

**Local Health Management Program for Sushi Restaurants**

**By**

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## **IMPLICATION**

Human health is dependent on food; therefore it is important to provide food that is safe to eat. In years past different types of food have been introduced into the United States from different cultures. Sometimes these foods are so untraditional that we are not familiar with the preparation, handling, and health and safety issues pertaining to them, nor have these issues been addressed by the food code that guides our current system. It is the job of local health departments of a state to overcome challenges presented by cultural differences to ensure that these restaurants do comply with procedural requirements. The work that has been done here outlines the risks associated with consuming sushi and sashimi and how these risks can be minimized by local health departments.

## **ABSTRACT**

Foods can become contaminated with pathogens naturally or by improper handling and preparation. This problem is usually rectified by the cooking process. This is not the case for sushi and sashimi. The cooking process that we depend on to eliminate most of the pathogens that contaminate our food is not used in the preparation of sushi and sashimi. It is for this reason that special consideration should be taken to ensure the safe handling of sushi and sashimi.

Food safety is one of the primary goals of health departments. Working with people and food from a different ethnic culture can present challenges that might affect the ability of a local health department to ensure the safety and quality of food. Special computer software, workshops and onsite meetings would serve to meet the challenges facing both the health department and the restaurant owners that find themselves in a different culture.

## **INTRODUCTION**

In the past fifteen years the Japanese tradition of eating raw fish has become a popular trend in America. Sushi and sashimi are the most popular items at sushi bars. The origin of sushi is said to have started in Southeastern Asia. Centuries ago in Japan, sushi began as a method of preserving fish. 'A cleaned, raw fish was pressed between layers of salt and weighted with a stone. After a few weeks, the stone was removed and replaced with a light cover, and a few months after that, the fermented fish and rice were considered ready to eat.'<sup>1</sup> It wasn't until the 1700's that raw fish was combined with vinegar rice and served, thus the start of sushi as we know it today. "Sushi" refers to food consisting of cooked and pressed rice flavored with vinegar and garnished with other food ingredients including raw or cooked or vinegar seafood, marine fish or shellfish roe, vegetables, cooked meat or egg on top or in the middle which may or may not be wrapped with seaweed and usually served in pieces. "Sashimi" is food consisting of fillets of marine fish, molluscs, crustaceans, fish roe or other seafood to be eaten in its raw state.<sup>2</sup>

The purpose of this paper is to serve as an informational source to aid in the development of a management program designed to meet the challenges faced by local health departments in Ohio. The first step when considering a program such as this is to determine if there is a need for the program. It is necessary to evaluate the risks associated with eating raw seafood at a Japanese restaurant, and implementing a management program if the risks are substantial.

## **RISK FROM SUSHI / SASHIMI**

It is said that Americans enjoy one of the safest food supplies in the world. Almost 50 billion meals are eaten in restaurants and cafeterias each year in this country.<sup>3</sup> In a recent study conducted by the FDA it was estimated that the risk of illness from seafood was 1 illness in every 250,000 servings. The same study estimated the risk from chicken was about 1 illness in every 25,000 servings.<sup>4</sup> What is the health risks associated with consuming sushi in a restaurant in the

United States? In America there has only been a few studies conducted in regard to sushi. A Seattle based study in 1994 conducted microbiological analyses on the rice associated with sushi. They found 10% of salmon sushi and 5% of mackerel sushi were infected with parasites.<sup>11</sup> In this same study, twenty restaurants participated in research that evaluated the microbiological safety of raw fish served at Japanese restaurants, as well as the cleanliness of food contact surfaces. For bacterial growth in sashimi, samples were tested for four indicator microorganisms. The aerobic plate count (APC) is intended to indicate the level of microorganisms in a product; Staphylococcus, E. coli, and Coliform are used as indicators to detect fecal contamination and poor sanitation, and can be useful to indicate quality. The APC test showed that 20% of salmon sashimi and 25% of tuna sashimi were not acceptable in quality. Coliform test showed that 25% of salmon and 15% of tuna were not acceptable in quality. The study states that possible reasons for the bacteria growth were that the fish might not have been properly handled during receiving, processing and storage, or cross-contamination might have occurred among the cutting boards, the food handlers' hands or other utensils to the fish. Among the 20 restaurants, 35% of cutting boards were contaminated with APC, 10% of cutting boards were contaminated with coliform. The study, concluded that consuming raw fish is safe as long as personal hygiene and sanitary practices are strictly observed, and only fresh, (not to say it is not frozen at some point) high quality fish are used for sashimi".<sup>9</sup>

There are several concerns which are unique to the preparation and service of sushi. The first concern is with biological contaminants such as parasites, bacteria and viruses.

### **Parasites**

A parasite is a living organism dependent on a host for which it takes nourishment. It grows naturally in many animals and can be transmitted to humans and cause illness. These organisms can be large or small, even microscopic, and pose hazards to both food and water. One of the major human health hazards of consuming uncooked, undercooked or unfrozen seafood are

the parasites, particularly, nematodes, or roundworms, tapeworms and flukes<sup>5</sup>  
The incidence of accidental ingestion of a parasite is higher in countries where raw fish is eaten (Japan, Pacific coast of South America, the Netherlands), and is increasing in the United States due to increased consumption of raw fish.<sup>6</sup>  
Parasites occur in mackerel, squid, cod, haddock, fluke, pacific salmon, herring, flounder, monkfish, anchovy, and tuna. Within one to six hours after the ingestion of infected larvae, violent abdominal pain, nausea, and vomiting may occur.

Preparation methods such as brining and pickling may reduce parasitic organisms in a fish, but it will not eliminate them or reduce them to an acceptable level. Nematode larvae have been shown to survive 28 days in 80° salimeter brine (21% salt by weight).<sup>7</sup> Another way to reduce the presence of parasites is to trim away the belly flaps of fish, or physically remove parasites from the flesh. This does not completely eliminate or minimize the hazard to an acceptable level.<sup>7</sup>

For the most effective way to kill parasites, the FDA requires cooking fish to a temperature of 145 degrees Fahrenheit for 15 seconds or freezing raw fish to -20°C or below for 7 days, or -35°C or below for 15 hours.<sup>7</sup> Seafood obtained to prepare sushi or sashimi must come from an approved source, which means they must have documentation of this freezing process, according to the FDA and the Ohio Administrative Code Chapter 3717-1-03.3 (D). Appendix A contains the Foodborne Illness Table: Parasitic Agents. Included in the table is information pertaining to incubation periods, signs and symptoms, duration of illness and the foods that are commonly associated with the organism.

### **Bacteria**

A living single-celled organism can be transmitted by food, water, insects, rodents, or humans. When conditions are favorable, they reproduce rapidly. Some bacteria have the ability to form spores which protects them during unfavorable conditions, such as cooking and freezing. Since spores are very difficult to destroy, it is important to properly cook, cool and reheat food properly.

Some bacteria can cause food spoilage while others cause illness. For bacteria to grow and reproduce it must have food, the appropriate level of acidity, temperature, oxygen, moisture, and adequate time.<sup>8</sup>

Bacteria and viruses that cause disease do not normally occur in the part of the fish that is eaten, the intact muscle. However, fish fillets and steaks can become contaminated by improper handling, storage, or preparation. There are many different types of bacteria, but one in particular is associated with the rice used to make sushi. *Bacillus cereus* is a spore forming bacterium commonly found in soil, dust, and raw foods which when ingested can cause profuse watery diarrhea, abdominal pain, vomiting, and nausea. The best way to prevent illness from bacillus is to control time and temperature, avoid preparing food too far in advance, and avoid holding cooked foods at room temperature.<sup>5</sup> Another bacteria associated with seafood is *Yersinia enterocolitica*. The source of these bacteria is soil, water, and domesticated and wild animals. The bacteria are transmitted to humans by cross-contamination from raw to cooked seafood, the consumption of raw seafood, and temperature abuse. When bacteria are ingested it causes diarrhea, vomiting, abdominal pain, and fever. *Vibrio* spp. is a bacterium that is commonly found in oysters and other shellfish (lobster, shrimp, clams and mussels). It is responsible for many foodborne illnesses and deaths.<sup>5</sup> Appendix B contains the Foodborne Illness Table: Bacterial Agents. Included in the table is information pertaining to incubation periods, signs and symptoms, duration of illness and the foods that are commonly associated with the organism.

### **Viruses**

A virus is an organism that does not rely on food to reproduce, but on other living cells. It is smaller than bacteria and responsible for several foodborne illnesses such as hepatitis A, Norwalk, and rotavirus. Viruses, in the case of food preparation, are passed from person to person, from people to food, as well as from people to food-contact surfaces. Food can become contaminated by a virus due to improper personal hygiene by a food handler. Cooking and freezing

may not always kill all viruses. Practicing good personal hygiene and minimizing bare-hand contact with ready-to-eat food is very important.<sup>5</sup> Most seafood associated diseases are caused by a virus, particularly the Norwalk virus. Seafood, particularly shellfish, may be contaminated by fecal material. The Norwalk virus can also be passed during handling or preparation of seafood by workers who did not wash their hands properly after using the bathroom. Another virus is hepatitis A, which is spread primarily from person to person contact. The source of Hepatitis A is fecal material and sewage. It is the most common type of hepatitis and is characterized by the sudden onset of fever, nausea, vomiting, fatigue and abdominal pain followed by several days of jaundice.<sup>5</sup> Appendix C contains the Foodborne Illness Table: Viral Agents. Included in the table is information pertaining to incubation periods, signs and symptoms, duration of illness and the foods that are commonly associated with the organism.

## **REPORTED FOODBORNE OUTBREAKS**

Foodborne disease outbreaks (FBDO) are reported to the Centers for Disease Control and Prevention, and the Foodborne and Diarrheal Diseases Branch each year by state, local and territorial health departments. 'A foodborne disease outbreak is defined as the occurrence of two or more cases of a similar illness resulting from the ingestion of a common food'.<sup>6</sup>

### **United States Center for Disease Control**

According to the Centers for Disease Control (CDC), foodborne diseases cause an *estimated* 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths annually.<sup>6</sup> The number of reported FBO is only a small fraction of the outbreaks that actually occur. The chance of an outbreak being brought to the attention of health officials depends on the awareness and interest of the patient and physician. Mild cases usually go undetected. Often times the motivation of the physician or patient to report the illness is a factor. Other factors complicate surveillance; it generally takes two days or longer for symptoms to occur after

eating food contaminated with bacteria or a virus. A common misconception is that it was caused by the last meal consumed. It is important to consider that pathogens are transmitted not only through food but by water and from person to person.

## **REGULATORY CONTROL**

Like all other food in the United States, seafood is subject to federal, state, and local government regulations and inspections, regardless of whether it is domestic or imported. The federal agencies responsible for seafood regulations are the Food and Drug Administration (FDA), the Environmental Protection Agency, and the National Marine Fisheries Service of NOAA. Various types of inspections are conducted by federal, state, and local agencies as well as some fishery industries.

### **Federal level**

In addition to primary responsibilities (regulation of seafood) the Food and Drug Administration, with input from the Conference for Food Protection, is responsible for writing recommendations for restaurants and regulations for foodservice operations. These recommendations are presented as the model Food Code, and are written to assist health departments at the state level in developing regulations for a foodservice inspection program.<sup>8</sup> The state of Ohio adopted the model Food Code (written laws) and refers to it in the Ohio Revised Code. From the Ohio Revised Code, which contains all of the laws for Ohio, specific rules are written called the Ohio Administrative Code. This administrative code is what is enforced at the local level by sanitarians. FDA, under the authority of the FD&C Act, conducts both mandatory surveillance and enforcement inspections of domestic seafood harvesters, growers, wholesalers, warehouses, carriers and processors.<sup>7</sup> Inspections, depending on the nature and complexity of the operation, can take a few hours to several days, and cover product safety, plant/food hygiene and economic fraud issues. The FDA also samples and tests seafood products, and enforces labeling requirements. It is

the discretion of the agency as to the frequency of inspections, and the requirement of the operation to submit to these inspections. Failure to comply with FDA regulations could bring about both criminal and civil penalties. The FDA works with the individual states to implement regulatory programs.

### **State**

Regulations governing restaurants and foodservice operations are usually written at the state level. In the state of Ohio, the rules, found in the Ohio Administrative Code (OAC), are written from the laws found in the Ohio Revised Code (ORC). The OAC covers many different aspects of food and sanitation in very specific terms, based off of the FDA written model Food Code. It is up to each individual state as to whether or not to adopt the federally written Food Code or some modified version of it. The state regulations are enforced by state and local health departments.<sup>8</sup>

### **Local**

All establishments in Ohio serving the public are subject to inspections by sanitarians and or environmental health specialists, who are employees of the city, county or state. A sanitarian is trained in food safety, sanitation, and public health principles, and enforces the rules written in the Ohio Administrative Code. The portion of the Ohio Administrative Code that contains the rules that govern restaurants and retail facilities that prepare and sell food to be consumed by the public is the Uniform Safety Code. The Uniform Safety Code is a very detailed document, describing every detail necessary for providing safe food to the public.

## **CHALLENGES OF COMPLIANCE**

In today's busy world restaurants are patronized more then ever before, therefore it is in the best interest of restaurateurs to ensure that their employees are adequately trained in food safety and consistently use safe food-handling methods. "A single outbreak of food-borne disease can depress a restaurant's

bottom line or even drive it out of business if the outbreak is identified and publicized".<sup>12</sup> The Centers for Disease Control and Prevention (CDC) have consistently stated that "where reported foodborne outbreaks were caused by mishandling of food, most of the time the mishandling occurred within the retail segment of the food industry, such as in restaurants and grocery stores where ready-to-eat food is prepared and provided to the public for consumption. In order to prevent foodborne illness outbreaks, it is imperative that local food safety regulators be able to educate their customers about the proper ways in which to purchase, store, handle, prepare, and serve food. One of the most important factors for the prevention of foodborne outbreaks is employee knowledge of the basic principles of food safety."<sup>13</sup>

### **Language**

It is common to find a sushi chef who does not speak English. Language can be a very effective barrier when it comes to communicating the proper food safety techniques, handling methods, and personal hygiene that is important to maintain the safety of the food and the integrity of the restaurant.

### **Sushi Chef**

In Japan training to become a sushi chef is a ten year process, which begins scrubbing floors and washing dishes, however, not all sushi chefs are Japanese. It is hard to determine the extent of their food safety knowledge, and if all sushi chefs are consistently taught the same techniques and methods.

### **Seafood Source**

According to the FDA and the model Food Code, the source for seafood must come from a reputable source. This means seafood must be obtained from sources that are FDA inspected. The FDA requires that fish be frozen at -4 degrees F for 7 days or at -35 degrees for 15 hours in order to destroy parasites. According to the FDA, the only raw fish that does not need to be frozen are those species in which parasites are not a hazard.<sup>13</sup> At the local level; the Uniform Safety Code (of the OAC) addresses parasite destruction in section, 3717-1-03.3

paragraph (D) “Parasite destruction – freezing”. It states that “Before service or sale in ready-to-eat form, raw, raw-marinated, partially cooked, or marinated-partially cooked fish other than molluscan shellfish shall be frozen throughout to a temperature of:

Minus four degrees Fahrenheit or below for one hundred sixty hours in a freezer; or

Minus thirty-one degrees Fahrenheit or below for fifteen hours in a blast freezer.

### **Preparation of Rice**

Microorganisms grow when conditions are favorable, this means between temperatures of 41 and 145 degrees Fahrenheit, otherwise known as the danger zone. Cultural tradition dictates the way rice is prepared. After sushi rice is cooked, it must be allowed to cool down to about 80 to 90 degrees Fahrenheit. The cooling down process is important to ensure quality and sensory appeal of the rice. It must be cool enough so as not to cook the fish it comes in contact with. The potential problem with this process is that bacteria, specifically *Bacillus cereus* (spore former), becomes a key concern due to time and temperature. According to the Uniform Safety Code section 3717-1-03.4 (I) “Time as a public health control”, a food not maintained at the proper temperature, (less than 41 degrees F. or above 145 degrees F.), has a life of 4 hours before it must be disposed .<sup>14</sup>

Another condition favorable to bacteria growth is acidity, and the range for optimal growth is between a pH of 4.6 and 7.5. All sushi rice is prepared with vinegar, which lowers the pH of the rice, rendering rice a non-potentially hazardous food. When rice has been properly acidified it can be left out at room temperature. The pH of the rice depends on the recipe being used by the chef, as to how much vinegar is added to the rice. Establishments who choose to use acidification methods may obtain a variance from the rules of section 3717-1-03.4 (I) “Time as a public health control”. The variance rule can be found under 3717-1-03.3 paragraph, (e), (iii). This rule states that the variance must be

approved by the Ohio Department of Health, or the Ohio Department of Agriculture.

### **Food Safety Training**

Potentially hazardous foods are foods in which microorganisms can grow rapidly. These foods have similar characteristics for example, they are moist, high in protein, and are only slightly acidic, between a pH of 4.6 and 7.5. To minimize the risks, it is important that the chef understands the potential of cross-contamination, and how to prevent it. Another important concept of food safety is the potential to pass bacteria and viruses by bare hands on ready to eat food. In the case of raw seafood, this is especially important because the cooking is not in the process. The OAC requires the use of gloves when preparing and handling ready to eat food to further reduce the risks.

### **THE LOCAL HEALTH DEPARTMENT MANAGEMENT PROGRAM**

The following suggestions are in response to the challenges that arise from working with people from another culture. By addressing these problems it seems hopeful that the risks associated with consuming sushi and sashimi will be reduced.

#### **A workshop**

A workshop would provide an opportunity for sanitarians and other members of the health department to learn about the cultural differences of these people, and the food they serve. A sanitarian is required to conduct an inspection of the food service establishments in his or her jurisdiction. Knowledge of ingredients, preparation, and handling are essential to providing a thorough inspection and securing the safety of the food. This information would be a valuable asset in assisting the health department in establishing an effective working relationship with the restaurateurs.

### **Food safety classes in appropriate language**

Many sushi chefs do not use English as their primary language; they usually know just enough to get by. Providing a food safety course in their native language would be providing a great service to them as well as to the public.

### **Develop a HACCP plan**

The purpose of the Hazard Analysis Critical Control Point system is to be able to prevent, eliminate or reduce biological, chemical or physical hazards. A HACCP plan would identify foods and procedures that are most likely to cause a foodborne illness. This would be beneficial not only for the chef but for the inspector, who would be less familiar with ethnic recipes.

### **Computerized language assistance**

A computer would be a very effective tool in the inspection field. Not only would it help to standardize inspections and inspection reports, but it could provide a copy of an inspection report in the appropriate language. Violations could be corrected on the spot with a mini tutorial session, which would also be available in the appropriate language. The computer would help to break down the language barrier and minimize miscommunications about the rules and requirements necessary to maintain an effective establishment.

### **On-site meetings**

The main purpose for increasing the frequency of visits by the inspector would be to establish and maintain a good working relationship with the operators. Language is an issue and one of the best ways to communicate with someone who does not speak the same language as you is to “talk” with them, face to face. Gestures, facial expressions, and body language can be an effective means of communication. Increasing visits to an operation could increase an inspector’s familiarity with the people and their concerns. Finally, increased visits from the health department might help to increase their awareness and establish good food safety related habits.

## **CONCLUSIONS AND RECOMMENDATIONS**

Based on the lack and inconsistency of data pertaining to reported foodborne outbreaks it is difficult to say with certainty that there is or isn't a risk associated with eating at sushi restaurants; however, some studies have concluded that in general sushi is safe to eat, though there have been some concerns about the bacteria found on cutting boards and the potential for cross contamination.

I recommend using a computer in the field to standardize the inspection process, and to communicate more effectively with those who are operating a facility, or handling food and do not speak English well enough. I would also recommend the use of on-site visits. I feel it is important to develop a good working relationship with operators, and chefs. I also believe everyone would be successful if they would learn to work together as a team.

## **ABOUT THE AUTHOR**

Dottie Eischen is currently a student in her last semester at Bowling Green State University. She will graduate with a bachelor's degree in Environmental Health.