



## WISCONSIN LEGISLATIVE COUNCIL INFORMATION MEMORANDUM

### Ensuring the Safety of the Food Supply in Wisconsin

Numerous federal, state, and local agencies currently share responsibilities for regulating the safety of the U.S. food supply. This organizational complexity, along with changing trends in U.S. food markets, poses ongoing challenges to ensuring food safety. This informational memo describes the roles of the many agencies involved in ensuring the security of the food supply and also illustrates how these agencies respond to foodborne illness outbreaks.

#### ***THE PREVALENCE OF FOODBORNE ILLNESS***

About 48 million people (one in six Americans) get sick, 128,000 are hospitalized, and 3,000 die each year from foodborne diseases.<sup>1</sup> A 2013 article published by the Centers for Disease Control and Prevention (CDC) found that the majority of foodborne illnesses in the U.S. from 1998-2008 can be attributed to produce, while the majority of foodborne illness-related deaths can be attributed to poultry. Dairy products were the second most frequent food source for infections causing illnesses and deaths.<sup>2</sup> Animal disease and bio-security hazards also pose serious threats to our underlying food production systems.<sup>3</sup>

Foodborne illness outbreaks can have significant economic impacts on the agricultural sector. Annual costs of foodborne illness in Wisconsin were estimated at \$2.9 billion in 2009, or approximately \$516 for each resident. This placed Wisconsin 17th nationally in per-capita costs of foodborne illness.<sup>4</sup> In an interconnected food system, problems originating at a single business or location can cause widespread harm to consumers and other businesses. From both a consumer and a business perspective, food regulation in Wisconsin remains an important collective enterprise including farmers, consumers, business and government.<sup>5</sup>

Additionally, the security of the food system has been a growing concern, especially since the terrorist attack on September 11, 2001. Disease outbreaks can undermine consumer confidence and devastate large sectors of the food industry. Wisconsin has one of the best programs in the

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<sup>1</sup> <http://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm247559.htm>.

<sup>2</sup> [http://wwwnc.cdc.gov/eid/article/19/3/11-1866\\_article.htm#r12](http://wwwnc.cdc.gov/eid/article/19/3/11-1866_article.htm#r12).

<sup>3</sup> <http://datcp.wi.gov/uploads/Food/pdf/FoodRegulationInWisconsin.pdf>.

<sup>4</sup> [http://www.pewhealth.org/uploadedFiles/PHG/Content\\_Level\\_Pages/Reports/PSP-Scharff%20v9.pdf](http://www.pewhealth.org/uploadedFiles/PHG/Content_Level_Pages/Reports/PSP-Scharff%20v9.pdf).

<sup>5</sup> <https://www.fas.org/sgp/crs/misc/RS22600.pdf>.

nation for detecting and reliably reporting disease outbreaks.<sup>6</sup> The Department of Agriculture, Trade, and Consumer Protection (DATCP) coordinates state emergency responses with the Wisconsin Department of Health Services (DHS) and federal authorities.

### **WHAT DOES A FOODBORNE ILLNESS OUTBREAK LOOK LIKE?**

It takes several steps to get food from the farm or fishery to the dining table. Contamination can occur at any step in this process - during production, processing, distribution, or preparation.<sup>7</sup>

| <b>Steps</b>        | <b>Definition</b>   | <b>Example of Contamination</b>  |
|---------------------|---|--|
| <b>Production</b>   | Growing the plants we harvest or raising the animals we use for food.                               | If fields are sprayed with contaminated water, fruits and vegetables can be contaminated before harvest.   |
| <b>Processing</b>   | Changing plants or animals into what we recognize and buy as food.                                  | If contaminated water or ice is used to wash, pack, or chill fruits or vegetables, the contamination can spread to those items.  |
| <b>Distribution</b> | Moving food from the farm or production plant to the consumer or a kitchen.                         | If refrigerated food is left on a loading dock for a long time in warm weather, it could reach temperatures that allow bacteria to grow.                                     |
| <b>Preparation</b>  | Getting the food ready to eat. This may occur in the kitchen of a restaurant, home, or institution. | If a cook uses a knife to cut raw chicken and then uses the same knife without washing it to slice tomatoes, the tomatoes can be contaminated by pathogens from the chicken. |

When two or more people get the same illness from the same contaminated food or drink, the event is called a foodborne outbreak.<sup>8</sup> Foodborne outbreaks can vary in size and scope. A small local outbreak could be caused by a contaminated casserole served at a church supper. A statewide or regional outbreak may be caused by a contaminated batch of ground beef sold at several locations. A nationwide outbreak may be caused by contaminated produce from one farm that was shipped to grocery stores nationwide.

If an individual contracts a foodborne illness and seeks medical attention, the physician will test a stool sample for diagnosis. If the patient has contracted one of 10 reportable enteric

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<sup>6</sup> <http://datcp.wi.gov/uploads/Food/pdf/FoodRegulationInWisconsin.pdf>.

<sup>7</sup> <http://www.cdc.gov/foodsafety/outbreaks/investigating-outbreaks/production-chain.html>.

<sup>8</sup> <http://www.fda.gov/Food/ResourcesForYou/Consumers/ucm180323.htm#whatis>.

(digestive tract) illnesses, their diagnosis must be reported to the local health department. The reportable enteric illnesses and their 2013 incidence rates are shown in the table below, provided by the Wisconsin Department of Health Services – Division of Public Health. A glossary defining these illnesses can be found at the end of this memorandum.

### **Reportable Enteric Illnesses Among Wisconsin Residents, 2013**

| <b>Disease</b>                       | <b>Count</b> | <b>Rate per 100,000</b> |
|--------------------------------------|--------------|-------------------------|
| Campylobacteriosis                   | 1,259        | 22.0                    |
| Salmonellosis                        | 904          | 15.8                    |
| Cryptosporidiosis                    | 688          | 12.1                    |
| Giardiasis                           | 514          | 9.0                     |
| E-Coli, Shiga Toxin-Producing (STEC) | 229          | 4.0                     |
| Shigellosis                          | 51           | 0.9                     |
| Cyclosporiasis                       | 24           | 0.4                     |
| Listeriosis                          | 16           | 0.3                     |
| Yersiniosis                          | 12           | 0.2                     |
| Vibriosis, Non Cholera               | 6            | 0.1                     |
| Total                                | 3,707        | --                      |

Because many individuals do not seek medical attention for foodborne illness, the majority of cases are untreated and unreported. DHS estimates that the true incidence of foodborne illness is 29 times the reported number of cases.

In 2012, there were 29 reported foodborne outbreaks in Wisconsin that affected 416 sick individuals. The diseases included Campylobacteriosis, Clostridium, E. coli, norovirus, and Salmonella. There were 24 hospitalized from E. coli or Salmonella. Ten of these outbreaks spread to other states.<sup>9</sup> Public health officials on the local, state, and federal levels investigate outbreaks to control them and to learn how to prevent similar outbreaks from happening in the future.

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<sup>9</sup> Interview Rachel F. Klos, DVM, MHP and Suzanne Gibbons-Burgener, DVM, Ph.D., Wisconsin Department of Health Services – Division of Public Health.

## **FEDERAL FOOD REGULATORY AGENCIES**

### ***FOOD AND DRUG ADMINISTRATION (FDA)***

The FDA is responsible for ensuring that all domestic and imported food products-except for most meats and poultry-are safe, nutritious, wholesome, and accurately labeled. The FDA regulates produce, dairy, seafood, and various processed foods. It also shares regulatory obligations with the Food Safety Inspection Service (FSIS) within the U.S. Department of Agriculture to ensure the safety of meat, poultry, and egg products. The FDA houses the Center for Food Safety and Applied Nutrition (CFSAN), which conducts research on food safety, monitors the implementation of policy, and monitors state safety programs. The FDA is also home to the Center for Veterinary Medicine, which monitors drugs and devices used to treat food animals.

The FDA cooperates with over 400 state agencies across the nation that carry out a wide range of food safety regulatory activities, such as DATCP. Though state agencies are primarily responsible for actual inspection, the FDA sets the safety standards for food establishments and commodities and evaluates the states' performance in upholding such standards as well as any federal standards that may apply. The agency also contracts with states to use their food safety agency personnel to carry out certain field inspections in support of the FDA's statutory responsibilities.<sup>10</sup>

### ***THE U.S. DEPARTMENT OF AGRICULTURE***

The USDA regulates meat and poultry production. The agency runs the FSIS, mentioned above, which regulates the safety, wholesomeness, and proper labeling of most domestic and imported meat and poultry and their products sold for human consumption. These products comprise roughly 10%-20% of the U.S. food supply. Twenty-seven states operate their own inspection programs for meat, poultry, or both. FSIS is statutorily responsible for ensuring that the states' programs are at least equal to the federal program. Plants processing meat and poultry under state inspection can market their products only within the state. If a state chooses to discontinue its own inspection program, or if FSIS determines that it does not meet the agency's equivalency standards, FSIS must assume the responsibility for inspection if the formerly state-inspected plants are to remain in operation. FSIS also has cooperative agreements with more than two dozen states under which state inspection personnel are authorized to carry out federal inspection in meat or poultry plants. Products from these plants may travel in interstate commerce.<sup>11</sup>

### ***THE CENTERS FOR DISEASE CONTROL AND PREVENTION***

The Centers for Disease Control and Prevention (CDC) is responsible for monitoring, identifying, and investigating foodborne disease problems to determine the contributing factors; working with FDA, FSIS, state and local public health departments, universities, and industry to develop control methods; and evaluating the effect of control methods. To do this, the federal government has created two tools: PulseNet and FoodCORE. PulseNet is a

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<sup>10</sup> <https://www.fas.org/sgp/crs/misc/RS22600.pdf>.

<sup>11</sup> <https://www.fas.org/sgp/crs/misc/RS22600.pdf>.

collaborative project between CDC, FDA, USDA, and state and some local health departments. It uses a national computer network to confirm outbreaks of foodborne illness and to link clusters occurring in multiple states caused by the same pathogen. Through PulseNet, public health laboratories across the country perform DNA fingerprinting on bacteria and exchange findings when outbreaks of foodborne disease occur.<sup>12</sup> In 2009, the CDC provided grant funding to states to develop new methods and build on existing best practices to detect, investigate, respond to, and control outbreaks of foodborne diseases, particularly Salmonella, STEC, and Listeria. In Wisconsin, some of the funding was used to establish the Surveillance and Outbreak Support (SOS) team, a team of students that helps state and local investigators interview patients, enters and maintains data in an electronic disease surveillance system, and investigates outbreaks. FoodCORE now covers approximately 14% of the U.S., including Wisconsin.<sup>13</sup>

### ***U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)***

The U.S. Environmental Protection Agency (EPA) is responsible for a number of activities that contribute to food security within the United States, in areas such as food safety, water quality, and pesticide applicator training. The EPA's primary contribution to food security is ensuring that the American public is protected from potential health risks posed by eating foods that have been treated with pesticides. The EPA is responsible both for registering new pesticides before they can be marketed and re-registering older pesticides to ensure that they meet current scientific standards.

### ***AGRICULTURAL MARKETING SERVICE***

USDA's Agricultural Marketing Service (AMS) is responsible for establishing quality and marketing grades and standards for many foods (including dairy products, fruits and vegetables, livestock, meat, poultry, seafood, and shell eggs), and for certifying quality programs and conducting quality grading services. Accordingly, AMS is primarily responsible for ensuring product quality and not food safety. USDA programs establishing quality grade standards to encourage uniformity and consistency in commercial practices are provided for under the Agricultural Marketing Act of 1946.<sup>14</sup> AMS also administers the Pesticide Data Program (PDP), a cooperative federal-state residue testing program that collects data on residual pesticides, herbicides, insecticides, fungicides, and growth regulators in over 50 different commodities. The pesticides and commodities to be tested each year are chosen based on EPA data needs, and on information about the types and amounts foods consumed, in particular, by infants and children.<sup>15</sup>

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<sup>12</sup> <http://www.cdc.gov/pulsenet/>.

<sup>13</sup> <http://www.cdc.gov/foodcore/about.html>.

<sup>14</sup> 7 U.S.C. §1621.

<sup>15</sup> <https://www.fas.org/sgp/crs/misc/RS22600.pdf>.

## **STATE FOOD REGULATORY AGENCIES**

### ***WISCONSIN DEPARTMENT OF AGRICULTURE, TRADE, AND CONSUMER PROTECTION***

Up until the early 20<sup>th</sup> century, food regulation in Wisconsin was handled by a patchwork of agencies, similar to those on the federal level. However, in 1929 these responsibilities were consolidated into one state agency that is now DATCP. DATCP has purview over food safety, animal and plant health, protecting water and soil and monitoring fair and safe business practices. The agency inspects and licenses businesses, analyzes laboratory samples to evaluate food contaminants and quality levels, offers education programs on best practices, and promotes Wisconsin's agricultural industry.<sup>16</sup> In the case of a foodborne illness outbreak, DATCP's Bureau of Laboratory Services (BLS) coordinates with local and tribal health departments and DHS to trace possible causes of contamination, conduct tests on food items, and work with food suppliers to eliminate the contaminated items.<sup>17</sup> BLS' work to trace the source of contamination may provide both evidence in cases of suspected law violations and indications of broader risks to public health and welfare.<sup>18</sup>

### **Wisconsin Department of Health Services**

DHS' Division of Public Health (DPH) has a role in promoting food safety at the distribution and consumer levels. DHS currently licenses restaurants, hotels and vending machine commissaries under s. 254.64, Stats. DHS also plays a key role in collecting health data and investigating foodborne disease outbreaks. The Communicable Disease Epidemiology Section (CDES) of DPH maintains a cluster database called the Wisconsin Electronic Disease Surveillance System, or WEDSS, to monitor outbreaks. When a number of similar illnesses appear in the database, DHS coordinates with the local or tribal health department to determine if a shared food source is the cause. While DATCP conducts tests on the food items, DHS tests fecal samples to assess the human impacts of the foodborne illness.

### **Wisconsin State Lab of Hygiene (WSLH)**

Part of the University of Wisconsin-Madison, the Wisconsin State Laboratory of Hygiene (WSLH) is the state's public and environmental health laboratory.<sup>19</sup> When a hospital or physician's office identifies a reportable disease, they will send the patient's stool sample to the WSLH for further testing. Scientists at the WSLH will use Pulsed-Field Gel Electrophoresis, or PFGE, which is a technique used to generate a DNA fingerprint for a bacterial isolate.<sup>20</sup> This DNA fingerprint is then entered into WEDSS and the CDC's PulseNet program to trigger

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<sup>16</sup> <http://datcp.wi.gov/uploads/Food/pdf/FoodRegulationInWisconsin.pdf>.

<sup>17</sup> Interview Rachel F. Klos, DVM, MHP and Suzanne Gibbons-Burgener, DVM, Ph.D., Wisconsin Department of Health Services – Division of Public Health.

<sup>18</sup> Legislative Fiscal Bureau, "Laboratory Service Charges and Equipment (Agriculture, Trade, and Consumer Protection)," Paper #138 (May 18, 2011).

<sup>19</sup> <http://www.slh.wisc.edu/about/>.

<sup>20</sup> <http://www.cdc.gov/pulsenet/pathogens/pfge.html>.

cluster investigations when there are numerous cases of a similar strain of disease such as Salmonella, E. Coli, or Lysteria.<sup>21</sup>

### **Local and Tribal Health Departments**

In 2014, there are about 100 local and tribal public health departments across Wisconsin. These departments may take a leading role in food safety regulation in their community by taking on the regulatory roles of DATCP and DHS. Currently, 37 cities and counties, as agents for DATCP, license and inspect retail food stores, and 50 cities and counties, as agents for DHS, license and inspect restaurants. DATCP and DHS set standards for these local programs, train and assist local staff, and evaluate local performance.<sup>22</sup> Local and tribal health departments also act as first responders in the case of a foodborne illness outbreak. The local departments monitor WEDSS for cases in their jurisdiction and dispatch a sanitarian to interview the patient to determine possible causes for the illness. The departments then coordinate with DHS and DATCP to trace the problem food. If the case is part of a national cluster, the agencies will coordinate with the CDC and other federal agencies as necessary.<sup>23</sup>

### **Investigating a Foodborne Illness Outbreak**

Local and state health agencies are often the first to detect the occurrence of an outbreak and to begin an investigation. There are three key elements of a state outbreak investigation:

- Epidemiologic Investigation - conducted by local public health nurses, epidemiologists, and health officers.
- Environmental Investigation - conducted by sanitarians, environmental health specialists, and DATCP regulatory agents.
- Laboratory Investigation - conducted by clinical laboratories, WSLH, and DATCP-Bureau of Laboratory Services.

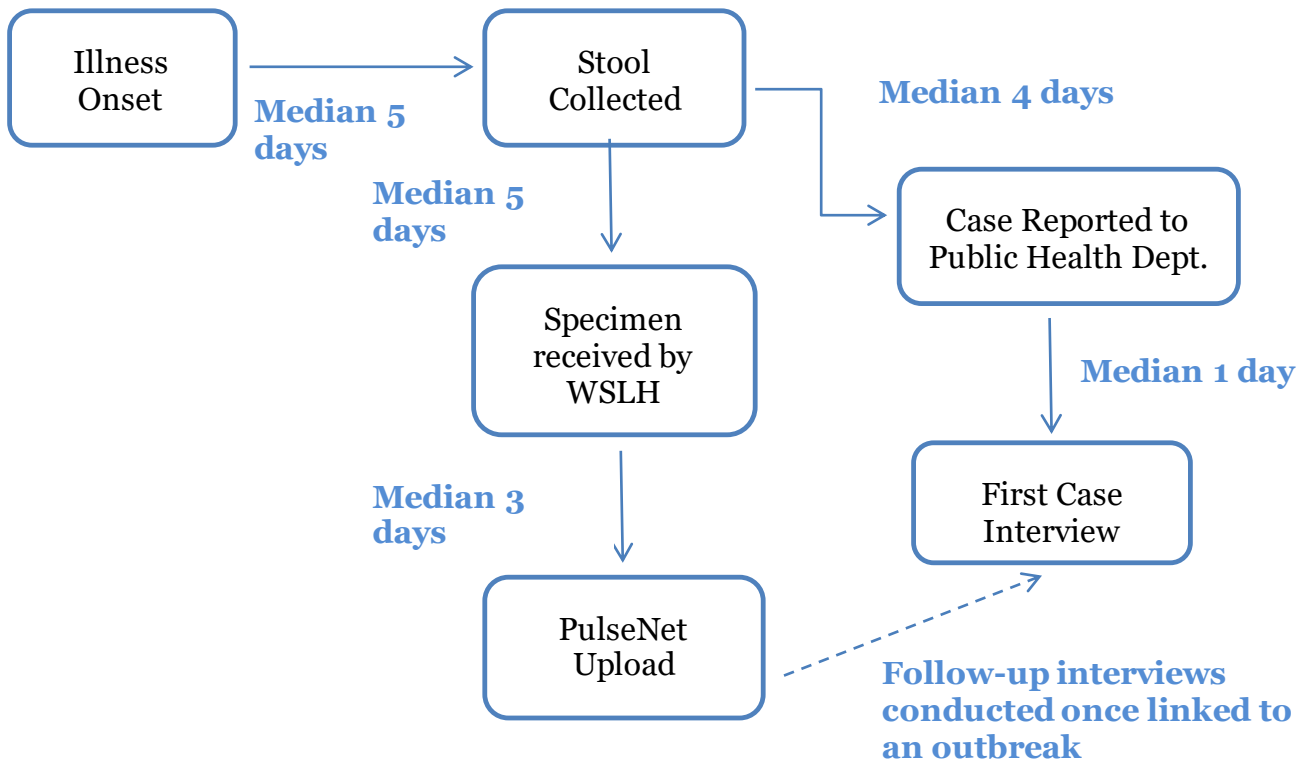
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<sup>21</sup> Interview Rachel F. Klos, DVM, MHP and Suzanne Gibbons-Burgener, DVM, Ph.D., Wisconsin Department of Health Services – Division of Public Health.

<sup>22</sup> [http://datep.wi.gov/programs/food\\_safety/](http://datep.wi.gov/programs/food_safety/).

<sup>23</sup> Interview Rachel F. Klos, DVM, MHP and Suzanne Gibbons-Burgener, DVM, Ph.D., Wisconsin Department of Health Services – Division of Public Health.

According to DPH, the average reporting timeline for an outbreak investigation in Wisconsin is:



On the federal level, outbreaks are tracked by the CDC's PulseNet System, which allows the CDC to step in when there is a multi-state cluster. The FDA, USDA, and EPA may become involved in an outbreak investigation when a product that they regulate is suspected as the cause.<sup>24</sup>

### **Case Study – 2012 Multistate Outbreak of Salmonella**

In 2012, a coordinated multistate investigation was conducted by many local, state, and federal agencies to address a large Salmonella outbreak. This investigation is an excellent example of how Wisconsin deals with foodborne outbreaks and coordinates with federal agencies to eliminate the contaminated product. Raw, scraped, ground tuna product (often used in sushi) was determined to be the source of Salmonella Bareilly and Salmonella Nchanga infections that sickened 360 people in 27 states and the District of Columbia. In Wisconsin, 22 residents had laboratory-confirmed Salmonella infections with the same DNA fingerprint as the national outbreak strains. Four residents were hospitalized but all patients recovered from the infection.

Staff of local health departments in Milwaukee, Waukesha, Washington, Fond du Lac, and Dane Counties; the Wisconsin DHS; DATCP; and WSLH worked closely with partners at the CDC and FDA to investigate the outbreak and identify the source of the Salmonella. As a result

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<sup>24</sup> Interview Rachel F. Klos, DVM, MHP and Suzanne Gibbons-Burgener, DVM, Ph.D., Wisconsin Department of Health Services – Division of Public Health.



of their efforts, Moon Marine USA Corporation voluntarily recalled three production dates of frozen raw yellowfin tuna product and the DATCP-Bureau of Laboratory Services (DATCP-BLS) isolated the outbreak strain of Salmonella Bareilly from the recalled product.

The success of this investigation highlights the importance of collaboration between public health partners and the benefits of maintaining robust routine surveillance systems that ensure outbreaks are detected early. Patient interviews conducted by local health departments were essential in generating the initial hypothesis that sushi consumption might be associated with the illness. Throughout the investigation, Wisconsin public health nurses, epidemiologists, and sanitarians at local health departments communicated regularly with epidemiologists and food safety personnel at the DPH and DATCP to ensure that the investigation was conducted quickly and thoroughly. The CDC FoodCORE SOS team at DPH also assisted local investigators by conducting some patient interviews during evening hours.

Local health departments supported the national investigation in the following ways:

- Provided timely interview information from patients regarding their food histories and other exposures.
- Completed in-depth assessments at restaurants and grocery stores.
- Collected invoice information for products of interest.
- Collected samples of tuna for testing by the DATCP-BLS.
- Gathered data from restaurants and grocery stores to assist in determining the background rates of consumption of particular sushi items.

These efforts greatly contributed to the success of the investigation that traced the contamination from the point of consumption through the distribution chain to its source.

### **New Challenges in Responding to Outbreaks**

Foodborne illness outbreaks appear to be increasing. Part of the reason is that because of increased surveillance and better detection methods, public health agencies are identifying more multistate outbreaks and linking sporadic cases from different states or regions that are caused by the same organism.

However, beyond improvements in identifying outbreaks, public health agencies at every level face a host of new challenges in responding to foodborne illness. New disease-causing organisms have emerged, some spreading worldwide. Because of changes in food production and distribution methods, the ways foodborne disease can arise and spread is changing and the scope of outbreaks can be much larger than before.<sup>25</sup> Modern food distribution often involves food products being transported through a number of distributors. As the product changes hands, it may be repackaged, which makes tracing the product back to its source very difficult, and sometimes impossible. Certain food items, particularly global imports and wild game, are

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<sup>25</sup> <http://www.fda.gov/Food/ResourcesForYou/Consumers/ucm180323.htm>.

not well regulated and can be the most difficult to trace.<sup>26</sup> Finally, although Wisconsin conducts 150 to 200 foodborne illness outbreaks each year, the responsible agencies at the local, state, and federal levels do not currently have the capacity to respond to and thoroughly investigate every outbreak.

### **GLOSSARY OF REPORTABLE ENTERIC ILLNESSES**<sup>27</sup>

**Campylobacteriosis** is an infectious disease caused by bacteria of the genus *Campylobacter*. Most people who become ill with campylobacteriosis get diarrhea, cramping, abdominal pain, and fever within two to five days after exposure to the organism. The diarrhea may be bloody and can be accompanied by nausea and vomiting. The illness typically lasts about one week. Some infected persons do not have any symptoms. In persons with compromised immune systems, *Campylobacter* occasionally spreads to the bloodstream and causes a serious, life-threatening infection.

**Cryptosporidiosis** is a diarrheal disease caused by microscopic parasites, *Cryptosporidium*, that can live in the intestine of humans and animals and is passed in the stool of an infected person or animal. Both the disease and the parasite are commonly known as “Crypto.” The parasite is protected by an outer shell that allows it to survive outside the body for long periods of time and makes it very resistant to chlorine-based disinfectants. During the past two decades, Crypto has become recognized as one of the most common causes of waterborne disease (recreational water and drinking water) in humans in the United States. The parasite is found in every region of the United States and throughout the world.

**Cyclospora cayetanensis** is a parasite composed of one cell that causes an intestinal infection called cyclosporiasis. The time between becoming infected and becoming sick is usually about 1 week. *Cyclospora* infects the small intestine and usually causes watery diarrhea, with frequent, sometimes explosive, bowel movements. Other common symptoms include loss of appetite, weight loss, stomach cramps/pain, bloating, increased gas, nausea, and fatigue. Vomiting, body aches, headache, fever, and other flu-like symptoms may also be noted. Some people who are infected with *Cyclospora* do not have any symptoms. If not treated, the illness may last from a few days to a month or longer. Symptoms may relapse one or more time.

**Escherichia coli** (abbreviated as *E. coli*) are a large and diverse group of bacteria. Although most strains of *E. coli* are harmless, some kinds of *E. coli* can cause diarrhea, urinary tract infections, respiratory illness and pneumonia, and other illnesses. Some kinds of *E. coli* cause disease by making a toxin called Shiga toxin. The bacteria that make these toxins are called “Shiga toxin-producing” *E. coli*, or STEC for short. The symptoms of STEC infections vary for each person but often include severe stomach cramps, diarrhea (often bloody), and vomiting. Symptoms generally appear three to four days after exposure and last five to seven days. Some infections are very mild, but others are severe or even life-threatening. Around 5-10% of those who are diagnosed with STEC infection develop a potentially life-threatening complication known as hemolytic uremic syndrome (HUS).

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<sup>26</sup> Interview Rachel F. Klos, DVM, MHP and Suzanne Gibbons-Burgener, DVM, Ph.D., Wisconsin Department of Health Services – Division of Public Health.

<sup>27</sup> Centers for Disease Control and Prevention. [<http://www.cdc.gov/nczved/divisions/dfbmd/diseases/>.]

**Giardiasis** is a diarrheal disease caused by the microscopic parasite *Giardia*. Once a person or animal (for example, cats, dogs, cattle, deer, and beavers) has been infected with *Giardia*, the parasite lives in the intestines and is passed in feces. *Giardia* infection can cause a variety of intestinal symptoms, including diarrhea, flatulence, greasy stool that can float, stomach or abdominal cramps, nausea and dehydration. These symptoms may also lead to weight loss. Symptoms normally begin one to three weeks after becoming infected and generally last two to six weeks. Once outside the body, *Giardia* can sometimes survive for weeks or months.

**Listeriosis**, a serious infection usually caused by eating food contaminated with the bacterium *Listeria monocytogenes*. The disease primarily affects older adults, pregnant women, newborns, and adults with weakened immune systems, though people without these risk factors can also be affected. A person with listeriosis usually has fever and muscle aches, sometimes preceded by diarrhea or other gastrointestinal symptoms. Almost everyone who is diagnosed with listeriosis has an “invasive” infection, in which the bacteria spread beyond the gastrointestinal tract. Pregnant women typically experience fever and other non-specific symptoms, such as fatigue and aches. However, infections during pregnancy can lead to miscarriage, stillbirth, premature delivery, or life-threatening infection of the newborn. In people other than pregnant women, symptoms can include headache, stiff neck, confusion, loss of balance, and convulsions in addition to fever and muscle aches.

**Salmonellosis** is an infection with bacteria called *Salmonella*. Most persons infected with *Salmonella* develop diarrhea, fever, and abdominal cramps 12 to 72 hours after infection. The illness usually lasts four to seven days, and most persons recover without treatment. However, in some persons, the diarrhea may be so severe that the patient needs to be hospitalized. In these patients, the *Salmonella* infection may spread from the intestines to the blood stream, and then to other body sites and can cause death unless the person is treated promptly with antibiotics. The elderly, infants, and those with impaired immune systems are more likely to have a severe illness.

**Shigellosis** is an infectious disease caused by a group of bacteria called *Shigella*. Most who are infected with *Shigella* develop diarrhea, fever, and stomach cramps starting a day or two after they are exposed to the bacteria. The diarrhea is often bloody. Shigellosis usually resolves in five to seven days. Persons with shigellosis in the United States rarely require hospitalization. A severe infection with high fever may be associated with seizures in children less than two years old. Some persons who are infected may have no symptoms at all, but may still pass the *Shigella* bacteria to others.

**Vibrio species (non-cholera)** infections are caused by *Vibrio* species bacteria in the same family as those that cause cholera, but do not cause cholera. Among healthy people, ingestion of *Vibrio* species (non-cholera) can cause vomiting, diarrhea, and abdominal pain. In immunocompromised persons, particularly those with chronic liver disease, these bacteria can infect the bloodstream, causing a severe and life-threatening illness. *Vibrio* species (non-cholera) can also cause an infection of the skin when open wounds are exposed to warm seawater. These infections can also occur from wounds exposed to brackish water or raw shellfish/seafood drippings. These infections may lead to skin breakdown and ulceration. Symptoms usually occur within 24 hours of eating contaminated food or within 12 to 72 hours after exposure to contaminated seawater.

**Yersiniosis** is an infectious disease caused by a bacterium of the genus *Yersinia*. In the United States, most human illness is caused by one species, *Y. enterocolitica*. Infection with *Y.*

enterocolitica occurs most often in young children. Common symptoms in children are fever, abdominal pain, and diarrhea, which is often bloody. Symptoms typically develop four to seven days after exposure and may last one to three weeks or longer. In older children and adults, right-sided abdominal pain and fever may be the predominant symptoms, and may be confused with appendicitis. In a small proportion of cases, complications such as skin rash, joint pains, or spread of bacteria to the bloodstream can occur.

This memorandum is not a policy statement of the Joint Legislative Council or its staff.

This memorandum was prepared by Anne Gargano Ahmed, Intern, and Laura Rose, Deputy Director, on January 27, 2015.

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