



Quick Reference Guide for the Investigation of Foodborne Disease Outbreaks

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Purpose of the guideline

The aim of this guideline is to provide a rapid summary of the essential steps in the investigation of a foodborne disease incident/outbreak for use by public health personnel in the field. **Prompt investigation** is essential to the successful control in a foodborne outbreak. Patients frequently recover rapidly following illness onset, and clinical and environmental samples are only available for sampling during a small window of opportunity. Morbidity and mortality can be averted by early and effective interventions.

Why investigate?

- 1) To confirm the presence of an outbreak
- 2) To institute appropriate management of cases and limit associated morbidity and mortality
- 3) To identify the source of the outbreak and eliminate it.
- 4) To decrease the risk of such outbreaks in South Africa in the future by implementing preventive action based on knowledge gained.

Definitions:

For the purposes of this document a foodborne illness outbreak (food poisoning) refers to any food poisoning incident involving 2 or more individuals that are epidemiologically linked to a common food/beverage source. The cause may be infectious or toxin related. In practice the majority of household-related and small food poisoning outbreaks are never reported and patients frequently recover without seeking health care. However, when reports of 2 or more such cases are received, they should be investigated as they may represent only a small proportion of actual cases and it is only when an investigation is launched that the magnitude of the incident is discovered.

A step by step guide:

1. Verify the outbreak

- 1.1. Obtain preliminary information as a matter of urgency (telephonically pending a detailed line-list and initial report). Essential information to gather at the first point of communication includes:
 - Number of people affected
 - Number of people who were exposed to the likely food/beverage/function
 - Setting e.g. school, function, gathering, home, restaurant, etc.
 - Nature of clinical symptoms, e.g.: diarrhoea (if yes, watery/bloody/other), abdominal cramps, vomiting, fever (if present, exact measurement), neurological signs/symptoms and other.
 - Extent of clinical disease: e.g.: mild vs. severe, has anyone been admitted to hospital, has anyone died, are patients receiving appropriate acute care.
 - Estimated the incubation period. How long after consumption of the implicated meal did people start to feel ill?
 - Which facilities are admitting patients – obtain names, contact numbers and key contact personnel (the infection control sister is the ideal contact if available at that institution)
- 1.2. Rapidly consider all information you have received and determine whether an investigation is warranted.
- 1.3. Request the event organisers to start a list of all persons attending the event (including contact details where possible), a list of food and beverages consumed, and to not discard any leftovers served. Left-over foods should be refrigerated until collection.

2. Rapid response – case findings, investigation and immediate control

After obtaining initial information, if an outbreak investigation is indicated, an immediate site visit should be made wherever possible. A site visit will permit rapid assessment of all ill persons, appropriate management of cases, clinical and environmental specimen collection, and detailed collection of data.

2.1. Verify the data that was collected telephonically

2.2. Identify as many cases as possible through activity case finding. This may include calls to clinics, hospitals, local GPs, other healthcare providers (pharmacies, traditional healers) in the area to identify cases.

2.3. Rapidly distribute guidelines and data collection tools to all referral facilities and response team members at the outbreak site. These should include:

- Line-list templates, investigation forms/questionnaires and clinical specimen collection guidelines – all available from www.nicd.ac.za/?page=guidelines&id=73.

2.4. Obtain a detailed list of all food and beverage items served at the implicated meal(s). Obtain a list of all persons who attended the function, including contact details if possible.

2.5. Collect detailed data on all persons exposed (cases and non-cases/controls) utilising line-list(s) and/or questionnaires

- Interview all cases who are still on site at the event/function. Obtain contact details (including cell phone numbers and residential addresses) from all cases to allow for follow-up interviews.
- Interview as many other non-cases/controls who attended the same event/meal.
- If interviews cannot be completed on site, obtain full contact details (full names, addresses, phone numbers) of all persons exposed, to allow for follow-up interviews to be completed.
- Establish which healthcare facilities are admitting patients. Ensure that all facilities are provided with a line-list to record all cases. Obtain names of cases admitted, case contact numbers and names and contract numbers of key personnel (the infection control sister is the ideal contact) of each facility.
- Utilising the same questionnaire, interview as many other persons exposed (non-cases). If interviews cannot be completed on site, obtain their full contact details to allow for follow-up interviews.

2.6. Collect clinical samples from as many symptomatic cases as possible. Request specimens from:

- Cases still on site at the event/function
- Cases receiving treatment at referral healthcare facilities
- Any symptomatic food handlers and other staff
- Home visits may also be conducted.

2.7. Perform an initial environmental inspection including sampling as required:

- Inspect the structural and operational hygiene of the implicated food premises, and procedures used in preparing suspect meals.
- Collect appropriate food/beverage and other environmental samples according to guidelines. These samples must be taken as soon as possible as food is often discarded.

2.8. Initiate immediate control measures as appropriate. NOTE: Always exercise caution in implicating a particular food/caterer when the investigation is still incomplete and evidence is only preliminary. Take all necessary precautions to protect the public but proceed with caution. Depending on the situation this may include:

- Management of cases to minimize morbidity and mortality and provide health education to prevent spread of infection
- Removal of suspect food/beverages from sale or from the premises
- Food-handlers who are ill should be excluded from work pending investigation

3. Data analysis – descriptive epidemiology

- 3.1. Collate data obtained on line-lists and case investigation forms.
- 3.2. Develop case definitions to establish who are confirmed cases, suspected cases, persons exposed (non-cases/controls) and persons who should be excluded from these investigations (e.g. illness not related to this outbreak).
- 3.3. Perform descriptive epidemiology on available cases (suspected and confirmed cases). This should include analyse the data to describe cases by person, place and time. Remember that time analysis may be in hours rather than days in a foodborne outbreak. Calculate attack rates and estimate the average incubation period (i.e number of hours from consumption of the implicated meal to onset of illness).
- 3.4. Obtain laboratory results for clinical specimens and record on line list of cases. Obtain laboratory results from environmental samples. Request assistance with interpretation of laboratory results as required.

4. Develop hypotheses

Review findings from step 3 and generate hypotheses about the likely source of the outbreak and possible aetiological agents (Table 1 and Table 2), if this is not already apparent from laboratory findings.

TABLE 1: SYNDROMES OF FOODBORNE DISEASE AND LIKELY CAUSES

Primary symptom	Likely agents
Vomiting (fever and/or diarrhoea may occur)	Viral gastroenteritis (rotavirus, caliciviruses), Preformed bacterial toxins (<i>S. aureus</i>), <i>Bacillus cereus</i> . Heavy metals
Acute watery diarrhoea (No dysentery, fever may be present)	Most enteric pathogens but classically: ETEC (enterotoxigenic <i>E.coli</i>), <i>Giardia</i> , <i>V. cholerae</i> , <i>Cryptosporidium</i> , <i>Cyclospora</i> , Enteric viruses, <i>Clostridium perfringens</i> toxin
Bloody stool and fever	<i>Shigella spp.</i> , <i>Campylobacter spp.</i> , <i>Salmonella spp.</i> , EHEC (enterohaemorrhagic <i>E.coli</i>) <i>Yersinia enterocolitica</i> , <i>Entamoeba histolytica</i> , <i>Vibrio parahaemolyticus</i>
Prolonged diarrhoea (>14 days)	<i>Giardia</i> , <i>Cyclospora</i> , <i>Cryptosporidium</i> , <i>Entamoeba histolytica</i>
Neurological symptoms	<i>Clostridium botulinum</i> , Mushroom poisoning, Fish toxins (various), Organophosphates, Thallium poisoning
Systemic illness (e.g.: fever, jaundice etc.)	Hepatitis A and E, <i>Salmonella Typhi</i> , <i>Listeria monocytogenes</i> , <i>Brucella spp.</i> , etc.

TABLE 2: TYPICAL INCUBATION PERIODS AND SOURCES FOR SELECTED BACTERIAL CAUSES OF FOODBORNE ILLNESS

Agent	Incubation period	Typical foods
<i>Staphylococcus aureus</i>	1-6 hours	Poorly refrigerated potato and egg salads, meat, cream pastries
<i>Bacillus cereus</i> (preformed enterotoxin – vomiting syndrome)	1-6 hours	Poorly refrigerated cooked rice and meats
<i>Bacillus cereus</i> (diarrhoeal toxin)	10-16 hours	Meat, stews, gravies, vanilla sauce
<i>Salmonella spp</i> (non-typhi)	12-72 hours	Contaminated poultry, eggs, meat, vegetables, unpasteurised milk and juices, cheese
<i>Clostridium perfringens</i> (toxin)	8-16 hours	Meat, poultry, gravy, dried or precooked food
<i>Clostridium botulinum</i> (preformed toxin)	12-72 hours	Home canned foods with low acid content, improperly canned commercial foods

5. Test hypotheses – analytical epidemiology

At this point it may be necessary to conduct additional epidemiological investigations, especially if the source of the outbreak is unclear and if there is a possibility of additional cases. This may include a cohort or case control study to determine the source of the outbreak. A cohort study is preferable when all exposed persons are available and it is feasible to interview them all. If not, a case-control study can be used. Advice from an epidemiologist should be sought in planning such studies. The NICD and South African Field Epidemiology and Laboratory Training Programme (SA-FELTP) residents are often available to freely assist investigations.

6. Institute any additional control measures & measures for prevention of future incidents

6.1. Depending on the findings of the investigation additional control measures may be implemented. These may include:

- Food recall/seizure from the market
- Changes in production and/or preparation of foods
- Closure of food premises (according to legislation)
- Exclusion of infected individuals from school/work according to guidelines and legislation. Generally this period of exclusion is for 24 hours **after** symptoms have ceased but in some instances, laboratory criteria may be required to declare fitness for work e.g.: typhoid fever cases. The following groups are usually excluded from work/school if they have diarrhoea and/or vomiting until they are non-infectious:
 - Food handlers – if they touch unwrapped food that will be eaten raw or without further cooking
 - Care givers for the very young, elderly or immunocompromised individuals
 - Children under age 5 years
 - Older children or adults if personal hygiene is poor and/or there are inadequate toilet, washing and or hand-drying facilities available at home, work or school

7. Report writing and communication

7.1. Write a detailed outbreak report including all available information and recommendations for future interventions. Every outbreak is a learning opportunity and can help to prevent similar future occurrences.

7.2. Share the experience of this outbreak with relevant stakeholders and consider publication of findings in peer-reviewed journals and local communicable disease publications as appropriate.

8. Post-outbreak evaluation, corrective actions and strengthen surveillance

8.1. Perform an outbreak evaluation which will permit all stakeholders to review their performance in the outbreak investigation and ensure improved quality for the next incident.

8.2. List challenges and corrective actions, responsible individuals and date for completion of all actions. An outbreak may offer an opportunity to motivate for strengthening of surveillance systems for foodborne diseases in the province. This may include systems for early detection and reporting of possible clusters of foodborne disease from various sources (e.g. local medical practitioners, hospitals, clinics, the public, the media, laboratories, others e.g. workplaces, crèche, schools, pharmacies).