Chapter 5: Public Health Management of VTEC

5.1 Introduction

The high morbidity and mortality associated with VTEC, its low infectious dose, potential for asymptomatic carriage and prolonged shedding, and consequent potential for person-to-person spread, means that considerable resources are devoted to the management of each case of VTEC infection.

The Infectious Disease Regulation 1981 (SI 390 of 1981) and amendments provide for the diagnosis and treatment of infectious diseases, the investigation of the nature and source of infectious diseases, the prevention of infectious diseases, the prevention of the spread of infectious diseases, and for removing conditions which favour the spread of infection.

There are a variety of possible transmission routes, e.g. foodborne, waterborne, person-to-person transmission, and contact with animals. There is a requirement for a multidisciplinary approach in the management of VTEC cases.

5.2 Aim of Public Health Management

The aim of public health investigation and management of cases who are infected or are suspected to be infected with VTEC (symptomatically or asymptomatically) is to:

- Prevent further cases of illness as a result of onward transmission directly or indirectly from the infected individual,
- Prevent further cases of illness as a result of continuing exposure of others to the source of infection of index case,
- Identify behaviour/activities that increase a person's risk of acquiring VTEC infection in order to inform public health policy.
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This chapter will focus primarily on the investigation of a single VTEC case and secondly on the management of VTEC outbreaks. In many ways, the management of outbreaks of VTEC does

not differ from the management of outbreaks caused by other infectious intestinal diseases (IIDs), and thus, the section on VTEC outbreak management will pay particular attention to those aspects that differ from the management of outbreaks of other IIDs.

The steps in public health management outlined below apply to a laboratory-confirmed case of VTEC or a patient with HUS (laboratory confirmation may be by culture, PCR, or for HUS cases, also by serodiagnosis –see case definition). The decision whether to proceed with an investigation prior to confirmation of toxin status must be made on a case-by-case basis. It is recommended that, at a minimum, cases of *E. coli* O157 and O26 should be treated as toxin-producing until established otherwise.

In the event that an *E. coli* isolate from a suspected case is found negative for verotoxin, specific public health action is not required other than the usual response to a person with diarrhoea (unless there are other unusual microbiological factors that may influence the assessment of pathogenicity).

5.3 VTEC Risk Assessment

A crucial preliminary step in the management of a (suspected) case of VTEC is a simple, rapid risk assessment. This process aims at:

1. **Confirming the diagnosis** in the index case
2. **Transmission:**
    - Determining the likelihood of spread from index case to **close contacts**
    - Determining the possibility of spread **beyond immediate contacts** (check is the index case in one of the risk categories)
3. **Source**:
    - Determining the **likely mechanism of exposure**
    - Determining if there could be a **potential continuing source of infection**
4. Assessing, if any, what **initial levels of control are required** to be put in place.

The above process will provide the framework for further management. It is important to remember that **a single case of VTEC may be part of a larger outbreak** and further active case finding should be undertaken to rule out that possibility.

Box 5.1: Principal stages in public health investigation and management of a single case of VTEC infection (Figure 5.1)

1. Confirm diagnosis
2. Inform professionals of case findings
3. Interview case/parents
4. Initial risk assessment
5. Prevent secondary spread to household and other contacts
6. Active case finding
7. Environmental assessment
8. Management of single cases/outbreak

A: Confirm Diagnosis

The Infectious Disease Regulation 1981 (SI 390 of 1981) and the Infectious Disease (Amendment) (No. 3) Regulations 2003 (SI No 707 of 2003) provide for the written notification to the MoH of specified infectious diseases by medical practitioners and by clinical directors of diagnostic laboratories "as soon as he or she becomes aware or suspects that a person on whom he or she is in professional attendance is suffering from or is a carrier of an infectious disease". In the case of VTEC and a limited number of other diseases, immediate preliminary notification shall also be given to the MoH.

Under the Infectious Diseases Legislation, medical practitioners must notify the Medical Officer of Health (MOH) of notifiable events (cases of notifiable infections, outbreaks and clusters) and must comply with requests for information and directions as above. The MOH in turn, must notify the Health Protection Surveillance Centre. For more information, please see the HPSC website here.

In general, public health personnel are made aware of a case (or suspected case) of VTEC by the clinical microbiologist or attending clinician. The Department of Public Health should verify and record the contact details, clinical details and available results of laboratory investigation. The timeliness of the response even to a single case of VTEC is key.

B: Inform relevant professionals

Following notification to the Department of Public Health, it is vital that all relevant personnel are informed as soon as possible. Where a number of health professionals are involved, it is important that there is early coordination and sharing of information.

1. The **Clinical Microbiologist** may be contacted for any further information, to ensure that the isolate has been sent for toxin assessment and to enquire if there are similar clinical cases potentially linked. If the clinical microbiologist is not available, the reference laboratory may be contacted.
2. The patients' **Clinician** should be contacted to ensure that the case/parents have been advised of the diagnosis.
3. An initial notification is made via CIDR **the same day,** to the **Health Protection Surveillance Centre (HPSC)**. Follow-up information can be provided when available.
4. If required, the **Principal Environmental Health Officer (PEHO)** (or his/her deputy) may be informed and the initial details of the case passed on directly, verbally or in writing.
5. If required, **other relevant professionals** may be informed, e.g. veterinary staff, local authority personnel, senior management, general practitioners, out-of-hours service, casualty departments.
6. As the investigation continues, the public health physician may liaise with relevant **clinicians** and keep other disciplines informed, as appropriate, regarding the condition of the index case and any other cases.

C: Interview Case/Parents and Active Case Finding

It is vital that cases are interviewed as soon as possible using the National VTEC Case Trawling Questionnaire (Appendix K), in order that a risk assessment can be undertaken of the likely threat of VTEC infection to others.

A single apparently sporadic VTEC case should be investigated thoroughly in order to outrule any associated cases (11) and to identify the potential source of infection.

Person-to-person spread is common with VTEC infection, in particular within households and from young children. Contact tracing of each VTEC case is important in order to prevent further spread. It can also provide key information in helping to suggest possible sources of infection and provide additional opportunities for targeted infection control advice.

Key message: All apparently isolated, sporadic VTEC cases should be investigated thoroughly in order to outrule any associated cases (11) and to identify the potential source of infection.

It is also important at this stage to ascertain if there is a possibility of an outbreak:

- If a case is a child in Risk Group 3 (Table 5.1), an urgent assessment should be made of the childcare arrangements/facility (See VTEC in Childcare Facilities Decision Support Tool).
- Assessments should also be made in nursing homes or other residential institutions, when residents in these facilities are identified as cases (See VTEC in Childcare Facilities Decision Support Tool).
- When a VTEC case is identified as a food-handler, an assessment should be made in conjunction with the Environmental Health Services to establish whether onward transmission could have occurred during the course of their work, whether there are cases among colleagues or customers, or whether the premises could have been the source of infection.

Key message: If a case is a child in Risk Group 3 (Table 5.1), an urgent assessment should be made of the childcare arrangements/facility (Section G and VTEC Decision Support Tool).

Any contact who goes on to develop symptoms should be referred for medical assessment, particularly if they are in one of the four risk categories. If signs and symptoms of HUS develop (weakness, lethargy, sleepiness, oliguria) coupled with bloody diarrhoea and purpuric lesions, then the patient should be referred by their clinician for nephrological assessment as soon as possible.

Check for other reported cases associated in time or place

It is important that risk assessment include review of surveillance data at regional and national level to identify possible temporal or spatial clusters of VTEC infection within a region or neighbouring regions.

Ways in which possible links between cases can be recognised include:

i. Routine review regionally of the VTEC trawling questionnaires of all VTEC cases closely associated in time. Each time a new case is reported, possible exposures identified through the trawling questionnaire are compared thoroughly with the data collected on previous cases.
ii. Consistent referral to other HSE-areas when possible exposures are identified that have occurred outside the cases' region. In this way, these exposures can be taken into account when reviewing contemporaneous regional data from the trawling questionnaires for cases in that locale.
iii.

Screen household and other contacts as appropriate

An individual risk assessment must be carried out on each VTEC case to identify close contacts. These should be categorised in terms of risk (Table 5.1 below).

Table 0.1: VTEC Risk Groups

Risk groups	
1	High-risk food handlers (e.g. those whose work involves touching unwrapped foods)
2	Health care, preschool, childcare facility, or other staff who have direct contact, or contact through serving food, with highly susceptible patients or people in whom an intestinal infection would have particularly serious consequences
3	Children under 5 years of age attending childcare facilities, nurseries, play groups, or other similar groups
4	Older children and adults who are unable to implement good standards of personal hygiene

Table 5.2 should guide the screening process to identify excreters and for microbiological clearance.

Table 0.2 Microbiological investigation of household and other* contacts in Risk and non- Risk groups

	Risk groups 1-4	Non-risk group
Symptomatic	Microbiological clearance	Test for VTEC
Asymptomatic	Microbiological clearance	Screening may be considered for epidemiological purposes

**Microbiological screening may be indicated for close contacts in residential and day care centres for vulnerable groups (Section G), or for high-risk work contacts (e.g. in food premises). The Specialist in Public Health Medicine (SPHM), in consultation with the Clinical Microbiologist should decide on the level of additional screening to be instituted.*

Household contacts should also be advised to consult their GP if they develop any diarrhoeal illness.

Microbiological clearance: Two consecutive negative stool samples taken at least 24 hours apart. In the case of symptomatic cases, both negative stool samples must have been taken after recovery from diarrhoea.

Screening: Testing of a single faecal specimen from an asymptomatic individual to determine their carrier status.

Consideration can be given to setting up additional case finding procedures such as regular liaison with the local general practitioners, hospitals, schools, hostels and hotels. Those identified should be facilitated to provide a stool sample for VTEC testing. The appropriate precautions for transport of stool specimens to the laboratory should be observed (see instructions Appendix E).

If household and other relevant contacts are laboratory confirmed, these should be investigated as cases of VTEC infection, a history obtained as above and exclusion guidelines applied as below. It is important that stool samples from contacts are obtained promptly as the number of VTEC organisms shed declines rapidly during the first few days of infection (7).

Follow-up of positive cases

VTEC is usually a self-limiting illness but resolves in 5 to10 days post infection.

Treatment: Oral rehydration and appropriate treatment as recommended by doctor (i.e. GP or hospital doctor) and/or clinical microbiologist.

Immunisation: None available.

Case follow-up: Cases followed up the Health Protection Teams within Departments of Public Health.

During the follow-up of laboratory-confirmed cases (symptomatic and asymptomatic), and the index case, the frequency of stool sampling is decided by the public health physician.

D: Prevent Secondary Spread to Household and Other Contacts

Provision of hygiene and other clinical advice to the case and contacts, and exclusion of cases and contacts in risk groups from school/work as appropriate, are two crucial early control measures.

VTEC is most infectious while the patient is symptomatic. The infectious dose is low. The duration of excretion of the pathogen is typically 5-10 days. Contact transmission- based precautions should be used for hospitalised and institutionalised patients.

Provision of advice to all cases and their contacts

Person-to-person transmission is a particular risk. In particular, interactions between babies and parents, amongst young children and in the toileting of children or disabled people have been shown to facilitate the spread of VTEC infection. It is important that hand hygiene and other enteric precautions be emphasised by health care staff managing VTEC patients.

Chapter 6 section III provides guidance on advice for childcare facilities where cases have attended, for infection control guidance for cases who are being cared for in health care facilities and for household settings. A fact sheet on VTEC infection is included in Appendix J.

Key message: It is important that hand hygiene and other enteric precautions be emphasised by health care staff managing VTEC patients.

Exclusion and clearance

Symptomatic individuals should not, if possible, prepare food for others, or share towels, and should be discouraged from swimming until 48 hours after symptoms cease, and until microbiological clearance if applicable. They should also refrain from sexual contact during this time.

All cases should be advised to refrain from attending work or educational establishment (including nurseries, schools and universities or colleges) until 48 hours after diarrhoea and/or vomiting have resolved, and until microbiological clearance if applicable. This exclusion should also extend to other group settings such as playgroups and sports clubs.

Exclusion of cases and contacts from school/work as appropriate

Contacts from work, school and childcare that do not require microbiological clearance are generally not excluded

The circumstances of each case, excreter, carrier, or contact should be considered individually and factors such as type of employment, provision of sanitation, facilities at work, school or other institution, and standards of personal hygiene should be taken into account as part of the risk assessment. In some situations, it will be necessary to ensure temporary exclusion from work or school or transfer a worker temporarily to duties in which he/she does not pose a special risk, or to make special sanitary arrangements in schools and institutions to reduce the risk. Once an individual fulfils the criteria for clearance (including microbiological clearance if applicable) he/she should no longer be considered a risk and should be allowed to return to normal working. All such decisions need to be justified, however, and particularly if they differ from the advice here, should be made only after a careful assessment of the risk of further spread (96).

In general, **ALL cases of gastroenteritis should be regarded as potentially infectious** and such patients should normally be excluded, from work, school or other institutional settings, for 48 hours after the person is free from diarrhoea and/or vomiting (96).

Certain groups of people are at particular risk of transmitting infection to others. It should be established as soon as possible if a VTEC case or their contacts are in risk groups 1-4 (Table 5.1).

The key criteria that assist in the prevention of person-to person spread of VTEC include the fact that:

1. Cases (symptomatic and asymptomatic) should have good personal hygiene
2. Cases should be excluded during symptomatic period
3. Cases from groups not requiring microbiological clearance should be excluded for 48 hours after recovery from diarrhoea
4. Effective workplace hygiene measures should be in place at their place of work/school/childcare facility
5. Cases in risk groups should be excluded until microbiological clearance
6. Household and other close contacts in risk groups should be excluded until microbiological clearance - see section G for additional guidance on exclusion of contacts in special settings

Key messages

- Specifically all VTEC cases should be excluded from work/school/childcare facilities, etc. until asymptomatic and 48 hours after the first normal stool.
- Additional exclusion criteria apply for VTEC cases in risk groups. If cases are in risk groups 1 to 4, microbiological clearance (two consecutive negative specimens after the patient has recovered and at least 24 hours apart) should be obtained
- (Table 5.3) before returning to work/school/childcare facility.
- It is also important to exclude a household or other close contact in a risk group who may be incubating the disease. If contacts of a case are in risk groups 1 to 4, microbiological clearance (two consecutive negative faecal specimens at least 24 hours apart) should be obtained (Table 5.3) before returning to work/school/childcare facility. Childcare facilities require special consideration. It is likely that the risk of transmission amongst children in a childcare facility is lower than the risk of transmission between siblings in a household setting but is higher than between children in other social settings (see Section G).
- The overriding prerequisite for fitness to return to work/school/childcare facility for persons in risk groups is strict adherence to personal hygiene.

Individuals, especially young children, can continue to shed *E. coli* O157 / VTEC in the stool for some time (up to several months) after the symptomatic infection has passed (see Chapter

1). It is important that cases and/or parents are aware that clearance can be a lengthy process. Ongoing support and communication may be required by parents/carers during the difficult time of protracted asymptomatic carriage. Provision should be made that ongoing contact be maintained by an appropriate public health professional.

Parents should be advised that prolonged excretion may occur which may necessitate a child to be excluded from childcare for the period that they continue to shed.

Table 0.3: Exclusion criteria for persons in risk groups who are VTEC cases or household or other* contacts of VTEC cases

	Risk groups	Exclusion of cases and contacts
1	High-risk food handlers (e.g. those whose work involves touching unwrapped foods)	Cases and contacts –exclusion and microbiological clearance
2	Health care, childcare facility, or other staff who have direct contact, or contact through serving food, with highly susceptible patients or people in whom an intestinal infection would have particularly serious consequences.	Cases and contacts –exclusion and microbiological clearance
3	Children under 5 years of age attending childcare facilities, nurseries, play groups, or other similar groups.	Cases and contacts –exclusion and microbiological clearance[a] – see section G in relation to childcare facility contacts of a case
4	Older children and adults who are unable to implement good standards of personal hygiene	Cases and contacts – exclusion and microbiological clearance[b]

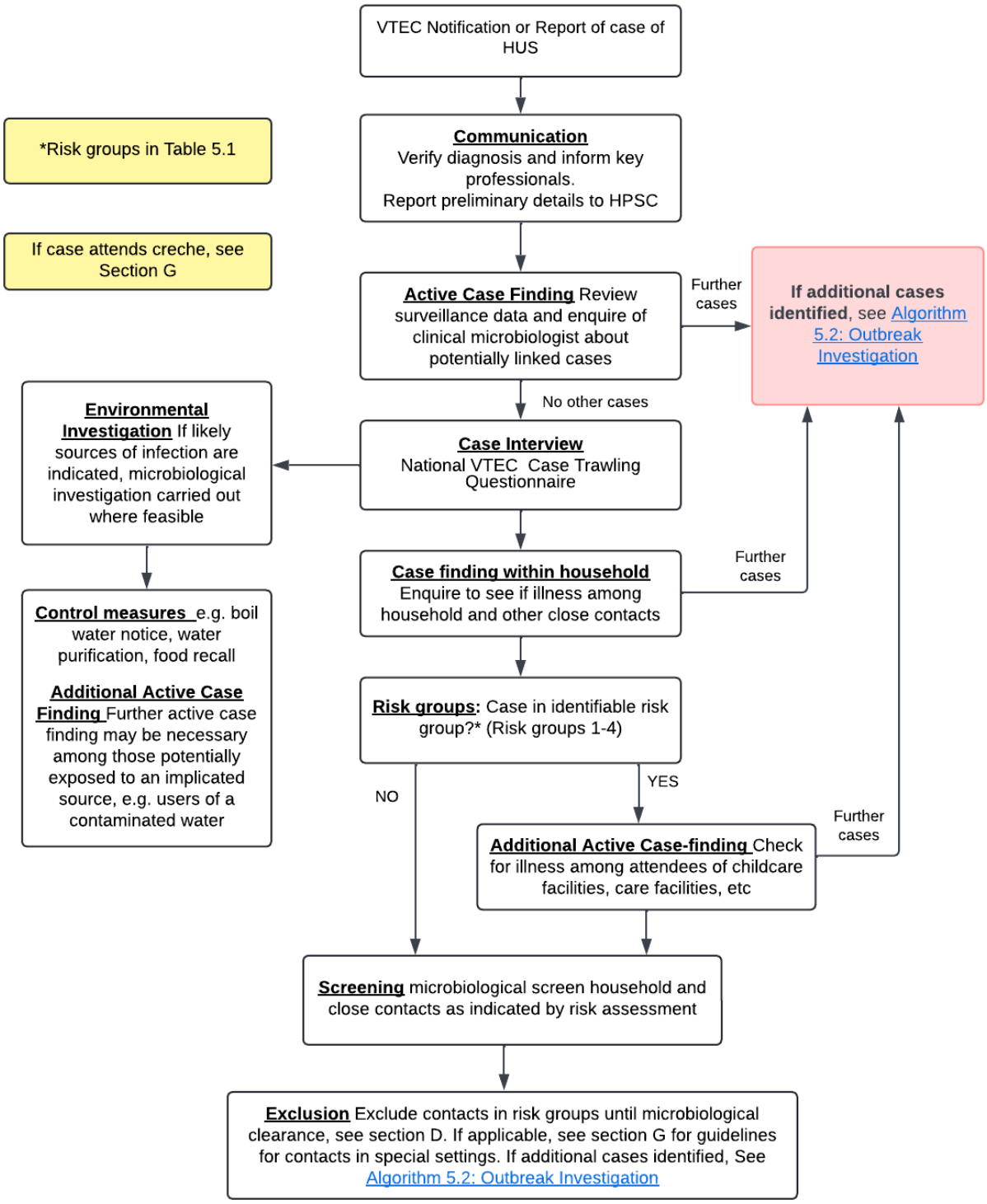
** may include close contacts in residential and day care centres for vulnerable groups, and in some instances, work contacts*

Special considerations

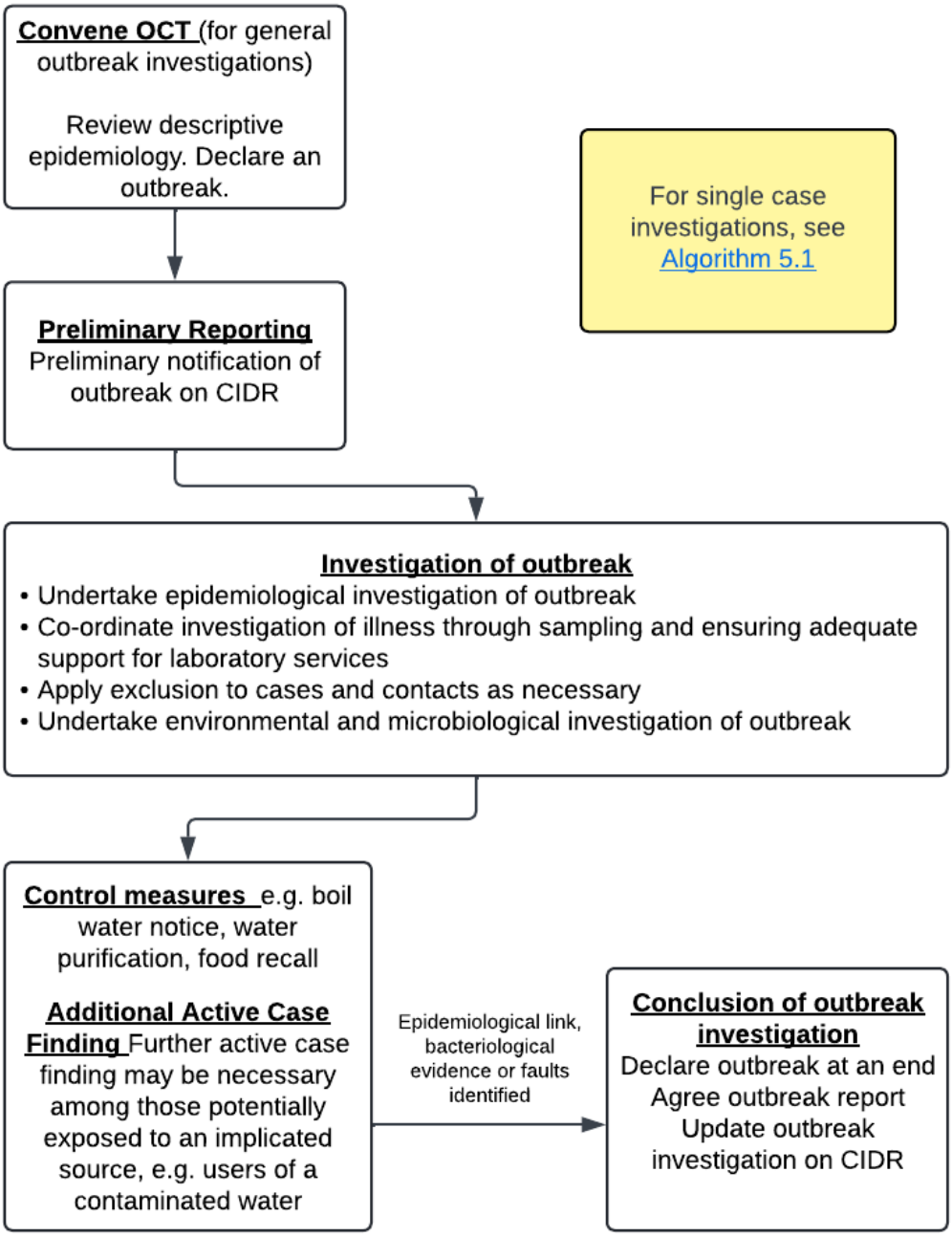
a The risk of **household contacts** in **Risk Group 3** spreading infection to other children in the childcare facility can be further reduced if the child household contact does not attend childcare until the household case is asymptomatic.

b For **contacts in Risk Group 4** exclusion from school or other care facilities may cause severe social problems. However, if exclusion is decided against, extreme care must be taken with hygiene and school staff must be advised of the potential risk and the hygiene measures necessary to avoid it.

Algorithm 5.1: Investigation of a Single case of VTEC



Algorithm 5.2: Investigation of a VTEC outbreak



E: Environmental Investigation

The single case

To establish the likely source of infection, each case of VTEC infection is interviewed and likely exposures identified. The National VTEC Case Trawling Questionnaire (Appendix K) should be used for the collection of information on likely exposures and covers areas listed in the box below (3).

Box 5.2 Ten-day retrospective checklist for the public health investigation of single VTEC cases

- Food history
- Handling or preparing raw vegetables, particularly root vegetables with soil attached
- Recent water supply problems or use of an untreated water source
- Attendance at communal events
- Recent foreign travel
- Whether another household member or close contact has been suffering from diarrhoea
- Attendance by children at a childcare facility
- Recent visits to premises where animals are kept, including farms, zoos, horse riding, pet shops
- The presence of pets in the household particularly if the pets have access to farmland and/or farm animals
- Recent contact with manure, or soil likely to contain manure, gardening
- Recent camping
- Recent exposure to recreational water
- The occupation or hobbies of all members of the household especially if they have close contact with farm animals or manure

Submission of food/water/environmental samples for analysis as appropriate

If likely sources of infection are identified, submission of samples (food/water/environmental) to an accredited public health laboratory for investigation is indicated.

The index of suspicion should be higher for drinking water sourced from private wells and group water schemes.

Testing of water samples specifically for VTEC uses a more sensitive testing regime than testing for indicator organisms. It is important when drinking water is a suspected mode of transmission during a VTEC investigation, that a one-litre aliquot is submitted to a specialist accredited public health laboratory for testing expressly for the suspected VTEC serogroup.

VTEC may be commonly carried and shed by clinically normal animals, particularly cattle and sheep. Companion animals, particularly herbivores such as rabbits, may also be potential sources, particularly if they have been in contact with farm animals. Sampling of animals may provide useful information on possible transmission routes during investigation of VTEC cases. This is particularly likely to be useful in the investigation of outbreaks associated with open farms. Companion animals, e.g. rabbits, dogs, should also be considered as possible sources.

In the event that it is decided that sampling of farm animals or investigation of/advice on farming practices would be useful, the farm owners should be advised of the decision and recommended that veterinary professionals be permitted to investigate.

F: Control Measures

Control measures in the early stages of the investigation focus on ensuring that that the standard measures to prevent the spread of VTEC are applied (Table 5.4).

Table 0.4: Standard Measures to Prevent the Spread of VTEC

Likely transmission route	Measures to prevent VTEC transmission	Useful sources of information
Person to person spread	Good hygiene practices Good environmental cleaning practices Exclusion of foodhandlers from work until non-infective Exclusion of children under 5 from childcare facilities, etc. until non-infective Exclusion of workers who are in contact with a vulnerable population, until non-infective	CHAPTERS 6 and 7 Guidelines for Hand Hygiene in Irish Healthcare Settings (100) Foodborne Disease: a focus on the infected food-handler (101) HSE-S leaflet on Infection Control for

		Childcare Providers
Water-borne spread	Treatment and maintenance of water supplies Maintenance of water piping etc Boil water	CHAPTER 7
Food-borne spread	Cooking food adequately Pasteurisation of milk products Good hygiene practices for food-handlers Adequate refrigeration and storage facilities for food Good environmental cleaning practices	CHAPTER 7 FSAI report/leaflets (www.fsai.ie) and Safefood leaflet (www.safefoodonline.com)
Direct spread from animals	Hand washing with soap and hot running water after contact with animals and before eating Open farms & pet farms should have good hygiene facilities with guidance provided for visitors to encourage good practice Separation of eating area from animal area Soiled overalls, coats, shoes etc should be kept separate from eating area & living quarters Recommendations regarding the recreational use of animal pasture, Chapter 7 section 3B	CHAPTER 7 SCIEH –Guidance note for Open Farms (97) HSE-S Zoonosis Committee –Guide to preventing zoonotic disease on Open Farms (98) HSE-SE Zoonosis Committee – Staying Healthy on your Farm (99) Scottish Task Force Report, Annex 7 – Interim Guidance on the Use of Animal Pasture (7)

Actions in the event that food/water/environmental samples taken during the course of the investigation are found to be positive for VTEC

In the event that food/water/environmental samples taken during the course of the investigation are found to be positive for VTEC, the environmental health service should institute additional control measures promptly. HPSC and any other relevant authorities should be informed.

Conventional and molecular typing methods can aid investigation and the Dublin Mid-Leinster

The Public Health Laboratory at Cherry Orchard should be consulted

Additional active case finding should be instituted if indicated, e.g. alerts to local general practitioners, hospitals. An alert to members of the public potentially exposed, or still at risk of being exposed to the source (e.g. food in fridges) may be necessary.

G: Management of VTEC in Special Settings

One of the most challenging areas of VTEC management is in the investigation of VTEC in childcare facilities and nursing homes/residential institutions.

Management of VTEC in a childcare facility

Full information on management of a case of VTEC can be found in the *VTEC (Verocytoxigenic E. coli) in Childcare Facilities: Decision Support Tool for Public Health* (available here).

Residential homes and workplaces for the intellectually disabled

As residential homes and disability institutions house a high density of vulnerable persons, many of whom may be in Risk Group 4, these settings can also provide the potential for outbreaks. That said, outbreaks in these facilities are rare and the presence of nursing staff means that infection control measures are more likely to be in place. Chapter 6 outlines the infection controls required in nursing homes.

Investigation of cases in these settings may at times require an approach similar to that for childcare facilities.

H: VTEC Outbreak Management

An outbreak, for practical purposes, can be considered to be an episode in which two or more people, thought to have a common exposure, experience a similar illness or proven infection.

(See Appendix C for a full definition under most recent legislation). Within outbreaks, there may be a mixture of VTEC strains. The response to an outbreak of VTEC will depend on the size of the outbreak and the circumstances. VTEC has caused large and often fatal outbreaks around the world. Effective outbreak management is crucial in the case of VTEC.

Most outbreak investigations are undertaken by a MOH in the geographic area where the cases or outbreak is occurring. If an outbreak is national or international, the epidemiological investigation is undertaken by the Director of National Health Protection/National MOH.

An Outbreak Control Team (OCT) can be convened to coordinate the investigation and management of the outbreak. The membership of the OCT should be relevant to the scale and impact of the outbreak. Figure 5.1 outlines the steps in a VTEC outbreak investigation.Through these investigations, risks associated with infection can be identified, and targeted public health interventions can be designed and implemented in order to prevent ongoing transmission, control spread of infection and control an outbreak.

Molecular epidemiological investigations can be very helpful in defining or outruling links and potential sources for widespread clusters of cases. The Public Health Laboratory (PHL) Dublin supports the investigation of gastro-enteric outbreaks nationwide & internationally along with the Health Protection Surveillance Centre (HPSC), Regional Departments of Public Health & HSE Environmental services using traditional and advanced molecular techniques. See here for more information.

Actions in the event that there is a strong epidemiological link or bacteriological evidence In the event that there is a strong epidemiological link or if there is bacteriological evidence implicating a source, the appropriate members of the investigating team should institute specific control measures at the earliest opportunity. HPSC and any other relevant authorities should be informed.