIT, MG, FQ, and OTC detected, residue from more than one antimicrobial was sometimes present in the same shrimp sample (e.g. FQ and NIT were present in Thailand, India, and Vietnam originated shrimp samples (Table 2), and 43 % of imported shrimp contained 10–100 ppm of sulfite. The presence of antimicrobial and sulfite residue in shrimp indicates that exporting and importing country's testing is insufficient as residue was found in shrimp that were already in the USA market and while safe for consumption according to FDA regulations, there is still concern that none of the imported shrimp products included sulfite on their labels. Proper steps need to be taken by importing countries to change the common practice of using antimicrobial drugs in shrimp farming. Additional efforts should be directed at determining where the contamination is occurring. Exporting governments could strictly prohibit the sale of banned veterinary drugs, provide training for shrimp farmers to improve awareness and try using alternatives. Importing countries need to improve the testing of seafood consignments. Future work should research the same brands and countries of origin for the shrimp to see how common residue violations are over time. Additional shrimp samples from countries with limited samples (e.g. Ecuador and Bangladesh) should be tested. Finally, additional work in needed for NIT to ensure any adulterated product is prevented from entering the US, but also that false positives do not lead to unnecessary rejections.

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CRediT authorship contribution statement

Murshida Khan: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Visualization, Writing - original draft, Writing - review & editing. **Julie A. Lively:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Writing - review & editing.

Declaration of Competing Interest

The authors report no declarations of interest.

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Appendix A. Supplementary data

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