Enteric Illness Protocol

MARCH 2008

COMMUNICABLE DISEASE CONTROL

Manitoba

Enteric Illness

Manitoba

Communicable Disease Control Branch

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Executive Summary

The purpose of the enteric illness protocol is to:

1) outline the initial control measures that should be implemented to help contain the outbreak and prevent spread,
2) detail the procedures and reporting that should be undertaken during an enteric illness outbreak investigation,
3) explain the terms and calculations used to determine whether an environmental exposure such as food or water is the source of the illness, and
4) define the roles and responsibilities of the individuals and organizations that may be involved in the investigation.

To help guide the enteric illness investigation, information on the etiology and epidemiology of enteric illness has been included. Surveillance activities that aid in prevention are briefly described. The exclusion process for affected employees is detailed as well as the communication procedures for internal, external and media communications. The steps for the preparation of the Enteric Illness Outbreak Summary Report are outlined.

A list of contacts and acronyms is found at the beginning of the protocol. The appendices section contains the forms that need to be completed for enteric illness investigations as well as instructions for specimen collection and submission. A section on noroviruses (NV) is contained in the appendices as they are the most common agents implicated in enteric illness outbreaks. In addition, a listing of other enteric illness-causing agents that may be transmitted by food or water is included. The appendices also contain detailed information on prevention measures, including water and food protection, routine infection control practices and initial control measures in public facilities. A sample outbreak investigation report is included in the appendices section in order to guide documentation. A list of references for further reading is found at the end of the protocol.

Contact Information

Name of Organization	Contact	Phone No.
Manitoba Health and Healthy Living – Office of the Chief Provincial Public Health Officer	Chief Provincial Public Health Officer	204-788-6666
Manitoba Health and Healthy Living – Food Protection	Director of Food Protection	204-788-6745
Manitoba Health and Healthy Living – Public Health	Manager of Public Health Inspectors	204-788-6726
Manitoba Health and Healthy Living – Regional MOHs	A listing may be found at www.gov.mb.ca/health/publichealth/cmoh/contactlist.html	
Manitoba Health and Healthy Living – CDC Surveillance Unit	Referral Liaison Inter/Intra Province	204-788-6736
Manitoba Health and Healthy Living – CDC Epidemiology	Epidemiologist	204-788-6786
Manitoba Health and Healthy Living – Infection Control	Infection Control Practitioner	204-945-6685
Cadham Provincial Laboratory	Outbreak Co-ordinator	204-945-7473
ALS Environmental (formerly Enviro-Test)	Manager	204-255-9737
Winnipeg Regional Health Authority (WRHA)	Medical Officers of Health	204-926-8083
First Nations and Inuit Health	Medical Officer of Health	204-984-8924
Canadian Food Inspection Agency	Regional Director	204-983-2202
Manitoba Water Stewardship – Office of Drinking Water	Manager	204-945-5762
City of Winnipeg – Environmental Health Services	Program Co-ordinator	204-986-2919
City of Winnipeg – Environmental Health Services (Branch Intake Line)		204-986-2443

List of Acronyms

CDC	Communicable Disease Control
CFIA	Canadian Food Inspection Agency
CIDPC	Centre for Infectious Disease Prevention and Control
CIOSC	Canadian Integrated Outbreak Surveillance Centre
CLSN	Canadian Laboratory Surveillance Network
CNPHI	Canadian Network for Public Health Intelligence
CPL	Cadham Provincial Laboratory
DWO	Drinking Water Officer
EHO	Environmental Health Officer
FNIHB	First Nations & Inuit Health Branch
HACCP	Hazard Analysis Critical Control Points
HPC	Heterotrophic Plate Count
IAMFES	International Association of Milk, Food and Environmental Sanitarians
MOH	Medical Officer of Health
NESP	National Enteric Surveillance Program
NLV	Norwalk-like virus
NML	National Microbiology Laboratory
NSAGI	National Studies on Acute Gastrointestinal Illness
NV	Norovirus
ODW	Office of Drinking Water
PHAC	Public Health Agency of Canada
PHI	Public Health Inspector
PHN	Public Health Nurse
P/T	Provincial/Territorial
RHA	Regional Health Authority
SRSV	Small round structured virus
TC	Total Coliform

1. Introduction

1.1 Purpose

This protocol is intended to act as a resource for enteric illness investigations by:

1) **Outlining the initial control measures** that should be implemented to help contain the outbreak and prevent spread.
2) **Detailing the procedures and reporting** that should be undertaken during an enteric illness outbreak investigation.
3) **Explaining the terms and calculations** used to determine whether an environmental exposure such as food or water is the source of the illness.
4) **Defining the roles and responsibilities** of the personnel and organizations involved in the outbreak investigation. The investigation requires the effort of an inter-professional *team* of many individuals with different areas of expertise. Investigations seldom respect jurisdictional boundaries and require the *team(s)* to operate in a seamless and consistent manner. Structure is provided for co-ordinating the activities of the various public health agencies that have responsibility for the investigation, prevention and control of enteric diseases in the province of Manitoba.

This protocol is intended as a guide only, as the investigation procedures will vary according to the nature and size of the outbreak. The goal of the investigation is to identify the source of the illness, so that potential control measures can be implemented. While it may be difficult to detect and prove the existence of small outbreaks (1, 2), large outbreaks are self-evident (1).

1.2 Definitions

Enteric Illness

Enteric illness, for the purposes of this protocol, is defined as a gastrointestinal infection or intoxication. Enteric illness may be of either known (laboratory confirmed) or unknown etiology.

Enteric Illness Outbreak

An outbreak of enteric illness is defined as the occurrence of case(s) in a particular area and period of time, which is in excess of the expected number of cases.

Foodborne Illness Outbreak

An incident in which two or more persons experience a similar illness, usually gastrointestinal, after ingestion of a common food **AND** epidemiological analysis implicates the food as the source of illness as demonstrated by:

- isolation of agent from food in agreement with laboratory criteria for confirming etiologic agent (Appendix 4.1); **OR**
- hazard analysis indicating obvious contamination and time-temperature abuse of epidemiologically-incriminated food; **OR**
- analysis of attack rate table (Appendix 4.2).

Outbreaks may be of:

- known etiology – outbreaks in which laboratory evidence of a specific etiologic agent is obtained and criteria in Appendix 4.1 are met.
- unknown etiology – outbreaks in which the epidemiological evidence implicates a food source, but adequate laboratory confirmation is not available.

A foodborne illness outbreak may also be indicated by a single case of rare or unusual illness such as one case of botulism.

See Appendix 4.3, Food Protection Measures in Manitoba.

Waterborne Illness Outbreak

An incident in which two or more persons experience a similar illness, usually gastrointestinal, after consumption of water; **OR** contact with water used for recreational purposes (e.g., swimming pools, lakes, hot tubs); **AND** epidemiological evidence implicates water as the source of the illness.

Characteristics common to documented waterborne disease outbreaks include:

- association with specific watershed events such as heavy rainfall, failures or upsets of water treatment equipment, exceeded water treatment parameters such as turbidity, and defects in the distribution system (3, 4);
- sudden and widespread occurrence of cases (4);
- rapid increase in associated syndromic cases (4);
- cases associated with residence in a specific water supply area with fewer cases found in an adjacent supply area (4);
- close proximity to animal populations (3).

If an epidemiological analysis reveals these characteristics, the Medical Officer of Health (MOH) or Communicable Disease (CD) Co-ordinator/Specialist must advise the authority having jurisdiction that a complete investigation of the drinking/recreational water is to be carried out and reported back to the MOH.

See Appendix 4.4, Measures Taken to Protect Manitoba's Drinking Water Systems.

Non-foodborne/Non-waterborne Enteric Illness Outbreak

Two or more cases of enteric illness related by time and place in which an epidemiological investigation is conducted and the results do not implicate food or water as a source of the outbreak. This type of enteric illness outbreak is the most common and is not always categorized as the result of a formal investigation. It may be difficult to distinguish whether an enteric illness is caused by person-to-person transmission or whether it is indicative of an environmental exposure, such as food, water or other environmental source.

1.3 Etiology of Enteric Illnesses

Enteric illnesses may be caused by chemicals or biological agents and/or their toxins including bacteria, viruses, protozoans, algae, fungi and parasites (5-9). Larger foodborne and waterborne enteric illness outbreaks are more likely to have their etiology identified (3, 12, 13). The specific etiologic agent(s) responsible is frequently not identified (3, 10, 11). Identification is hindered through failure to sample, sampling difficulties and/or transient contamination (3, 5). In the United States, it was estimated that unidentified agents accounted for approximately 81% of foodborne illnesses and hospitalizations (14).

Of reported enteric illness outbreaks in Canada (1996–2003) having a confirmed or suspected causative agent, 68% were viral, 27% were bacterial, 4% were parasitic and 0.2% were due to toxin/poison or yeast/fungus (15). The most commonly confirmed viral agent in these outbreaks was norovirus (80% of viral enteric outbreaks) while the most commonly confirmed bacterial agent was Salmonella (34% of bacterial enteric outbreaks) (15). Giardia was associated with 76% of confirmed parasitic enteric outbreaks (15). Foodborne and waterborne diseases are listed in Appendix 4.1; however, the list is not exhaustive. Appendix 4.5 contains more information on norovirus enteric illness.

1.4 Epidemiology

1.4.1 Transmission

It is difficult to categorize enteric illness by mode of transmission (12) and the transmission route often goes undetermined in outbreak settings (15). Of reported enteric outbreaks in Canada for which a mode of transmission was available, 53% were person-to-person, 40% were foodborne and 2% were waterborne (15). While some bacterial pathogens that cause enteric illness such as *Staphylococcus aureus*, *Clostridium perfringens* and *Salmonella* are almost always associated with foodborne transmission, other bacterial pathogens such as *Shigella* are more frequently transmitted person-to-person (14). Parasitic outbreaks are usually associated with waterborne or person-to-person transmission (14, 15). In outbreaks, viruses are most often reported as being transmitted person-to-person (15). Direct and indirect transmission of enteric pathogens has been responsible for outbreaks at venues where the public comes into contact with farm animals (16, 17).

See Appendix 4.1 for information on incubation, principal symptoms, typical food vehicles, mode of contamination and disease prevention for specific disease agents.

1.4.2 Occurrence

Canada: Enteric diseases are widely under-reported due to no or mild symptoms, short duration, lack of a physician visit and the absence of laboratory diagnosis even when attending a physician (3). As well, not all organisms that cause enteric disease are reportable. For an eight-year period (January 1, 1996 to December 31, 2003), Canadian provinces and territories reported 5,854 enteric disease outbreaks involving 179,801 cases (15). The majority of outbreaks (55%) occurred in residential institutions such as personal care homes and hospitals (15). Most outbreaks occurred between November and March, an event driven in part by viral outbreaks, particularly norovirus (15). Bacterial outbreaks peaked between June and August (15).

Manitoba: In 2004, 48 enteric illness outbreaks were reported of which 67% had an undetermined etiology (19). Of the outbreaks for which a causative agent was identified, 14 (88%) were due to small round enteric viruses, one (6%) was due to *Salmonella* and one (6%) was due to *Clostridium perfringens* (19). While the small round enteric virus category used in Manitoba would include norovirus, it is not specific for norovirus (18). Also captured in this category would be astroviruses, parvoviruses and picornaviruses as the identification techniques used did not permit further differentiation (18). In 2005, 46 enteric outbreaks were reported with 46% having an undetermined etiology (19). Of the outbreaks for which a causative agent was identified, 18 (72%) were due to small round enteric viruses, two (8%) were due to *Salmonella*, two (8%) were due to Hepatitis A, and there was one outbreak each (4%) of *Cryptosporidium*, *E. coli* and *Clostridium difficile* (19). No transmission or source information was available (19).

2. Prevention of Enteric Illness Outbreaks

Programs and activities to prevent enteric illness outbreaks have been developed through the collaboration of many individuals and organizations. Surveillance activities and public facility inspections are briefly described below. Food and water protection are also important and are detailed in Appendices 4.3 and 4.4 . Routine Infection Control Practices are found in Appendix 4.6.

2.1 Surveillance

Ongoing surveillance to support early identification of outbreaks is an important public health function (92) and may include:

- monitoring the environment for climatic events and natural disasters (e.g., flooding) that may have an impact on water used for drinking and/or recreational purposes (4, 20, 21);
- investigating complaints of food and water quality reported to a water utility (5, 21);
- identifying food processing deviations during inspection activities (22);
- detecting unacceptable levels of contaminants through routine sampling in food (23, 24), drinking water (25, 26) and water used for recreational purposes (27);
- identifying and removing contaminated products from the commercial market (6);
- investigating consumer complaints concerning a food which may involve reports of illness (22);
- reporting of a food safety problem from external sources (e.g., foreign health officials) (22);
- recognizing, treating and reporting cases of gastrointestinal illness in general practices and in hospitals (clinical surveillance) (20, 28);
- documenting an increase of positive laboratory results indicating possible enteric/foodborne/waterborne agents (laboratory surveillance) (28, 29);
- monitoring over-the-counter drug sales in pharmacies (syndromic surveillance) (30, 31);
- integrating information from investigations based on interviews and standardized questionnaires (28, 32).

See Manitoba Health and Healthy Living *Communicable Disease Surveillance Protocol*.

Surveillance data from enteric illness and outbreak investigations may be acquired through:

- **Regional Health Authorities (RHAs) in Manitoba** – Reportable disease cases are tracked and investigated by RHA public health staff.
- **Communicable Disease Control (CDC) Branch, Manitoba Health and Healthy Living** – The CDC Branch receives case reports from the RHAs as well as from Cadham Provincial Laboratory (CPL). A monthly summary of communicable diseases is published on the CDC website at www.gov.mb.ca/health/publichealth/cdc/surveillance/index.html. Other updates and reports on specific reportable diseases are also available.
- **National and International Enteric Disease Surveillance Systems**

  C-EnterNet is a comprehensive sentinel site surveillance system in Canada that will be implemented through local health units (34). The sentinel sites are localized networks enabling a co-ordinated investigation into potential sources and reservoirs of pathogens known to have the greatest potential to cause enteric disease in Canada. The information collected may be extended to the general population. Sentinel site surveillance will involve active sampling of people with infectious enteric disease at specific sentinel sites as well as water, agriculture and retail food sampling in the community to determine potential sources of disease (34).

  National Studies on Acute Gastrointestinal Illness (NSAGI) was developed by The Foodborne, Waterborne and Zoonotic Infections Division of the Public Health Agency of Canada (PHAC) to generate baseline period prevalence rates of self-reported acute gastrointestinal illness (AGI) in communities across Canada (35). Data generated from this program indicated that for each case of enteric illness reported to the province of Ontario, an estimated 313 cases of infectious gastrointestinal illness occurred in the community (36).

  Canadian Integrated Outbreak Surveillance Centre (CIOSC) – All of the regional health authorities in Manitoba are registered users of the CIOSC Public Health Alerting /Notification application (37). CIOSC was developed by the Canadian Network for Public Health Intelligence (CNPHI) to improve the surveillance and identification of multi-jurisdictional outbreaks, including enteric outbreaks (22). Enteric Alerts is a tool for posting alerts concerning confirmed or suspected enteric outbreaks under investigation that allows for public health authorities to read the alerts and make contact with those responsible for the investigation (22). Enteric Alerts was designed to detect outbreaks early through recognition of identical cases across jurisdictions (22). Users are contacted by e-mail.

  National Enteric Surveillance Program (NESP) – Cadham Provincial Laboratory (CPL) participates in NESP which compiles laboratory-based surveillance data on enteric pathogens that has been collected at regional and provincial levels. The information is used for detecting emergent and re-emergent pathogens, serovars, phage types, molecular types and increasing or decreasing trends of particular enteric pathogens (41).

  PulseNet Canada – Manitoba is a participant in PulseNet Canada through the CPL and the National Microbiology Laboratory (NML) (38). As part of the Canadian Laboratory Surveillance Network (CLSN), PulseNet Canada was established to identify clusters of foodborne pathogens based on DNA fingerprints (39). With large food production facilities distributing products over a broader area, there has been a shift from point source outbreaks to more diffuse, widespread outbreaks that occur over many communities with only a few illnesses in each community (38). Finding similar patterns through PulseNet, scientists can determine whether an outbreak is occurring, even if the affected persons are geographically far apart (38). Outbreaks and their causes can be identified in a matter of hours rather than days (38). A memorandum of understanding (MOU) was signed allowing simultaneous exchange and comparison of information between PulseNet USA and PulseNet Canada (40).

ProMED-mail – An informal global electronic reporting system for outbreaks sponsored by the International Society for Infectious Diseases where clinicians and public health officials post unusual occurrences of infectious diseases (33).

2.2 Public Facility Inspections

Public health inspectors/environmental health officers (PHIs/EHOs) routinely inspect and enforce disease prevention measures for community shelters, group homes, child care centres, preschools and public recreational water facilities as well as food establishments (Appendix 4.3 Food Protection Measures in Manitoba). PHIs/EHOs should be notified immediately by Public Health whenever a foodborne illness outbreak is suspected in a public facility. The medical officer of health (MOH) may seek the assistance of the PHI/EHO or public health nurse (PHN) in non-foodborne cases of enteric illness in a public facility.

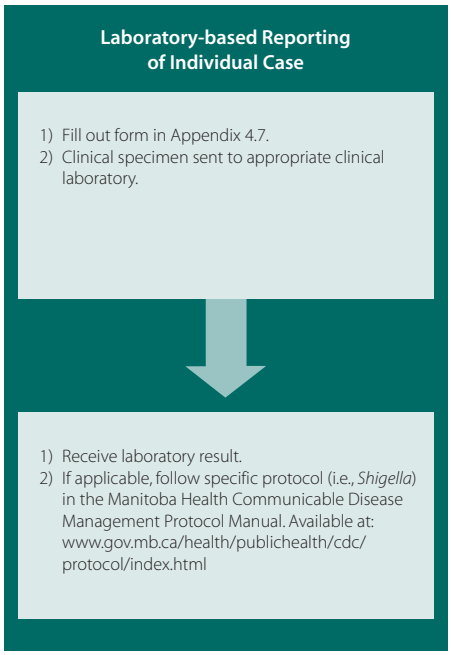
3. Response to Enteric Illness Outbreaks (5, 8)

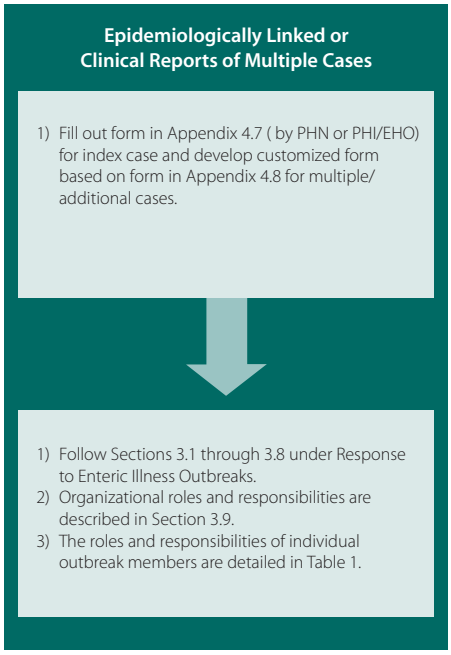
It is the responsibility of each unit identified within this document to ensure staff are appropriately trained in the response procedures to follow in the event of an enteric illness outbreak.

Multijurisdictional Outbreak Situations

Situation	Lead Investigational Body
Region-specific	Regional Health Authority
Multiregional (i.e., Parkland, Interlake and Winnipeg regions)	Manitoba Health and Healthy Living
Interprovincial	Public Health Agency of Canada (PHAC) Centre for Infectious Disease Prevention and Control/Canadian Food Inspection Agency (CFIA)
Reserve and Off-Reserve	First Nations & Inuit Health Branch (FNIHB)/Regional Health Authority
International	PHAC/CFIA

Enteric Illness Investigation





3.1 Detection

As indicated in the surveillance section above (Section 2.1), there are many routes through which an enteric illness outbreak can be detected by surveillance activities. In non-outbreak situations

there is reliance on passive disease surveillance, which involves the receipt of reports of infections/disease from physicians, laboratories and other health professionals who are required to submit such reports as defined by public health legislation. In outbreak situations, active disease surveillance may also be used to identify additional cases. Active disease surveillance involves contacting physicians, hospitals, laboratories and individuals in a community to "actively" search for cases. See *Communicable Disease Surveillance* in the Manitoba Health and Healthy Living *Communicable Disease Management Protocol Manual*.

3.2 Reporting Requirements

Prompt notification is essential for reportable diseases, and required under *The Public Health Act* Disease and Dead Bodies Regulation. Certain communicable enteric illnesses (Appendix 4.1), and **all identified disease outbreaks** are reportable by laboratory and health professionals to the Communicable Disease Control Branch, Manitoba Health and Healthy Living (Telephone 204-788-6736, fax 204-948-2040 or in accordance with other accepted communication protocols). Information is then forwarded to Public Health authorities in the relevant region. If the RHA is notified first, they are to report to the Communicable Disease Control Branch, Manitoba Health and Healthy Living. In addition, all public health events of significance should be reported to the Chief Provincial Public Health Officer (CPPHO).

Protocols for specific communicable diseases can be found in Manitoba Health and Healthy Living's *Communicable Disease Management Protocol Manual* at www.gov.mb.ca/health/publichealth/cdc/protocol/index.html

3.3 Risk Assessment

The source of enteric illness is not always determined at a specific stage of the investigation. Identifying the source of illness will help to guide the investigation. Non-infectious causes of gastrointestinal symptoms such as medication reactions should be ruled out before deciding the outbreak is due to a communicable disease.

If food or water is implicated (i.e., point source outbreak), a foodborne/waterborne illness investigation will be initiated (see step 6 below, Plan and Conduct On-Site Investigation under Outbreak Investigation Procedures, p. 13).

Drinking water officers and public health inspectors conduct risk assessments and will notify the medical officer of health in accordance with established notification protocols if a potential public health risk is identified. The RHA's medical officer of health (or designate), under the authority of the Chief Provincial Public Health Officer (or designate) of Manitoba, has ultimate responsibility and authority over decisions made concerning the investigation of any reportable enteric illness in the province.

The nature of the outbreak will define the areas of responsibility for the various disciplines involved.

The investigation will require a **co-ordinated team effort** involving public health nurses (PHNs), public health inspectors (PHIs)/environmental health officers (EHOs), epidemiologists, communicable disease (CD) co-ordinators, drinking water officers (DWOs), medical officers of health (MOH) and others. **The MOH will assume the lead role for assessment, management and decision-making during an outbreak investigation.**

3.4 Initial Control Measures

Initial control measures for acute care hospitals, long-term care facilities, child care centres and the home are found in Appendix 4.9. **The control measures found in Appendix 4.9 are guidelines that should be considered in consultation with facility infection control and regional public health staff and in accordance with available resources in the event of an enteric illness outbreak.** The facility Infection Prevention and Control staff would manage the outbreak and bring in Public Health if needed. Routine Practices and Contact Precautions should be followed. Initial control measures should be reviewed and assessed to determine whether they are effective (96), and then modified if necessary. For outbreaks where a specific organism is known or suspected, refer to the Manitoba Health and Healthy Living *Communicable Disease Management Protocol Manual* available at: www.gov.mb.ca/health/publichealth/cdc/protocol/index.html .

3.5 Outbreak Investigation

General Points

Interviews should be conducted as soon as possible as memories fade, people scatter and the suspect vectors — including food(s) or water samples — may be discarded and unavailable for testing or worse, consumed by others.

- In small outbreaks an effort should be made to question **all** individuals who were exposed, whether ill or not, for symptoms and history of food and water consumption (form in Appendix 4.8 should be filled out by PHN or PHI/EHO).
- To identify the responsible agent(s), a method analogous to prospective study design is commonly used (Appendix 4.2). Rates of illness in those who consumed specific items are calculated and compared with the rates of illness in those who did not consume those items:

$$\text{Attack Rate (\%)} = \frac{\text{Number of ill people who ate specific food}}{\text{Total number of people who ate specific food}} \times 100$$

- Persons with the highest exposure to implicated vectors generally have the highest attack rates.
- The implicated food/water should have the greatest difference between the attack rate for those who consumed it and the attack rate for those who did not consume it when compared to the differences in attack rates for those who consumed and those who did not consume for each of the other foods or water sources studied. This difference is referred to as the *attributable risk*, which is the rate of disease that can be attributed to the food product or water source under consideration. For example, if 86% of people who were ill ate the meatballs and 2% of people who were ill did not have the meatballs, and 66% of people who were ill ate the egg salad and 50% of people who were ill did not eat the egg salad; the attributable risk for meatballs would be 84% (86% - 2%) and 16% (66% - 50%) for the egg salad. As the meatballs have a much higher attributable risk, they are much more likely to be the cause of the illness.
- The association of illness with an implicated vector is rarely perfect for a number of reasons:
  - the implicated item may not be contaminated throughout;
  - host susceptibility varies;
  - the quantity consumed varies;
  - case histories may contain reporting errors through lack of recall, uncertainty or deliberate misinformation; there may also be errors in recording food and water source history details;
  - those who report illness but have no reported exposure to the incriminated vector may have coincidental illness or secondary infection due to the outbreak, or their illness may be due to trace contamination of other foods by the implicated foods when these were prepared or served.
- If an outbreak is large and it is not possible to interview all participants, a random sample of 25 ill and 25 well individuals should be selected and questioned for symptoms and history of exposures. Six to 10 stool samples from ill individuals is adequate sampling for microbiologic purposes. Large outbreaks may be investigated using a case control study design, and in fact, there may be no alternative to case control studies when the overall attack rate is low and the exposed population is large.

Procedures

The following procedures are based on the procedures developed by the International Association of Milk, Food and Environmental Sanitarians, Inc. (IAMFES) for waterborne and foodborne illness investigations. The procedures are presented in the sequence usually followed during investigations; however, depending upon the nature and size of the outbreak, procedures may be conducted simultaneously or in an alternative order. These steps are similar to those described in the Manitoba Health and Healthy Living Epidemiological Investigation of Outbreaks found at: www.gov.mb.ca/health/publichealth/cdc/protocol/investigation.pdf. See Appendix 4.10 for how to write the outbreak investigation report.

1) **Act on Notification of Illness**

- Log all food and water-related complaints and refer ill individuals to proper health care and/or other facility as necessary. **It is important to complete and submit information for each complaint.** First indication of illness may be through a laboratory report. For single cases, fill out form in Appendix 4.7 (by PHN or PHI/EHO). This form should be faxed to the Manitoba Health and Healthy Living CDC Branch at 204-948-2040. If it has been established that multiple cases of enteric illness originated from a single source, the PHN or PHI/EHO should fill out the form in Appendix 4.8 to summarize case histories.

2) **Confirm Diagnosis**

- Obtain case histories (Appendix 4.7, previously filled out by public health nurse or PHI/EHO).
- Obtain clinical specimens (Appendices 4.11, 4.12 and 4.13). As soon as an outbreak is identified or suspected in a region, regardless of who is collecting the stool specimens, the MOH or designate should call the Cadham Provincial Laboratory (CPL) ahead of sample submission to obtain the outbreak code the specimens must be labeled with. See Appendix 4.13. The PHI/EHO should alert ALS Environmental (formerly Enviro-Test) or other accredited laboratory, if appropriate.
- Obtain and transport food and water samples that have been collected to laboratory for analysis (Appendices 4.14, 4.15).

3) **Develop a Case Definition**

- See example in Appendix 4.10.
- Start off with broad definition to detect as many potential cases as possible.
- Review case histories to refine case definitions.
- Consider using multiple case definitions (i.e., confirmed, suspected).

4) **Make Epidemiologic Associations**

- Make time, place and/or person associations.
- Determine whether outbreak has occurred according to enteric outbreak definition (Section 1.2).
- Formulate hypothesis based on existing information and modify case definition as needed.
- Based on hypothesis, if evidence is strong, recommend or take precautionary control actions.
- Submit initial outbreak report form to Manitoba Health and Healthy Living Communicable Disease Control Branch (Appendix 4.16, filled out by CD Coordinator/Specialist or MOH delegate).

5) **Expand the Investigation**

- Obtain assistance if necessary from other organizations (i.e., if epidemiological associations indicate imported product, CFIA and Public Health Agency of Canada should be involved).
- Find and interview additional persons at risk.
- Find and interview controls. An instruction sheet for interviewing purposes specifically designed for the outbreak should be prepared by the MOH or designate.
- Modify procedures if necessary.

6) **Plan and Conduct On-Site Investigation (Environmental Investigation, conducted by PHI/EHO)** (See Appendix 4.17)

NOTE: There should be a water plant inspection report if the drinking water system is suspected, general sanitation report if person-to-person spread is suspected, a recreational water inspection report or other depending on suspected environmental exposure.

- Inspect equipment and observe operations at water source or food establishment.
- Gather and review monitoring records.

- Conduct hazard analysis if applicable. The hazard analysis involves determining what specific factors contributed to the outbreak and may include:
  - checking calibration of temperature-measuring devices;
  - measuring temperature, pH or water activity of foods;
  - investigating locations where foods were harvested, processed, stored, etc.
- Identify contributing factors to the survival and amplification of pathogens.
- Collect original food, water or other environmental samples if not previously done and submit to ALS Laboratory Group (See Appendix 4.14 and 4.15).
- Interview employees and collect clinical specimens if indicated (See Appendix 4.11).
- Trace and confirm source of contamination.
- Detain questionable and suspect food(s) and water until further information is obtained; confiscation may be necessary (6).
- Provide training on safe food handling (6).

7) **Analyze Data from Outbreak Investigation**

- Plot the epidemic curve as it helps to determine whether the outbreak originated from a common source vehicle, such as water or food, or via person-to-person transmission.
- Determine the main signs and symptoms of illness; summarize case histories if not previously done (see Appendix 4.8).
- Determine responsible or suspect food/water source.
- Calculate attack rates (see Appendix 4.2)
- Interpret laboratory and other results (see Appendix 4.10).

8) **Test Hypothesis Based on Results**

- Factors such as incubation period, type of illness, duration of illness, population affected and contributing factors leading to contamination of food/water and the proliferation or survival of organism in food/water should be consistent with the suspected agent.

9) **Recommend and Implement Control Measures**

Appropriate control measures may involve:

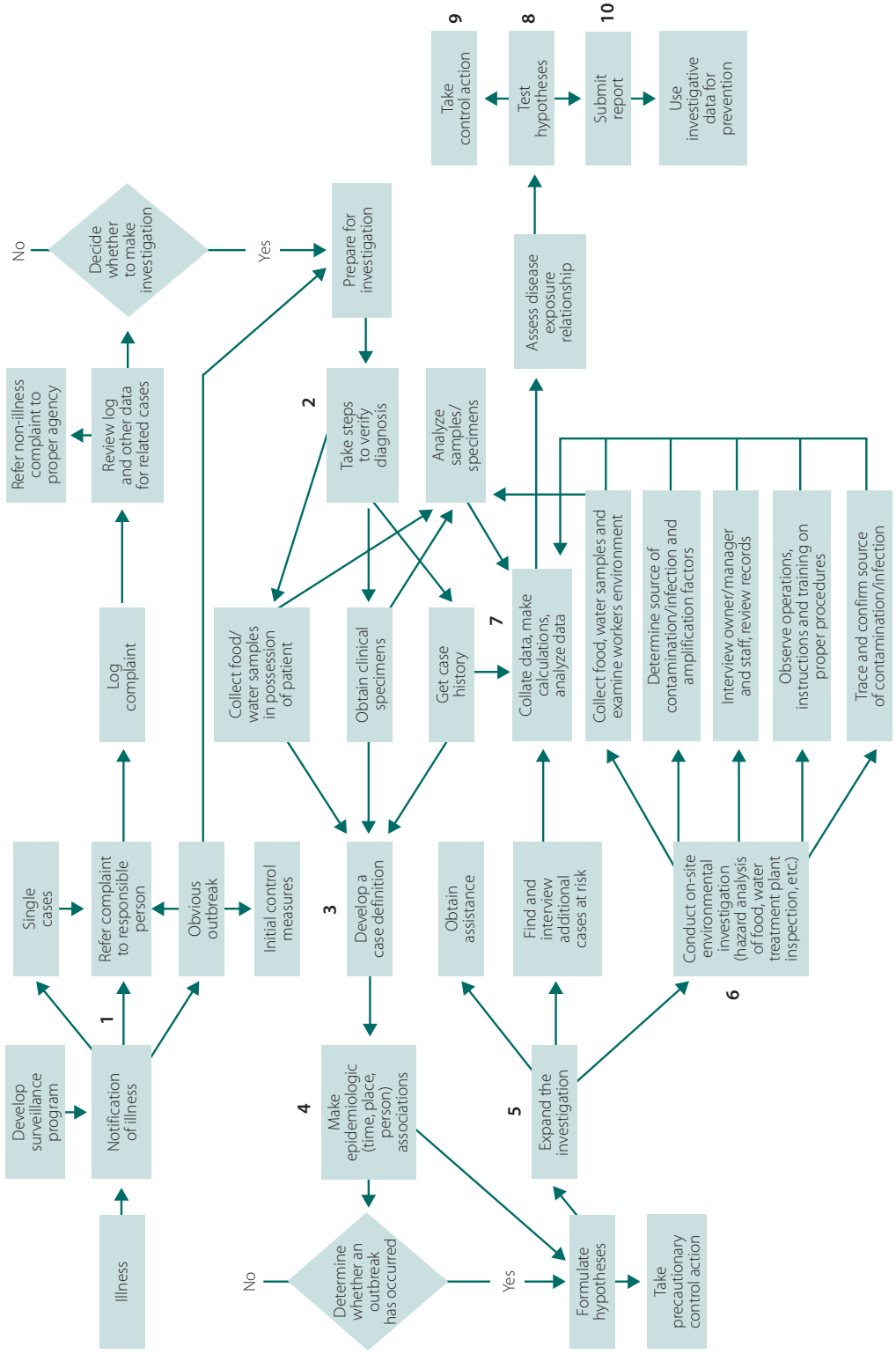
- informing the public;
- excluding infected persons from handling food or from attending a facility (in consultation with Medical Officer of Health, see Section 3.6 and Appendix 4.18);
- stopping distribution, recalling and destroying epidemiologically implicated food;
- closing establishment implicated in outbreak until problem is corrected;
- issuing boil water advisory;
- certifying all food handlers in establishment implicated in outbreak under the Food Handlers Certification Program (6).

10) **Prepare and Submit Written Reports (CD Co-ordinator/Specialist or MOH delegate, see Appendices 4.10 and 4.16)**

- Disseminate to outbreak team members (6).
- Disseminate abbreviated report to the public.
- Use as a basis for the development of preventive measures.
- Staff training (6).

See Figure A for a flow chart representation (based on the IAMFES flow charts) of the sequence of events for a typical enteric illness investigation.

Figure A. Sequential events in investigating a typical outbreak of enteric illness



3.6 Exclusion

At times it is necessary to exclude the food handlers/caregiver from employment to prevent potential transmission of the disease-causing organism from the employee to other individuals. Food and Food Handling Establishments Regulations provide authority to exclude food handlers and may be referred to for more details. It may also be necessary to exclude a child from a child care facility or school. See also Manitoba Health and Healthy Living *Communicable Disease Management Protocol Manual* for disease or organism-specific exclusion requirements.

Consideration of exclusion as a control strategy should take into account:

- the potential risk for serious illness to be spread to others;
- the vulnerability of the specific population exposed;
- the behaviour or modification of such by the infected individual.

The PHN will usually assess the individual's personal hygiene practices. Alternatively, if a PHI/EHO is carrying out a food inspection, the general hygiene of the infected individual as well as the personal knowledge, awareness and consideration of the individual's ability to maintain good handwashing practices may be determined by the PHI/EHO. As well, the specifics about any existing related symptoms are reviewed in detail. If either of these two areas raise concerns that the potential for further transmission exists, the PHN/PHI/EHO should encourage the individual to refrain from any activities that could spread the organism. Thus, the person may work at activities other than food handling with the agreement of the employer, or if their entire job presents some risk, the person will need to be absent from work.

Where this is not possible, and if the PHN/PHI/EHO feels there may continue to be a risk for the person to spread the infection, they may call the Communicable Disease Control (CDC) Branch to review the assessment and to request that a letter of exclusion be sent to the employer. This letter contains the employer's name and address as well as the employee's name, and indicates that the individual has a gastrointestinal infection (specific disease not named) and should be excluded until a further letter allows the employee to return (Appendix 4.18).

This letter is signed by the MOH under whose authority the exclusion is enforced and sent by fax or courier to the employer with a copy given to the client and to the PHN/PHI/EHO managing the case. At times the employee may voluntarily absent himself/herself from work until symptoms resolve, but may need such a letter to validate his/her absence.

A second letter allowing the person to return to work is sent once the risk is deemed to be reduced (i.e., laboratory tests may indicate the infection is resolved, or the symptoms have resolved, or the person is able to comply with good hygienic practices).

For reasons of a practical nature and so as not to create unnecessary hardship, exclusion is reserved as a last effort and the length of time is minimized according to the above criteria. If a worker is excluded, Manitoba Health and Healthy Living is not responsible for any economic adversities that the individual may experience because of this situation.

3.7 Communication

3.7.1 Internal

Develop and maintain regular lines of communication between key investigation team members including the MOH, CDC Branch, PHI/EHO supervisor, PHN and PHI/EHO. Occasional or daily teleconferences (co-ordinated by the MOH or designate) may be indicated in more serious and complex outbreaks.

3.7.2 External

Develop and maintain regular lines of communication with the water system or establishment presumed to be the source of the outbreak, as well as with the affected clients. These external lines of communication are best established by the "field" workers (PHNs and PHIs/EHOs and

DWOs) in collaboration with the MOH, CDC Branch and PHI/EHO supervisor. The involvement of the MOH, CDC Branch and PHI/EHO supervisor in external communications is especially important in more serious and complex outbreaks. Communication with external partners should remain objective, as meticulous microbiologic sampling and carefully collected epidemiologic data will usually lead to an analysis with clear results, obviating the need to "point the finger." The goal of external communications should be to rectify the source of the problem as soon as possible, ensure that steps are taken to prevent a future recurrence and reassure the affected clients that the problem has been resolved.

3.7.3 Media

Media intervention is rarely indicated in a foodborne illness outbreak. However, in a more serious or complex outbreak, it may be appropriate to involve the media. When multiple stakeholders are involved such as the CFIA, province and regional health authorities, there is an option to coordinate with all agencies before initiating a media intervention. Some basic principles that should be followed when communicating to the public through the media include:

- assign one media spokesperson (usually the MOH);
- be proactive rather than reactive (as much as possible, anticipate what the public/media need/want to know and prepare appropriate messages in advance including a Q & A sheet);
- prepare daily media bulletins in collaboration with Manitoba Health and Healthy Living media communication services (may be posted on the Manitoba Health and Healthy Living website);
- be accessible and approachable to the media and respect their deadlines;
- be honest (especially with bad news; "take the high road" rather than trying to cover up);
- be knowledgeable, but not afraid to say, "I don't know" when that is the appropriate answer;
- be calming (especially in the midst of potential hysteria over a foodborne illness outbreak).

3.8 Enteric Illness Outbreak Summary Report

This report is intended to provide a framework for documenting the complete investigation. Once completed, the report will be filed in a central outbreak file. It will also be circulated within the department and to external agencies as appropriate. See Appendix 4.10 for a sample report.

1. What prompted the investigation? (e.g., community concerns, pathogen/infectious agent)
2. Dates of investigation
3. Outbreak contact person and outbreak code
4. Community/regions involved
5. Facility/institution involved
6. Food handling establishment involved

Clinical Description

- Summary of Cases and Controls – give total numbers, age and gender distribution, range of dates and times of onset of illness
- Data collection tool
- Verify the diagnosis
- Cases: description of symptoms, treatment, lab confirmation, infectious agent
- Controls: number, type of symptoms (if any), laboratory testing

Epidemiologic Data

- Date of onset of symptoms of first and last case (epidemiological curve)
- Food history results (two-by-two tables with odds ratios)
- Prevalence of this organism compared to expected incidence in the community (link with CD surveillance personnel)
- Possible sources – suspected or confirmed, summarize the findings of the various health professionals and any food/water results, lab results of food/water samples
- Association of cases with a common environmental source

- Suspected foods, brands, places purchased, preparation, handling or storage
- Total population at risk/exposed, total tested, total number of clinical and number of laboratory confirmed cases

Case Characteristics

- Final case definition
- Association of individual characteristics
- Compare these characteristics with unaffected individuals related to the outbreak

Community Interventions

Education, immunization clinics, chemoprophylaxis, exclusion from school or workplace, facility inspection, implementation of additional infection control measures among staff, facility disinfection, closure.

Conclusion

- Source of outbreak (confirmed or suspect) and method of transmission.
- Recommendations for follow-up for immediate control and future prevention (individual, community and system recommendations).
- Include any interagency recommendations.

3.9 Roles and Responsibilities

Table 1 (adapted from the Winnipeg Regional Health Authority Enteric Illness protocol) outlines outbreak investigation procedures, including notification and documentation, and associated roles and responsibilities of the PHN, PHI /EHO, Epidemiologist, CD Co-ordinator/Specialist, PHI/EHO Supervisor, MOH and Communicable Disease Clerk.

Other Outbreak Team Members

Depending upon the location, nature and size of the outbreak, the following organizations in addition to Manitoba Health and Healthy Living, Cadham Provincial Laboratory, the regional health authority and the City of Winnipeg Environmental Health Services Branch may participate in the outbreak investigation.

- **First Nations & Inuit Health Branch (FNIHB)** – In split jurisdiction communities, RHA staff may be required to work closely with FNIHB staff. FNIHB may have their own protocols in place and there should be one lead person directing the investigation.
- **Manitoba Conservation** – Manitoba Conservation maintains a 24-hour reporting line for environmental spills 204-945-4888. The Manitoba Emergency Plan identifies Manitoba Conservation as the lead provincial agency in Manitoba for dangerous goods incidents that may have an impact on the environment or Public Health. Manitoba Conservation and its regional environment officers also have knowledge of livestock operations and wastewater treatment facilities such as lagoons.
- **Manitoba Water Stewardship** – Manitoba Water Stewardship is responsible for the long-term maintenance of healthy watersheds in Manitoba.
- **Office of Drinking Water** – The Office of Drinking Water (ODW) will have a technical/ support role to the health authority in a waterborne disease outbreak. A Drinking Water Officer (DWO) should be assigned to evaluate the public, semi-public or private water supply system in question and report findings to the health authority. Recreational waters (pools, beaches) remain assigned to the PHIs.
- **Planning and Co-ordination Branch** – Watershed management including source water protection and conservation districts.
- **Water Science and Management Branch** – Employs water quality specialists and is responsible for groundwater, surface water and recreational beach monitoring (Manitoba Clean Beaches Program).
- **Canadian Food Inspection Agency (CFIA)** – The CFIA delivers all federal inspection and enforcement services related to food production and manufacturing. In addition, the CFIA inspects the seed, livestock feed, fertilizers, plants and animals on which a safe food supply

depends. The CFIA contributes to the investigation and control of foodborne illness outbreaks through its regional and nation-wide food safety investigation and recall activities, as well as its regulatory compliance and enforcement activities (22).

- **Public Health Agency of Canada (PHAC)** – The Centre for Infectious Disease Prevention and Control (CIDPC) is the usual first point of contact for provinces on cross-jurisdictional issues related to actual or potential enteric illness outbreaks and is responsible for public health surveillance and applied epidemiological studies. When human illness is recorded in two or more provinces/territories (P/T), or there is exposure to a common food distributed to more than one P/T, CIDPC will co-ordinate the epidemiological investigation, in collaboration with the affected P/Ts (22). In an international foodborne illness outbreak, CIDPC will act as the main liaison (22).

Table 1. Suspected/Confirmed Outbreak of an Enteric Illness

Role	Responsibilities		Notification and Documentation	
Public Health Nurse (PHN)	*Telephone Complaint:* 1. Complete a health history (Appendix 4.7) 2. Orient case histories according to person, place and time 3. Refer symptomatic individuals to physician 4. Obtain name of event organizer or guest/ staff list 5. Ensure that clinical specimens are obtained to verify diagnosis 6. Participate in problem solving, management and control	*Confirmed CD Investigation:* 1. Inform physician of positive lab results 2. Interview client and provide education 3. Obtain case history of current illness (Appendix 4.7) 4. Discuss etiology (cause), epidemiology of pathogen (source, transmission, incubation period and period of communicability) and treatment – as required 5. Discuss preventive measures, including safe food handling and hygiene practices. Clients may be referred to the Canadian Partnership for Consumer Food Safety Education website at www.canfightbac.org/en/ 6. Determine list of contacts and obtain clinical specimens (Appendix 4.11) – as required 7. Determine occupation and assess risk factors for transmission 8. Obtain follow-up clinical specimens – as required 9. Refer client/contacts to physician – as required 10. Complete follow-up teaching, referral for counseling – as required 11. Participate in additional epidemiological investigation (e.g., case control study)	*Telephone Complaint:* 1. Complete summary of case histories/epi table (Appendix 4.8) 2. Notify MOH 3. Notify CD Co-ordinator/Specialist 4. If food or water is suspected as a transmission vehicle, notify PHI/EHO as soon as possible in order to begin food, water or environmental sampling requirements and to see if PHI/ EHO has received similar complaints 5. Document as appropriate	*Confirmed CD Investigation:* 1. Consult with CD Co-ordinator/ Specialist or MOH to determine if high-risk categories require exclusion and to rule out outbreak 2. Notify PHI/EHO if public premise is involved such as home child care, licensed child care, restaurant 3. Complete all documentation as appropriate and refer completed investigation to CD Co-ordinator/ Specialist and MOH as appropriate

Table 1. Suspected/Confirmed Outbreak of an Enteric Illness

Role	Responsibilities	Notification and Documentation
Public Health Inspector (PHI)/ Environmental Health Officer (EHO) (See also PHI/EHO Supervisor)	*Complaint or Referral:* 1. Receive complaints involving food services establishments 2. Interview ill person(s) for a thorough case history (Appendix 4.7) 3. Obtain information regarding: • location of event/place • event organizer • guest list/staff list • menu (including beverages) • food sources/suppliers, other suspect items 4. Refer to reference material for possible causative agent(s) 5. Obtain and transport clinical and original food/water/ environmental specimens to appropriate laboratories as quickly as possible (Appendix 4.11, 4.13, 4.14) 6. Conduct HACCP based inspection (Environmental Investigation, Appendix 4.17) of incriminated food service establishment, known food/water supplies and other potential sources (sanitation, housing) 7. May determine occupation and assess risk factors for transmission 8. Institute immediate prevention and control actions to prevent further illness 9. Advise complainant and food handling operator of food testing results 10. Participate in problem solving, management/control of the outbreak 11. Provide enforcement of Public Health legislation. 12. Provide follow-up investigation and, if necessary, education of food handlers.	1. Complete foodborne illness complaint form (Appendix 4.7) and submit to FBI Notification Registry 2. Notify and consult with EHO/PHI supervisor 3. Notify and consult with MOH/CD Co-ordinator/Specialist 4. Notify and consult with PHNs 5. Notify and consult with Office of Drinking Water/DWO 6. Notify CPL regarding submission of clinical specimens and environmental laboratory regarding submission of environmental specimens; complete corresponding requisitions; attach copy of case history to CPL requisitions (refer to Appendices 4.11, 4.12, 4.13, 4.14)
Communicable Disease (CD) Co-ordinator/ Specialist	1. Co-ordinate public health nursing aspects of outbreak response, including assignment of PHN case managers; act as resource for PHN regarding case management 2. Carry out epidemiologic investigation 3. Liaison – outbreak response team and other stakeholders 4. Identify and arrange for additional staff and material resources (as required) 5. Participate in problem solving, management/control of the outbreak 6. Participate in the development and implementation of preventive measures 7. Outbreak debriefing, staff development and training 8. Participate in outbreak report writing. 9. In the absence of this position, the MOH should either assign or handle these duties.	1. Notify MOH, team managers and EHO/ PHI supervisor and consult with Outbreak Response Team 2. Obtain outbreak code from CPL 3. Complete and submit Manitoba Health Outbreak Report Form (initial assessment and final report (Appendix 4.16) 4. Ensure that all aspects of case/contact management are documented appropriately 5. Maintain updated line-list 6. Contribute to outbreak investigation summary report (public health nurse management and response)

Table 1. Suspected/Confirmed Outbreak of an Enteric Illness

Role	Responsibilities	Notification and Documentation
PHI/EHO Supervisor NOTE: If the region does not have a PHI/EHO Supervisor, these responsibilities may be assumed by the PHI/EHO.	1. Co-ordinate environmental investigations/inspections associated with outbreak response, including assembly of environmental health case managers and team leader 2. Liaison – outbreak response team and other stakeholders 3. Identify and allocate additional staff and material resources (as required) 4. Participate in problem solving, management/control of the outbreak 5. Participate in the development and implementation of preventive measures 6. Outbreak debriefing, staff development and training 7. Participate in outbreak report writing	1. Notify MOH/CD Co-ordinator/Specialist and consult with Outbreak Response Team 2. Notify and consult with Manitoba Health and Healthy Living (Food Protection) and/or CFIA 3. Maintain foodborne illness notification registry 4. Contribute to outbreak investigation summary report (environmental investigation/inspection, results and response)
Epidemiologist or Delegate	1. Receives outbreak notification and outbreak code from CPL 2. Provides epidemiologic support and leadership to the managing region, which may include: • provision of provincial stats • development of investigation forms • development of outbreak database and management of database entry • alerting and sharing information with PHAC if national implications for outbreak 3. Manages alerting system – creates CIOSC alert if outbreak has potential to spread outside a given region or outside the province 4. PulseNet contact (when similar strains or patterns are detected in other geographical regions)	1. Notifies and consults with Outbreak Response Team 2. Notifies other regions and provinces through CIOSC alerts as needed 3. Notifies and consults with PHAC
Medical Officer of Health (MOH)	1. Outbreak response team lead role (decision-making authority): confirm existence of an outbreak, establish case definition, carry out surveillance, develop or coordinate Outbreak Specific Instruction Sheet for interviewing potential cases, epidemiologic and environmental investigations, risk assessments; implement response, management and control actions, communicate internally and externally and formulate policy recommendations. 2. Enforcement of regulations under *The Public Health Act*, *The Drinking Water Safety Act*, *Environment Act* as required. 3. Submit report and conduct debriefing. 4. Implementation of policy recommendations	1. Notify and consult with Outbreak Response Team 2. Notify and consult with Manitoba Health and Healthy Living senior management and Communications Services Manitoba 3. Notify and consult with WRHA and Public Health Agency of Canada (as required) 4. Notify and consult with other agencies: Office of Drinking Water (Manitoba Water Stewardship), First Nations Inuit Health Branch (FNIHB), Manitoba Conservation, CFIA
Communicable Disease Control Clerk	1. Receives and refers positive lab results and clinical case reports to case managers 2. Receives and disseminates outbreak documentation to team members 3. Assists with data entry (as required)	1. Notify CD Co-ordinator/Specialist/PHN of positive lab results or clinical case reports 2. Maintains central documentation file

Appendix 4.1
List of Enteric Organisms Which May be Transmitted by Food and/or Water

* Denotes when a single case is reportable by laboratory to the Communicable Disease Control Branch, Manitoba Health and Healthy Living as required under The Diseases and Dead Bodies Regulations of *The Public Health Act*. ALL outbreaks are reportable.

+ Can be found in the Manitoba Health and Healthy Living Communicable Disease Management Protocol Manual. Bracketed text indicates the name that the organism is listed under in the manual.

Aeromonas hydrophila sobria

**Bacillus cereus*

*+*Campylobacter jejuni*, Campylobacteriosis, (*Campylobacter* Infection)

*+*Clostridium botulinum* (Botulism)

*+*Clostridium difficile*

**Clostridium perfringens*

*+*Cryptosporidium parvum* (Cryptosporidiosis)

Cyclospora cayetanensis

*+*Entamoeba histolytica*, Amebic Dysentery, (Amebiasis)

*+*Escherichia coli* – verotoxin-producing (VTEC), (Verotoxigenic *E. coli* {VTEC} Infection)

Escherichia coli – other than VTEC

*+*Giardia lamblia* (Giardiasis)

*+Hepatitis A virus

*+*Listeria monocytogenes* (Listeriosis)

Microsporidium spp.

Rotavirus

*+*Salmonella* species (Salmonellosis, non-Typhoid)

*+*Salmonella typhi/paratyphi* (Typhoid and Paratyphoid Fever)

*+*Shigella* species (Shigellosis)

Small round structured viruses, also called Norovirus, Norwalk and Norwalk-like

*+*Staphylococcus aureus* (Staphylococcal Food Intoxication)

Streptococcus pyogenes

*+*Vibrio cholerae* 01

*+*Vibrio* non-cholerae 01

*+*Yersinia pseudotuberculosis/enterocolitica* (Yersiniosis)

*+Toxoplasmosis (*Toxoplasma gondii*)

The following tables have been taken and adapted from the Massachusetts Department of Public Health Foodborne Illness Investigation and Control Manual (50) and the Rhode Island Department of Health Guidelines for Investigating Foodborne Illness Outbreaks (9).

Common Foodborne Diseases Caused by Bacteria

Disease Causative agent	Latency Period (Duration)	Principal Symptoms	Typical Foods	Mode of Contamination	Prevention of Disease
Bacillus cereus food poisoning diarrheal	8 – 16 hours (12 – 24 hours)	Diarrhea, cramps, occasional vomiting	Meat products, soups, sauces, vegetables	From soil or dust	Thorough heating and rapid cooling of foods
Bacillus cereus food poisoning, emetic	1 – 5 hours (6 – 24 hours)	Nausea, vomiting, sometimes diarrhea and cramps	Cooked rice and pasta	From soil or dust	Thorough heating and rapid cooling of foods
Clostridium botulinum Botulism food poisoning (heat-labile toxin)	12 – 36 hours (months)	Fatigue, weakness, double vision, slurred speech, respiratory failure, sometimes death	Types A and B: vegetables, fruits, meat, fish and poultry products, condiments Type E: fish and fish products	Types A and B: from soil or dust Type E: water and sediments	Thorough heating and rapid cooling of foods
Clostridium botulinum Botulism food poisoning infant infection	Unknown	Constipation, weakness, respiratory failure, sometimes death	Honey, soil	Ingested spores from soil or dust or honey colonize intestine	Do not feed honey to infants – will not prevent all
Campylobacter jejuni Campylobacteriosis	3 – 5 days (2 – 10 days)	Diarrhea, abdominal pain, fever, nausea, vomiting	Infected food-source animals	Chicken, raw milk	Cook chicken thoroughly, avoid cross-contamination irradiate chickens, pasteurize milk
Vibrio cholerae Cholera	2 – 3 days (hours to days)	Profuse, watery stools, sometimes vomiting, dehydration, often fatal if untreated	Raw or undercooked seafood	Human feces in marine environment	Cook seafood thoroughly; general sanitation
Clostridium perfringens food poisoning	8 – 22 hours (12 – 24 hour)	Diarrhea, cramps, rarely nausea and vomiting	Cooked meat and poultry	Soil, raw foods	Thorough heating and rapid cooling of foods
Escherichia coli foodborne infections enterohemorrhagic	12 – 60 hours (2 – 9 days)	Watery, bloody diarrhea	Raw or undercooked beef, raw milk	Infected cattle	Cook beef thoroughly; pasteurize milk
Escherichia coli Foodborne infections enteroinvasive	At least 18 hr (uncertain)	Cramps, diarrhea, fever, dysentery	Raw foods	Human fecal contamination, direct, or via water	Cook foods thoroughly, general sanitation
Escherichia coli Foodborne infection: enterotoxigenic	10 – 72 hour (3 – 5 days)	Profuse watery diarrhea, sometimes cramps, vomiting	Raw foods	Human fecal contamination, direct or via water	Cook foods thoroughly, general sanitation
Listeria monocytogenes Listeriosis	3 – 70 days	Meningoencephalitis: stillbirths, septicemia meningitis in newborns	Raw milk, cheese and vegetables	Soil or infected animals, directly or via manure	Pasteurization of milk; cooking
Salmonella species Salmonellosis	5 – 72 hours (1 – 4 days)	Diarrhea, abdominal pain, chills, fever, vomiting, dehydration	Raw and undercooked eggs, raw milk, meat and poultry	Infected food source, animals, human feces	Cook eggs, meat and poultry thoroughly; pasteurize milk, irradiate chickens
Shigella species Shigellosis	12 – 96 hours (4 – 7 days)	Diarrhea, fever, nausea, sometimes vomiting, cramps	Raw foods	Human fecal contamination, direct or via water	General sanitation; cook foods thoroughly
Staphylococcus aureus Staphylococcal food poisoning (heat stable enterotoxin)	1 – 6 hours (6 – 24 hours)	Nausea, vomiting, diarrhea, cramps	Ham, meat and poultry products, cream-filled pastries, whipped butter, cheese	Handlers with colds, sore throats or infected cuts, food slicers	Thorough heating and rapid cooling of foods
Streptococcus pyogenes Streptococcal foodborne infection	1 – 3 days (varies)	Various, including sore throat, erysipelas, scarlet fever	Raw milk, deviled eggs	Handlers with sore throats, other "strep infections"	General sanitation, pasteurize milk

Disease Causative agent	Latency Period (Duration)	Principal Symptoms	Typical Foods	Mode of Contamination	Prevention of Disease
Vibrio parahaemolyticus foodborne infection	12 – 24 hour (4 – 7 days)	Diarrhea, cramps, sometimes nausea, vomiting, fever, headache	Fish and seafood	Marine coastal environment	Cook fish and seafood thoroughly
Vibrio vulnificus foodborne infection	In persons with high serum iron: 1 day	Chills, fever, prostration, often death	Raw oysters and clams	Marine coastal environment	Cook shellfish thoroughly
Yersinia enterocolitica Yersiniosis	3 – 7 days (2 – 3 weeks)	Diarrhea, pains, mimicking appendicitis, fever, vomiting, etc.	Raw or undercooked pork and beef, tofu packed in spring water	Infected animals especially swine, contaminated water	Cook meats thoroughly, chlorinate water

Common Foodborne Diseases Caused by Viruses

Disease Causative agent	Latency Period (Duration)	Principal Symptoms	Typical Foods	Mode of Contamination	Prevention of Disease
Hepatitis A virus Hepatitis A	15 – 50 days (weeks to months)	Fever, weakness, nausea, discomfort; often jaundice	Raw or undercooked shellfish; sandwiches, salads, etc.	Human fecal contamination, via water or direct	Cook shellfish thoroughly: general sanitation
Norwalk-like viruses Viral gastroenteritis	1 – 2 days (1 – 2 days)	Nausea, vomiting, diarrhea, pains, headache, mild fever	Raw or undercooked shellfish; sandwiches, salads, etc.	Human fecal contamination, via water or direct	Cook shellfish thoroughly; general sanitation
Rotaviruses Viral gastroenteritis	1 – 3 days (4 – 6 days)	Diarrhea, especially in infants and young children	Raw or mishandled foods	Probably human fecal contamination	General sanitation

See Appendix 4.5 on Norovirus (NV) Enteric Illness

Common Foodborne Illnesses Caused by Fungi Other than Mushrooms

Disease Causative agent	Latency Period (Duration)	Principal Symptoms	Typical Foods	Mode of Contamination	Prevention of Disease
Aspergillus flavus and related molds) Aflatoxicosis	Varies with dose	Vomiting, abdominal pain, liver damage; liver cancer (mostly Africa and Asia)	Grains, peanuts, milk	Molds grow on grain and peanuts in fields and storage: cows fed moldy grain	Prevent mold growth; do not eat or feed moldy grain or peanuts; treat grain to destroy toxins
Alimentary toxic aleukia (trichothecene toxin of fusarium molds)	1 – 3 days (weeks to months)	Diarrhea, nausea, vomiting; destruction of bone marrow; sometimes death	Grains	Mold grows on grain especially if left in the fields through winter	Harvest grain in the fall; do not use moldy grain
Ergotism (toxins of *Claviceps purpurea*)	Varies with dose	Gangrene (limbs die and drop off); or convulsions and dementia; abortion (now not seen in the US)	Rye or wheat, barley and oats	Fungus grows on grain in the fields; grain kernel is replaced by sclerotia	Remove sclerotia from harvested grain

Common Foodborne Diseases Caused by Protozoa and Parasites

Disease Causative agent	Latency Period (Duration)	Principal Symptoms	Typical Foods	Mode of Contamination	Prevention of Disease
PROTOZOA					
Amebic dysentery (*Entamoeba histolytica*)	2 – 4 weeks (varies)	Dysentery, fever, chills; sometimes liver abscess	Raw or mishandled foods	Cysts in human feces	General sanitation; thorough cooking
Cryptosporidiosis (*Cryptosporidium parvum*)	1 – 12 days (1 – 30 days)	Diarrhea; sometimes fever, nausea and vomiting	Mishandled foods	Oocysts in human feces	General sanitation; thorough cooking
Giardiasis (*Giardia lamblia*)	5 – 25 days (varies)	Diarrhea with greasy stools, cramps, bloat	Mishandled foods	Cysts in human and animal feces, directly or via water	General sanitation; thorough cooking
Cyclosporiasis (*Cyclospora cayetanensis*)	1 – 7 days (5 – 40 days)	Diarrhea; sometimes fever, nausea and vomiting	Mishandled foods	Oocysts in human feces	General sanitation; thorough cooking
Toxoplasmosis (*Toxoplasma gondii*)	10 – 23 days (varies)	Resembles mononucleosis; fetal abnormality or death	Raw or undercooked meats; raw milk; mishandled foods	Cysts in pork or mutton, rarely beef; oocysts in cat feces	Cook meat thoroughly; pasteurize milk; general sanitation
ROUNDWORMS (NEMATODES)					
Anisakiasis (Anisakis simplex, *Pseudoterranova decipiens*)	Hours to weeks (varies)	Abdominal cramps, nausea, vomiting	Raw or undercooked marine fish, squid or octopus	Larvae occur naturally in edible parts of seafood	Cook fish thoroughly or freeze at minus 4 degrees F. for 30 days
Ascariasis (*Ascaris lumbricoides*)	10 days – 8 weeks (1 – 2 years)	Sometimes pneumonitis, bowel obstructions	Raw fruits or vegetables that grow in or near soil	Eggs in soil, from human feces	Sanitary disposal of feces, cooking food
Trichinosis (*Trichinella spiralis*)	8 – 15 days (weeks, months)	Muscle pain, swollen eyelids, fever; sometimes death	Raw or undercooked pork or meat of carnivorous animals (e.g., bears)	Larvae encysted in animals muscles	Thorough cooking of meat; freezing pork for 30 days; irradiation
TAPEWORMS (CESTODES)					
Beef tapeworm (*Taenia saginata*)	10 – 14 weeks (20 – 30 years)	Worm segments in stool; sometimes digestive disturbances	Raw or undercooked beef	Cysticerci in beef muscle	Cook beef thoroughly; freeze below 23 degrees F
Fish tapeworm (*Diphyllobothrium latum*)	3 – 6 weeks (years)	Limited; sometimes vitamin B-12 deficiency	Raw or undercooked fresh water fish	Pleroceroids in fish muscle	Heat fish 5 minutes at 133 degrees F or freeze 24 hours at 0 degrees F.
Pork tapeworm (*Taenia solium*)	8 weeks – 10 years (20 – 30 years)	Worm segments in stool; sometimes cysticercosis of muscles, organs, heart or brain	Raw or undercooked pork; any food mishandled by a T. solium carrier	Cysticerci in pork muscle; any food-human feces with T. solium eggs	Cook pork thoroughly or freeze below 23 degrees F.; general sanitation

Foodborne Diseases Caused by Chemicals and Metals

Disease Causative agent	Latency Period (Duration)	Principal Symptoms	Typical Foods	Mode of Contamination	Prevention of Disease
TOXINS IN FIN FISH					
Ciguatera poisoning (ciguatoxin, etc)	3 – 4 hrs (rapid onset) 12 – 18 hrs (days-months)	Diarrhea, nausea, vomiting, abdominal pain Numbness and tingling of face; taste and vision aberrations, sometimes convulsions, respiratory arrest and death (1 – 24 hrs)	"Reef and island" fish: grouper, surgeon fish, barracuda, pompano, snapper, etc.	(Sporadic); food chain, from algae	Eat only small fish
Fugu or pufferfish poisoning (tetrodotoxin, etc.)	10 – 45 min to ≥ 3 hrs	Nausea,vomiting, tingling lips and tongue, ataxia, dizziness, respiratory distress/arrest and sometimes death	Pufferfish, "fugu" (many species)	Toxin collects in gonads, viscera	Avoid pufferfish or their gonads
Scombroid or histamine poisoning (histamine, etc)	Minutes to few hours (few hours)	Nausea,vomiting, diarrhea, cramps, flushing, headache, burning in mouth	"Scombroid" fish (tuna, mackerel etc): mahi-mahi, others	Bacterial action	Refrigerate fish immediately when caught
TOXINS IN SHELLFISH					
Amnesic shellfish poisoning (domoic acid)		Vomiting, abdominal cramps, diarrhea, disorientation, memory loss; sometimes death	Mussels, clams	From algae	Heed surveillance warnings
Paralytic shellfish poisoning (saxitoxin, etc)	< 1 hr (< 24 hrs)	Vomiting, diarrhea, paresthesias of face, sensory and motor disorders; respiratory paralysis, death	Mussels, clams, scallops, oysters	From "red tide" algae	Heed surveillance warnings
MUSHROOM TOXINS					
Mushroom poisoning (varies greatly among species)	< 2 hrs to ≥ 3 days	Nausea, vomiting, diarrhea, profuse sweating, intense thirst, hallucinations, coma, death	Poisonous mushrooms	Intrinsic	Don't eat wild mushrooms
PLANT TOXINS					
Cyanide poisoning (cyanogenetic glycosides from plants)	(Large doses) 1 – 15 minutes	Unconsciousness, convulsions, death	Bitter almonds, cassava, some lima bean varieties, apricot kernels	Intrinsic, natural	Proper processing; avoid some so-called foods

Disease Causative agent	Latency Period (Duration)	Principal Symptoms	Typical Foods	Mode of Contamination	Prevention of Disease
(METALS)					
Cadmium	Depends on dose	Nausea, vomiting, diarrhea, headache, muscular aches, salivation, abdominal pain, shock, liver damage, renal failure	Acid foods, food grilled on shelves from refrigerator	Acid or heat mobilizes cadmium plating	Select food contact surfaces carefully
Copper poisoning	Depends on dose (24 – 48 hrs)	Nausea, vomiting, diarrhea	Acid foods, foods contacting copper, soda fountains, beverages	Acid mobilizes copper	Select food contact surfaces carefully
Lead poisoning	Depends on dose	Metallic taste, abdominal pain, vomiting, diarrhea, black stools, oliguria, collapse coma (also chronic effects)	Glazes, glasses, illicit whiskey	Lead dissolves in beverages and foods	Test glazes and glasses; avoid illicit whiskey
Mercury poisoning	Depends on dose	Metallic taste, thirst, abdominal pain,vomiting, bloody diarrhea, kidney failure	Treated seeds (fungicide); fish	International; food chain	Eat only seeds intended for food
Zinc poisoning	Depends on dose (24 – 48 hrs)	Nausea, vomiting, diarrhea	Acid foods in galvanized containers	Acid mobilizes zinc plating	Select food contact surfaces carefully

Appendix 4.2
Attack Rate Table

	Place of Outbreak									*Complaint Number*
Food	**Number of Persons Linked to Vector**				**Number of Persons Not Linked to Vector**				**Difference In Percent (Attributable Risk)**	Significance
	ill	Well	Total	Percent ill (Attribute)	ill	Well	Total	Percent ill		

Remarks and Interpretation

Suspect Vector

Appendix 4.3
Food Protection Measures in Manitoba

Food inspection in Manitoba is a shared responsibility of the federal and provincial governments and the City of Winnipeg (23). The measures taken to protect the food supply in Manitoba are described below. Public health inspectors and environmental health officers will follow up food complaints and notify the medical officer of health immediately when it is believed that a foodborne illness outbreak has occurred. In some situations it is the medical officer of health that notifies public health inspectors/environmental health officers of a food complaint or potential foodborne illness outbreak.

1) **Regulations and Guidelines**

- All food manufactured or sold in Canada must comply with *The Food and Drugs Act* and *The Consumer Packaging and Labelling Act* (43). Factual information such as the ingredients must be declared on the labels of food products (44). This information is particularly important for individuals with allergies (44), intolerances or restrictive diets.
- Food handling establishments in Manitoba require registration and permits (45). Depending on the jurisdiction and the type of food involved, registration and permitting in Manitoba may be handled by the Canadian Food Inspection Agency (CFIA), Manitoba Agriculture Food and Rural Initiatives (MAFRI), Manitoba Health and Healthy Living or the City of Winnipeg Environmental Health Services (45).
- All potentially hazardous food products sold in retail stores in Manitoba must come from an approved source (23).
- The CFIA encourages and in some cases (fish and seafood) legislatively mandates industry's adoption of science-based risk management practices such as the Hazard Analysis Critical Control Points (HACCP) (46).
- Maximum levels of some chemical contaminants in retail foods have been established by Health Canada and are enforceable by the CFIA (47).
- Bacterial guidelines for some food categories based on public health requirements pertaining to food safety and disease prevention have been established (48). See Appendix 4.15 for Recommended Guidelines for Ready-to-Eat foods.
- Some large processing firms perform routine microbiological sampling of their food products (23).
- See Manitoba's Food and Food Handling Establishments Regulation under *The Public Health Act*.

2) **Inspection**

- Inspections of all food processing plants, restaurants, institutional food services, meat processing plants, retail food stores, mobile canteens, caterers and temporary food services are conducted for identification and remediation of unsafe food practices (23, 45). Establishments are generally inspected by the same organization that issued the permit or registered the establishment.
- The CFIA inspects foods produced at federally registered establishments within Manitoba (49). Inspections may involve product testing activities (46). Food samples are collected and tested by the CFIA for chemical, microbiological and physical hazards (24).
- Imported foods are examined by the CFIA to ensure their compliance with Canadian standards (24, 45).
- Bilateral arrangements with foreign countries allow Canadian officials to conduct audits of foreign inspection systems to verify that Canadian requirements are met (46).

3) **Regulations Enforcement and Follow-up**

- Where non-compliance with regulations occurs, enforcement action may include detentions, seizures, recalls, license suspensions, canceling of registration, injunctions, prosecutions and monetary penalties (46).
- Following a recall, the CFIA monitors the actions taken by recalling firms in removing affected products from the Canadian marketplace by conducting recall effectiveness checks (46).
- Other actions that may be taken after regulation violations include targeted sampling, follow-up inspection and testing of production facilities, mandatory testing of subsequent shipments (import alert) and reviewing importing practices (46).
- At the discretion of the MOH and depending upon the type of illness and level of personal hygiene, a food handler who is ill may be excluded from work (23).
- The City of Winnipeg posts enforcement statistics for public review.

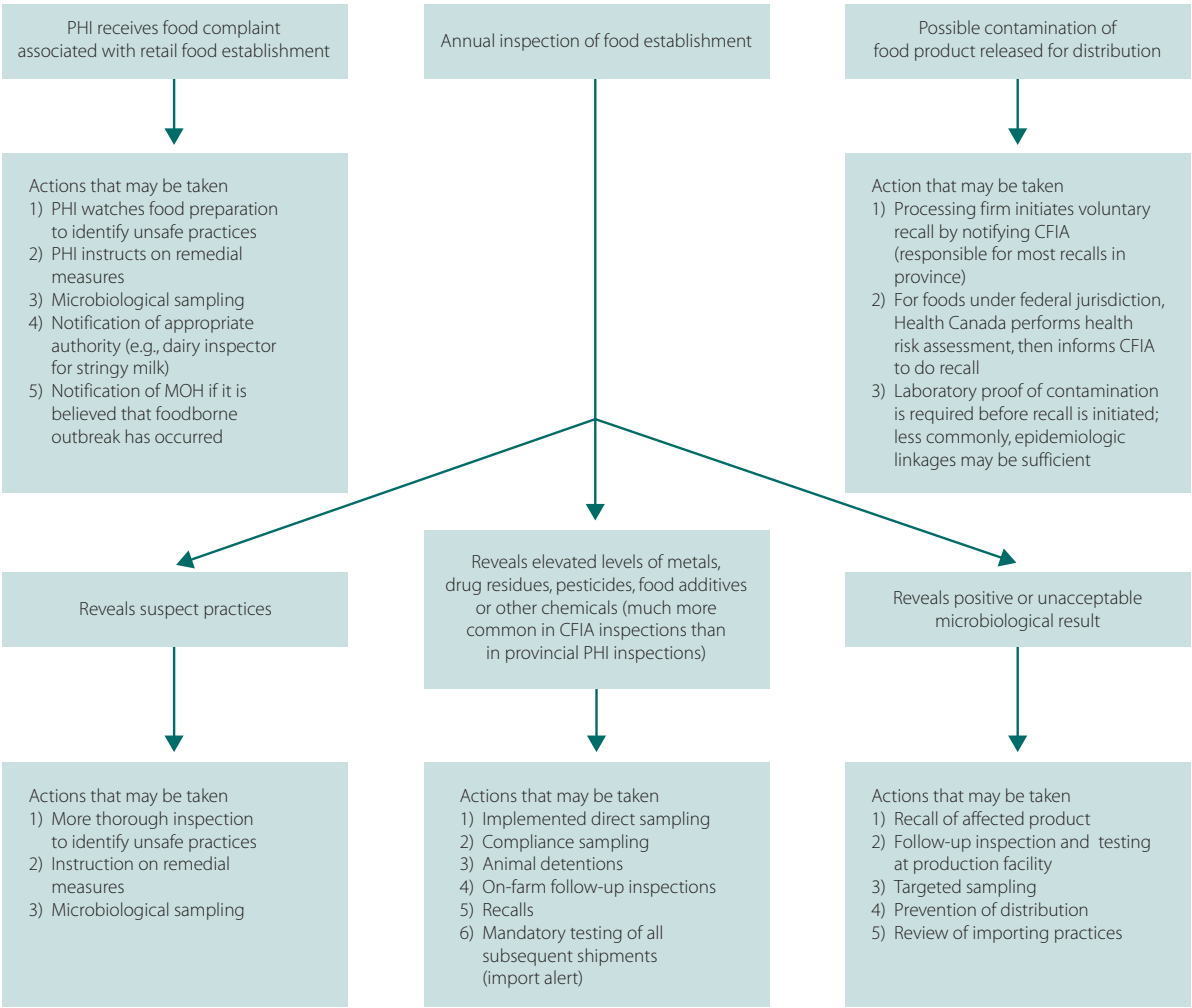
4) **Foodborne Complaint Investigations**

- All complaints by patrons of food establishments are investigated by public health inspectors (PHIs) (23). Foodborne illness outbreak investigations that transcend more than one RHA may be co-ordinated by Manitoba Health and Healthy Living (24).
- If there is laboratory proof of contamination of a retail food product available for sale in Manitoba, Health Canada performs a health risk assessment that might result in the CFIA initiating a recall for the food item (23).
- Available food samples suspected of being involved in a foodborne illness are collected by the assigned PHI and submitted to the laboratory (ALS Laboratory Group, formerly Enviro-Test) for analyses (23).

5) **Partnerships and Education**

- Food safety information is provided to the public by Manitoba Health and Healthy Living and City of Winnipeg PHIs. (45).
- Manitoba Health and Healthy Living co-ordinates food handler training programs in Manitoba (24). Food handler training is mandatory within the City of Winnipeg (bylaw).
- Many produce growers in the province use third-party audits to verify that they are following Good Agricultural Practices (GAP) (24).
- Health Canada and the CFIA have developed active surveillance and monitoring programs for potentially hazardous chemicals in foods (51).
- Manitoba Health and Healthy Living partners with the Canadian Partnership for Consumer Food Safety Education Information. Information on safe food handling practices may be obtained from their web site at www.canfightbac.org/en/ .

Protection of Manitoba's Food Supply



Appendix 4.4
Measures Taken to Protect Manitoba's Drinking Water

The provincial Office of Drinking Water, under the direction of the Minister of Water Stewardship, with support and advice from Manitoba Health and Healthy Living along with the provincial medical officers of health, is responsible for the inspection of drinking water systems. Exceptions include drinking water systems under federal jurisdiction, such as those serving First Nations communities, military bases and national parks. While private[1] water systems are the responsibility of the owner, the Office of Drinking Water provides technical advice. Public[2] water systems and smaller semi-public[3] water systems are regulated under *The Drinking Water Safety Act*.

1) **Regulations and Guidelines**

The Drinking Water Safety Act and its supporting regulations (25, 26, 52) set out requirements for public and semi-public water systems. Public water systems have historically been regulated under *The Public Health Act*. *The Drinking Water Safety Act* requirements are being phased in for semi-public water systems with the initial focus on bacteriological and microbial safety of the water supply. Public water systems will have up to five years (or more) to comply with the new drinking water regulations. The regulatory requirements are listed below.

- Water treatment standards, including disinfection requirements
- Bacteriological standards for total coliform and *E. coli*
- Microbial standards for surface water and groundwater under the influence of surface water systems for *Cryptosporidium, Giardia* and virus removal/inactivation
- Physical standards (turbidity) for surface water and groundwater under the influence of surface water systems
- Chemical standards for key health-related parameters including trihalomethanes for surface water-sourced systems, and arsenic and uranium for groundwater-sourced systems
- Corrective actions that must be undertaken in the event that a turbidity standard or bacteriological standard (see CHART 1) is exceeded
- Application for and acquisition of a licence detailing the general and specific standards for the particular water system prior to operating a drinking water system
- Periodic third-party assessments of public and semi-public water systems
- Monitoring and reporting requirements, including disinfectant residuals, Total Coliform (TC), *E.coli* (EC) and turbidity (for surface water or groundwater under the influence of surface water-sourced systems)
- Emergency notification procedures for laboratories if the results of a water sample analysis indicate a serious health risk.

2) **Inspection and Enforcement**

- Drinking water officers (DWOs) conduct regular inspections of public water systems and issue inspection letters identifying deficiencies, and required and recommended remedial actions.
- DWOs may also conduct inspections in response to a water quality issue, at the request of the water system, to confirm that remedial actions have been undertaken.
- DWOs undertake bacteriological, disinfectant, turbidity and chemical sampling as part of inspection activities.

1 Private water systems refer primarily to wells owned by private citizens for their own domestic use.

2 Public water systems refer to those systems that serve cities or towns and have 15 or more connections.

3 Semi-public water systems have fewer than 15 connections but still serve the public (i.e., schools, day cares, community wells and restaurants which use their own wells).

- The Office of Drinking Water works co-operatively with the owners and operators of water systems to identify and remediate water system component or operational deficiencies.
- The DWO is notified in the event of water treatment system failures or other major upsets and events (53).
- Where an immediate concern over the safety of the water supply is identified, a boil water advisory is issued.
- *The Drinking Water Safety Act* empowers the Office of Drinking Water or Medical Officer of Health to issue a drinking water safety order requiring a water system owner to undertake actions in response to an identified or potential public health risk.

3) **Partnerships and Education**

- Information is provided to owners and operators of water systems through the regional DWOs and through the Office of Drinking Water website.
- DWOs provide on-site assistance to water system operators.
- Operator training is provided through various agencies including Red River College and the Manitoba Water and Wastewater Association.
- Manitoba Conservation manages the provincial water and wastewater operator certification program.
- A series of well water fact sheets are available through the Manitoba Health and Healthy Living website, and include procedures for testing and disinfecting private wells.

Turbidity

Turbidity itself does not represent a threat to human health, but **MAY** indicate the presence of pathogens or other biological or chemical concerns or interfere with water treatment processes such as chlorine or ultraviolet light (UV) disinfection (55). The following actions are aimed at preventing and controlling excess turbidity in Manitoba drinking water systems.

- Specific turbidity standards for each category of filtration system employed by public water systems.
- Continuous monitoring of water turbidity for large public systems (53).
- Periodic reporting of turbidity monitoring results to a DWO (53).
- If the turbidity standard for the specific filtration system employed by a public water system is exceeded, the regional DWO is notified (53). The DWO may consult with the MOH. Resulting action is dependent upon the level of excess turbidity, the condition of the source water and redundancy in the system and may include a boil water advisory (53).

It should be emphasized that contaminant categories are not mutually exclusive; interactions occur between them (55). Turbidity caused by high levels of organic matter can provide a substrate for bacterial growth (55, 57). Similarly, bacterial growth increases turbidity.

Microbiological Parameters

1) **Disinfection**

- Every public water supplier is required to use chlorine or other approved disinfection method(s) (25, 26).
- Semi-public water systems may be required to use a disinfection process depending upon individual circumstances (25, 26).
- Water suppliers that are required to disinfect must ensure the disinfected water is tested for disinfectant residuals by an approved method at specified times and locations (25, 26).

2) **Bacteriological**

Measures taken to protect Manitoba drinking water systems from bacterial contamination include the following:

- Standards where every public water supplier and semi-public water supplier must ensure that all water in the distribution system meets specific bacteriological standards (25, 26).
- Specified sampling intervals, locations (raw and treated samples), and number of samples that are to be collected by water supplier (25, 26). Typically bi-weekly sampling is required.
- Routine reporting requirements of water analysis results by the laboratory to the DWO (53).
- The laboratory undertaking bacteriological analysis must give immediate notification to the regional DWO/MOH where the analysis indicates that the water sample does not meet a bacteriological drinking water quality standard (53).
- Subsidized bacteriological testing of private and semi-public drinking water systems (58). Although there is no requirement for bacteriological testing of private water systems, it is recommended that water samples be submitted for bacterial analysis at least annually (59), with this data being used for pattern surveillance.
- Specific corrective actions for public or semi-public water systems when background[4] bacteria or heterotrophic plate counts (HPC)[5] are exceeded, when total coliform (TC) standards are exceeded, when high[6] total coliform readings or multiple[7] total coliform positive samples are found and when *E .coli* is detected (25).
- Corrective actions may include retesting at problem sites, increasing disinfectant levels, flushing water lines, implementing treatment process changes, boil water advisories and/or other actions as directed by the DWO or MOH (25).

See CHART 1 (next page) for a flow chart representation of protective measures for microbiological safety of drinking water systems in Manitoba.

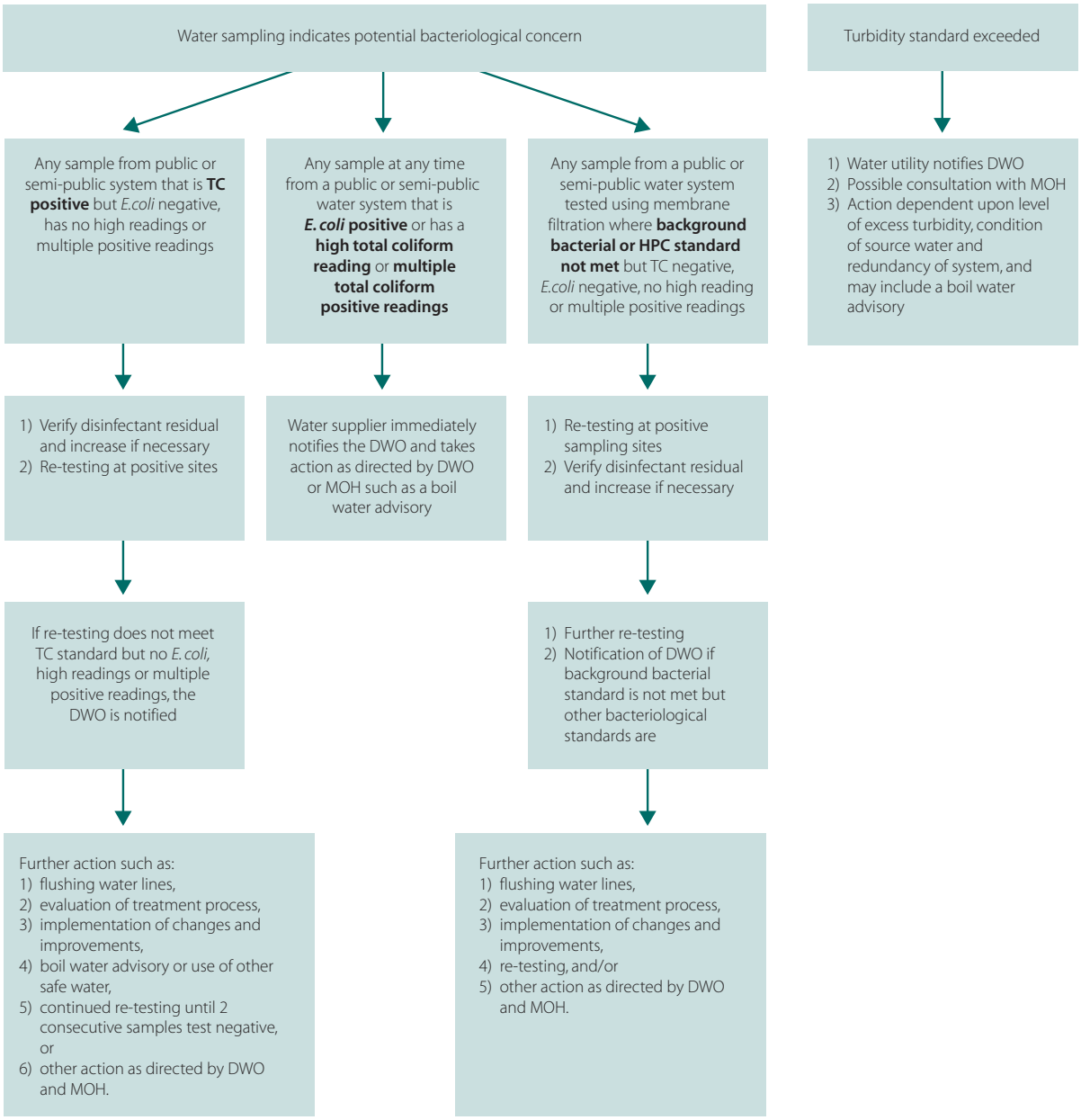
4 Background bacteria refer to bacterial colonies formed by heterotrophic bacteria, other than those sought to test the bacteriological safety of water.

5 Heterotrophic plate count refers to the determination of the general bacterial content of a water sample.

6 A high reading is where a sample has a total coliform concentration that is > 10 coliforms per 100 ml.

7 Multiple positive samples refers to when the number of samples taken in a four-week period or in a month i) is 10 or more, and analyses show that more than 10% of the samples test positive for total coliform, or ii) is fewer than 10, and analyses show that two or more samples test positive for total coliform.

Chart 1: Protective Measures for Microbiological Safety of Drinking Water



Appendix 4.5
Norovirus (NV) Enteric Illness

While it is known that hepatitis A virus, rotaviruses and certain adenoviruses are significantly associated with gastrointestinal illness, noroviruses are responsible for more than 50% of all reported enteric outbreaks in Canada (15). The majority of outbreak cases with an unidentified etiology are also now believed to be due to noroviruses (65).

Norovirus

Noroviruses (NVs) are members of the *Caliciviridae* family and have also been called Norwalk-like viruses (NLVs), caliciviruses and small round structured viruses (SRSVs) (66). In the past, human enteric caliciviruses have been designated according to the location where each strain was detected (e.g., Hawaii, Snow Mountain) (65). In Manitoba, noroviruses are included in the small round enteric virus category and cannot presently be differentiated from astroviruses, parvoviruses and picornaviruses. Sapoviruses, previously referred to as "Sapporo-like viruses" and also members of the *Caliciviridae* family, are associated with gastroenteritis as well (67, 68). Sapoviruses appear more frequently to infect young children (67, 69) and have rarely been associated with outbreaks of gastroenteritis (67).

Noroviruses are hardy and capable of surviving on many surfaces including door handles, sinks, railings and glassware (70). Although NV transmission is primarily from person-to-person (71, 72), NV has been efficiently transmitted by food (62, 63, 73-77, 79), drinking water (63, 65, 67, 75, 78), recreational water (80-82) and contaminated environmental surfaces (71, 83). The major route of person-to-person transmission is fecal-oral (42, 68). Airborne spread has been suggested as an additional route of person-to-person transmission (64, 75, 79). The low infectious dose of NV permits efficient transmission (74). NV transmission occurs year round (63, 75, 84); however, cold weather peaks have been documented (75). NV infects individuals of all ages (64, 84), but is more common among older children and adults (84). Humans are the only known reservoir (64).

The most common settings reported for NV outbreaks are catered meals (62, 63), nursing homes and hospitals (61, 63), schools (62, 63), child care centres (63), camps (63) and cruise ships (63, 87, 88). Outbreaks of NV have been traced to foods contaminated at the source (65) and to foods contaminated by food handlers (65, 76, 89). Almost any type of food that has contact with contaminated water may serve as a vehicle for outbreaks of norovirus gastroenteritis (68). A food handler is more likely to be implicated in a NV outbreak than in a bacterial outbreak (73). However, infected food handlers identified during investigations may be victims rather than sources of infection (90). NV outbreaks are strongly associated with eating salads, sandwiches and produce (73), suggesting that contamination of foods that require handling without subsequent heating is an important source of NV infection (73). Linking NV outbreaks to a common source may be difficult due to the high secondary attack rate that results from rapid person-to-person transmission (71). NV outbreaks on cruise ships are associated with multiple modes of transmission (88), and environmental contamination has been suggested as a mechanism that prolongs the course of NV outbreaks (11, 88). Prolonged viral shedding has been demonstrated in human volunteers challenged with norovirus (42, 91). The following characteristics (often referred to as Kaplan's criteria) (54) are associated with NV outbreaks:

- incubation period of 24 to 48 hours (42, 64, 68, 76, 89);
- illness of short duration (12 to 60 hours) (56, 68, 73, 76, 89);
- high percentage of patients with vomiting (56, 68, 73, 76, 89);
- lack of identifiable pathogens on routine examinations of stool samples (56, 68);
- high secondary attack rates (61, 68, 71).

The characteristics of NV that facilitate spread during epidemics are (5, 86):

- low infectious dose;
- prolonged asymptomatic shedding;
- environmental stability;
- substantial strain diversity; and
- lack of lasting immunity.

Appendix 4.6
Routine Infection Control Practices in Health Care

Routine Practices, briefly described below, are the foundation for preventing transmission of infections in all health care settings. Routine Practices refer to the level of care that should be provided for all patients/residents/clients. This standard of practice, as recommended by the Public Health Agency of Canada, is required to prevent and/or minimize transmission of micro-organisms. Hands shall be washed with soap and water when hands are visibly soiled with blood, body fluids, secretions, excretions and exudates from wounds.

- Hand hygiene for *Clostridium difficile* requires soap and water washing and is addressed in Manitoba Health and Healthy Living's *Clostridium difficile – Associated Diseases (CDAD) Infection Control Guidelines* available at: www.gov.mb.ca/health/publichealth/cdc/protocol/index.html .
- When hands are not visibly soiled, use an alcohol-based hand rub or wash with soap and water.
- Gloves are used as an additional measure and are not a substitute for hand hygiene. Hand hygiene should be performed immediately after removing gloves.
- Clean, non-sterile gloves of appropriate size shall be worn:
  - whenever contact with blood, body fluids, secretions and excretions, mucous membranes, draining wounds or non-intact skin is likely;
  - for handling items visibly soiled with blood, body fluids, secretions or excretions;
  - when a health care worker has open lesions on his/her hands.
- Gowns are used to protect uncovered skin and prevent soiling of clothing during procedures and patient/resident/client care activities likely to generate splashes or sprays of blood, body fluids, secretions and excretions.
- Masks/face protection/eye protection should be worn to protect the mucous membranes of the nose and mouth during procedures and patient/resident/client care activities likely to generate splashes, sprays or aerosols of blood, body fluids, secretions or excretions.
- Appropriate cleaning and disinfection of patient/resident/client care equipment and environmental surfaces is required.

For more information on specific routine practices for acute care, long-term care, ambulatory care and home care settings see the Public Health Agency of Canada document *Routine Practices and Additional Precautions for Preventing the Transmission of Infection in Health Care*, available at: www.phac-aspc.gc.ca/publicat/ccdr-rmtc/99pdf/cdr25s4e.pdf . Additional precautions are used for patients/residents/clients known or suspected to be infected or colonized with certain micro-organisms. The additional precautions are based on the modes of transmission of these micro-organisms such as airborne, droplet or contact transmission. There are also additional precautions for antimicrobial resistant organisms (AROs). See *Manitoba Guidelines for the Prevention and Control of Antibiotic Resistant Organisms (AROs)* available at: www.gov.mb.ca/health/publichealth/cdc/ipc.html . The Manitoba Health and Healthy Living document *Infection Control Guidelines for Community Shelters and Group Homes* may also be accessed from this website.

Appendix 4.7

Communicable Disease Control Investigation Form:

Manitoba Health

Date: ___/___/___ (y m d)

A: Notified by: _____ Phone number: _____

This is a: ☐ New report or ☐ Update of previous report

B: Diagnosis: _____

Patient name: _____ Date of birth: ___/___/___ (y m d) Age: _____

Address: _____ Sex: ☐ M ☐ F

Phone number: Work: _____ - _____ Home: _____ - _____

Physician/Clinic: _____ Phone number: _____ - _____

Address: _____

Region: _____ Health Unit: _____

Race/Ethnicity:

Aboriginal: ☐ Status Indian ☐ Inuit

Nonaboriginal: ☐ Born in Canada: ☐ Immigrant Family

☐ Unknown

Foreign Born:

Country of Origin/Birth: _____

Resident Here: _____ Years

School or Day Care attended: _____

Occupation: _____ Place of employment: _____

Sample

C: Disease: _____ Symptomatic: ☐ Y ☐ N ☐ U

Date of onset of symptoms: ___/___/___ Duration of symptoms: _____ (days)

Clinical history: _____

Clinical course: Treatment: ☐ Y ☐ N ☐ U If yes, list:

Drug	Dose	Duration

Hospitalized: ☐ Y ☐ N ☐ U If yes, _____ days

Sequelae: ☐ Y ☐ N ☐ U If yes, specify: _____

Permanent: ☐ Y ☐ N ☐ U Died: ☐ Y ☐ N ☐ U

Underlying illness: ☐ Y ☐ N ☐ U

If yes, specify: _____

D: Laboratory Investigation

Organism identified: _____ Specimen date: ___/___/___

Site/Source: _____

Antigen detection: ☐ Y ☐ N ☐ U Culture: ☐ Y ☐ N ☐ U

Serologic findings: ☐ Y ☐ N ☐ U Other: Specify: _____

First specimen date: ___/___/___ Result: _____

Second specimen date: ___/___/___ Result: _____

Serogroup: _____ Serotype: _____ Phage type: _____

Biotype: _____

MG-2357

E: Source of infection

1. ☐ Food – specify: _____
2. ☐ Water – specify: _____
3. ☐ Person to person
4. ☐ Other – specify: _____
5. ☐ Unknown

Transmission setting

1. Unknown
2. Day care
3. School
4. Hospital
5. Travel*
6. Home – Urban
7. Home – Rural
8. Residential facility: Specify: _____
9. MD office
10. Workplace
11. Sexual contact
12. Wound
13. Camping
14. Restaurant
15. Other: Specify: _____

*Travel history available: ☐ Y ☐ N

Country/City/Area visited	Arrival date	Length of stay	Accomodation code**

** 1. Urban/Hotel/Business/Hostel 2. Rural/Backpack/Trek

Sample

F: Immunization history (if relevant)

Immunization status known: ☐ Y ☐ N

If yes: Dose	Date	Agent
1.		
2.		
3.		
4.		
5.		

If not immunized, reason:

- ☐ Medical contraindication
- ☐ Religious/philosophical exemption
- ☐ Previous disease documented
- ☐ Not recommended/not eligible
- ☐ Other – specify _____
- ☐ Unknown

G: Outbreak associated ☐ Y ☐ N ☐ U

If yes, outbreak name: _____ Number: _____

Comments: _____

Signature: _____

H: For use by CDC

Case type: ☐ Confirmed ☐ Clinical ☐ Carrier

Reportable: ☐ Y ☐ N Reported: ☐ Y ☐ N Date reported: ___/___/___

Contact person: _____

Notified by phone: ___/___/___

Date investigation report received: ___/___/___

Date closed: ___/___/___

Appendix 4.8
Summary of Case Histories/Epidemiological Table

							Place of Outbreak					Dates of Outbreak				Complaint Number						
ID No.	Name of ill person or well person (list all exposed persons whether or not ill)	Address	Phone	Sex	Age	Ill	**Time of Eating**		Time of Initial Symptom		Incubation period (difference between eating and onset)	**Signs and Symptoms**				Severity						
							Day	Hour	Day	Hour		Nausea	Vomiting	Abdominal cramps	Diarrhea	Fever			Duration	Physician seen	Hospitalized	Death
Investigator			Title								Median					Suspected Etiology						

Appendix 4.9
Initial Control Measures

Control Measures for Acute Care Hospitals

Internal infection control policies should be reviewed within their respective regions on a regular basis, prior to outbreak situations.

Communications

- Inform the infection control practitioner/ team (if applicable) whenever there is an outbreak of unexplained vomiting or diarrhea among patients or staff on a ward (93).
- Refer to facility outbreak policy (93).
- Alert other departments and wards so that surveillance is increased (93).
- Guidelines and a summary of the outbreak situation with regular updates should be issued to all staff (96).

Patient Control Measures

- Isolate (93) or cohort symptomatic patients if possible (93, 95, 96).
- Confine ill patients to their rooms until 48 hours after symptoms resolve (99).
- Restrict communal gatherings of patients as much as possible (96).
- If possible, avoid transferring patients or admitting new patients to affected ward (93, 94, 95).
- If possible, avoid transferring patients who have been exposed to an ill patient to another room or area of the facility (99).

Staff Control Measures

- Exclude affected staff until they are symptom-free. Some sources recommend excluding affected staff until at least 48 hours post recovery (93-96, 99).
- Remind staff of the often abrupt onset of vomiting and the need to leave an affected area rapidly if nausea arises while at work (93).
- Minimize or eliminate movements of staff between affected and unaffected wards (93-95, 99). When this is not possible, affected wards should be visited after unaffected wards (93).
- Exclude non-essential staff/volunteers from affected clinical areas (93, 95).
- Emphasize the importance of handwashing before and after patient/environmental contact (93-95).
- Institute enteric precautions (in addition to routine precautions) in affected areas (95, 96, 99).

Visitors

- Caution visitors that they may be exposed to infection (93).
- Instruct visitors to perform hand hygiene on entering and leaving the facility (99).
- Discourage or restrict visitors, particularly the young and the elderly, and those who are unwell (93, 95).

Facility Cleaning and Disinfection

Routine cleaning and disinfection, paying special attention to bathroom and other frequently touched environmental surfaces, should occur more frequently than usual (106). Routine Practices should be followed.

Vomit and Feces

- Use paper towels to soak up excess liquid and dispose along with any solid matter into a plastic garbage bag (93, 99).
- Clean the soiled area with detergent and hot water using a disposable cloth (93, 99).
- Disinfect contaminated area with freshly prepared 1,000 ppm chlorine bleach[8] solution (generally a dilution of 1 part household bleach solution to 50 parts water) (98, 99).

8 Household bleach = 5.25% hypochlorite

Cleaning up Vomit in Food Preparation Areas

- Disinfect the food preparation area (including vertical surfaces) using freshly prepared 1:50 (1,000 ppm) bleach solution (93, 99).
- Discard any exposed food, food that may have been contaminated and food that has been handled by an infected person (93, 99).
- Use a commercial dishwasher with hot water rinse (82°C) or chemical sanitizer rinse (99).

Treatment of Specific Materials

- Contaminated hard surfaces, such as floors, should be washed with detergent and hot water using disposable cloths, and then disinfected with freshly prepared 1:50 bleach solution (93, 99).
- Furniture and soft furnishings should be cleaned with detergent and hot water, using a disposable cloth (93, 99). Disinfection can be achieved by placing in the sun for several hours if possible, steam cleaning or by using bleach, if bleach resistant (93, 99).
- Vinyl covered furnishings should be cleaned with hot water and detergent, and then wiped down with a freshly prepared 1:50 bleach solution (99).
- Contaminated linens should be handled as little as possible, placed in laundry bags, machine washed with detergent and hot water at the maximum cycle length and machine dried (99, 106).
- Contaminated carpets should be cleaned with detergent and hot water, then disinfected with chlorine bleach (1:50), if bleach resistant or steam cleaned (93, 99, 107). Dry vacuuming is not recommended since the infectious agents may become airborne (107).
- Bathroom fixtures, door handles etc. should be washed with hot water and detergent using a disposable cloth, then disinfected with freshly prepared bleach solution (1:50) (93, 99).
- Non-disposable mop heads should be washed with detergent in hot water at the maximum cycle length (recommended 71°C for 25 min.), and then machine (hot air) dried (99).

NOTE: While bleach is a good disinfectant, good air exchange is necessary to reduce occupational health issues associated with fumes. Alternative hospital grade disinfectant cleaners are described in the Ontario Ministry of Health and Long-Term Care document *Best Practices for Cleaning, Disinfection and Sterilization in All Health Care Settings* at www.health.gov.on.ca/english/providers/program/infectious/diseases/ic_cds.html .

Control Measures for Long Term Care (LTC) Facilities

LTC facilities should ensure that regular, ongoing measures are in place to mitigate outbreaks of enteric illness, including:

- education to staff and residents about gastroenteritis (105). This should include a focus on recognizing signs and symptoms, and infection control measures that can be taken.
- surveillance for enteric illness that is able to identify new cases in both residents and staff (101, 105).

Resident Control Measures

- Restrict ill residents to their rooms as much as possible until 48 hours after resolution of symptoms (99-101, 105).
- Cohort symptomatic residents if possible (109).
- If possible, postpone new admissions or transfers to other-aged care facilities until outbreak is over (101, 104).
- Residents should not be moved from an affected area to an unaffected area (106).
- In multi-bed rooms, transfer of well residents into an ill resident's room should not occur (99).
- Keep well residents away from affected floors and/or wings (99, 101).
- Inform other facilities of the occurrence of the outbreak when residents who are not ill attend medically necessary appointments (99).
- Hospitalization of severely dehydrated residents should not be delayed due to an outbreak of gastroenteritis (99).

- Ill residents should be served meals in their room (108, 109).
- Limit self-service in the cafeteria/dining room to minimize food handling by residents (107, 109).
- Consider restricting or discontinuing group activities and outings until the outbreak is resolved (99). Outings with family or friends do not need to be restricted (99).

Staff Control Measures

- A meeting should be scheduled with staff to review infection control procedures (106).
- Review and reinforce hand hygiene with all staff (99-101, 104, 105).
- Exclude affected staff (care providers and food handlers) until symptom-free. Some sources recommend excluding affected staff until at least 48 hours after symptoms have resolved (99-102, 105).
- Staff should not work in other facilities while they are ill or convalescing (110).
- Instruct employees to monitor themselves for gastrointestinal (GI) symptoms and stop working if they feel ill (99).
- Cohort staff if possible during the course of the outbreak (99, 105).
- Avoid transferring staff (104).
- Since some transmission through aerosolization of infectious material has been documented (95, 97), workers may consider wearing surgical masks when caring for residents who are vomiting or when cleaning areas grossly contaminated by feces and vomit (86, 98, 99, 106, 107, 109); however, expert opinion varies.

Visitor and Volunteer Control Measures

- Post signs to notify persons entering the building of the outbreak (99, 102).
- Instruct visitors/volunteers to perform hand hygiene upon entering and leaving the facility (99).
- Instruct visitors/family caregivers on measures to take to decrease the transmission of illness (99).
- Discourage ill individuals from visiting (99).

Facility Cleaning and Disinfection

See Facility Cleaning and Disinfection under Control Measures for Acute Care Hospitals (p. 42).

Typical Control Measures for Child Care Centres and Schools

Facility-specific protocols may be available for staff to follow.

Children

- Children who become ill with nausea, vomiting or diarrhea should be removed from the classroom immediately (99, 112).
- Symptomatic children should be segregated (112) or grouped (85) and sent home as soon as arrangements can be made (99, 112).
- Affected children should not return to school until symptoms resolve (85, 99, 111, 112).
- Children should be instructed to wash their hands or have a staff member wash their hands on arrival, after going to the toilet or after a diaper change, and before all snacks and meals (111). Children should have access to liquid soap, running water and single-use towels (99, 111). Staff should monitor young children to ensure proper handwashing.
- Children should not prepare food or serve food and should be discouraged from sharing food (111).

Staff/Caregivers

- Daily attendance records and reasons for absences should be maintained (111).
- Inform all parents of exposed children about the illness, and ask parents to watch their children for signs and symptoms of the disease (112).
- Staff should wash their hands on arrival, after diaper changes, after assisting children at the toilet and before preparing, serving or eating food (112).
- Staff that prepare or serve food should not change diapers or assist children in using the toilet, if possible (111).

Cleaning and Disinfection

- Immediately wash, rinse and sanitize any object or surface that has been soiled with discharge (i.e., feces) (112).
- Diaper tables, potty chairs and toilets should be cleaned and disinfected with a dilute bleach solution or other disinfectant used according to product label after each diaper change or use (111, 112). If the diapering surface cannot be easily cleaned, use a disposable material such as wax paper (112).
- Plastic toys should be disinfected each day. Cloth toys that cannot be disinfected should be removed (111).
- Other frequently touched surfaces and play equipment should be disinfected with bleach according to product label. (85, 111-113).

Control Measures in the Home

- Everyone in the family should wash their hands well with soap and water (99).
- Having visitors while individuals in the home are ill should be discouraged (99).
- Prompt clean-up and disinfection (1:50 bleach solution) after episodes of vomiting or diarrhea is essential (99, 107).
- Do not share towels (99). Quickly remove and machine wash towels, linens etc. used by sick household members (99).
- Clean contaminated carpets with detergent and hot water and then steam clean if possible (99).
- If conditions permit, place contaminated cloth-covered furnishings (that cannot tolerate bleach) outdoors in the sun for a few hours (99).
- If possible, use the dishwasher "hot cycle" for all dishes, glasses, utensils etc. (99).
- Symptomatic individuals should not prepare food for others (107).
- Any food that has been handled by someone who is sick with vomiting and/or diarrhea should be thrown out (99, 107).
- Food that was uncovered when someone vomited nearby in the room should be disposed of (99).
- Thoroughly clean and disinfect floors, counters, bathrooms and furniture when sickness is over (99).

Appendix 4.10
Sample of Outbreak Investigation Report

Wedding Reception
(Enter Date)

Reason for Investigation

A large number of people who attended a wedding reception at the (enter location) on (enter date) reported becoming ill with an enteric illness. A foodborne outbreak was suspected on the basis of preliminary information, and an investigation was initiated.

Investigation

On (enter date) the Public Health Inspector (PHI), received a phone call from a person who had attended the banquet on (enter date). This individual reported that numerous attendees had become ill with gastrointestinal symptoms. The Communicable Disease and Immunization Co-ordinator (CDIC) and the Medical Officer of Health (MOH) were notified on (enter date), and the decision made to proceed with the investigation on (enter date). The PHI conducted an inspection of the facility and interviewed staff on (enter date).

Public Health Nurses (PHNs) from _____ , _____ and the WRHA worked collaboratively to interview affected individuals and arrange for collection of clinical specimens. The PHI arranged for collection of food specimens from the kitchen of _____. The groom provided a list of the wedding reception attendees and the decision was made to interview as many of the 20 symptomatic individuals as possible, and approximately the same number of asymptomatic individuals. Investigation into the food and food handling was planned, and both stool and food specimens were to be obtained. Cadham Provincial Laboratory (CPL) was notified and an outbreak code assigned (_____).

Initial interviews anecdotally identified that 18 of 20 symptomatic individuals had consumed the meatballs and the reception attendees seemed convinced that this was the source of their illness. A questionnaire was developed and sent to all reception attendees to obtain data to establish the time of onset, symptoms and duration of illness. Food histories were obtained for both symptomatic and asymptomatic individuals. A menu of the buffet-style meal served at 6 pm on (enter date) was entered on a spread sheet to facilitate standardized interviewing. In total, completed questionnaires were obtained from 18 ill and 19 asymptomatic attendees, which was approximately 90% of all attendees at the function. Interview data was analyzed in EpiInfo 6.04c. A case-control analysis was run to identify a suspect food, as well as a descriptive analysis of the symptoms, duration of symptoms and incubation period.

Stool specimens were obtained from six individuals who had been symptomatic. One stool was obtained from an asymptomatic individual. Most specimens were obtained within one week of the onset of illness. An investigation into the suspected food, and food handling procedures was conducted by the PHI.

Cases

Cases were defined as those who attended the function and subsequently had diarrhea (two or more loose stools in 24 hours).

Total # interviewed by questionnaire: 37

Symptomatic and meeting case definition: 18

Asymptomatic: 19

Ill and having mild GI symptoms but not meeting case definition: 0

Attack Rate: 18/37= 48.6%

Clinical Description

Age

For all interviewees, the mean was 33.4 years and median was 33.9. The range was 1.5-68.6. For females the mean age was 31.8 and the median was 33.9 with a range of 1.5-65.9. For males, the mean was 35.7 and median age was 32.1 with a range of 6.4-68.6. Predominantly, the outbreak occurred in a young adult population.

Gender

Twenty females and 17 males were interviewed. Of the females, 10 were ill and 10 were not ill. Of the males, eight were ill and nine were not ill. There was no difference in attack rates, and hence susceptibility, between males and females.

Symptoms

Symptoms	Diarrhea	Bloody Diarrhea	Abdominal Cramps	Nausea	Vomiting	Fever
Number ill	18	0	13	6	3	1
(% of total attendees)	(49)	(0)	(35)	(16)	(8)	(3)
Number ill	18	0	13	6	3	1
(% of symptomatic attendees)	(100)	(0)	(72)	(33)	(17)	(5.5)

Incubation and Duration of Illness

	Mean	Median	Minimum	Maximum
Incubation (hrs)	11.0	10.0	8.0	25.0
Duration (hrs)	24.9	11.0	6.0	180

NOTE: All incubation periods were within 14 hours except one outlier at 25 hours. The one outlier illness duration of 180 hours was in an individual with preexisting inflammatory bowel disease.

Overall, the illness had a fairly short incubation period (9-10 hours) and a short duration (10-12 hours).

No epidemiological curve is shown as all but 1 case became ill between 02:00 hrs and 07:30 hrs on (enter date) and no secondary transmission was reported. The pattern is clearly one of a point source exposure.

Food History Results:

Food	People who ate the food			People who did not eat the food			OR	CI and p
	ill	not ill	total	ill	not ill	total		
Meat balls and gravy	17	3	20	1	16	17	90.7	6.9-2810 p<0.001
Cabbage rolls	12	3	15	5	16	21	12.8	2.0-586 p=0.003
Chicken	17	12	29	1	7	8	9.9	1.0-249 p=0.04
Strawberries	9	2	11	9	17	26	8.5	1.2-74 p=0.02
Scalloped potatoes	14	8	22	4	11	15	4.8	0.9-27 p=0.06
Cubed cheeses	11	6	17	6	13	19	4.0	0.8-21 p=0.1
Beverages	16	14	30	2	5	7	2.9	0.4-26 p=0.4
Marshmallow salad	2	1	3	14	18	32	2.6	0.2-82 p=0.6
Garlic sausage	7	4	11	11	15	26	2.4	0.5-13.3 p=0.4
Bean salad	5	3	8	12	16	28	2.2	0.4-15 p=0.4
Garden salad	11	9	20	7	10	17	1.8	0.4-8 p=0.6
Black forest cake	7	5	12	11	14	25	1.8	0.4-9.2 p=0.6
Potato salad	8	6	14	10	13	23	1.7	0.4-8.4 p=0.6
Pork and beans	3	2	5	15	17	32	1.7	0.2-18 p=0.7
Hot peppers	1	1	2	17	18	35	1.1	0-44 p=1.0
Macaroni salad	1	1	2	116	18	34	1.1	0-46 p=1.0
Salmon jelly salad	1	1	2	17	18	35	1.1	0-44 p=1.0
Ham	9	9	18	9	10	19	1.1	0.3-5.0 p=0.9
Veg tray and dip	9	10	19	9	9	18	0.9	0.2-4.0 p=0.9

Food	People who ate the food			People who did not eat the food			OR	CI and p
	ill	not ill	total	ill	not ill	total		
Mushrooms	2	3	5	16	16	32	0.7	0.1-6.1 p=1.0
Pasta salad	4	7	11	14	12	26	0.5	0.1-2.6 p=0.5
Dinner rolls	8	13	21	10	6	16	0.4	0.1-1.7 p=0.25
Caesar salad	5	10	15	13	9	22	0.35	0.1-1.7 p=0.2

The most suspect food was the meatballs and gravy, as originally suggested by attendees, with an odds ratio of 90.7, confidence intervals well above 1, and p<0.001. Other foods with significantly high odds ratios were cabbage rolls (12.8; p=0.003), chicken (9.9; p=0.04), and strawberries (8.5; p=0.02). Other foods with moderately elevated odds ratios such as scalloped potatoes and cubed cheeses did not attain statistical significance. The remaining foods had odds ratios of less than 3, and none were statistically significant. On the basis of the food analysis, the most implicated food was the meatballs and gravy.

Lab Results

Food Samples (see enclosed PHI report)

The only food sample obtained was meatballs and gravy. They yielded a positive culture for *Staphylococcus aureus*. However, contamination of the sample during collection in the kitchen was the most likely explanation for the positive culture.

Clinical Samples

Four of the seven stool specimens submitted yielded a positive result. The three negative stool results were from individuals who had been ill, but were receiving antibiotics.

#1 stool positive for *Clostridium perfringens* > 1 million in an individual who was ill

#2 stool positive for *Clostridium perfringens* > 1 million in an individual who was ill

#3 stool positive for *Clostridium perfringens* > 1 million in an individual who was ill

#4 stool positive for *Bacillus cereus* in an individual who was not ill

Summary

This was a point source outbreak of an enteric illness without secondary spread, likely related to food ingested at a wedding reception on (enter date) at the (enter location). On the basis of the incubation time, and duration and type of symptoms, the clinical picture is compatible with a *C. perfringens* foodborne illness. The food most strongly implicated on the basis of the statistical analysis was meatballs and gravy. Three stool specimens yielded *C. perfringens*. Although other pathogens were also found in food and stool specimens, *C. perfringens* is the pathogen that best fits the scenario, and therefore it is likely the etiologic agent.

Results of Investigation

Place: (enter location) - wedding reception

Time: (enter date) Buffet served at 6 pm

Total guests: 41 attended

Number of guests interviewed: 37

Number of guests who became ill: 18
(estimated attack rate = 44% to 49%)

Symptom pattern: Of the 18 cases interviewed, 18 (100%) had diarrhea, 13 (72%) had abdominal cramps, 6 (33%) had nausea, 3 (17%) had vomiting, 1 (5.5%) had fever, and none had bloody diarrhea. Thus the most prominent symptom was diarrhea.

The average time of onset from eating at the reception was 11 hrs. The average duration of illness was 11 hrs, excluding one outlier with underlying inflammatory bowel disease. Everyone recovered and none required hospitalization.

Results of food inquiry analysis: The most suspect food was the meatballs and gravy with an odds ratio of 90.7. Other foods with high odds ratios were cabbage rolls, chicken, and strawberries. The remaining foods had odds ratios of less than 5, and none were statistically significant. On the basis of the food analysis, the most strongly implicated food was the gravy and meatballs.

Results of food sample tests: Leftover meatballs and gravy were sampled. No other foods were sampled. The positive culture for *S. aureus* was likely due to specimen contamination upon collection.

Results of clinical tests on guests: Four of the seven stool specimens submitted yielded a positive result, three for *Clostridium perfringens* > 1 million in individuals who had been ill and one for *Bacillus cereus* in an individual who had not been ill.

Results of restaurant inspection:

Action taken: Inspection of the kitchen and education of the staff occurred on the day the Public Health Inspector was notified (enter date).

Implications for prevention: A similar foodborne illness outbreak also caused by *C. perfringens* associated with ingestion of meat balls and gravy occurred at a Christmas party banquet function on (enter date) at the same facility. It would therefore seem prudent that food handling practices be reviewed once again by the Public Health Inspector with the kitchen staff.

Conclusions:

Based on the information gathered, the following conclusions were made:

1. A foodborne illness outbreak occurred at (enter location) on (enter date).
2. On the basis of available clinical, epidemiologic, and laboratory data the outbreak was most likely caused by *Clostridium perfringens*.
3. The food most strongly implicated on the basis of the analysis was meatballs and gravy.

Appendix 4.11

Instructions for Stool Sample Collection

NOTE: Clinical specimens should be collected A.S.A.P.

1. **Things you will need**

   To collect the sample you will need a clean plastic container (e.g., an ice cream-pail or margarine container) **or** saran wrap **or** a new (unused) plastic bag. You have been given a sample bottle to put it in, a plastic scoop to scoop it and a sample bottle bag. **You may have a form to fill out.**

2. **Collect the stool (poop) sample**

   If using a plastic container:

   - Sit on the toilet and hold the container under you, or sit right on the container.

   If using a plastic bag or saran wrap:

   - Lift the toilet lid and seat.
   - Place the plastic bag or saran wrap over half of the toilet bowl and put the seat back down.
   - Sit on the toilet over the bag or saran wrap.

   THEN:

   Go (poop) into the clean plastic container or into the bag or saran wrap over the toilet. Do not get any urine (pee) in it. Wipe without putting the toilet paper into the stool (poop).

   (NEVER take a sample of stool right from the toilet water!)

3. **Scoop the stool sample into the sample bottle**

   Use the scoop attached to the sample bottle lid to fill the bottle **one-third (1/3)** full. (Don't overfill — it might spill!) Put the lid on tightly. Put the sample bottle into the sample bag provided.

4. **Clean up**

   Flush the rest of the stool down the toilet. Carefully throw the plastic bag or plastic container in the garbage. (Don't throw away the sample).

5. **Wash your hands**

   Use soap and warm water to wash your hands well (for at least 30 seconds).

6. **Get the sample ready**

   The stool sample should always be placed into a plastic re-sealable sample bag with the requisition on the outside, then placed into a paper bag. Keep the sample in the fridge. DO NOT LET THE SAMPLE FREEZE. Follow the instructions given for pick up or drop off of the sample. **Make sure the patient information data is completed on the requisition form.**

Clearance Stool Samples

If clearance stool specimens are required and the client is taking antibiotics, the sample should be collected at least 48 hours after treatment has been completed. If more than one clearance specimen is required, specimens must be at least 24 hours apart.

Stool Submissions by Public Health Inspector

On occasion, it may be advantageous for a public health inspector to facilitate the submission of a stool specimen directly to CPL as part of a foodborne illness (FBI) investigation. The PHI/EHO will review the Stool Submission Checklist below prior to collecting stool specimens from the client.

Stool Submission Checklist

Eligibility Criteria	• All clients at least 16 years of age with clinical symptoms of a gastrointestinal illness consistent with FBI. • All clients under 16 years of age ***must*** have parental/legal guardian documented consent.
Mental Status	• The individual is able to understand the information, benefits and risks that are relevant to making a decision to be tested. **If any doubts about the individual's capacity to consent, testing should NOT be done by the PHI and the client should be referred to a physician.**
Informed Consent	• The individual must be provided with: • explanation of the testing procedure; • implications of negative and positive results; • a plan for follow-up and sharing of results.
Specimen Collection	• The specimen submission slip (i.e., lab requisition) should contain: – PHI's full name and phone number; – indication that this is a "suspect FBI"; – request for C&S, viral cultures, and EM; – appropriate facility number and – CD Coordinator/MOH phone number.
Documentation	• On the appropriate Client Record (i.e., Case History Form), the PHI will document: – client has provided verbal informed consent; – date of specimen collection; – follow-up plan for sharing of results (i.e., identification of who will be sharing results with the client); – risk reduction education and resources offered.
Notification	• Notify the Manitoba Health CD Co-ordinator/Specialist (by fax or phone).

NOTE: CPL will notify the physician, PHN or PHI/EHO whose name and contact information appears on the requisition.

Instructions for Vomit Sample Collection

If you have been asked to collect a vomit (throw up) sample:

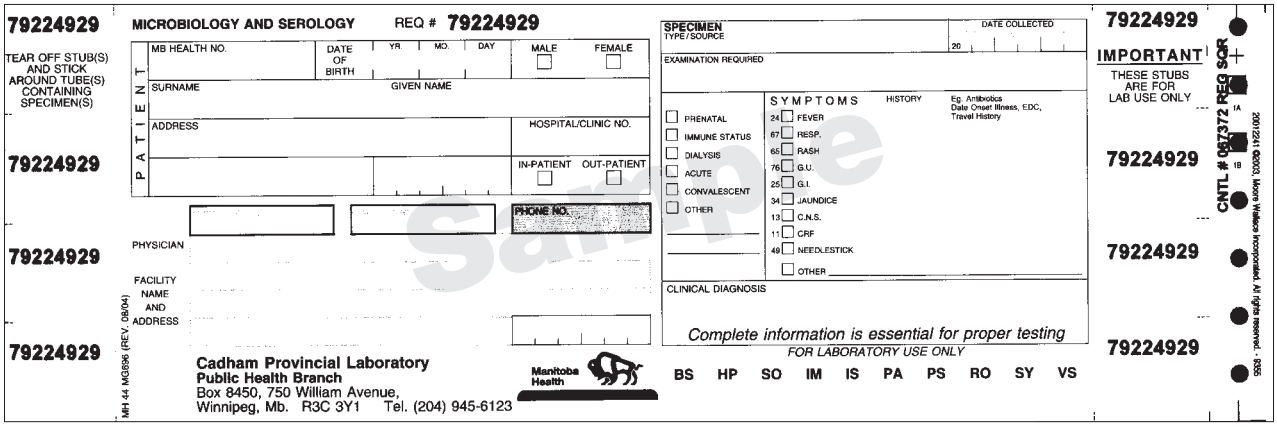
- vomit (throw up) directly into the plastic bag provided; **or**
- vomit (throw up) into a clean plastic container and then put it into the bag provided;

then seal the bag tightly.

For more information call: _____

Appendix 4.12
Format for Completing Requisition Forms for CPL

1. Fill in client's name, address, date of birth, gender and Manitoba Health number.
2. All requisitions are to be submitted under the CDC Branch **facility number 05470**.
3. Identify the type of specimen and its source, date of onset and symptoms, type of testing required (be specific) and outbreak code. Be sure to note that it is a foodborne outbreak and the restaurant/facility/event involved.
4. Once requisition is complete, attach lab requisition numbered sticker on each specimen container and on the client record.
5. The client should fill in the "date collected" or if the specimen is dropped off, the PHN should obtain this information and complete the requisition before submitting the specimen.
6. Once the specimen is obtained, arrange for appropriate delivery to the CPL.
7. Results will be sent to the central CDC Branch to be reviewed by the CDC and forwarded to the appropriate PHN or PHI/EHO whose contact information appears on the requisition.


79224929
TEAR OFF STUB(S) AND STICK AROUND TUBE(S) CONTAINING SPECIMEN(S)
79224929
79224929
79224929
MICROBIOLOGY AND SEROLOGY
REQ # 79224929
PATIENT
MB HEALTH NO.
DATE OF BIRTH
YR. MO. DAY
MALE
FEMALE
SURNAME
GIVEN NAME
ADDRESS
HOSPITAL/CLINIC NO.
IN-PATIENT
OUT-PATIENT
PHONE NO.
PHYSICIAN
FACILITY NAME AND ADDRESS
Cadham Provincial Laboratory
Public Health Branch
Box 8450, 750 William Avenue,
Winnipeg, Mb. R3C 3Y1 Tel. (204) 945-6123
Manitoba Health
MH 44 MG896 (REV. 08/04)
SPECIMEN
TYPE / SOURCE
DATE COLLECTED
20
EXAMINATION REQUIRED
PRENATAL
IMMUNE STATUS
DIALYSIS
ACUTE
CONVALESCENT
OTHER
SYMPTOMS
HISTORY
Eg. Antibiotics
Date Onset Illness, EDC,
Travel History
24 FEVER
67 RESP.
65 RASH
76 G.U.
25 G.I.
34 JAUNDICE
13 C.N.S.
11 CRF
49 NEEDLESTICK
OTHER
CLINICAL DIAGNOSIS
Complete information is essential for proper testing
FOR LABORATORY USE ONLY
BS HP SO IM IS PA PS RO SY VS
79224929
IMPORTANT
THESE STUBS ARE FOR LAB USE ONLY
79224929
79224929
79224929
CNTL # 067372 REG SQR
1A
1B
20012241 02003, Moore Wallace Incorporated. All rights reserved. - 9355
Sample

Appendix 4.13
Laboratory Foodborne Illness Investigation

While Cadham Provincial Laboratory (CPL) processes most enteric illness clinical specimens, the Westman Laboratory in Brandon receives clinical specimens from all of western Manitoba in addition to some specimens from northern Manitoba. Specimens are sent to CPL for definitive serotyping. While CPL will initiate a foodborne or waterborne illness investigation, Westman Laboratory does not. One of the authorities that Westman Laboratory reports to may decide to initiate an investigation. The Westman Laboratory reports results to the primary care physician, the regional health authority and the Communicable Disease Control Branch, Manitoba Health and Healthy Living. Westman Laboratory handles clinical specimens only, and does not test water and food samples.

Guide to CPL Usage

- **Location:** 750 William Avenue
- **Services Available:** Analysis of clinical specimens for the purposes of investigating an enteric illness. Specimens should be submitted by a PHI/EHO, PHN, or physician.
- **Hours of Operation:** Regular hours of service are 0830 to 1630 hrs, Monday to Friday. Most sections are partially staffed on weekends and statutory holidays. Selected tests are available 24 hours a day.
- **Specimen Delivery:** During regular business hours, specimens can be taken to the receiving room. After hours, ring for the security guard and place specimens in the fridge on the main floor. PHNs and PHI/EHOs whose worksite is 601 Aikins Street or 385 River Avenue can have specimens delivered to CPL via courier. The time of specimen pickup and where to store the specimens differs with the site. For staff working at other sites, specimens are delivered by the PHN or PHI/EHO.
- **Reporting Results:** Positive results of *reportable* diseases (see Appendix 4.1), which covers most organisms commonly associated with foodborne illness, are reported electronically to the central office CD Clerk. Central Office will relay the results to the appropriate branch office (based on the branch code listed on the requisition).
- **Supplies**: CPL provides various supplies for the collection and transportation of specimens. Each office can order supplies by calling 945-6123 or in writing.

Clinical Specimen Collection

- **Requisition:** Ensure all required information is provided on the requisition regarding the client, i.e., name, date of birth, home address and MHSC # if available. The importance of *clinical information* cannot be overstated. This should include details of immunization, treatment, date of onset of illness and clinical diagnosis. Mention any domestic or foreign travel and countries visited. **The more information sent with the specimens, the more relevant will be the tests performed and the results reported.** Each specimen requires a separate requisition. This will allow you to distinguish between a positive result and a negative result. **Where an enteric illness is possibly food-related, indicate on requisition "Suspect Foodborne Illness." Include outbreak code (when applicable) and a copy of the FBI complaint form.** Ensure facility #, central office phone # (or if a physician, give physician's phone #), office code and PHN or EHO/PHI initials or name are included on the requisition (Appendix 4.12).
- **Specimen Containers:** All specimen containers must be clearly labeled with the client's name. Tear off a numbered stub from the requisition and place onto the specimen container. A numbered stub should also be placed on the interview/investigation form, and on any other forms related to the investigation. Using a black marker, indicate the one-third full line on the outside of the container. Place each specimen container into a plastic bag. The correlating requisition should then be attached to the outside of the plastic bag with an elastic band or inserted inside the pocket of the plastic bag. Do not staple the requisition onto specimen bags (can cause injuries). **Specimens that leak or are damaged will not be processed.**

- **Stool Specimens:** Sterile screw-capped container, *no more than one-third full* and tightly capped. If clearance specimens are required and client is taking antibiotics, collect sample at least 48 hours after treatment is completed. If more than one clearance specimen is required, specimens must be at least 24 hours apart.
- **Storage of Specimens:** Take or send specimens as soon as possible to Cadham Lab. Where possible, *keep refrigerated* until sent to lab. Extreme heat or cold (freezing) can destroy some organisms and give false negatives. *Specimens should not be left out of the fridge for longer than four hours*. In general, when stool specimens are left out and not refrigerated, other microorganisms can overgrow those organisms being sought. Specimens can be refrigerated for up to 48 hours; however, it is best to send in as soon as possible for testing.
- **Contact Person:** Set up one contact person through PHI/EHO supervisor or CD Co-ordinator/Specialist to communicate with CPL and environmental laboratory (ALS).
- **Log Sheet:** Develop a log sheet to record all data concerning clinical specimens (i.e., name, specimen/food, lab requisition #, date submitted, results, epidemiological associations and other pertinent information).

Laboratory Procedure

If a sporadic case of foodborne illness (FBI) is suspected, stool samples should be sent to Cadham Provincial Laboratory (CPL) for FBI investigation. The requisition should be labeled **FBI** and **F1** to alert the laboratory technologists that an FBI investigation is required. Specimens labeled in this manner are automatically examined by Bacteriology and Virus Detection. **Stool specimens for bacteriology and virus testing should be sent in dry containers with NO preservatives or transport media.** The same container may be sent for both tests. If the potential FBI appears to involve a large number of individuals and an outbreak is suspected, a separate special study code (**outbreak code**) will be assigned. This code, assigned by CPL personnel, would then be used in place of the F1 code on the requisition.

Bacteriology

Specimens labeled "F1" are automatically examined for *Staphylococcus aureus, Bacillus cereus, Clostridium perfringens, Salmonella, Shigella, Yersinia, Aeromonas, Listeria monocytogenes* and *Campylobacter*. Specimens are examined for *C. perfringens* only if >1.5 grams of stool are available. Specimens are only tested for vibrios if symptoms or patient history are consistent with *Vibrio* infection. If *S. aureus* is isolated from more than two epidemiologically linked individuals, or if the chief investigator feels it is warranted, *S. aureus* toxin testing will also be conducted. For sporadic FBI (F1) investigations, all stools (both liquid and solid) will be assayed for verocytotoxin activity. Specimen results will be reported as they are completed, therefore, multiple reports for a single specimen may be received over a period of two to seven days. For example, culture of some organisms like *Salmonella* may be completed within 24 to 48 hours and will be reported at that time, while toxin testing will require longer periods of time to complete.

If one of the suspect organisms is present in the sample, it is reported as organism isolated (e.g., organism isolated — *Salmonella typhimurium*). *Clostridium perfringens* is reported as positive if >106 organisms per gram of stool are isolated. All other organisms would be reported as present if there are sufficient numbers in the specimen for them to be isolated and identified. The standard negative result is: *No S. aureus*, *Salmonella*, *Shigella*, *Campylobacter*, *Aeromonas*, *Yersinia*, *B. cereus*, or *C. perfringens* isolated. *L. monocytogenes* negative results would be reported on a separate line as *Listeria monocytogenes not isolated*. Verotoxin results are reported as 1) *Verotoxin positive* or *negative* or 2) *Verotoxigenic organisms detected* or *not detected.*

Nurses and inspectors receiving results should note that *S. aureus* and *C. perfringens* can be normal flora in some individuals. Their significance in terms of the FBI may need to be determined in conjunction with the clinical symptoms present. Their potential significance also increases if they are isolated from several linked cases or if they are isolated from food samples. DNA fingerprinting

techniques (PFGE) can be used to provide more definitive information on whether the same strain of a given bacterial species has infected several individuals. Please contact CPL (945-7473) to determine if PFGE is warranted for a given outbreak.

Care must be taken to indicate on the requisition that the specimen is for an FBI (F1) investigation, as culture and sensitivity for stools normally includes testing only for *Salmonella*, *Shigella*, *Yersinia*, *Aeromonas* and *Campylobacter*. Note that if an MOH or their representative feels this reduced testing menu is sufficient (e.g., if a virus is strongly suspected) they may request that we conduct routine culture and sensitivity only.

Virology

All FBI specimens are tested by electron microscopy (EM) and culture. The specimen is read by EM within 48 hours, Monday to Friday. This is reported as a preliminary result. The culture will be examined for up to 14 days if the specimen continues to be negative. The culture result will be a separate report. The lab is able to detect Rotavirus and Small Round Enteric Virus (SREV) by EM only. Adenovirus and Enterovirus (which includes Coxsackievirus and Echovirus) can be detected by EM and/or culture. However, SREV is the virus indicated in most viral FBI investigations.

For hepatitis A (HAV) investigations, the diagnosis of acute HAV is based on the detection of IgM against HAV in serum. The anti-HAV IgM is detected from the very onset of the symptoms and remains positive for approximately four months. Some patients have been IgM positive for one year after the appearance of the clinical symptoms of infection. Given that HAV detection requires a serum specimen, this test is not a routine part of an FBI investigation. For further information on this test type please refer to the 2005 Cadham Provincial Laboratory Guide to Services or consult with the serology section of CPL.

Parasitology

Parasite testing is not normally included in FBI investigations unless the chief investigator feels it is warranted. Separate stool specimens must be sent in for this diagnostic service and the requisition must specify ova and parasite (O and P) testing. Stool specimens for parasite testing must be sent in **SAF preservative**.

Written 1998/11/13

Revised 2006/27/11

Appendix 4.14
Environmental Specimen Testing (Current contract is with ALS Laboratory Group, formerly Enviro-Test)

Guide to ALS Usage

- **Location**: Unit 12, 1329 Niakwa Road East, Winnipeg, Manitoba, R2J 3T4
- **Phone Numbers:** Reception: 255-9720, Micro Water: 255-9724, Micro Food: 255-9753, Shipping: 255-9733, Customer Service: 255-9740, 255-9753, 255-9755
- **Services Available:** Bacteriological analysis of food, drinking water and recreational water samples for the purposes of investigating a waterborne or foodborne illness. These samples must be submitted through a PHI/EHO, DWO or PHN. Routine bacteriological analysis is also performed on water samples from public, semi-public and private water sources.
- **Hours of Operation:** Regular hours of service are 0800 to 1630 hrs, Monday to Friday. Partial staffing on weekends ensures that all samples are processed within 24 hours. (Note: Samples received at the lab after 2 pm may not be processed until the following day.)
- **Sample Delivery:** When food/water samples are being submitted, please call ahead to advise ALS that samples are forthcoming (255-9724). During regular business hours, samples can be taken to the sample receiving counter, accessible through the front entrance. After hours: evenings, weekends or holidays call emergency pager number 931-3145. The call will be returned within one hour and will allow access to the lab for receipt and storage of specimens. After-hours analysis of specimens may be arranged (Surcharge: Emergency-weekend/ holiday service, Rush-priority service or Legal Samples).
- **Reporting Results:** Results are usually mailed to the submitter named on the requisition form. If notification of results is urgent, then mark the appropriate box(es) on the requisition form and results will be faxed or telephoned with confirmations mailed later. Interpretation of ALS results is outlined in Appendix 4.15.
- **Supplies:** The ALS Laboratory provides various supplies for the collection and transportation of specimens. Each office can order supplies including requisition forms by calling the shipping department at 255-9733, or by submitting a written request.

Specimen Collection

In any suspected foodborne/waterborne illness investigation, and especially if it appears to be an outbreak, obtaining samples (and specimens) quickly is of the utmost importance. The most valuable sample is one that is left over from the meal that is suspected to have caused the illness.

- All samples should be collected by a PHI/EHO, DWO or PHN using standard aseptic processes. Samples submitted by the patient/client may not provide accurate results. Sterile "Whirlpak" bags should be used for solid foods and liquids, and sterile water collection bottles (treated with a dechlorinating agent) should be used for sampling chlorinated water/ice. Where possible, submit sample in its original container (i.e., it is not necessary to transfer bottled water to another sample bottle).
- Food wraps such as foil, plastic or "baggies" are not an acceptable alternative to the sterile Whirlpak bags. However, if the patient has a small amount of the suspect meal left over in a plastic, foil or foam container, submit the entire container and its contents to the lab.
- Samples should be submitted to the lab immediately after collection. Where this is not possible, arrangements must be made to keep the sample under refrigeration temperatures (5°C). If a food or water sample is accidentally frozen, consult with supervisor at ALS for instructions. Transport the sample in a cooler with frozen icepack. To maintain temperature, the food should be secured to the icepack.
- **Solid Food and Ice Samples:** Use sterile (or appropriately sanitized) utensils to obtain a minimum 250-gram sample. Record

temperature of food using an infrared temperature probe or sterilized thermometer. Note temperature of sample, hot or cold (i.e., storage conditions, whether sample was left out or refrigerated immediately). Do not compromise the sample by opening container. Ensure the sample is transported to the lab, in a cooler with ice, within 24 hours of sampling. Upon receipt at the lab, the temperature of the food sample is taken using an infrared temperature probe.

- **Liquid/Semi-liquid Foods:** To subsample large volumes: Thoroughly mix or stir the product (with sterile utensil) prior to sampling to ensure a homogeneous mixture. Use sterile (or appropriately sanitized) equipment to obtain a 250-mL sample. Record temperature of food using an infrared temperature probe or sterilized thermometer. Note temperature of sample, hot or cold (i.e., storage conditions, whether sample was left out or refrigerated immediately). Do not compromise the sample by opening container. Ensure the sample is transported to the lab, in a cooler with ice, within 24 hours of sampling. Upon receipt at the lab, the temperature of the food is taken using an infrared temperature probe.
- **Water Samples:** The Water and Waste Department routinely carries out sampling and analysis of City of Winnipeg water. Public drinking water purveyors and swimming pool operators are required to routinely submit water for microbiological analysis. If samples from a faucet in a home or place of business are required, call the water quality complaints line at 986-4683. A laboratory technician will respond as necessary. If the PHI/EHO, DWO or PHN must obtain water samples, remove the aerator screen from the tap, then wash the tap with a strong disinfectant solution (as per Info Sheet on Well Water from the Office of the Chief Medical Officer of Health, MB Health, March 2001). Flush for three to five minutes with fast-running cold water prior to collecting the sample. For well water samples, by-pass the water softener. Multiple samples may be necessary depending on the tests required; consult with ALS prior to collection.
- **Submission/Requisitions:** Chain of Custody submission forms/requisitions must be filled out completely. Ensure that samples are numbered and labeled clearly, and that they are consistent with the information on the requisition. Include batch numbers, lot numbers, bar codes or expiry dates whenever possible. Where applicable, include specimen ID numbers or food outbreak code for specimens submitted to the laboratory.
- "Suspect Foodborne Illness" should be clearly marked on the requisition form below.
- Legal samples must be indicated as such on the Chain of Custody submission form. There is extra documentation required and a surcharge for legal samples. A sample may be rejected as a legal sample upon receipt if there are deficiencies with the sampling procedures.

Specimen Analysis

- ALS is able to analyze food and water samples for the organisms listed on the attached requisition form. The analysis (organism) is determined at the lab based on the following information: symptoms/onset of symptoms (time), type of food product, type of processing and the indicator organisms (total coliform), *Staphylococcus* and heterotrophic plate count (HPC) to assess cross-contamination. The PHI/EHO, DWO or PHN may indicate organisms on the submission form.
- Viral testing of food and water samples is not performed but specimens may be split with one part being sent to the National Microbiology Laboratory if a viral agent is suspected. The sample should be split in the lab using aseptic technique. Note: It is important to obtain a uniform sample from solid food.
- Specimens may be analyzed for parasites such as *Cryptosporidium parvum* if requested (i.e., if outbreak is associated with a swimming pool). A 10L sample of water is required for *Cryptosporidium/Giardia* analysis (preservative not required). A collapsible jug is available from the lab.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Ship to: Unit 12, 1329 Niakwa Rd East, Winnipeg, Manitoba, R2J 3T4
Telephone: (204) 255-9720(info) Micro Food (204)255-9753, Micro Water(204)255-9724
Fax: (204) 255-9721
Toll Free: 1-800-607-7555

SUSPECTED FOOD BOURNE ILLNESS ANALYTICAL REQUEST FORM

Prov of Manitoba –

Service Requested: Regular _____ Priority _____ Emergency
Submitted by: _____
Customer #: __W3000_____MB Health_____

Food Venue Name & Location:_____
Lot # or date made:_____**(Actual or Like sample)**
Legal sample: (yes/no)

Sample ID	Sampled By	Date/Time Sampled	Sample Type	Total Coliform	Fecal Coliform	E. Coli	HPC	Staph. aureus	Salmonella	Bacillus cereus	Clostridium perfringens	Campylobacter jejeuni	Listeria moncytogenes	Yeast & Moulds	Foreign Matter I.D.
Consumed hot or reheated:															
Time of consumption:															
Incubation time:															
Symptoms: stomach cramps nausea vomiting diarrhea bloody stool headache fever															

Sample

CLIENT INFORMATION:
REPORT TO: **Province of Manitoba**
Address:

Phone: (204) _____
Fax: (204) _____
ATTENTION:

_____

Copies To: Jim Drew
MB Health Fax# 948-2040

RELINQUISHED BY:	DATE:	RECEIVED BY:	DATE:
	TIME:		TIME:

FOR LABORATORY USE ONLY

SAMPLE CONDITION UPON RECEIPT: FROZEN _____ COLD _____ AMBIENT
OTHER (BREAKAGE, LEAKAGE, ETC.):

Appendix 4.15
Explanation of ALS Laboratory Group Bacteriological Results and Recommended Guidelines (City of Winnipeg) for Ready-to-Eat Foods

S.P.C. – Standard Plate Count

High counts may indicate contaminated raw materials, unsatisfactory sanitation methods, post-process cross-contamination or improper time/temperature conditions during production, storage or transportation (temperature abuse). PLATE COUNT for ready to eat food items should be 300,000 CFU per gram or less.

Coliforms

The presence of coliforms indicates exposure to conditions that might introduce or allow proliferation of pathogenic (harmful) species. Therefore, coliforms are used as 'indicator organisms' as an index of sanitation. In a processed food, coliforms indicate inadequate processing or post processing contamination, sources of which may be workers, dirty equipment and surfaces, or raw food before processing. GUIDELINE for coliforms in ready to eat foods is 100 CFU per gram or less.

E. coli

The native habitat for *E. coli* is the intestinal tract of humans and other warm blooded animals. The presence of *E. coli* is an indicator of fecal contamination in most foods; therefore, the bacteriological GUIDELINE in ready to eat foods is 0 CFU per gram.

Coagulase Positive Staph

Certain staphylococci produce enterotoxins that cause food poisoning. Coagulase positive staphylococci are considered to be strains of *Staphylococcus aureus*, many of which are capable of causing food poisoning. The presence of *S. aureus* in a processed food usually indicates contamination from the mouth, nose, or skin infections of workers handling food, or from inadequately cleaned equipment. Large numbers of staphylococci are an indication of inadequate sanitation or temperature control. The recommended GUIDELINE for coagulase-positive staphylococci in ready to eat foods is 150 CFU per gram or less.

Salmonella

All *Salmonella* species are considered to be potential pathogens of humans. Therefore, the GUIDELINE for ready to eat food is that *Salmonella* must not be detected in a sample of 25 grams of food.

Listeria monocytogenes

No tolerance exists for this organism although several other species of *Listeria* (not considered pathogenic for humans) are prevalent at refrigeration temperatures.

NOTE: More information on standards and guidelines for the microbial safety of food may be obtained from the Food Directorate's (Health Canada's) web site at: www.hc-sc.gc.ca/ahc-asc/branch-dirgen/hpfb-dgpsa/fd-da/index_e.html

Food Bacterial Guidelines

The guidelines are based on public health requirements pertaining to food safety and disease prevention and on results that have been researched and shown can be achieved by industry.

"Ready to Eat" Foods (sandwiches, salads, cold cuts etc. but excluding cultured or fermented products)	
STD Plate Count (SPC)	<300,000/g
Coliforms	<100/g
Yeasts	<100/g
Coagulase-positive Staph.	<150/g
Clostridium perfringens	<100/g
Salmonella	0/25g
E. coli	0/g
Campylobacter jejuni	0/25g
S. faecalis	<10/g
Moulds	<10/g
Milk Products (excluding fluid milk)	
STD Plate Count (SPC)	<50,000/g/ml
Coliforms	<10/g/ml
Soft Ice Cream	
STD Plate Count (SPC)	<50,000/g/ml
Coliforms	<10/g/ml

Yogurt	
Coliforms	<10/g/ml
Milk Products or "Ready to Eat"	
Listeria monocytogenes	0/g
Shigella	0/g
Bacillus cereus	100/g
All Food Products (except raw meat)	
E. coli	0/g
Raw Ground Beef	
STD Plate Count (SPC)	10,000,000/g
Total coliform	1000/g
E. coli	500/g
S. aureus	1000/g
Salmonella	0/25g

Appendix 4.16

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OUTBREAK REPORT **Manitoba Health** **CDC Unit Fax: (204) 948-3044**

INSTRUCTIONS Upon suspicion of a communicable disease outbreak please complete the **Outbreak Identification** sections on both sides of this page and the **Initial Assessment.** Fax to above number.

OUTBREAK IDENTIFICATION Month Outbreak Recognized (mm/yy) _____/_____

Choose 1 Syndrome: ❑ GI Only ❑GI/Jaundice ❑Fever/Headache ❑STD/UTI ❑Fever/Rash ❑ Resp. Only ❑ GI/Resp. ❑Other *pls. specify* _____

Please choose a unique name to be used for this outbreak only: _____ *(max 10 letters)*

INITIAL ASSESSMENT

NOTE: Unchecked boxes assumed negative

Contact Person: _____ Phone/fax: _____/_____

RHA(s) involved _____ **Date** (yyyy/mm/dd) _____/___/___

Site/Location (***Check all that apply)*** *Name(s)* *Name(s)*

❑ Food Handling Establishment _____ ❑ Hospital _____

❑ Geriatric Extended Care Facility _____ ❑ School _____

❑ Other Extended Care Facility _____ ❑ Daycare _____

❑ Correctional Facility _____ ❑ Other Facility _____

❑ General Community on Reserve *Name reserve(s)* _____

❑ General Community *Name area, city, town(s), etc. involved* _____

Sample

Cadham Provincial Lab "Outbreak" Code _____ **Total # Cases** _____

Working Case Definition ***(Check all that apply):***

❑ Local working case definition included cases identified using clinical signs and symptoms

❑ Local working case definition used laboratory confirmed results

Onset of first symptoms of first case: _____/___/____ (yyyy/mm/dd)

Infectious Agent: ❑ Unknown ❑ Suspected ❑ Confirmed (organism: _____)

Current/Proposed Interventions ***(Check all that apply and provide details below):***

❑ Handwashing / Hygiene enhancement
❑ Barrier procedures (e.g. gloving, etc)
❑ Isolation / Restriction of movement
❑ Closure (e.g. institution, ward, restaurant)
❑ Active Case finding
❑ Exclusion
❑ Vaccination
❑ Prophylaxis
❑ Environmental disinfection
❑ Water boil order
❑ Product Recall
❑ Training/Education

Details:

_____

_____

People Notified ***(Check all that apply):***

❑ Facility infection control nurse
❑ Regional MOH(s)
❑ Environmental Health (PHI/EHO)
❑ Office of the Chief MOH
❑ Office of Drinking Water
❑ Cadham Lab Outbreak Liaison
❑ Cadham Lab Infection Control
❑ City of Winnipeg
❑ MSB
❑ Other _____
❑ Environmental Testing Lab
❑ Local Government
❑ Local Health Professionals
❑ Media

Other Details/Comments: _____

CDC Surveillance Unit, Public Health Division, Manitoba Health Revised 2007.10.10

For Office Use Only ☐ ☐ ☐ ☐ ☐

OUTBREAK REPORT Manitoba Health CDC Unit Fax: (204) 948-3044

INSTRUCTIONS Upon suspicion of a communicable disease outbreak please complete the **Outbreak Identification** sections on both sides of this page and the **Final Assessment.** Fax to above number.

OUTBREAK IDENTIFICATION Month Outbreak Recognized (mm/yy) _____/_____

Choose 1 Syndrome: ❑ GI Only ❑ Resp. Only ❑ GI/Jaundice ❑ GI/Resp. ❑ Fever/Headache ❑ Other *pls. specify* _____ ❑ STD/UTI ❑ Fever/Rash

Unique name used for this outbreak only *(From Initial Assessment)*: _____

FINAL REPORT

NOTE: Unchecked boxes assumed negative

RHAs Involved (*Check all that apply*):

❑ Winnipeg ❑ Brandon ❑ Central ❑ Interlake ❑ South Eastman ❑ North Eastman ❑ Assiniboine ❑ Parkland ❑ NOR-MAN ❑ Burntwood ❑ Churchill

Jurisdiction *(Check one):*

❑ Federal ❑ Provincial ❑ Band

Date: _____/____/____ yyyy/mm/dd

CPL "Outbreak" Code: _____ **OR** ❑ not assigned

Working Case Definition *(Check all that apply):*

❑ Local working case definition included cases identified using clinical signs and symptoms
❑ Local working case definition used laboratory confirmed results

Infectious Agent: ❑ Unknown ❑ Suspected ❑ Confirmed (organism: _____)

Please list symptoms necessary to case definition: _____

Case Details:

Onset of first symptoms: (yyyy/ mm / dd)
1st case ____/___/___
last case ____/___/___
last day of last case ____/___/___
Outbreak finished ____/___/___

	Clinical cases	Lab confirm'd	Deaths d/t outbreak	Total pop'n in facility
# of facility client cases				clients
# of facility staff cases				staff
Total # of cases in outbreak				

Transmission mode and source with highest index of suspicion *(Check one in each column)*

Transmission: ❑ Suspected ❑ Confirmed
(Check one in each column)

❑ Indirect (e.g. contact with inanimate object, Insect/animal vector, airborne)
❑ Transfusion/transplant/surgery
❑ Direct animal to person
❑ Sexually transmitted from person to person
❑ Fecal/oral transmitted person to person
❑ Droplet spread person to person
❑ Other _____

Source: ❑ Suspected ❑ Confirmed
(Check one in each column)

❑ Point/Common
❑ Water
❑ Food/Food Handler
❑ Animal
❑ Environment (e.g. soil, air conditioner)
❑ Biologic (e.g. blood, HGH, vaccine)

❑ Propagated
❑ Vaccine Failure
❑ Unvaccinated population
❑ Break in control of endemic illness

❑ Other _____

Major Interventions: ***(Check all that apply and provide details below)***

❑ Closure ❑ Exclusion ❑ Vaccination ❑ Prophylaxis ❑ Water boil order ❑ Product Recall ❑ Training/Education

Details: _____

Recommendations for policy/practice change(s):

_____

_____

Completed by: _____ Organization: _____

CDC Surveillance Unit. Public Health Division. Manitoba Health Revised 2007.10.10

Sample

Appendix 4.17
Foodborne Illness Premises Inspection Report

A. Establishment: Name _____ Type _____
Address _____ Phone No. _____
Contact Person _____ Position _____

B. General Sanitation of Establishmant (Critical Control Points)

_____

_____

C. Suspected Food:

1. Obtain menu and ingredients (if applicable) _____
2. Source _____
3. Handling and preparation procedures _____

   _____
4. Preparation date _____
5. Consumption date _____
6. Food temperature recording a) Cooking: (final temp.) _____
   b) Cooling: Method _____ Time _____
   c) Storage: Method _____ Time _____
   d) Reheating: Method _____ Time _____
   e) Display: Method _____ Time _____
7. Infestation _____
8. Storage of toxic items _____
9. Food additives _____

D. Equipment:

1. Refrigeration facilities _____

   _____
2. Utensils _____

   _____
3. Work tables (cutting boards, etc.) _____

   _____
4. Hot holding facilities _____

   _____
5. Dishwashing _____ Temperature _____ Chemical _____

Sample

E. Personnel Involved in Food Preparation:

Name	Address	Illness (Yes or No)	Hygiene (Good or Poor)
1.			
2.			
3.			
4.			

F. Observations and Comments:

_____

_____

G. Conclusion:

_____

_____

H. Attachments:: F.B.I. Report ☐ Lab. Analysis Form ☐ Specimen Report ☐

_____ _____

Date Inspector

Sample

Appendix 4.18
Sample Letter of Exclusion

Date

Name and Address of Employer

Dear Sir/Madam:

Re: Client's Name, Date of Birth, Address

Please be advised that the above named employee has been identified as having an infection that can be transmitted by food. Since he/she is involved in the handling of food, this individual must be excluded from the workplace until the signs of illness have resolved and he/she has been tested with results documenting that he/she is clear of the infection.

You will be notified at once when he/she is permitted to resume his/her duties.

Sincerely,

Medical Officer of Health

Appendix 4.19
Foodborne/Waterborne Illness Investigation Checklist

1. **INVESTIGATION WARRANTED**
   - ☐ Complete Case History (Appendix 4.7, 4.8 as appropriate)
2. **NOTIFICATION AND INVESTIGATION**
   - ☐ Notify MOH
   - ☐ Notify supervisor
   - ☐ Notify Food Protection, Public Health Division, Manitoba Health and Healthy Living/Drinking Water Office, Water Stewardship/Manitoba Conservation as appropriate
   - ☐ Notify Cadham Provincial Laboratory
   - ☐ Notify Environmental Laboratory
   - ☐ Notify DWO or PHI/PHN as appropriate
   - ☐ Secure guest lists/menu information
3. **SPECIMEN COLLECTION**
   - ☐ Collect food/water samples and arrange delivery to Environmental Laboratory
   - ☐ Arrange clinical specimen/record requisition number
   - ☐ Arrange clinical sample/specimen delivery to CPL with completed Case History Form
   - ☐ Determine Investigation Expansion
4. **CASE DEFINITION AND INVESTIGATION EXPANSION**
   - ☐ Develop Case Definition
   - ☐ Instruction Sheet for interviewing prepared
   - ☐ Preventative Health Education
   - ☐ Interview additional cases
   - ☐ Notification of other involved jurisdictions
   - ☐ PHI inspects establishment using HACCP/DWO inspects water treatment system/Manitoba Health and Healthy Living PHIs inspect recreational water facility/beach
   - ☐ Collection of food/water samples (actual/representative)
   - ☐ Correlation of food/water samples and clinical specimens (record requisition numbers)
   - ☐ Determination of employee work exclusion
   - ☐ Determination of facility closure (i.e., pool)
   - ☐ Advise outbreak team members of sample/specimen results
   - ☐ Follow reporting requirements

5. CONCLUSION

- ☐ Data correlation
- ☐ Complete report detailing involvement
- ☐ Final report correlation
- ☐ Report forwarded to Food Protection/Drinking Water Office, Water Stewardship/Manitoba Health and Healthy Living PHIs as appropriate
- ☐ Advise complainant of results
- ☐ Advise establishment of results
- ☐ Debriefing
- ☐ Follow-up education of food handlers/establishment staff
- ☐ Follow-up clients with additional health support
- ☐ Implement policy recommendations

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