Foodborne Illness Investigation and Control Reference Manual

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC HEALTH

THE WORKING GROUP ON FOODBORNE ILLNESS CONTROL
MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH
FOOD PROTECTION EPIDEMIOLOGY LABORATORY SCIENCES

Updated February, 2019

FOODBORNE ILLNESS INVESTIGATION AND CONTROL REFERENCE MANUAL

A publication of the Massachusetts Department of Public Health Bureau of Infectious Disease and Laboratory Sciences and Bureau of Environmental Health Working Group on Foodborne Illness Control

TABLE OF CONTENTS FOR THE INTRODUCTORY INFORMATION

EPIDEMIOLOGY PROGRAM

(Bureau of Infectious Disease and Laboratory Sciences)

617-983-6800 (Regular and Emergency Number)

Contact for technical assistance with the epidemiologic investigation such as obtaining medical and food histories, coordinating stool specimen submissions and developing questionnaires. On-site investigation assistance is often available for larger outbreaks. An epidemiologist is on-call for emergencies 24 hours per day, 7 days a week, 365 days per year at the above number.

FOOD PROTECTION PROGRAM

(Bureau of Environmental Health)

617-983-6712

Contact for policy and technical assistance with the environmental investigation such as conducting a HACCP risk assessment, initiating enforcement actions and collecting food samples. On-site investigation assistance is often available for larger outbreaks.

For assistance with foodborne illness emergencies after business hours, call the Epidemiology Program at the number above.

STATE PUBLIC HEALTH LABORATORY

(Bureau of Infectious Disease and Laboratory Sciences)

617-983-6201

Contact for technical assistance with the collection protocol for food and clinical specimens and interpretation of laboratory results. **24/7 Laboratory Telephone: 617-590-6390**

IMPORTANT REFERENCE DOCUMENTS (Updated October, 2018)

The documents listed below are the major documents that should be referenced when a foodborne illness is being investigated. Links updated October, 2018.

Summary of Reportable Diseases, Surveillance, and Isolation and Quarantine Requirements, extracted from 105 CMR 300.000:
https://www.mass.gov/files/documents/2016/07/xx/rdiq-reg-summary.pdf

Guide to Surveillance, Reporting and Control:
https://www.mass.gov/handbook/guide-to-surveillance-reporting-and-control

Disease Fact Sheets:
http://www.mass.gov/eohhs/gov/departments/dph/programs/id/epidemiology/factsheets.html

"MA Food Code," Regulation 105 CMR 590.000: Minimum Sanitation Standards for Food Establishments, Article X: https://www.mass.gov/files/documents/2018/10/09/105cmr590.pdf

The 2013 FDA Food Code and 2015 Supplement to the 2013 Code are available on FDA's website at:
https://www.fda.gov/Food/GuidanceRegulation/RetailFoodProtection/FoodCode/ucm374275.htm

CIFOR (Council to Improve Foodborne Outbreak Response): Guidelines for Foodborne Disease Outbreak Response - 2nd Edition and Industry Guidelines, plus other resources at **http://cifor.us/**

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A. PURPOSE

Foodborne illnesses are a continuing threat to the public's health. They cause illness, suffering, and death and they place an enormous financial burden on society. Although some foodborne illnesses have been controlled by modern advances, these are constantly emerging or re-emerging. The Massachusetts Department of Public Health (MDPH) places strong emphasis on improving the investigation and control of foodborne illness. This reference manual is part of the MDPH's focus on providing more trainings and technical assistance for local boards of health and health department staff (LBOH). The purpose of the manual is to guide LBOHs through foodborne illness investigation and control. It is designed as a comprehensive reference covering both epidemiologic and environmental aspects of a foodborne illness investigation, and emphasizes the practical and necessary features of investigation and control. Contained within the manual are basic information, guidelines, recommendations and regulatory requirements. While this manual is targeted to LBOHs, other health professionals can also use the information to facilitate understanding of how LBOHs operate, and how they, themselves, play a role in foodborne illness investigation and control. This 2nd Edition also focuses on meeting Standard #5 of the FDA's Voluntary National Retail Food Regulatory Program Standards as of 2015.

This manual is comprised of individual chapters addressing the different aspects of investigating and controlling foodborne illnesses. It has been specifically designed for online use so that each chapter is self-contained with emergency numbers and attachments appropriate to that chapter's content. However, chapters may include references to other chapters as appropriate.

This manual has also been designed so that individual chapters can be updated as needed, without updating the entire manual. The original revision date for all of the chapters is June, 2017. When accessing this manual online in the future, however, you may notice that particular chapters will have more current revision dates. Individual chapters can be printed if a hard copy would be more useful to your particular board's or department's needs. We encourage you to check online, however, when using your printed copy, to make sure that you have the most current revisions.

B. THE WORKING GROUP ON FOODBORNE ILLNESS CONTROL

The MDPH Working Group on Foodborne Illness Control (WGFIC) is comprised of members of the Bureau of Environmental Health's Food Protection Program (FPP) and the Bureau of Infectious Disease and Laboratory Sciences (BIDLS) Epidemiology Program, Office of Integrated Surveillance and Informatics Services (ISIS), and the Massachusetts State Public Health Laboratory (MA SPHL). The group's mission is to identify and prevent foodborne illness through information exchange both within MDPH and among local partners, develop best practices in foodborne illness outbreak investigation, and share knowledge through presentations, educational materials and reports.

WGFIC's main functions are:

1) To respond to consumer complaints regarding foodborne illness,
2) To assist and/or train LBOHs in investigations of foodborne illness or outbreaks,
3) To identify causes of outbreaks through environmental investigations, laboratory analysis and epidemiologic analysis,
4) To track cases and complaints linked to the consumption of food, and
5) To make recommendations and take necessary steps for the prevention and control of foodborne illness.

C. TEAM APPROACH

Investigation of an outbreak of foodborne illness is a team effort in which each member plays an essential role. The collaborative nature of WGFIC has contributed to improved communication between the programs at MDPH and a better understanding of what is happening throughout Massachusetts in regard to foodborne illness. Collaboration and close working relationships with LBOHs who address foodborne illness will be emphasized throughout the manual. Increased understanding of others' responsibilities and even cross-training can result in improved local foodborne illness investigation and control programs. LBOHs are encouraged to work closely with MDPH on all foodborne illness investigations, and particularly on outbreaks, to facilitate a shorter timeline between notification and the institution of prevention and control measures.

D. ORGANIZATION OF THIS MANUAL

Chapter I: History and Trends presents an overview of the history and trends of foodborne illness for the United States and Massachusetts.
Chapter II: Disease Characterization and Pathogenesis provides an overview of the pathogenesis of foodborne illness and discusses how foodborne disease is classified. It also contains descriptions of causative agents and associated illnesses. The focus of the manual is on illness caused by three common microbial food hazards: viruses, bacteria and parasites. Other less common etiological agents such as molds and chemicals are referenced, but not specifically addressed.
Chapter III: Foodborne Illness Surveillance explains the concepts of disease surveillance, describes the methods by which foodborne illness data are collected and used, and addresses important data collection issues.
Chapter IV: Investigating Foodborne Illnesses and Outbreaks focuses on the responsibilities of LBOHs in the investigation and the use of the Enteric Disease Reporting Form along with the Foodborne Illness Complaint Worksheet. A summary of sequential steps in an outbreak investigation is included as an attachment.
Chapter V: The Epidemiologic Investigation explains the steps taken to determine the source(s) of the illness(s) and the way in which information is analyzed to assist in prevention and control measures.
Chapter VI: Electronic Reporting and Surveillance System (MAVEN) describes the very sophisticated communication system used in Massachusetts allowing LBOHs, members of WGFIC, as well as other hospitals and laboratories to communicate information regarding foodborne illness more rapidly.
Chapter VII: Conducting an Environmental Investigation is a detailed description of the role of the LBOH in working with ill individuals reported to them; conducting a HACCP risk inspection of the suspect facility; and implementing prevention and control measures.
Chapter VIII: When There Are Sick Employees is a detailed description of how LBOHs should handle sick employees at a suspect facility; work with the Person-in-Charge to implement exclusions and restrictions and subsequent reinstatement; and includes a detailed section on hepatitis A.
Chapter IX: Working with the State Public Health Laboratory describes the following: the role of the laboratories; what samples are tested; how samples should be submitted; and how the reports should be interpreted.
Chapter X: Summarizing the Investigation describes the contents of a complete report, summarizing all of the steps taken from beginning to end of a foodborne illness investigation.

E. ACKNOWLEDGEMENTS

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The Working Group on Foodborne Illness Control wishes to thank all the individuals who served as contributors and reviewers in the development and completion of the 1st edition of this manual, as well as the following individuals for their work in the production of this 2nd edition:

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F. LIST OF ACRONYMS

a_w	Water Activity
AIDS	Acquired Immune Deficiency Syndrome
AR	Attack Rate
ASTHO	Association of State and Territorial Health Officials
BIDLS	Bureau of Infectious Disease and Laboratory Sciences
CD	Communicable Disease
CDC	U.S. Centers for Disease Control and Prevention
CIDT	Culture Independent Diagnostic Test(s)
CMR	Code of Massachusetts Regulations
CCP	Critical Control Point
CSTE	Council of State and Territorial Epidemiologists
EIA	Enzyme Immuno-Assay
ELR	Electronic Laboratory Reporting
FDA	U.S. Food and Drug Administration
FPP	MDPH Food Protection Program
GI	Gastrointestinal
HACCP	Hazard Analysis Critical Control Point
HAV	Hepatitis A Virus
HRA	HACCP Risk Assessment
HUS	Hemolytic Uremic Syndrome
IG	Immune Globulin
I&Q	Isolation and Quarantine
ISIS	Office of Integrated Surveillance and Informatics Services
LBOH	Local Board of Health(s)
LIMS	Laboratory Information Management System
MDPH	Massachusetts Department of Public Health
MGL	Massachusetts General Law
MMWR	Morbidity and Mortality Weekly Report
O&P	Ova and Parasites
PCR	Polymerase Chain Reaction
PFGE	Pulsed-Field Gel Electrophoresis
PIC	Person in Charge
PSP	Paralytic Shellfish Poisoning
SLI	State Laboratory Institute
SPHL	(Massachusetts) State Public Health Laboratory
STD	Sexually Transmitted Disease
STEC	Shiga Toxin-producing *Escherichia coli*
TCS	Time/Temperature Control for Safety Food
USDA	U.S. Department of Agriculture
VNA	Visiting Nurse Association
WGFIC	Massachusetts Working Group on Foodborne Illness Control
WGS	Whole Genome Sequencing

G. GLOSSARY

Anaerobic. Able to live without oxygen.

Aseptic technique. Method used to prevent contamination in procedures where sterility is necessary.

Asymptomatic. Without symptoms.

Attack rate. The proportion of a well-defined population that develops illness over a limited period of time, as during an epidemic or outbreak. It is often expressed as a percentage. The difference between attack rates for those exposed and not exposed to a particular food provides important clues in the investigation of the etiology of an acute outbreak.

a_w (water activity). See water activity.

Bacteria. One-celled living microorganisms with a cell wall.

Bioassay. The determination of the strength of a drug or substance by comparing its effect on a live animal or an isolated organ preparation to the effect of a standard preparation.

Carrier. An individual who can tolerate an infection so as not to become ill, yet is able to transmit the disease-causing organism to cause infection and illness in others.

Case or Patient. One who is ill, infected, injured or diagnosed with a reportable disease or injury; in a foodborne illness outbreak, an individual or diseased person or animal having specific clinical, laboratory and epidemiologic characteristics.

Colonization. Multiplication of a microorganism, on or within, a host without causing cellular injury. A colonized host can serve as a source of infection.

Communicability (Period of). The interval during which a person or animal that has an infection is a potential source of infection.

Comminuted. Reduced in size by methods including chopping flaking, grinding or mincing. Includes fish or meat products that are reduced in size and restructured or reformulated such as gefilte fish, gyros, ground beef and sausage; and a mixture of two or more types of meat that have been reduced in size and combined, such as sausages made from two or more meats.

Contact. A person or animal that has been in such association with an infected person or animal, or a contaminated environment, as to have had exposure capable of transmitting the infection to that person.

EIA (Enzyme Immuno-Assay). A laboratory method used to detect a target (can be DNA, RNA, antigen, antibody or toxin) in a clinical specimen or environmental sample.

Endemic. The expected, or the usual, prevalence of a disease or infectious agent in human populations within a given geographic area.

Enteric. Pertaining to the gastrointestinal tract.

Epidemic. A disease occurring in a greater-than-usual number of individuals in a community at the same time.

Epidemic curve. A graph that depicts the association of the time of onset of illness of all cases that are associated with the outbreak. It helps in determining whether the outbreak originated from a common source or from person to person spread.

Epidemiologist. A person who applies epidemiologic principles and methods to the prevention and control of disease.

Epidemiology. Study of the distribution and determinants of health-related states and events in populations, and the application of this study to the control of health problems.

Etiology. The cause of a disease (i.e., type of bacteria, virus, toxin, etc.)

Fecal-oral transmission. Describes the spread of pathogens from the feces of a human (or animal) into the mouth of a person, which can occur via fecal contamination of the food or water supply, or by hand-to-mouth transmission following inadequate handwashing after touching contaminated items.

Foodborne disease. Illness resulting from ingestion of contaminated food or water.

Foodborne infection. An illness caused by ingestion of food or water contaminated by viruses, bacteria or parasites. Either they invade and multiply in the intestinal mucosa and/or other tissues or, in addition, they then release a toxin that causes damage or interferes with normal function.

Foodborne intoxication. An illness caused by ingestion of food already contaminated by a toxin, such as certain bacteria, poisonous chemicals or natural toxins.

Foodborne pathogens. Microorganisms causing illness through the ingestion of food.

Genus. In biology, a category of classification for living organisms. This group is between the species and the family.

Guillain-Barre' Syndrome. Nerve damage resulting in varying degrees of paralysis or weakness, usually reversible.

HACCP (Hazard Analysis Critical Control Point). HACCP is a concept which permits a systematic approach to the identification and assessment of hazards and risks associated with the manufacture, distribution and use of a food product, as well as the definition of preventive measures for their control.

Hermetically-sealed. Airtight.

Host. Organisms, including man, that are capable of being infected by a specific agent (e.g., a person infected by contaminated food.)

HUS (Hemolytic Uremic Syndrome). An acute condition consisting of anemia due to red blood cell damage, low platelet count, bleeding tendency and kidney damage.

Hypothesis. An unproven assertion or statement, based on available information, which commonly deals with the identity of an etiologic agent, the source of infection and the mode of transmission. Its role is to provide a rational basis for further investigation.

Imminent health hazard. A significant threat or danger to health that is considered to exist when there is sufficient evidence to show that a product, practice, circumstance, or event creates a situation that requires immediate correction or cessation of operation to prevent injury based on the number of potential injuries and the nature, severity and duration of the anticipated injury.

Immune globulin (IG). A solution of antibodies that is effective in preventing certain diseases, such as hepatitis A, if given prior to exposure or in the early incubation period after exposure to the hepatitis A virus.

Immunity. Possession of protective antibodies or cellular components sufficient to protect from infection and/or illness following exposure to an infectious agent. (See also Resistance.)

Immunocompromised. An immune system functioning in a less than optimum manner or at an overall reduced level.

Incubation period. Time from ingestion or other acquisition of a pathogen until symptoms occur in the human body.

Infectivity. The ability of an agent to infect a host.

Infective dose. The quantity of bacterial cells, viral particles, or parasitic cysts required to induce illness.

Infectious period. Time period during which one is capable of transmitting a disease to others.

Invasive. The ability of a microorganism to enter the body and to spread throughout the tissues.

Investigations. Studies conducted to identify the source of individuals' cases and the mode of the pathogen's transmission.

Isolate. (verb) To obtain a pure culture of an infectious agent, such as bacteria or viruses.
(noun) A pure culture of an infectious agent; bacteria

Isolation. Separation, for the period of communicability, of infected persons from others in such places and under such conditions as will prevent the direct or indirect transmission of an infectious agent to susceptible people or to those who may spread the agent to others. This also applies to animals.

MAVEN. The Massachusetts Virtual Epidemiologic Network, MDPH's infectious disease surveillance and case management system.

Microbial. Relating to microorganisms (e.g., bacteria).

Mucoid. Mucus-like.

Mucopurulent. Consisting of pus and mucus.

Outbreak or Cluster. The occurrence in a community, facility, workplace or region of cases of an illness clearly in excess of the number of cases usually expected. The number of cases indicating an outbreak or cluster will vary according to the infectious agent or the site conditions/hazards, size and type of population exposed, previous experience or lack of exposure to the disease, and time and place of occurrence. Outbreaks or clusters are therefore identified by significant increases in the usual frequency of the disease in the same area, among the specified population, at the same season of the year.

Parasite. An organism living on or within an animal of another species, from which it obtains nutrients.

Pasteurization. The process of heating a fluid or food at a moderate temperature for a definite period of time in order to destroy undesirable bacteria without changing to any extent its chemical composition.

Pathogen. A microorganism capable of producing a disease.

Pathogenic. Productive of disease.

Pathogenesis. Origin and development of disease.

Pathogenicity. Capacity of an organism to cause disease.

PCR (Polymerase Chain Reaction). A laboratory method used to amplify and detect DNA or RNA in a clinical specimen or environmental sample.

pH. An expression used to indicate the degree of acidity or alkalinity of a substance: pH 7 is neutral; acids have a pH of less than 7; bases have a pH more than 7.

Plausible. Having an appearance of truth or reason but usually open to question.

Protozoa. One cell organisms with cell nuclei and other structures.

PulseNet. The national molecular subtyping network for foodborne illness surveillance and outbreak detection. PulseNet is housed at the U.S. Centers for Disease Control and Prevention.

Resistance. The sum total of body mechanisms which interpose barriers to the progress of invasion or multiplication of infectious agents or to damage by their toxic products. Immunity is that resistance usually associated with possessing antibodies or cells having a specific activity against the etiologic agent of an infectious disease. Passive immunity is attained either naturally by maternal transfer or artificially by introducing specific protective antibodies. Passive immunity is of brief duration. Active immunity is attained by infection, with or without symptoms, or by introducing certain fractions or products of the infectious agent or the agent itself in a killed, modified or variant form. Natural resistance is the ability to resist disease independently of antibodies or a specific cellular response. It commonly rests in anatomic, cellular or physiologic characteristics of the host. It may be genetic or acquired, permanent or temporary.

Quarantine. Restricting the freedom of movement of well persons or domestic animals who have been exposed to a communicable disease for a period of time relating to the usual incubation period of the disease, in order to prevent effective contact with those not so exposed (compare Isolation).

Risk. The likelihood of the occurrence of a hazard (e.g. illness).

Septicemia. Presence of pathogenic bacteria in the blood. If allowed to progress, the organisms may multiply and cause an overwhelming infection and death.

Sequelae. A condition that may be of long duration following, and resulting from, a disease.

Serotype. In microbiology, a microorganism determined by the kinds and combinations of specific chemical structures that interact with specific antibodies.

Spore. A reproductive cell usually unicellular, produced by plants, some protozoa, and certain bacteria. The spores of bacteria are difficult to destroy because they are very resistant to heat and require prolonged exposure to high temperatures to destroy them.

Species (spp.). In biology, a category of classification for living organisms. This group is just below genus.

Strain. In microbiology, a division of serotype as determined by PFGE or WGS.

Surveillance of Disease. Monitoring the occurrence and spread of disease and indications of such occurrence and spread.

Toxigenic. The ability of an organism to elicit toxic symptoms.

Toxic Dose. The quantity of toxin required to induce illness.

Toxin. Proteins or conjugated protein substances which can be lethal to other organisms. They are produced by some higher plants, certain animals and pathogenic bacteria.

Virulence. Relative power and degree of pathogenicity possessed by organisms that produce disease.

Viruses. A minute organism too small to be seen with a light microscope yet visible with an electron microscope. It is entirely dependent on living cells for its metabolic and reproductive needs.

Water activity (a_w). A unit of measurement reflecting the amount of moisture that is readily available for the metabolic activity of microorganisms. A reduction of water availability will reduce microbial proliferation.

H. LIST OF FIGURES AND ATTACHMENTS (Updated October, 2018)

I. REFERENCE MANUAL CHAPTERS

J. INDEX (By Chapter-Page)