



Infectious Intestinal Disease: Public Health & Clinical Guidance

Version 1.1 July 2012

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Introduction

Infectious intestinal disease (IID) or gastroenteritis is one of the commonest reasons for patients presenting to General Practice and IID pathogens are the commonest cause of outbreaks of infectious disease in Ireland. Their management in acute and residential health settings erodes budgets, consumes resources, and produces significant hardship for patients (and their carers) and frustration for staff and managers. Outbreaks of foodborne IID in commercial settings (such as hotels, catering and food production establishments and restaurants) pose a threat to the health of consumers and damage the economic viability of such businesses.

The range of pathogens responsible for IID is constantly growing. Our population travels more extensively than ever before, placing them at increasing risk of exposure of intestinal infection. Moreover, we are seeing the emergence of more virulent and challenging strains of pathogens (most notably VTEC, a toxin producing *Escherichia coli*). Finally, their management and investigation places a considerable burden on the health system and wider society, meaning that the costs resulting from these infections require effective containment through the selective application of available diagnostic methods, therapies, and control and preventive measures.

This aim of this document is to provide guidance on the public health and clinical management of cases of IID. Its aim is to guide the practice of Consultants in Public Health Medicine and General Practitioners as well as Consultants in Clinical Microbiology, Infectious Diseases, Emergency Medicine, Paediatrics, General Medicine and Occupational Medicine.

It is intended as an informative and useful resource for Environmental Health Officers, Infection Control Nurses, Non-consultant Hospital Doctors and other Specialist Medical staff whose work does not normally involve management of these pathogens and diseases described here. The advice in this document is the most current in relation to exclusion and other guidance issues regarding Infectious Intestinal Disease (IID) and supersedes advice in other Irish national guidance.

This document is intended for use primarily in controlling spread of IID in the community but should prove equally useful in acute hospital or long-stay settings.

The evidence base for this document comes from the review of numerous sources including definitive documents such as the PHLS Advisory committee document, "*Preventing person-to-person spread following gastrointestinal infections: guidelines for public health physicians and environmental health officers*" published in 2004,¹ and the *Control of Communicable Disease Manual*² combined with recent reviews and publications. Guidance in relation to General Practice has been developed from material developed in conjunction between **saferfood** and a GP research initiative in 2006. Relevant data and evidence is referenced throughout.

As with all guidance, the information in this document is intended as an aid to decision making. It should be applied in conjunction with local professional expert knowledge informed by parallel risk assessment.

It does not consider management of outbreaks of illness and is intended to supplement existing guidance on management of outbreaks, VTEC, norovirus and *Clostridium difficile* infection in hospital settings.

This document has been drawn up by a group comprising Consultants in Public Health Medicine who work in the area of gastroenteric and zoonotic diseases.

I am particularly grateful to Professor Martin Cormican, Professor of Medical Microbiology, University Hospital Galway, and to the Quality in Practice Committee of the Irish College of General Practitioners for their comments and assistance in devising these Guidelines.

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1. Working group of the former PHLS Advisory Committee on Gastrointestinal Infections. Preventing person-to-person spread following gastrointestinal infections: guidelines for public health physicians and environmental health officers. *Comm Dis Pub Hlth*, 2004;7:362-384. Available at http://www.hpa.org.uk/cdph/issues/CDPHVol7/no4/guidelines_2_4_04.pdf.
2. Heymann DL. *Control of Communicable Disease Manual*. 19th Edn. APHA, Washington DC: 2008.

Glossary

Asymptomatic infection: (*syn.* Sub-clinical infection) asymptomatic infection occurs when a person has been infected and has mounted an immune response but exhibits no symptoms.

Bloody diarrhoea: diarrhoea (see definition below) in which there is macroscopically visible blood in a fresh specimen. Infectious haemorrhagic colitis (caused by VTEC or *Campylobacter*) produces a loose stool, in which blood is mixed throughout the volume of the stool (rather than just coating the surface).

Carrier: a carrier is a person, animal or arthropod who harbours an infectious agent in the absence of clinical illness with or without an accompanying detectable immune response. The carrier state may indicate carriage of the organism:

- In the incubation period prior to onset of symptoms
- *During apparent (symptomatic carriage) or inapparent infection (asymptomatic or healthy carriage)
- *Following recovery (convalescent carriage)

Carriage may be of brief or long duration (chronic carriage) and it may be intermittent or continuous.³ Carriers are potential sources of transmission. In general, the rate at which carriers shed pathogens is less than that of symptomatic cases. The term excreter is also used and is synonymous with carrier.

Case: a person with gastrointestinal or other relevant infection (e.g. neurological in the case of botulism) who has been identified as having a particular disease. Cases may be asymptomatic. Asymptomatic cases with diarrhoeal or vomiting illness tend to shed for shorter periods than symptomatic cases. Cases may be:

Primary: this is the first case to introduce an infection into a population (e.g. children in a crèche)

Secondary: these are cases that have been infected by a primary case.

Index case: this is the first case identified as part of an outbreak.

CDC: The US's Centers for Disease Control and Prevention which is its main agency for surveillance and control of all diseases.

Clinical surveillance: observation of (or by) a person (generally a contact who has been exposed to a person with an infectious disease) to determine if s/he develops relevant symptoms. This generally involves educating the person about the relevant symptoms, with instructions to seek medical advice should the symptoms develop.

Communicable Disease: a communicable disease is generally considered to be an infectious disease capable of being passed from one person to another, either

directly from one person to another or through fomites (q.v.)

Contact: a person who is likely to have been exposed to the excreta of an infectious person (case, excreter or carrier) or other source of infection (such as contaminated food, water or animals). Other forms of contact, where relevant, are described below under individual diseases.

Contamination: the presence of disease-causing microorganisms or their by-products (e.g. toxins), chemicals and/or foreign bodies, at a level sufficient to present a potential health hazard.

Contagious: (*syn.* communicable) any infectious disease capable of being passed directly from one person to another.

Diarrhoea: is defined as the passage of watery or "loose" stools with an increase in stool frequency - at least three times in a 24-hour period.⁴ Diarrhoeal stool is a sufficiently liquid consistency to take up the shape of the container into which it is passed. "Watery diarrhoea" is a commonly used (and misunderstood) term. Watery refers to the consistency of the stool, implying a high fluid content rather than a stool that is clear or translucent. The stool of cryptosporidiosis is watery but with a faecal colouration; the stool of severe cholera - rice water stool - is both watery and clear.

Epidemiological link: cases are said to share an epidemiological link when they appear, or are thought to have, a potential common source such as two cases of salmonellosis that had eaten in the same restaurant, or three cases of campylobacter that had consumed the same type of liver pâté, or four cases of VTEC that had attended the same crèche.

Exclusion: the isolation from work/school/childcare or other occupational settings of a person suffering, or suspected to be suffering from a contagious infectious disease.

Excreter: (*syn.* "carrier") a person who sheds pathogenic organisms in their faeces, vomitus or urine. They may be symptomatic or asymptomatic.

Exposure interval: the period during which a person is likely to have been exposed to a pathogen.

Exposure-prone groups: these are groups in which there is an increased likelihood of exposure to a particular pathogen. For example, children under the age of five and campylobacteriosis, or men who have sex with men and giardiasis. Exposure-prone groups for each disease are outlined in the corresponding disease section. It is important to remember that while these are the groups that have the **highest** likelihood of becoming infected by the pathogen in question, they are, by no means, **the only** groups that can become infected by the pathogen in question.

3. Evans AS, Brachman PS. Bacterial infections of humans: epidemiology and control. 3rd Edn. Plenum, New York: 1998.

4. De Bruyn G. Diarrhoea. Clin Evid. 2002 Dec;(8):684-92.

Fomite: a fomite is inanimate object or substance that is capable of transmitting infectious organisms from one person to another.

Foodborne illness: any disease of microbial origin caused by, or thought to be caused by, the consumption of food or water. Foodborne illness is synonymous with food poisoning.

Gastroenteritis: (*syn* infectious intestinal disease or IID) any infection of the gastrointestinal tract, regardless of the source. Gastroenteritis may be bacterial, viral or protozoal in nature.

Haemolytic Uraemic Syndrome (HUS): a vascular disorder characterised by microangiopathic haemolytic anaemia with thrombosis triggered by endothelial damage mainly in the renal microvasculature leading to thrombocytopenia and acute renal failure. More than 90% of cases result from the verotoxin produced by VTEC (but also *Shigella* spp.).

HPA: Health Protection Agency is an independent body that protects the health and well-being of the UK population.

HPSC: the Health Protection Surveillance Centre, Ireland's specialist agency for the surveillance of communicable diseases

IDU: injecting drug user. This group are at increased risk of a number of enteric pathogens most seriously wound botulism following intradermal inoculation of *Clostridia* into an injection site.

IID: infectious intestinal disease or gastroenteritis. The terms are used synonymously throughout this document. IID is any infection of the gastrointestinal tract, regardless of the source.

Incidence: the incidence of an infectious disease is the rate at which new cases are identified in a given time period. It is normally expressed as a ratio of the number of new cases reported per unit of population during a calendar year.

Infectious Disease: an illness due to a specific infectious agent or its toxic products that arises through transmission of that agent or its products from an infected person, animal or reservoir to a susceptible host, either directly or indirectly through an intermediate plant or animal host, vector or inanimate object.

Infectious dose: (*syn*. inoculum) the dose of pathogen to which a person must normally be exposed in order to produce clinical illness. This varies greatly between IID pathogens, from thousands of cells in the case of salmonella to less than five cells in the case of VTEC.

Immunocompromised/Immunosuppressed: a person who has impaired immunity due to disease (e.g. cancer) or medical treatment (e.g. corticosteroid drugs or radiotherapy).

Incubation period: the period between exposure to an infectious agent and the development of symptoms or signs of illness.

Isolation: the segregation of cases (that may be symptomatic or asymptomatic) from the uninfected population.

Microbiological clearance: following isolation of a microorganism from stool, microbiological clearance occurs when there has been a reduction of the number of pathogenic organisms in a specimen to below that detectable by conventional means. The number of microbiologically clear specimens before "microbiological clearance" can be affirmed varies according to the organism.

Outbreak: the occurrence of two or more linked cases (see 'Epidemiological link') of the same illness or the situation where the observed number of cases exceeds the expected.

Quarantine: the segregation and observation of potentially exposed but asymptomatic individuals for a specified time period to determine if they develop symptoms and signs of a particular infectious disease.

Subclinical infection: (*syn*. asymptomatic) subclinical infection occurs when a person has been infected and has mounted an immune response but exhibits no symptoms.

TTP: Thrombotic Thrombocytopenic Purpura, a rare blood disorder characterised by thrombotic microangiopathy (microscopic microthrombi form within the small blood vessels). The idiopathic form is an autoimmune disorder; the secondary form is associated with cancer, bone marrow transplantation, pregnancy and infection (e.g. HIV, *Campylobacter*, VTEC). Mortality is 90% in untreated cases and 10% in treated cases. Plasmapheresis is the treatment of choice.

Verotoxin: (*syn*. shiga-like toxin) is the toxin released by verotoxigenic *Escherichia coli* (VTEC). It is a shiga-like toxin. Shiga toxin is released by toxigenic forms of *Shigella* which produces the haemorrhagic colitis typical of bacillary dysentery. Verotoxin released by VTEC strains acts on vascular endothelium (particularly in the intestine, the renal glomeruli and the lungs). In the intestine it adheres to and disrupts the intestinal epithelium leading to a haemorrhagic colitis. As a result of its renal action it can head to HUS (q.v.).

Vulnerable Groups: these are groups in which, following exposure, there is an increased likelihood of severe disease. This would include children under 5 years, frail and weakened patients, the elderly, the immunocompromised and pregnant women.

VTEC: (*syn*. STEC) Verotoxigenic *Escherichia coli*. Also referred as STEC (Shiga-like toxin producing *Escherichia coli*). VTEC release verotoxin (q.v.) which leads to damage of the intestines and kidneys.

Zoonoses: zoonotic diseases (zoonoses) are those that can be transmitted from vertebrate animals to man.

Notifiable Infectious Diseases in Ireland

In Ireland, early reporting (or notification) of cases of infectious diseases to the local Medical Officer of Health is intended to ensure that necessary controls to restrict the spread of the disease can be put in place as rapidly as possible.

Under current (and preceding) legislation ([S.I. No. 452/2011](#) — Infectious Diseases (Amendment)

Medical Practitioners and Directors of Clinical Laboratories are required, in legislation, to notify all cases of reportable infectious disease to the Medical Officer of Health

Regulations 2011), as soon as a medical practitioner becomes aware of or suspects that a person on whom he/she is in professional attendance is suffering from or is the carrier of an infectious disease, or a clinical director of a diagnostic laboratory

as soon as an infectious disease is identified in that laboratory, he/she is required to transmit a written or electronic notification to a Medical Officer of Health.⁵ (<http://www.hpsc.ie/hpsc/NotifiableDiseases/Whotonotify/>). In addition to the list of pathogens that are required to be notified, unusual clusters and outbreaks of any infectious pathogen or disease and changing patterns of any illness are required to be notified to a Medical Officer of Health.

In addition, where a medical practitioner is aware of certain, more serious diseases (including the following infectious intestinal diseases: VTEC, typhoid/paratyphoid and cholera) or where s/he is of the opinion that there is a serious outbreak of infectious disease in a locality, s/he is **required to give immediate preliminary notification to the Medical Officer of Health, preferably by telephone**. These requirements are laid out in full in [S.I. No. 707 of 2003](#) - Infectious Diseases (Amendment) (NO. 3) Regulations 2003.

Under the Infectious Diseases (Amendment) Regulations, 2000 ([S.I. No 151 of 2000](#)) as amended by [S.I. No. 865 of 2004](#), the Health Protection Surveillance Centre (HPSC) has been assigned responsibility for the collation and analysis of weekly notifications of infectious diseases, taking over from the Department of Health and Children. The HPSC produces [weekly statistics](#) of numbers of notifications of infectious disease in Ireland. In addition it produces Quarterly and [Annual Reports](#) with synthesis and analysis of data. HPSC also produces guidance documents in relation to [all forms of infectious disease](#).

On 1st January, 2004 revised regulations came into operation. [S.I. No. 707 of 2003](#) established a revised list of notifiable diseases and introduced a requirement for laboratory directors to report infectious diseases. A list of [diseases notifiable in Ireland](#) can be found in Appendix 1.

In addition, any disease, if it produces sufficient cases or extensive disruption can progress to become a PHEIC (Public Health Emergency of International Concern) under the [International Health Regulations \(2005\)](#), which will require reporting to the World Health Organization (WHO).

VTEC, Typhoid/ Paratyphoid and Cholera and Outbreaks should be notified immediately.

5. For a full description of the notification legislation and the process of infectious disease notification see <http://www.hpsc.ie/hpsc/NotifiableDiseases/NotificationLegislationandProcess>. A full list of Medical Officers of Health is available at <http://www.hpsc.ie/hpsc/NotifiableDiseases/Whotonotify/File,13160,en.pdf>.

Response to a Case of Gastroenteritis

Acute gastroenteritis or infectious intestinal disease (IID) – the terms are used interchangeably in this document – is a condition, the management of which can fall within the scope of Public Health or General Practice or both. The public health response will be directed towards the population and will be concerned with identification of cases and outbreaks as well as control and prevention measures. The clinical response will be directed towards the patient and will be concerned with the clinical management of the patient. If however a clinician identifies features suggestive of the possibility of further transmission (i.e. if the patient belongs to a Risk Group - see Section 4, Page 15, below - or the case potentially being part of an outbreak) then this provides the ideal opportunity for clinicians to offer immediate public health advice and alert Public Health colleagues of the potential threat. In many cases, Public Health physicians must take clinical decisions regarding individual patient management; this document should prove valuable in assisting them in this regard.

The response to cases is laid out below on Public Health lines and on Clinical lines.

Public Health Management of IID

Acute gastroenteritis or infectious intestinal disease (IID) continues to produce a considerable load on the health system, and on the wider social system, and reducing the incidence of these illnesses provides the possibility for significant reduction in disease burden.

Risk factors for acquisition of gastroenteritis include:

- Poor personal hygiene (including in foodhandlers)
- Lack of sanitation (including in food preparation and healthcare settings)
- Poverty
- Undercooked food
- Contaminated food (ready to eat food contaminated with the uncooked juices /blood of uncooked food product)
- Immunosuppression (including HIV/AIDS, cancer, immunosuppressive therapy, post-splenectomy, high dose steroids)

1. Infection Control

Acute gastroenteritis or infectious intestinal disease (IID) is a spectrum of common, yet readily preventable illnesses.

- The main symptoms include vomiting, diarrhoea, abdominal cramps and fever.
- Although infectious and non-infectious agents can cause these symptoms, all cases of gastroenteritis should be considered as potentially infectious until a microbiological cause has been excluded.
- Most cases are caused by common bacterial or viral pathogens but parasites and toxins can frequently be responsible.

- Diarrhoea is a cardinal symptom of most IIDs.
- A liquid stool is more likely than a formed stool to contaminate hands and the environment, and as such poses a significantly greater risk of onward transmission of pathogenic microorganisms.
- Conversely, asymptomatic adults and older children probably pose a risk of onward transmission that is only slightly increased. This is particularly true of those with bacterial enterocolitis; asymptomatic cases of viral gastroenteritis have been shown to be capable of spreading readily.
- Similarly vomitus may contain large numbers of infectious agents and can contaminate a wide area, including through aerosolisation.
- In addition some pathogens continue to be shed in stools for a period after clinical recovery.
- Finally, many have considerable powers of survival. VTEC, for example has been shown to retain the capacity to grow following a number of weeks on bare metallic surfaces. Norovirus has, likewise, been shown to survive for weeks in soft furnishings. However, good personal hygiene markedly reduces the risk of onward transmission.

Scrupulous handwashing is the single, most important factor in the prevention of spread of gastrointestinal infection

To prevent secondary spread, enteric precautions and in some cases, exclusion from work/school, are required.

2. Enteric precautions

Use of enteric precautions is the most effective method of minimising the threat posed by enteric pathogens in any setting. The core requirements for effective enteric precautions are:

- effective **handwashing** at every opportunity
- effective and safe **disposal** of waste (including excreta and vomitus) and soiled materials
- careful management of **spillages**
- effective **decontamination** of soiled areas.
- **education** of patients and staff is crucial to ensure the use of enteric precautions becomes as habitual as possible.

2.1. Hand washing

Scrupulous hand washing with soap (preferably liquid) in warm running water, and thorough drying (ideally with disposable hand towels), is the single most important factor in preventing the spread of gastrointestinal (and many other) infections.⁶

6. In addition to preventing intestinal and other faeco-oral infections, handwashing is an effective method of preventing the spread of a wide range of diseases including influenza, conjunctivitis, TB, SARS, typhus, toxoplasmosis, tetanus, infectious mononucleosis, meningitis, Crimean Congo Haemorrhagic Fever, infective skin eruptions, acute upper and

Patients and their carers should also be advised in particular, to wash hands:

- After using or cleaning the toilet
- After attending to anyone with diarrhoea or vomiting
- After touching articles contaminated by diarrhoea or vomiting
- After handling contaminated clothing or bedding (including nappies)
- After handling household and garden waste or rubbish
- After touching or handling pets or other animals (including their kennels/hutches/tanks, bedding etc.)
- On returning to the house having been working in the garden/farm
- Before handling, preparing, serving, or consuming food or drink after going to the toilet or changing babies' nappies and before preparing or serving food or eating meals.
- Particular care must be taken with hand hygiene and cleaning of surfaces and utensils after handling raw meat and poultry

More extensive guidance on Social and Antiseptic Hand Hygiene for Healthcare Workers is laid out in Appendix 2.

2.2. Disposal of waste and soiled materials

At home, people symptomatic with gastroenteritis should normally use a flush toilet. If someone is ill with gastroenteritis:

- Ideally, one toilet should be identified for the sole use of the infected individual (although this may not be possible).
- In instances where a bedpan or commode has to be used, the carer should wear disposable gloves and ideally a disposable apron.
- The bedpan or commode should be emptied in to the toilet bowl and then washed with hot water and a household detergent.
- Aprons and gloves should be discarded in a plastic bag, sealing the neck and disposed of as solid household waste.
- Hands should be washed thoroughly after removal of gloves and apron.
- In the case of gross soiling of clothing and bed linen, solid material should first be scraped off into the toilet bowl or plastic bag
- The items washed separately in a domestic washing machine at the highest temperature that they will tolerate (e.g. 60°C plus for linen).
- Soaking in disinfectant is not recommended as it may damage fabrics.

lower respiratory infections, helminthic infections and hospital acquired infections.

- The exterior of the machine should be wiped down with hot water and detergent after the washing machine is turned on.
- Disposable gloves and apron should be worn throughout this procedure and hands should be washed thoroughly upon their disposal.

2.3. Spillages

Any spillage of vomit or faeces should be cleaned immediately by absorbing any excess with disposable paper towels or by scraping into a toilet and then thoroughly cleaning the area with hot water and detergent. Sanitizers may also be used once all visible soiling is removed. Soft furnishings should be cleaned with hot water and detergent or with a steam cleaner if available.

2.4. Decontamination

As it may not be possible for a toilet to be identified for the sole use of the infected individual, it is important that:

- The toilet area to be kept clean, including areas that are frequently touched by hand (e.g. flush handles, toilet seats, taps, light switches, toilet door handles).
- Cleaning should be carried out at least daily - more often depending on use.
- Hot water and detergent should be used.
- Commercial sanitizers, wipes or a dilute bleach solution may also be used (in accordance with the manufacturer's instructions), once all visible soiling has been removed.
- Disposable gloves, aprons and cloths should be used when cleaning, and hygienically discarded following use.
- Hands should be washed thoroughly after cleaning.

2.5. Education

Good personal hygiene should be emphasized to

- patients
 - their carers and
 - household contacts
- with particular emphasis placed on hand hygiene and the hygienic preparation and serving of food.
- Schools and institutions should have adequate hand-washing facilities and the toilet hygiene of young children and people with learning disabilities should always be supervised.

3. Risk Groups

People in risk groups pose an increased risk of **spreading infection**. It is particularly important to assess infected people who belong to one of the four **Risk Groups** for whom special action/exclusion criteria may apply. People (cases and contacts) who fall into this category

Risk group categorisation should be determined for every case (or contact) of gastroenteritis

pose a greater risk of **onward transmission** and must be treated with particular care (see individual pathogens for fuller details).

Table 1: Risk Groups

(Categories of patients who pose a greater risk of **onward transmission**)

Risk Group	Risk Categorisation
1	High-risk food handlers ⁷ (e.g. those whose work involves touching unwrapped foods that will not undergo further heat treatment).
2	Health care, preschool nursery, 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 (for example, the immunosuppressed).
3	Children under 5 years of age attending nurseries, play groups, or other similar groups (who have not yet fully developed toilet hygiene).
4	Older children and adults who are unable to implement good standards of personal hygiene (particularly toilet hygiene).

4. Exclusion

All cases of gastroenteritis should be considered infectious and should, if at all possible, remain off work/school until 48 hours after symptoms have cleared. Certain individuals pose a greater risk of spreading infection and additional exclusion criteria may apply. In addition, microbiological clearance may be required for cases infected with certain pathogens.

Contacts of cases of certain infectious disease may also require microbiological clearance before being permitted to return to work/school (see individual pathogens for guidance on requirements for microbiological clearance).

RISK GROUPS

- Food handlers
- Healthcare/nursery staff
- Children <5
- Those with suboptimal hygiene

The circumstances of each case, carrier or contact in these risk groups should be considered individually and factors such as their type of employment, provision of

toilet and handwashing facilities at work, school or institution and standards of personal hygiene should all be taken into account. In certain instances, it might make sense temporarily to reallocate a convalescing worker to alternative role that does not pose an infectious risk to others. Alternatively, special sanitary arrangements can be put in place to reduce the risk of spread.

For those illnesses requiring microbiological clearance (such as VTEC and

All cases of gastroenteritis should remain off work/school until 48 hours after symptoms have cleared

Typhoid/Paratyphoid), once the criteria for microbiological clearance are satisfied, the individual should no longer be considered a risk and should be allowed to return to normal working.

7. Guidance on the strengthening procedures to combat foodborne disease and to provide expert advice on best practice in relation to food safety is available in the HPSC Document Preventing Foodborne Disease: A Focus on the Infected Food Handler (2004) available at <http://www.hpsc.ie/hpsc/A-Z/Gastroenteric/Foodbornellness/Publications/>

Management of IID in Primary Care

Gastroenteritis is a common reason for presentation in General Practice. On the Island of Ireland, 4.5% of the population present to their GP with gastroenteritis each month.⁸ This represents 8,800 episodes of gastroenteritis every day (or 3.2 million episodes per year). Each patient will, on average be unwell for four days. In terms of workload in Ireland and Northern Ireland, this translates into 3,100 GP consultations per day (or 1.1 million per year). Sixty four thousand stool samples will be submitted from the community each year and 1.5 million working days will be lost due to absences related to gastroenteritis (this equates to €173.5 million on the island of Ireland in lost earnings alone). On average, GPs have seven consultations for acute gastroenteritis per week, accounting for 4.5% of all consultations. The importance of gastroenteritis lies in its potential clinical severity coupled with the fact that most gastroenteritis pathogens are contagious, meaning a single case can transmit to many people. The great majority of cases of IID are managed successfully in primary care; such cases have self-limiting and mild illnesses that require no specific treatment.

Additionally, a significant number of cases of gastroenteritis will present to Emergency Departments (EDs). Because of the high risk of onward transmission of certain gastroenteric pathogens such as norovirus, it is not desirable that uncomplicated and straightforward cases of IID are managed, in the first instance, in EDs. Nevertheless, severe or complicated cases of gastroenteritis will often require hospital management. Should patients present to the Emergency Department with diarrhoea or vomiting, the principles relating to enteric precautions and initial identification and management of uncomplicated cases laid out in this document apply. More severely ill or complex cases require specialist intervention. In this case, individual patient management will be beyond the scope of this guidance document.

The following definitions regarding the duration of diarrhoea provide a useful basis for considering the potential underlying causes:⁹

- *Acute*: ≤14 days duration
- *Persistent*: 14-30 days duration
- *Chronic*: > 30 days duration

Most cases of uncomplicated, acute infectious diarrhoea in immunocompetent individuals (whether caused by bacteria, viruses or parasites) tend to have a duration of less than 14 days. Diarrhoea that is persistent or chronic, in immunocompetent individuals, suggests a non-

infectious aetiology. In a clinical setting, therefore, it is important to identify early those cases of diarrhoea that are more likely to have an infectious aetiology (p20).

1. Aetiology

Most cases of acute infectious diarrhoea will be viral in origin (norovirus, the cause of winter vomiting disease, rotavirus, the commonest cause of infantile and paediatric gastroenteritis and other, less common viruses such as adenovirus and astrovirus). Bacterial causes tend to produce more severe diarrhoeal disease; gastroenteritis lasting more than three days in most likely to be bacterial (or protozoal in nature).

Different pathogens exert their pathogenic effects in different portions of the gastrointestinal tract. Small bowel involvement tends to be seen with norovirus and rotavirus; with *Salmonella**, VTEC, *Staphylococcus aureus*, *Bacillus cereus*, *Vibrio cholerae*, and *Clostridium perfringens*; and with *Cryptosporidium** and *Giardia*. Colonic involvement tends to occur with adenovirus; with *Campylobacter**, *Shigella*, *Clostridium difficile* and *Yersinia*; and with *Entamoeba histolytica* (*can affect both large and small bowel).

2. Clinical Evaluation

A careful history and examination can provide valuable clues as to the clinical and public health management of cases of gastroenteritis.

2.1. History

Initial assessment of patients presenting with acute gastroenteritis should include a careful history to determine the symptom duration and onset¹⁰.

- onset of symptoms within 1-2 hours of food consumption/exposure suggests a bacterial enterotoxin such as that produced by *Staphylococcus aureus* or *Bacillus cereus*
- onset of symptoms that begin between 6 and 18 hours suggest *Clostridium perfringens* intoxication
- symptom onset greater than 18 hours suggest the commoner bacterial causes of gastroenteritis
- stool frequency (diarrhoea is defined as three or more liquid stools per day¹¹, severe diarrhoea is six or more liquid stools per day)
- stool character (watery/bloody). Watery diarrhoea (see [Glossary](#)) refers to the consistency and not the colour of the stool

Are there epidemiological clues as to the cause?

- other family/friends/colleagues with similar symptoms
- are there indicators as to a foodborne aetiology (recent wedding, eating out etc),¹²

8. Acute Gastroenteritis in Ireland, North and South

A Telephone Survey (2003). Available at

<http://www.hpsc.ie/hpsc/A->

Z/Gastroenteric/GastroenteritisorIID/Publications/AcuteGastroenteritisinIrelandNorthandSouth.

9. Guerrant RL, Van Gilder T, Steiner TS, et al. Practice guidelines for the management of infectious diarrhea. *Clin Infect Dis* 2001; 32:331.

10. See appendix 3 for a list of incubation periods and typical periods of duration for common gastrointestinal pathogens

11. World Health Organization. Available at <http://www.who.int/topics/diarrhoea/en>.

- recent animal contact
- consumption/contact with untreated water e.g. swimming in lakes/ponds, consumption of well water)?

The form and severity of symptoms depend on the type and quantity of pathogen or toxin ingested, coupled with the general health of the patient. The diagnosis of gastroenteritis is usually apparent from the symptoms, which tend to be quite suggestive. The cause may be suggested by the history. Toxins have the shortest incubation periods (a matter of hours), viruses become clinically apparent in a day or two, bacteria tend to have incubation periods that range from a couple of days to a number of weeks (see Appendix 3 for further details).

Viral pathogens can produce extensive epidemics. Those caused by rotavirus (largely children under the age of six but occasionally in the elderly) tend to be more circumscribed and are commonest in healthcare and childcare settings while outbreaks of norovirus (winter vomiting illness), which can be very extensive, are seen in almost any setting but most commonly in hospitals, long-stay institutions, hotels and cruise ships. Viral gastroenteritis tends to produce quite watery diarrhoea.

Bloody diarrhoea strongly indicates bacterial infection (VTEC or *Shigella* but also *Salmonella* and *Campylobacter*). Fever suggests an invasive bacterial cause. Patients with bacterial gastroenteritis frequently feel very unwell with anorexia, malaise and weakness.

Infectious Diarrhoea: It is clinically important to differentiate, at any age, between those episodes of diarrhoea that may be of an infectious nature and those suggestive of inflammatory bowel disease or a discrete lesion. If a patient presents to primary care with diarrhoea, a careful history can be useful in differentiating between an infectious and a non-infectious aetiology.

Table 2: Assessment of Likelihood of Diarrhoea being Infectious in Origin¹³

Feature	History	Significance
Contact	Has the patient had contact with another case of diarrhoea or bloody diarrhoea?	If so this would support an infectious aetiology (but does not out rule a non-infectious source).
Exposures	Ask about exposures that would plausibly suggest an infectious aetiology?	For example: recent visit to petting zoo, or recent unusual contact with farm animals or consumption of well water (these are all well described risk factors for VTEC).
Recent Symptoms	Has the patient been well in recent weeks?	Infectious diarrhoea is usually acute, non-infectious diarrhoea tends to be rather less acute in onset.
Abdominal Pain	How severe is the abdominal pain?	Pain out of proportion to the severity of the diarrhoea is more indicative of an infectious aetiology.
Pyrexia	Is the patient febrile?	Although not a universally present sign of infectious intestinal disease, pyrexia is strongly suggestive of an infectious aetiology (pyrexia is a variable sign in children with VTEC infection: in adults with VTEC, pyrexia is uncommon).
Urinary Output	Is the patient oliguric?	Oliguria (or anuria) suggests dehydration. In the absence of dehydration, oliguria (especially in a child and particularly if accompanied by bloody diarrhoea) suggests the possibility of HUS.
Bloody Stools	If stool is bloody, what is the nature of the blood staining?	If blood is mixed through a liquid stool, this suggests an (infectious) haemorrhagic colitis (VTEC being the most important cause but <i>Salmonella</i> and <i>Campylobacter</i> are also relatively common causes, bacillary dysentery is another, less common cause); blood streaking of a solid stool's surface suggests a benign rectal bleed, commonly from haemorrhoids or an anal fissure.

12. See Appendix 4 for a list of foods with which particular pathogens are most frequently associated

13. Adapted from: Pollock KG, Stewart A, Beattie TJ, Todd WT, Ahn CK, Tarr PI, Cowden JM. From diarrhoea to haemolytic uraemic syndrome - when to seek advice. *J Med Microbiol.* 2009 Apr;58(Pt 4):397-8.

Bloody Diarrhoea: Bloody diarrhoea is a medical emergency at any age, but especially so in children under 15 years of age. In the developed world, bloody diarrhoea in children is 15-20 times more likely to be caused by intestinal infection than by inflammatory bowel disease (Wood, 2008). Any child presenting with bloody diarrhoea should be strongly suspected as having VTEC infection until proved otherwise, as VTEC is the commonest cause of haemorrhagic uraemic syndrome (HUS). HUS is an important cause of childhood renal failure. All paediatric cases of bloody diarrhoea should be assessed urgently.

Other Cases: Other family members/friends/colleagues may have had similar symptoms, suggesting the possibility of an outbreak. There may be an indication of a common point source (such as contaminated water or a meal at a wedding or a restaurant).

Foreign Travel. It is crucial to enquire as to the possibility of foreign travel.

2.2. Examination

The appearance of the patient and their state of hydration will give important pointers as to further management.

Do they appear well?
Are there signs of dehydration (e.g., diminished skin turgor, delayed

Examination

- **Looks unwell?**
- **Dehydration/Shock**
- **Tachycardia/tachypnoea**
- **Blood pressure**
- **Abdominal tenderness**
- **Pyrexia**

capillary refill time, low blood pressure, dry mucosal membranes/eyes, orthostatic hypotension, postural hypotension [see Appendix 6 for assessment of severity of dehydration in children])?

Severe illness (implying the possibility of invasive bacterial disease) would be suggested by one or more of the following features:

- Profuse watery diarrhoea with signs of hypovolaemia or impending shock
- Pyrexia $\geq 38.5^{\circ}\text{C}$
- Bloody diarrhoea (blood mixed through, not coating, the stool – a medical emergency especially in children, the elderly and the immunocompromised)
- Duration of symptoms >48 hours
- Severe abdominal pain (focal abdominal tenderness with rebound is suggestive of an inflammatory condition)
- recent history of antibiotic use in hospitalized patients

While degree of hydration is an important and useful pointer in the clinical management of adult cases of gastroenteritis, hydration is a vital sign in children (see Appendix 7).

Differential Diagnosis:

- **Appendicitis:** it is important to bear in mind that (especially in children) appendicitis can present with symptoms and signs suggestive of gastroenteritis and even if there is no sign of an acute abdomen at the time of the examination - be prepared to repeat the examination as signs can appear later.
- **Mesenteric adenitis** often preceded by a viral pharyngitis in children can also mimic an acute abdomen or early gastroenteritis. If the abdomen is distended, listen for bowel sounds.
- **Meningitis:** it is vital to outrule meningitis (nuchal rigidity, altered level of consciousness, non-blanching rash, peripheral shutdown)
- Occasionally, urinary tract infection, pneumonia, otitis media or septicaemia may present with diarrhoea and/or vomiting.

If **ANY** of the following are present,¹⁴ consider an alternative diagnosis to IID:

- Fever:
 - Temperature of 38°C or more in children younger than 3 months of age
 - Temperature of 39°C or more in children 3 months of age or older
- Shortness of breath or tachypnoea
- Altered conscious state
- Neck stiffness
- Bulging fontanelle in infants
- Non-blanching rash
- Blood and/or mucus in stool
- Bilious (green) vomit
- Severe or localized abdominal pain.
- Abdominal distension or rebound tenderness

Appendices 5 and 6 outline the clinical approach to adult and paediatric cases of acute diarrhoea, respectively, while Appendix 8 outlines the clinical features of infection with selected diarrhoeal pathogens.

14 . NICE (2009) Diarrhoea and vomiting in children under 5 (NICE guideline). Available at <http://www.nice.org.uk/guidance/CG84/NiceGuidance/doc/English>.

Microbiological Stool Examination: Microbiological stool examination is not necessary in every case of gastroenteritis, but there are certain instances where this may be indicated for clinical and/or public health reasons:

- Where features indicate the **clinical need:**
 - Severe illness
 - Bloody diarrhoea
 - Fever
 - Constitutional symptoms lasting > 5 days
 - Diarrhoea lasting > 5 days
 - Co-morbidity that is likely to result in complications (e.g. concomitant inflammatory bowel disease or medically complicated cases where the diagnosis is in doubt).
- If the patient is **very young** (i.e. a baby/small child) or **very elderly**.
- In general, patients who are known to be **moderately or severely immunosuppressed** (due to untreated AIDS, disseminated carcinomatosis or immunosuppressive or anti-cancer therapy) are at risk of prolonged severe gastroenteritis from the common pathogens (including *Campylobacter*, *Salmonella*, *Cryptosporidium* and VTEC). On presentation, such patients should have their stool routinely examined for the common bacterial and parasitic pathogens.
- Where there is a public health risk because the patient is in a **Risk Group** (page 11).
- Where there is a public health risk because the case may be part of an **outbreak** (have there been other cases of similar illness among family members, work colleagues, friends with whom the patient socialised or dined?).

Investigation

Submit a stool sample if:

- **Clinical need**
- **Very young/old**
- **Immunocompromised**
- **Risk Group**
- **? Part of an outbreak**

The above is a general rule-of-thumb; under certain specific circumstances (e.g. during active case finding as part of an outbreak investigation) it may be necessary to sample much more widely.

It is important that all practitioners acquaint themselves with the local testing regimes for stool samples in their local laboratory.

3. Clinical Management

In order to facilitate management and to remove some of the uncertainty that surrounds the diagnosis of gastroenteritis, the following are intended as clinical and public health pointers. In general, from the perspective of the general public, all cases of diarrhoea should be considered to be infectious and patients presenting with diarrhoea should be urged to remain off work until they are symptom-free for 48 hours.

The causative agent for most cases of gastroenteritis is never identified; management is not usually dependent upon cause. In the vast majority of cases, gastroenteritis (regardless of the origin) will resolve spontaneously on simple measure such as:

- General supportive measures
- Maintenance of hydration.

Fasting is not necessary if the patient feels able to eat. Patients should avoid spicy and fatty food until their bowel habits have returned to normal.

The initial management of patients with gastroenteritis involves the use of general supportive measures (including rest if severe illness), alteration of diet (typically brief fasting) and maintenance of hydration.

Management + Advice

- **No anti-diarrhoeals**
- **No antibiotics unless specific indication**
- **Rehydration**
- **Enteric hygiene advice**
- **Work/school exclusion**

3.1. Hydration

The most decisive intervention in the management of gastroenteritis is the use of appropriate rehydration measures, preferably by the oral route and using solutions that contain water, salt and sugar,¹⁵ especially if the patient has frequent or severe diarrhoea or is vomiting. Oral rehydration is particularly valuable in the management of paediatric gastroenteritis.

There is compelling evidence that oral rehydration therapy is underused in the developed world. It is estimated that appropriate use of this form of rehydration could reduce paediatric admissions in the US by 100,000 hospitalisations per year.¹⁶ Oral Rehydration Solutions (ORS) containing glucose and sodium chloride permit effective rehydration because, even in those conditions that affect the mucosa of the small bowel, the intestine maintains its ability to absorb water if glucose and salt are present, as these compounds promote the transport of water from the intestinal lumen. ORS are available in commercially prepared sachets

The World Health Organization recommends that ORS should be used in the prevention and treatment of dehydration due to diarrhoea. The WHO recommends the following formulation for ORS: Sodium Chloride (2.6g), Trisodium Citrate Dihydrate (2.9g), Potassium Chloride (1.5g) and Anhydrous Glucose (13.5g) reconstituted using one litre of potable water.¹⁷

15. Wanke CA. Approach to the adult with acute diarrhoea in developed countries. UpToDate available at <http://www.uptodate.com/contents/approach-to-the-adult-with-acute-diarrhea-in-developed-countries>

16. Santosham M, Keenan EM, Tulloch J, et al. Oral rehydration therapy for diarrhea: an example of reverse transfer of technology. *Pediatrics* 1997; 100:E10.

17. World Health Organization. Monographs: Dosage forms: Specific monographs: Sales perorales ad rehydratationem - Oral

It is important for the patient to re-establish normal eating patterns as soon as possible. Adequate nutrition is important to ensure renewal of enterocytes and a return to healthy absorption and transport of salts and nutrients.

Hydration is a key pointer in the assessment of children (and, to a lesser extent, in adults) with diarrhoea. The Centers for Disease Control and Prevention guidance relating to rehydration in the management of acute gastroenteritis among children¹⁸ indicates that oral rehydration therapy is the preferred treatment of fluid and electrolytes lost by diarrhoea in children with mild-to-moderate dehydration.

3.2. Anti-diarrhoeal Therapy

There is no clinical indication for the use of anti-diarrhoeal and anti-emetic medication in the management of acute gastroenteritis.

3.3. Antibiotics

Antibiotics are **only very rarely indicated** for the treatment of diarrhoea since the illness is usually self-limiting. They should be reserved for special circumstances where there is evidence of invasive enteric bacterial disease or other special circumstances, such as antiprotozoal treatment of giardiasis. In general, a decision to prescribe antimicrobial agents for diarrhoea should be taken in consultation with a Consultant in Public Health Medicine, a Consultant Microbiologist or Infectious Disease Physician and should be reserved for severe invasive bacterial disease. In general patients who require antibiotic therapy for suspected invasive disease are likely to require hospital assessment. Antibiotic resistance in bacteria associated with diarrhoea is an increasing concern therefore, wherever possible, choice of antibiotic should be dictated by definitive identification of the specific bacterium and its sensitivity profile. Typhoid and Paratyphoid deserve special mention as they require treatment with antibiotics but generally present with systemic disease, gastrointestinal presentation being very common.

3.4. Enteric Hygiene Advice

The following advice should be offered to **all** cases of gastroenteritis:

1. **Handwashing:** thorough handwashing with soap and warm water is the most effective way of preventing spread of enteric pathogens. This is particularly important for

healthcare workers, food handlers and those working with the elderly and the young.

2. **Disposal:** At home, sick people should normally use a flush toilet. Bedpans, commode pans and urinals should be emptied into the toilet bowl and then washed with hot water and detergent. Soiled clothing and bed linen should be washed separately from other clothes in a domestic washing machine at the highest temperature that they will tolerate (see page 13).
3. **Spillages:** spillages and contamination with faeces or vomitus should be cleaned immediately. Full information on cleaning and decontamination is available on the [HPSC's website](#).
4. **Education:** patients should be educated in the hygienic preparation and serving of food (**safefood** have excellent [resources](#) on their website).
5. **Exclusion:** Any patient who presents with diarrhoea and/or vomiting from any infectious cause should not return to work for 48 hours after resolution of their symptoms. Patients continue to shed pathogens for that first 48 hours and are at risk of introducing infection into the workplace. In the case of more serious illness such as shigellosis, VTEC infection and typhoid, your local Department of Public Health can advise on the requirements regarding exclusion.
6. **Exposure prone Groups:** these are group who are at greater risk of **contracting** a particular infectious intestinal disease due to their being more likely to come into contact with a particular pathogen; these vary depending on the disease in question (exposure prone groups for each pathogen are listed in the relevant pathogen's section). Such groups should be targeted with enteric hygiene advice to reduce the likelihood of contracting disease.
7. **Vulnerable Groups:** these are groups which, following exposure, have an **increased likelihood of developing severe disease**. They include:
 - The very young
 - The very old
 - The most marginalised in society and
 - Those with weakened immune systems, and include patients taking immunosuppressive medication (such as anticancer medication or steroids) and those with chronic disease that weakens the immune system including HIV/AIDS.

As such groups are at risk of severe disease, they should be actively targeted with enteric hygiene advice to reduce of contracting disease.
8. **Risk Groups:** (p11) Risk Groups differ from Vulnerable Groups. Risk Groups pose a greater than average risk of **transmitting** infectious intestinal disease. These include:

rehydration salts. Available at:

<http://apps.who.int/phint/en/p/docf>. Accessed 20/7/2011.

18 . King CK, Glass R, Bresee JS, Duggan C; Centers for Disease Control and Prevention. Managing acute gastroenteritis among children: oral rehydration, maintenance, and nutritional therapy. MMWR Recomm Rep. 2003 Nov 21;52(RR-16):1-16.

- High-risk food handlers
- Healthcare and childcare workers
- Children under the age of 5 and
- Individuals with poorly developed personal hygiene.

These individuals should be targeted with hygiene advice and may require extended periods of exclusion depending on which pathogen is responsible for their illness. Stool samples should always be considered in individuals falling into these Risk Groups. If in doubt, discuss with your local Consultant in Public Health Medicine.

Individual Diseases

The following pages outline the clinical and public health approaches to the commoner pathogens.

1. *Bacillus cereus* food-borne illness

(Notifiable)

Description: *Bacillus cereus* is a gram positive rod shaped spore forming bacterium. It may lead to foodborne illness with two different clinical presentations depending on the toxin involved. It can cause quite extensive outbreaks of illness. *B. cereus* is ubiquitous in the environment and is frequently found in raw, dried and processed food. It is not infrequently found in asymptomatic subjects.

Annual Numbers: about one case per year, on average.

Seasonal Distribution: There is no seasonal pattern of incidence.

Causative Agent: *B. cereus* intoxication produces two distinct types of illness, an emetic type and a diarrhoeal type, caused by two distinct metabolites. *B. cereus* proliferation in food results in the release of one of two toxins; a heat-stable emetic toxin (*syn. cereulide*) that causes a short incubation vomiting syndrome and a heat-labile enterotoxin that produces a longer incubation diarrhoeal syndrome.

Reservoir: Worldwide; no human or animal sources. The organism is ubiquitous in the environment and is found at low levels in many fresh and processed foods. Fried rice is the food most notably associated with *B. cereus* infection but pasta, cream dishes, meatballs, poultry and baked meat dishes such as meatloaf have been implicated in outbreaks.

Transmission: It is almost exclusively a foodborne illness due to temperature abuse of cooked food prior to reheating. If temperature abuse occurs during cooling the spores that survived cooking germinate and multiply, leading to hazardous levels of vegetative cells and/or toxins in the food at the time of consumption.

- The emetic intoxication is due to the ingestion of preformed cereulide toxin in the food where the *B. cereus* levels exceeds 105 cfu/g. Cereulide toxin can withstand temperatures in excess of 120°C for 90 minutes and is not inactivated by re-heating food. The dose of enterotoxin required to produce human illness is relatively large.
- The diarrhoeal syndrome is due to inadequate reheating of food contaminated with *B. cereus* (at levels exceeding 106 cfu/g) and/or its heat-labile diarrhoeal enterotoxin. Large numbers of the bacteria are required to cause illness.

Poisoning with toxigenic *B. cereus* is best prevented by storing properly cooked foods at above 60°C or below 10°C before re-heating or consumption.

Outbreak Potential: *B. cereus* has moderate to high outbreak potential if transmitted through food.

Incubation period: In general, 2-3 hours (range 0.5-6hr) for the emetic form and 8-12 hours (range 6-24) for the diarrhoeal form.

Period of communicability: *B. cereus* is not a contagious pathogen.

Epidemiology: Incorrect food preparation, particularly temperature abuse, poor hygiene during canning or inadequate reheating (especially in congregate setting such as restaurants and schools) pose the greatest risk of causing illness. Outbreaks tend to have high attack rates (in excess of 50%).

Exposure-prone groups: Those exposed to contaminated foods, food handlers, residents in residential institutions.

Clinical Features:

- The emetic form presents with vomiting, nausea, abdominal pain and occasionally late onset diarrhoea which can resemble *S. aureus* food poisoning in its symptoms and incubation period. This is usually mild, lasting less than 12 hours.
- The diarrhoeal form usually presents with abdominal pain, diarrhoea (often watery and profuse) and tenesmus occasionally followed after by mild nausea and diarrhoea. Symptoms generally subside after 24 hours. The diarrhoeal form may be difficult to distinguish from *Clostridium perfringens* foodborne intoxication.

Clinical Management of Cases: Rehydration and enteric precautions are all that are required. Information on enteric precautions should be provided by the attending physician. The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Public Health Management of Cases: Obtain a three day food history (particularly meals consumed out of the house and rice meals in particular) and determine if others may have consumed the same food. Determine if there are linked cases.

Food Hygiene Implications: Food hygiene re-education is necessary for food handlers.

Public Health Management of Contacts: Not applicable as it is not communicable from person to person.

Exclusion: Although secondary spread does not occur, it is prudent to exclude risk groups with diarrhoea or vomiting until 48 hours after recovery.

Microbiological Clearance: Not required.

Notifiable: to the local [Medical Officer of Health](#).

2. Botulism

(Notifiable)

Description: *Clostridium botulinum* (and more rarely other *Clostridia* including *Cl. butyricum*), spore forming anaerobes, can carry one of a range of neuroparalytic toxins that produce a progressive neuroparalytic syndrome that is fatal in 5-10% of cases.

Annual Numbers: an average of one case per year in Ireland.

Seasonal Distribution: There is no seasonal pattern of incidence.

Causative Agent: Botulism neurotoxin (BoNT) is responsible for the clinical syndrome and belongs to one of six alphabetically named groups; only A, B, E and very rarely F result in human illness. Botulism is a clinical and public health emergency. BoNT blocks the release of acetylcholine at the neuromuscular junction resulting in a descending flaccid paralysis.

Reservoir: *Cl. botulinum* is widely distributed in nature, being particularly prevalent in soil and aquatic and marine sediment. It is found in the gastrointestinal tract of most mammals including humans.

Transmission: There are six naturally occurring modes of transmission, three of which account for the vast majority of cases:

- **Foodborne botulism:** occurs when the spores of *Cl. botulinum* have germinated and the bacteria have reproduced in food and produced BoNT. If the food is consumed, depending on the dose of BoNT (only a tiny dose is required – BoNT is, weight-for-weight, one of the most powerful natural toxins), the patient becomes intoxicated hours or days after consumption of the food, depending on the dose of BoNT consumed. Early onset suggests a larger dose of BoNT and the likelihood of a more severe course to the illness. Outbreaks of food-borne botulism have potential to be a public health emergency because the contaminated food may be eaten by other people.
- **Infant botulism:** (also referred to as intestinal botulism) most common in infants less than six months, is extremely rare (fewer than 80 cases are reported in the US each year and only one ever recorded in Ireland in 2011). This occurs when the baby ingests *Clostridium* spores which germinate in the gut and release toxin. Infants may be at special risk because their bowel flora is not sufficiently developed to be able to displace *Clostridium*.

- **Wound botulism:** has the same symptoms as other forms, but occurs when the organism enters an open wound and is able to reproduce in the anaerobic environment provided within and beneath the dermis. Cases have been associated with injecting drug users. **NB: Wound botulism should be considered in any IDU with acute onset illness or sudden death characterised by soft tissue sepsis (abscess, cellulitis, fasciitis or myositis) and severe toxicity.**

In the case of wound botulism in an IDU; **unless there is no doubt that an infected wound is the source of the patient's botulism, a food history should always be obtained to ensure that no potential foodborne source is overlooked.**

Other possible routes of infection:

Accidental botulism may follow mis-injection of pharmaceutical preparations of botulinum neurotoxin. Four cases occurred in December 2004 in Florida following cosmetic injection with botulinum toxin that was not approved for human use.

Inhalation botulism does not occur naturally, but has been demonstrated in model systems and in real cases (three cases were reported in 1962 in veterinary technicians in Germany). Aerosolised toxin is a potential route for deliberate release by bioterrorists.

Water-borne botulism may also be caused by ingestion of pre-formed toxin. This route will only pose a risk to human in some deliberate release scenarios because the toxin is inactivated by normal treatment of mains water supplies. There have been no reported cases of illness in humans worldwide due to contaminated water supplies.

Outbreak Potential: *Cl. botulinum* has moderate to high outbreak potential if transmitted through food. Asymptomatic excretion is common but of minimal clinical significance.

Incubation period: If foodborne, typically 12-36 hours (but may be up to 30 days following consumption of food). In the case of infant botulism, it is often impossible to determine when exposure occurs and so incubation cannot be calculated reliably, but an exposure interval of 30 days before onset of symptoms should be used to determine potential exposures. The same is true for wound botulism especially if associated with intravenous drug use, although 10 days is taken by many authorities, as a typical incubation period for wound botulism.

Period of communicability: Botulism is not a contagious condition.

Epidemiology: *Clostridia* and their spores are ubiquitous in the environment. While certain studies have identified BoNT type A as being more common in the Western US, Type B is more commonly found in the Eastern US and Type C is the most common form in the UK and Ireland. It is likely that all three neurotoxins are

widely distributed in nature. Type E tends to be found more in aquatic environments. All have essentially similar clinical impact.

Exposure-prone groups: Infants, those who prepare/consume home-canned food, IDUs.

Clinical Features:

Symptoms generally begin with blurred vision, dry mouth and bulbar signs including difficulty in swallowing and speaking. Occasionally, diarrhoea and vomiting occur.

Visual disturbances and a flaccid, symmetrical, descending paralysis follow. Death generally results from respiratory paralysis. Residual weakness is common following recovery.

Clinical Management of Cases: Isolation of the patient is not required. Handwashing is necessary following handling of soiled personal garments including nappies in the case of infant cases. Infant botulism is associated with honey administration, aquatic reptiles and recent, nearby dusty construction work. These risk factors should be sought.

Polyvalent botulinum antitoxin should be administered as soon as condition suspected and clinical samples obtained.

Antitoxin supply and administration: available from

**Duty Medical Officer
Cherry Orchard Hospital
Tel: 01 620 6000**

who authorises delivery of anti-toxin. **Anti-toxin administration should NOT BE DELAYED pending microbiology/toxin testing results.** Turnaround times for reliable negative results can be up to one week.

Hospital pharmacy should be informed of request.

**NB: Botulism is a clinical and public health emergency
Look for blurred vision, dry mouth and difficulty swallowing and speaking**

Take an urgent food history and try to rapidly determine if others (in same household/workplace/friends etc) may have consumed the same food. Determine if case is in a risk category.

Report urgently to Public Health (and speak with the Consultant on call) any suspected cases of botulism so that a thorough investigation/risk assessment can be undertaken.

The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Public Health Management of Cases: Obtain an urgent full food history (unless in a case of wound botulism where the wound is considered, with complete certainty, to be the source of the infection). Determine if there are linked cases or common food exposure. Rapidly interview and assess such people.

Public Health Management of Contacts: none necessary, unless they consumed the same food as consumed by a case transmitted by foodborne route.

Food Hygiene Implications: Food hygiene re-education is necessary for food handlers.

Exclusion: Nil necessary.

Microbiological Clearance: Not required for adults but clearance might be considered prudent in infant cases. This should be discussed with the attending microbiologist.

Notifiable: to the local [Medical Officer of Health](#).

Resources: National botulism surveillance forms are available from the HPSC website at <http://www.hpsc.ie/hpsc/A-Z/Gastroenteric/Botulism> .

**Antitoxin is available from:
Duty Medical Officer
Cherry Orchard Hospital
Tel: 01 620 6000.**

3. Campylobacteriosis

(Notifiable)

Description: *Campylobacter* produces a diarrhoeal and systemic illness. Its public health importance lies in the fact that it is the commonest bacterial cause of IID in Ireland.

Annual Numbers: There are between 1600 and 1900 cases reported in Ireland each year.

Seasonal Distribution: There is a seasonal peak in May-June each year.

Causative Agent: *Campylobacter* are helical Gram-negative bacteria. *C. jejuni* is the species most frequently seen. *C. coli*, *C. lari* and *C. fetus* are much less common. Quite a low infectious dose (fewer than 500 cells is required to produce illness).

Reservoir: Campylobacteriosis is a zoonotic infection. *C. jejuni* is associated primarily with poultry but also cattle and domestic pets. *C. coli* is associated with pigs and poultry and *C. fetus* with cattle. Asymptomatic carriage is not uncommon.

Transmission:

Primary: Ingestion of contaminated food or water. It is likely that about 80% of campylobacteriosis cases are transmitted by food. Poultry especially chicken is the primary reservoir.

Secondary: Person-to-person spread can occur if hygiene is poor. Transmission is also possible from contact with infected pets or animals. Milk borne transmission is well described from raw milk.

Outbreak Potential: *Campylobacter* has low outbreak potential if transmitted through food and moderate outbreak potential if transmitted through water.

Incubation period: Medium: typically 3 days (range 2-5 days). Range may vary from 1-10 days depending on infectious dose and physical condition of patient. Median symptom duration is about 7 days.

Period of communicability: Generally while organism is present in the stool, but much more infectious while symptomatic. Infectivity can last as long as 7 weeks. Excretion of bacteria falls exponentially following resolution of gastrointestinal symptoms at which point risk of onward transmission becomes very low.

Epidemiology: The infective dose is low (as few as 500 cells) are needed to cause infection. It is mostly foodborne (raw/undercooked poultry, unpasteurised milk or dairy products, sausages and undercooked pork and milk - raw or from bird-pecked bottles). Water (untreated water supplies, sea swimming) is also an important route of infection. Other risk factors include travel abroad, contact with dogs and cats (particular risk for children). *Campylobacter* does not readily cause outbreaks and those that occur tend to be small.

Campylobacter does not replicate on food. Transmission from foodhandlers is very rare.

Clinical Features: Profuse diarrhoea, which is bloody in at least one quarter of cases. Headache, abdominal pain and fever (at least 75% of cases), which are often prodromal, can be very prominent. Vomiting is uncommon. Infection may be mild or subclinical. Median duration of diarrhoea is 6 days (7 in children), duration of more than 10 days is unusual. Rare complications include haemolytic uraemic syndrome (HUS), thrombocytopenia and perforation of ileum. Sequelae include reactive arthritis (within three weeks of infection) (1:100 campylobacteriosis cases) and Guillain-Barré syndrome (GBS) (1:1000 campylobacteriosis cases are complicated by GBS). *Campylobacter* infection is suspected as the cause in approximately 30% of all GBS cases. In addition, campylobacteriosis is associated with a thrombotic thrombocytopenic purpura (TTP) syndrome.

Exposure-prone groups:

Small children (especially toddlers), residents in institutions, food handlers, diners at barbecues, those consuming home prepared poultry and dog owners.

Clinical Management of

Cases: Enteric precautions and rehydration are all that are required. Information on enteric precautions should be provided by the attending physician – a follow up letter can also be provided. The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Public Health Management of Cases: unnecessary unless part of a confirmed or suspected outbreak.

Food Hygiene Implications: Food hygiene re-education may be necessary for food handlers.

Public Health Management of Contacts: Nil required except to advise that if symptoms develop, they manage conservatively at home unless so symptoms become severe.

Exclusion: Until 48 hours after first normal stool.

Microbiological Clearance: Not required.

Notifiable: to the local [Medical Officer of Health](#).

Campylobacter tends not to produce extensive, general outbreaks – outbreaks, when they occur, tend to be restricted to families.

4. Cholera

(Urgently Notifiable)

Description: *Vibrio cholerae* produces a life threatening secretory diarrhoea. Cholera is endemic in the poorest countries of Asia, Africa and South America that have inadequate sanitation and lack of clean drinking water. It is becoming endemic in an increasing number of countries around the world. Its public health importance lies in the potential for onward transmission in Ireland from infected individuals returning to Ireland. There is rarely more than one case each year in Ireland.

Annual Numbers: Less than one case per year.

Seasonal Distribution: There is no seasonal pattern of incidence.

Causative Agent: Classic *Vibrio cholerae* (serogroups O1 and O139) and *V. cholerae* biotype El Tor (responsible for the Seventh Cholera Pandemic beginning in 1961). Clinical disease is mediated by the production of a powerful enterotoxin. The latest biotype "El Tor" differs from classical cholera in having a greater capacity to become endemic and have a slightly increased infectivity.

Reservoir: Marine and freshwater aquatic environments where vibrios can survive for years. Contaminated water forms the reservoir of vibrios with humans as the only host. *V. cholerae* has been shown to survive for up to 14 days in food. They are readily killed by human stomach acid.

Transmission:

Primary: Ingestion of water or food (e.g. raw or undercooked shellfish, foods washed in contaminated water) contaminated with the faeces or vomitus of infected persons is the predominant method of transmission of cholera. Foodborne transmission probably accounts for about 60% of cases in the developed world.

Secondary: Person to person transmission is not a major method of spread but transmission by ready to eat food touched by contaminated hands is possibly important for onward transmission within households.

Outbreak Potential: *Vibrio cholerae* has moderate outbreak potential if transmitted through food and high outbreak potential if transmitted through water. Asymptomatic carriage of cholera strains is unusual but the carrier state may occur with El Tor strains.

Incubation period: Short: 6-48 hours but may be as long as 3 days.

Period of communicability: Patients are infectious from the onset of symptoms until seven days after resolution of diarrhoea. The carrier state may develop and persist for a few months. Very rarely, chronic biliary carriage

can develop in adults with intermittent shedding can persist for years.

Epidemiology: The infectious dose is large – generally greater than 10^6 organisms are required to produce significant illness. Cholera is rare in Ireland, with only single, sporadic cases being notified annually since 1998. The very slight increase is probably related to the increased amount of travel to, and numbers of people coming to Ireland from, areas where cholera is endemic.

Exposure-prone groups: Travellers to endemic areas.

Clinical Features: The classical form is characterised by sudden onset profuse, painless, watery stools ('rice-water' or 'chicken-soup' stools), nausea and vomiting; rapid dehydration, hypotension and eventually shock – stool volumes can be as high as 30 litres per day. Untreated, severe cases have greater than a 50% case fatality rate.

Cholera tends to produce copious diarrhoea, vomiting and eventually hypotension and shock

With effective treatment, using fluid and electrolyte replacement, mortality readily falls to less than 1%. Most cases however are asymptomatic.

Clinical Management of Cases:

Rehydration and enteric precautions. More severe cases are generally admitted to the care of an Infectious Diseases Specialist. Milder cases can be managed on an outpatient basis.

Cases require rapid and adequate rehydration. *Vibrio cholerae* preserves the mucosal cells and absorption is generally unaffected meaning oral rehydration can be extremely effective. Intravenous rehydration is generally only required for those who are shocked or exhausted.

In the cases of severe or prolonged disease or disease in the elderly, shocked or debilitated, chemotherapy may be indicated. Oral tetracyclines (or alternatives such as ciprofloxacin if isolate is tetracycline-resistant or parenteral administration is necessary) can effectively shorten the duration and severity of diarrhoea.

Obtain history on travel, exposure to water and food consumption during three days prior to onset of symptoms. The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Public Health management of Cases: Determine if there are linked cases.

Food Hygiene Implications: Food hygiene re-education is necessary for food handlers.

Public Health Management of Contacts: Clinical surveillance of contacts who shared food and drink with a case for five days. If secondary transmission is thought to be likely, chemoprophylaxis (tetracycline, doxycycline or erythromycin) should be administered. Cholera vaccination does not have a role in the management of contacts. No cholera vaccine is currently licensed in Ireland.

Exclusion: Until 48 hours after first normal stool.

Microbiological Clearance: For patients in Risk Group 1, two consecutive negative samples taken at least 48hr apart

Notifiable: **urgently** to the local [Medical Officer of Health](#).

5. *Clostridium perfringens* (Type A) food-borne Intoxication

(Notifiable)

Description: *Clostridium perfringens* (formerly *C. welchii*) *Clostridium perfringens* is a spore-forming foodborne pathogen that produces a mild gastroenteritis caused by an enterotoxin. It results mainly in sporadic disease but can occasionally produce outbreaks.

Annual Numbers: About one case per year.

Seasonal Distribution: There is no seasonal pattern of incidence.

Causative Agent: *Clostridium perfringens* produces a mild self limiting gastroenteric illness mediated by an enterotoxin. Asymptomatic carriage is not uncommon. Type A is the form most commonly seen in the UK and Ireland. This strain also produces gas gangrene. Severe extensive outbreaks of the Type C strain (pigbel - a severe necrotising enteritis with a high case fatality rate) followed the Second World War in Germany, and are still seen in Indonesia and Papua New Guinea.

Reservoir: Worldwide in man and other vertebrates. Found also in soil, aquatic and marine sediment. Asymptomatic carriage is extremely common.

Transmission: Almost exclusively foodborne transmission due to inadequate heating or reheating of meat based foods, such as stews and pies, especially if the food has been contaminated by soil or faeces. Spores survive cooking to germinate and grow during cooling. If the food is not reheated properly, the organism multiplies in the lower GI tract releasing enterotoxin. The dose of enterotoxin required to produce human illness is large.

Outbreak Potential: *Clostridium perfringens* has moderate outbreak potential if transmitted through food.

Incubation period: Generally 10-12 hours (range 6-26).

Period of communicability: Not applicable

Epidemiology: Incorrect food preparation, poor hygiene during canning or inadequate reheating. Congregate setting such as restaurants or schools poses the greatest risk. Large scale meal preparation increases the potential that food may not be adequately reheated. Heavy bacterial contamination (>10⁵ bacteria/gram of food) is generally required to produce adult disease.

Exposure-prone groups: Residents in institutions, those consuming contaminated food and food handlers.

Clinical Features: Sudden onset colic followed by watery, copious diarrhoea and nausea. Vomiting and

fever are generally absent. The duration is short, usually less than 24 hours.

Clinical Management of Cases: Enteric precautions. Admit to hospital if necessary. The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category. Simple rehydration is generally all that is necessary.

Public Health Management of Cases: Determine if there are linked cases. Obtain food history for three days prior to symptoms.

Food Hygiene Implications: Food hygiene re-education is necessary for food handlers.

Public Health Management of Contacts: Not applicable.

Exclusion: Until 48 hours after first normal stool.

Microbiological Clearance: Not required.

Notifiable: to the local [Medical Officer of Health](#).

6. Clostridium difficile-associated disease (CDAD)

(Notifiable)

Description: *Clostridium difficile* produces a diarrhoeal disease that varies in severity from asymptomatic colonisation to severe diarrhoea and complicating colitis. It has become a common cause of hospital acquired infections. *C. difficile*-associated disease (CDAD) is nearly always associated with, and triggered by, the use of antibiotics in elderly or debilitated hospitalised patients. Its public health importance lies in the scale of illness, the severity of disease, the emergence of strains producing more damaging toxins and in the disruption produced in hospitals and nursing homes. HPSC has published extensive national expert guidance on the management of [CDAD](#).

Annual Numbers: About 1,500 cases per year.

Seasonal Distribution: There is no defined seasonal pattern of incidence.

Causative Agent: *C. difficile* induces tissue damage through the toxins that it produces. These toxins are enterotoxins (toxin A and toxin B).

Reservoir: The human gastrointestinal tract. It is part of the normal gut flora of children under two (asymptomatic colonisation *C. difficile* can be present in up to 80% of healthy newborns and infants). Asymptomatic carriage is seen in about 3% of healthy adults and up to one-quarter of hospital patients. Spores can survive for extended periods in the environment.

Transmission:

Primary: person to person is a highly significant method of transmission. Transmission is by the faecal oral route and environmental contamination. Hospital equipment such as commodes, bedrails, and bedpans are the areas most likely to be contaminated.

Transmission to healthcare staff, although reported, is rare. Transmission is very unlikely from an asymptomatic carrier. *C. difficile* has moderate outbreak potential when transmitted from person to person.

Outbreak Potential: *C. difficile* has moderate to high outbreak potential, particularly in healthcare settings.

Incubation period: The important epidemiological period for *C. difficile* is the period between initiation of antibiotics and development of diarrhoea and this is typically between 5 and 10 days after commencement of antibiotic therapy but may be prolonged up to ten weeks after.

Period of communicability: This can be difficult to determine as asymptomatic patients and those who have been successfully treated may shed the organism in their stools.

Epidemiology: Infection is particularly associated with antibiotic (especially broad spectrum antibiotics) use, which disrupts the normal flora of the gut rendering it susceptible to colonisation by and proliferation of *C. difficile*. Risk factors include recent antibiotic administration, advancing age, recent gastrointestinal surgery or procedures, immunosuppressive therapy and concurrent illness. Clusters and outbreaks have only been described in hospital and nursing homes.

Exposure-prone groups: Hospital patients, residents in institutions, healthcare workers and those on broad-spectrum antibiotics.

Clinical Features: Typical features include diarrhoea, fever, loss of appetite, nausea, abdominal pain/tenderness. In most patients, the illness is mild and they usually make a full recovery. However elderly patients may become seriously ill with dehydration as a consequence of the diarrhoea. Prior antibiotic therapy, significant diarrhoea (> three partially formed or watery stools per 24 hour period), and abdominal pain

CDAD is mainly associated with healthcare settings – recent broad spectrum antibiotic use often precedes illness

have been shown to be independent predictors for toxin-producing *C. difficile*. CDAD tends to present as diarrhoea, abdominal cramps, fever and leucocytosis. Pseudomembranous colitis (PMC) is the most severe complication producing a pan-colitis characterised by fever, pain and decreased gut motility often with only mild diarrhoea. It is important to note that severe disease may present as abdominal pain and distension without diarrhoea.

Clinical Management of Cases: Most cases will be identified in hospital/long stay institution and the two most important interventions will be application of enteric and standard precautions to prevent further cases.

- If infection occurs in a hospitalised patient, isolation or cohorting of affected patients is required.
- If safe to do so, all current antibiotics should be discontinued. If continuation of antibiotic therapy is clinically indicated, transfer to one with a lower likelihood of inducing CDAD may be possible. Normally this should be in consultation with a Consultant Microbiologist or Infectious Disease Physician.
- Antidiarrhoeal or antimotility agents are not indicated. Obtain medical microbiological advice on alternative antibiotic treatment - currently metronidazole or vancomycin (in pregnancy or those intolerant of metronidazole) are the antibiotics of choice. Severe, complicated disease may require colectomy. Determine if case is in a risk category.

The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Public Health Management of Cases: Public Health action may be required for cases in community institutions which do not have ready access to a clinical microbiologist. As in a hospital setting, the priorities will be instituting of enteric and standard precautions to prevent onward transmission. Determine if cases are potentially linked.

Management of Contacts: Monitor susceptible contacts (elderly, those on antibiotics)

Exclusion: Until 48hr after first normal stool. There is no need to exclude asymptomatic carriers from nursing homes once hygiene levels are acceptable. Repeat testing when clinical features have resolved (for microbiological clearance) is not appropriate.

Microbiological Clearance: Not required.

Notifiable: to the local [Medical Officer of Health](#).

7. Cryptosporidiosis

(Notifiable)

Description: *Cryptosporidium* is a protozoal parasite that generally produces an unpleasant but (in healthy individuals) self-limiting intestinal infection. Its public health importance lies in its ability to generate large waterborne outbreaks (following contamination of drinking water supplies) and the severe, protracted disease in immunocompromised individuals.

Annual Numbers: Between 400 and 600 cases per year. Ireland has the highest cryptosporidiosis notification rate in the EU.

Seasonal Distribution: There is a seasonal peak in spring time corresponding with the lambing/calving season.

Causative Agent: *Cryptosporidium hominis* (formerly known as *C. parvum* genotype 1) and *C. parvum* (formerly *C. parvum* genotype 2). Parasites of both genogroups produce disease by attachment to surface epithelial cells that line the gastrointestinal tract. Cryptosporidia are resilient; they are highly resistant to standard levels of chlorination in drinking water and can only be counteracted by removal using fine filters (sand or artificial filters less than 1µm) or boiling water to kill the oocysts (water needs only to be brought to the boil to kill *Cryptosporidia*; it does not have to be boiled for any length of time). Parasitic oocysts can survive in the environment for many months in moist conditions. Previous infection induces some degree of protective immunity.

Reservoir: The gastrointestinal tract of humans (*C. hominis*) and animals (*C. parvum*) including cattle, sheep, pigs, cats, dogs, poultry and fish. Asymptomatic carriage ranges from less than 1% to more than 3%.

Transmission:

Primary: Transmission is through ingestion of water or food contaminated with the faeces of an infected human or animal. It is likely that more than 90% of cases will be transmitted through water. High risk foods include fresh produce irrigated with inadequately treated water. Direct contact with animals and swimming pools are increasingly recognised as important transmission routes.

Secondary: Person to person transmission can be a significant feature of spread particularly in the case of shedding food handlers.

Outbreak Potential: *Cryptosporidium* has moderate to high outbreak potential if transmitted through food or by person to person and a very high to extremely high outbreak potential if

Cryptosporidium is capable of producing extensive outbreaks – most cases are transmitted via water

transmitted through water.

Incubation period: Medium-Long: typically 7-10 days but a range of 1-28 days has been reported.

Period of communicability: Cases remain infectious for as long as viable oocysts are excreted in the stool - certainly while diarrhoea is present. Patients generally remain infectious for between two and four weeks. Shedding may continue for up to two months after symptoms subside. Symptoms last between one and four weeks. In the severely immunosuppressed, *Cryptosporidium* produces a prolonged, severe and often highly debilitating illness.

Epidemiology: *Cryptosporidium* is found in the intestine of infected humans or animals. Millions of oocysts are released in a bowel movement from an infected human or animal. It is found in soil, food, water and surfaces that have been contaminated with human or animal faeces. It is a common cause of waterborne outbreaks of gastroenteritis. The infectious dose is comparatively low, possibly as few as 100-300 parasites.

Exposure-prone groups: those who take their water from untreated or inadequately-treated supplies, those who work with animals (especially during birthing), residents in institutions, children in day centres, childcare staff, returning travellers, hikers and backpackers, lake swimmers and food handlers.

Clinical Features: *Cryptosporidium* produces watery or mucoid diarrhoea that lasts between two days and four weeks in immunocompetent patients. There is occasionally mild fever. Symptoms may wax and wane before recovery. There may be prodromal anorexia and vomiting can be prominent (particularly in children). Asymptomatic infection is common. In immunocompromised individuals, it may produce debilitating disease, most especially in those patients with CD4 T-lymphocyte counts below 200 cells/mm³; such individuals may have extreme difficulty clearing the parasite from the gut.

Clinical Management of Cases:

Enteric precautions. In healthy individuals, cryptosporidiosis is self-limiting and requires no treatment other than routine rehydration measures. Cryptosporidiosis in immunocompromised individuals can be quite challenging and such patients should be referred for specialist advice. The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Public Health Management of Cases: Obtain history of raw water consumption, swimming, nursery attendance, travel and animal contact for 14 days prior to onset of symptoms. Determine if linked cases.

Food Hygiene Implications: Food hygiene re-education is necessary for food handlers.

Public Health Management of Contacts

Clinical surveillance only. Screening of household members and contacts is only necessary if an outbreak is suspected. Food hygiene re-education is necessary for food handlers.

Exclusion: Until 48hr after first normal stool. Cases should avoid using swimming pools for two weeks after the first normal stool.

Microbiological Clearance: Not required.

Additional Information: Since infection in severely immunocompromised patients can lead to severe, prolonged potentially fatal disease with chronic shedding, all such individuals should discuss with their hospital consultant the need to ensure that their water is of potable quality.

Notifiable: to the local [Medical Officer of Health](#).

8. Giardiasis

(Notifiable)

Description: Giardiasis is a parasitic infection of the upper small intestine prevalent across the world. It is a common cause of “traveller’s diarrhoea” and probably the most important cause of parasitic gastroenteritis in the developed world.

Annual Numbers: Between 50 and 70 cases are notified in Ireland each year.

Seasonal Distribution: Peak seasonal incidence is between July and October.

Causative Agent: *Giardia lamblia* (more correctly *Giardia intestinalis*) is the causative flagellated protozoan parasite. *Giardia* cysts contaminate ground water and are highly environmentally resistant, surviving until ingestion.

Reservoir: Humans are the primary reservoir but they are readily identified in many mammals including beaver (“beaver fever”), dogs, cats, cattle, chickens, rats. In the US it is estimated that 10-15% of companion dogs and cats carry *Giardia*.

Transmission: Transmission is by the faeco-oral route involving ingestion of *Giardia* cysts, most frequently associated with consumption of contaminated water (or contact with recreational water), or direct contact with colonised animals or their faeces. Person to person contact accounts for about one quarter of cases.

Outbreak Potential: *Giardia* has relatively low outbreak potential if transmitted by person to person spread but

Giardiasis is probably the commonest cause of parasitic gastroenteritis in the developed world

high outbreak potential if transmitted through water. *Giardia* cysts are quite resistant to chlorination, making water filtration a crucial element of

effective water treatment to prevent giardiasis. Waterborne outbreaks are generally as a result of consumption of untreated surface water (particularly that from an unfiltered supply) or of sewage contamination of drinking water.

Incubation Period: Generally 7-10 days (range 3-25 days).

Period of communicability: *Giardia* is transmissible throughout the period that a patient is infected. This can be up to a number of months in duration (average duration 2-6 weeks).

Epidemiology: It is estimated that *Giardia lamblia* may be carried in the intestines of 2-3% of healthy subjects in developed countries (although a recent study in the UK

found a carriage rate of 0.5 per 1000 healthy subjects) and in up to 30% of people in developing countries. Children are more affected than adults.

Exposure-prone groups: Residents in institutions, children in day centres, childcare staff, overseas travellers and men who have sex with men.

Pathogenesis: Ingestion of cysts leads to their hatching into trophozoites in the upper small intestine and leading to attachment to the enterocytes of the microvilli of the duodenum leading to tissue damage through a number of different pathways.

Clinical Features: Typically abdominal pain, flatulence, foul-smelling greasy stools, bloating nausea and anorexia. Chronic carriage is not uncommon with steatorrhoea, malabsorption syndrome and weight loss. About three quarters of cases are asymptomatic.

Clinical Management of Cases

Enteric precautions.

Metronidazole and tinidazole are effective antimicrobial agents against *Giardia* and treatment of individual cases forms the basis of control of giardiasis. There is some evidence that treatment of asymptomatic carriers can limit outbreak size in congregate settings (such as crèches). The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Public Health Management of Cases

Most cases are paediatric. Determine if linked cases. Linked cases are most likely to be associated with paediatric settings.

Food Hygiene Implications: Food hygiene re-education is necessary for food handlers.

Public Health Management of Contacts

Screen household contacts to identify additional symptomatic cases requiring treatment. If the index is in Risk Group 3 and there are reports of diarrhoeal illness in the previous two weeks in a childcare facility attended by the index, consideration should be given to screening symptomatic classmates.

Exclusion: Until 48hr after first normal stool.

Microbiological Clearance: Not required.

Notifiable: to the local [Medical Officer of Health](#).

9. Hepatitis A

(Notifiable)

Description: Hepatitis A virus (HAV) produces acute infection of the liver. Its public health importance lies in its ability to produce severe prolonged disease and explosive, extensive outbreaks. Ireland is a low incidence country. In developing countries asymptomatic infection occurs in childhood.

Annual Numbers: Between 30 and 50 cases per year.

Seasonal Distribution: There is no seasonal pattern of incidence.

Causative Agent: Hepatitis A virus (HAV) is a single stranded RNA virus. Infection with HAV induces lifelong immunity.

Reservoir: The gastrointestinal tracts of humans (and possibly certain primates including chimpanzees).

Transmission:

Primary: Person to person spread via the faeco-oral route. It is likely that less than 10% of cases are transmitted by food. Food vehicles most commonly associated include shellfish and garden produce.

Secondary: Ingestion of contaminated food or water.

Outbreak Potential: Hepatitis A has moderate outbreak potential if transmitted through food and person to person contact and a high outbreak potential if transmitted through water.

Incubation period: Long: mean period is 28 days (range 15-50 days). Larger inocula tend to lead to more rapid development of symptoms.

Period of communicability: From two weeks before the onset of jaundice until one week after. In anicteric patients, infectivity generally corresponds to period of peak levels of alanine transaminase (ALT). Prolonged viral excretion (for up to six months) can occur in infants and small children. The infectious dose is not known but is very probably low (10-100 virus particles). Faeces can contain up to 108 particles/ml just before and in the first week of jaundice.

Epidemiology: Hepatitis A virus is primarily spread from person to person via the faecal-oral route. Spread may also occur through food that has been contaminated by infected food handlers or by contaminated water. Shellfish that have been grown in waters contaminated with human faeces are a not uncommon source of extensive outbreaks of hepatitis A. Europe, Japan and North America are low prevalence regions (<2% Anti-HAV-Antibody) while Africa, Asia and Central/South America are high prevalence regions (>8% Anti-HAV-Antibody). Russia and Eastern Europe are intermediate prevalence regions.

Exposure-prone groups: Residents in institutions, men who have sex with men, returning travellers from areas of high endemicity, children in day care and their staff, and food handlers.

Clinical Features: Fever, nausea, loss of appetite and abdominal pain, are the commonest features. Jaundice follows between 3 and 5 days after. Many paediatric cases are asymptomatic; disease severity increases with age. Mortality is low, about 4/1000 cases in developed countries but rising to almost 20/1000 cases in those over 50. Acute liver failure is the most serious complication being commonest in those with underlying chronic liver disease.

Clinical Management of Cases: Enteric precautions until 1 week after onset of jaundice or 10 days from onset of symptoms.

The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Public Health Management of Cases: Collect risk factor data for 2-5 weeks prior to onset: contact with case, travel, seafood consumption, occupation, blood transfusions. Determine if linked cases.

Food Hygiene Implications: Food hygiene re-education is necessary for food handlers.

Public Health Management of Contacts: Clinical surveillance of contacts that shared food and drink, or had close household contact with a case during their period of communicability.

Post exposure prophylaxis with Hepatitis A vaccine is usually recommended for the management of contacts of cases and for outbreak control. Immunoprophylaxis should be given to household and close contacts of cases that have no previous history of hepatitis A vaccine or of laboratory confirmed hepatitis A infection as soon as possible after exposure to HAV. Full immunisation advice is available at <http://www.hpsc.ie/hpsc/A-Z/VaccinePreventable/Vaccination/Guidance/ImmunisationGuidelinesforIreland2008-UpdatedSeptember2011/File,3077,en.pdf>.

Exclusions: For risk groups until 7 days after onset of jaundice and/or symptoms.

Microbiological Clearance: None

Notifiable: to the local [Medical Officer of Health](#).

10. Listeriosis

(Notifiable)

Description: *Listeria monocytogenes* is a bacterial infection that causes gastroenteritis. Severe cases can develop septicaemia or meningitis. Although a rare infection, its public health importance lies in its having a high case fatality rate with a wide range of groups at increased risk of infection and harm.

Annual Numbers: Between 10 and 20 cases per year.

Seasonal Distribution: There is no seasonal pattern of incidence.

Causative Agent: *Listeria monocytogenes* is the species responsible for causing human disease. The serovars responsible for more than 90% of clinical cases are 4b, 1/2a and 1/2b. *Listeria* can grow at temperatures down to 0°C. Although *Listeria* is permitted at low levels in ready to eat (RTE) food, the Food Safety Authority of Ireland has indicated that the presence of *L. monocytogenes* in RTE foods of more than 100 colony forming units per gram of food is unacceptable.

Reservoir: Environment: soil, surface water, drains, sewage and food.

Transmission:

Primary: Usually foodborne, frequently associated with raw (unpasteurised) milk or foods made from raw milk, soft or mould-ripened cheeses (e.g. feta, Brie, Camembert, blue-veined cheeses), cooked meats, pâtés or smoked fish. Contact with infected animals. Foodborne transmission is probably for in excess of 95% of cases.

Secondary: person to person transmission takes place more readily between mother and baby. Transplacental transmission also occurs. Person to person transmission has occasionally been documented in crèches.

Outbreak Potential: *Listeria* has low to moderate outbreak potential if transmitted through food.

Incubation period: The incubation period for listeriosis varies widely and ranges from 3 to 70 days, with the typical incubation period being about three weeks.

Period of communicability: Communicability lasts as long as *Listeria* is shed in faeces.

Epidemiology: *Listeria* is very hardy and can remain viable in silage and soil for more than two years. Five percent of the population carry *Listeria* in the gastrointestinal tract. The disease affects primarily pregnant women (and their unborn children), newborns, the immunosuppressed and the elderly.

Exposure-prone groups: residents in institutions, those eating high risk foods (pâtés, cheeses, smoked fish), food handlers.

Clinical Features: generally a flu-like illness with fever and myalgia; diarrhoea is only occasionally seen. The disease may present with features of a foodborne infection with diarrhoea. Those who are immunosuppressed (and small babies) often present with features of bloodstream infection or meningitis. Infection in pregnant women is quite common (pregnancy is a hypimmune state) and may result in spontaneous abortion or neonatal infection. Case fatality rates are particularly high in neonates and those over 65. Overall the mortality rate is between 10 and 20%.

Clinical Management of Cases

Enteric precautions.

Admit to hospital if necessary.

The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Public Health Management of Cases: Obtain food history for one month prior to symptoms. Determine if linked cases.

Food Hygiene Implications: Food hygiene re-education is necessary for food handlers.

Public Health Management of Contacts

Clinical surveillance.

Exclusion: Until 48hr after first normal stool (if diarrhoeal presentation).

Microbiological Clearance: None

Notifiable: to the local [Medical Officer of Health](#).

Listeriosis has a high mortality rate – about 25% in severe cases of illness

11. Norovirus

(Notifiable)

Description: Norovirus produces a clinical syndrome characterised by pronounced vomiting and mild diarrhoea. Between 1% and 5% of the population will develop norovirus gastroenteritis each year.

Annual Numbers: Not accurately quantified but between 1% and 5% of the population will develop noroviral infection each year. There are between 1,000 and 1,800 notified cases of norovirus and about 200 norovirus outbreaks notified each year in Ireland.

Seasonal Distribution: There tends to be an elevated plateau each winter but the peak in this can vary from November until April. Norovirus upsurges occur every few years; minor upsurges occur every 3-4 years and major upsurges occur every 10 or so years.

Causative Agent: Norovirus is an RNA virus and is the commonest cause of IID.

Reservoir: the human gastrointestinal tract.

Transmission: Noroviruses are primarily transmitted by the faeco-oral route. Spread is through person-to-person by direct or indirect contact with infectious vomitus or faeces. Can also be food- and waterborne.

Outbreak Potential: Norovirus has very high to extremely high outbreak potential whether transmitted person to person, through food or through water.

Incubation period: The incubation period for norovirus-associated gastroenteritis in humans is usually between 24 and 48 hours (median incubation period calculated from outbreak data is about 33 to 36 hours).

Infectivity: Noroviruses are shed for at least 2 weeks after a bout of gastroenteritis. In general shedding is maximal when diarrhoea is present and in the first couple of days following resolution of symptoms.

Epidemiology: Noroviruses are extremely common and produce large waves of outbreaks especially during winter months. Outbreaks tend to occur in congregate setting (including hospitals, nursing homes, hotels, cruise ships), food handlers. The infectious dose is very small – it can be as few as 10 virions. Recent evidence from the CDC suggests that norovirus causes 800 deaths per annum in the US

Exposure-prone groups: residents in institutions, hospital patients and staff, hotel guests, those in childcare settings.

Clinical Features: Nausea (often sudden onset), vomiting (often projectile), watery diarrhoea.

Clinical Management of Cases:

Enteric precautions: paying particular attention to handwashing and thorough cleaning and decontamination of contaminated environmental surfaces. Consider isolation if institutionalised.

The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Public Health Management of Cases:

Determine if linked cases appear in a congregate setting (hospital, nursing home, hotel, aircraft, cruise ship, school, large workplace etc).

Norovirus is highly infectious – even in those with the highest possible levels of personal hygiene – exclusion from work for at least 48 hours following cessation of symptoms is crucial to prevent introducing the infection into the workplace/hospital/school

Food Hygiene Implications: Food hygiene re-education is necessary for food handlers.

Public Health Management Contacts: Clinical surveillance with advice to manage conservatively and stay away from work for exclusion period.

Exclusion: Until 48hr after first normal stool or last episode of vomiting

Microbiological Clearance: None

Resources: Guidance on norovirus is available at: <http://www.hpsc.ie/hpsc/A-Z/Gastroenteric/Norovirus/Publications/>

Notifiable: to the local [Medical Officer of Health](#).

12. Rotavirus

(Notifiable)

Description: A viral gastroenteritis and worldwide the commonest cause of childhood diarrhoea.

Annual Numbers: Not accurately quantified but about 20% of children under 5 will be infected with rotavirus each year. Between 1,500 and 2,300 cases of rotavirus are notified each year in Ireland.

Seasonal Distribution: There is a strong seasonal pattern of incidence with most cases being seen between March and May in Ireland.

Causative Agent: Rotavirus is an RNA virus and is the commonest cause of severe diarrhoea among infants and young children. Groups A, B, and C produce mostly human disease (mainly group A in Ireland). There are vaccines against rotavirus licensed in Ireland but these are not provided for under the National Routine Childhood Immunisation Schedule.

Reservoir: the human GI tract.

Transmission: Usually person-to-person via the faecal oral route and by environmental contamination. Foodborne outbreaks have occasionally been described.

Outbreak Potential: Rotavirus has high outbreak potential when transmitted person to person, particularly so in a healthcare setting.

Incubation period: generally 2-3 days.

Infectivity: transmission generally continues for the period of diarrhoea.

Epidemiology

Infants and young children in crèches and children's hospitals are most often infected. Susceptibility is greatest between 6 and 24 months of age. Usually by three years of age most people have been infected and have acquired immunity to the virus. The virus is also occasionally seen in the elderly living in long-term care facilities.

Exposure-prone groups: residents in institutions, those in a hospital setting.

Clinical Features

Vomiting, watery diarrhoea, and fever. Can cause dehydration in the young and elderly. Illness lasts from 3 to 8 days. Outbreaks occur readily (nosocomial in hospitals and in nursing homes for the elderly). Crèche outbreaks are occasionally seen.

Clinical Management of Cases

Enteric precautions.
Consider isolation if institutionalised.

The case should be notified to the local Department of Public Health. It is important to determine if the case/parent is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Public Health Management of Cases

In institutional or hospital setting, determine if linked cases.

Food Hygiene Implications: None.

Public Health Management of Contacts: Clinical surveillance.

Exclusions: Until 48hr after first normal stool.

Microbiological Clearance: None

Notifiable: to the local [Medical Officer of Health](#).

13. Salmonellosis (excluding Typhoid and Paratyphoid)

(Notifiable)

Description: Salmonellosis produces a classical gastroenteritis with pronounced, occasionally bloody, diarrhoea. Ninety five percent of cases are foodborne.

Annual Numbers: Between 350 and 450 cases per year.

Seasonal Distribution: There is a seasonal peak during the summer months.

Causative Agent: *Salmonella enterica* of which there are approx 2,500 serotypes. *S. enterica* Typhimurium and *S. enterica* Enteritidis are the most frequent causes of salmonellosis in Ireland.

Reservoir: GI tract of many wild and domestic animals, birds (especially poultry), reptiles and amphibians.

Transmission: Usually foodborne. Person to person spread is also possible usually during the acute diarrhoeal phase of the illness. Contact with infected animals may also lead to infection.

Outbreak Potential: *Salmonella* has high outbreak potential if transmitted through food.

Incubation period: from 6-72 hours (generally 12-36 hours)

Infectivity: throughout course of infection - may be up to a number of weeks especially in carrier state. Infectivity much greater when patient is symptomatic.

Epidemiology: Foodborne from animal reservoir (poultry, eggs, pigs and reptiles). A significant degree of underreporting occurs, with estimates of 36 unreported for every reported in the US and approximately 3 unreported for each reported in the UK. In Ireland under-reporting is difficult to quantify, but it is likely that for every one case of *Salmonella enterica* reaching national the national surveillance system, there are about 4-5 cases that remain undetected in the community.¹⁹ The greatest degree of under-reporting is likely to occur in the 15-65 age category as these are less likely to present to GP (particularly in those groups who have to pay for GP visits). Spread from food handlers is not uncommon. The infectious dose is quite large; about 1000 cells to produce clinical disease in an immunocompetent adult.

Exposure-prone groups: Residents in institutions, those exposed to contaminated foods (especially poultry, eggs), food handlers.

Clinical Features: Headache (75%), abdominal pain (90%), diarrhoea, nausea, fever (almost 90% of cases) and occasionally vomiting. Diarrhoea may be bloody (>20% of cases). Median duration of symptoms is 6-7 days but in 25% of cases will have diarrhoea at 14 days. Reactive arthritis is possible within a month of exposure.

Clinical Management of Cases

Enteric precautions. Manage symptomatically.

Occasionally, severe invasive disease may require appropriate antibiotic treatment. If

antimicrobial agents are considered necessary, this can be discussed with the microbiology laboratory as susceptibility testing may have been performed but not reported. The case should be notified to

the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Salmonellosis is mainly foodborne (>95% of cases) - for every case microbiologically confirmed there are probably four cases that go undiagnosed in the community

Public Health Management of Cases

Obtain three day food, travel and animal exposure history (forms are available at

<http://www.hpsc.ie/hpsc/A-Z/Gastroenteric/Salmonellosis/SurveillanceForms>.

Determine if linked cases.

Food Hygiene Implications: Food hygiene re-education is necessary for food handlers.

Public Health Management of Contacts

Clinical surveillance. Reinforce hygiene advice.

Exclusion: Until 48hr after first normal stool.

Microbiological Clearance: None.

Notifiable: to the local [Medical Officer of Health](#).

19. de Jong B, Ekdahl K. The comparative burden of salmonellosis in the European Union member states, associated and candidate countries. *BMC Public Health*. 2006 Jan 10;6:4.

14. Shigellosis

(Notifiable)

Description: Shigellosis produces a classical gastroenteritis with pronounced, occasionally bloody, diarrhoea. About one third of cases are foodborne.

Annual Numbers: Between 40 and 80 cases per year.

Seasonal Distribution: There is no seasonal pattern of incidence.

Causative Agent: The causative agents of shigellosis are *Shigella sonnei*, *Shigella boydii*, *Shigella dysenteriae* and *Shigella flexneri*. *S. sonnei* and *S. dysenteriae* each account for about 40% of cases. About 40% of cases report recent travel to Africa. Fewer than 10% of cases did not travel outside Ireland.

Reservoir: The gastrointestinal tracts of humans and (occasionally) apes.

Transmission: Spread is usually by the faeco-oral route. Person to person and waterborne spread comprise the major modes of transmission. Spread may also take place by means of contaminated food, usually fresh produce and ready to eat foods, especially if they have been in contact with contaminated water. Cases are occasionally reported in men who have sex with men, particularly of *S. sonnei*, anal sex being recognised transmission route of a number of faeco-oral pathogens.

Outbreak Potential: *Shigella* has moderate outbreak potential if transmitted person to person and via food, and high outbreak potential if transmitted by water.

Incubation period: generally 1-3 days (range 12 hours – 4 days). The incubation period for *S. dysenteriae* Type 1 can be as long as one week.

Infectivity: While organism is present in the stool, but much more infectious whilst symptomatic. Infectivity generally lasts up to 4 weeks.

Epidemiology: Shigellosis is a worldwide infection. *S. sonnei* is the only recognised endemic *Shigella* strain in Ireland; the other three strains are found in subtropical and tropical zones. Asymptomatic carriage is very common. Most cases are paediatric. Those at greatest risk of infection include children in child care centres and their parents, overseas travellers, institutionalized people and men who have sex with men. The infectious dose depends on the strain; low (< 10 organisms for *S. dysenteriae* Type 1 but 500 organisms for *S. sonnei*).

Exposure-prone groups: Residents in institutions, men who have sex with men, food handlers, children in day centres, staff in such centres.

Clinical Features: Bloody diarrhoea, fever, abdominal pain. Infection with *S. sonnei* is generally mild symptoms

lasting about a week. The tropical forms cause more severe illnesses. Symptoms usually last 2- 4 weeks. Infection with *S. dysenteriae* tends to be severe and prolonged and requiring hospital admission. Toxic megacolon is occasionally seen in disease caused by *S. dysenteriae* Type I. Infection with *S. flexneri* can lead to Reiter's Syndrome (reactive post-infectious arthropathy). HUS is a recognised complication of bacillary dysentery (it is closely associated with infection due to *S. dysenteriae* Type I) and is more likely to develop if amoxicillin is given during the diarrhoeal phase. The case fatality rate with *S. dysenteriae* Type I is between 20 and 40% even in developed countries.

Clinical Management of Cases

Enteric precautions including hygiene advice. The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Public Health Management of Cases

Enteric precautions including hygiene advice. Obtain one week travel and food history for *S. boydii*, *S. dysenteriae* and *S. flexneri*. Determine if there are linked cases.

Food Hygiene Implications: Food hygiene re-education is necessary for food handlers.

Public Health Management of Contacts

Clinical surveillance for non-risk groups
Contacts of *S. boydii*, *S. dysenteriae* or *S. flexneri* cases in risk groups should be screened.
Supervision of handwashing by children recommended.

Exclusion: For *S. sonnei* infection exclude until 48hr after first normal stool

For *S. boydii*, *S. dysenteriae* or *S. flexneri* exclude until microbiological clearance

Microbiological Clearance:

None for *S. sonnei*. Two negative stool samples taken not less than 48 hours apart for *S. boydii*, *S. dysenteriae* or *S. flexneri*.

In Crèche Settings: Cases and contacts (especially those in Risk Groups) of *S. boydii*, *S. dysenteriae* or *S. flexneri* should be managed in the same way as VTEC cases.

Notifiable: to the local [Medical Officer of Health](#).

Shigella sonnei is the only serogroup readily found in the environment in Ireland, other serogroups are almost invariably imported

15. *Staphylococcus aureus* Foodborne Intoxication

(Notifiable)

Description: Staphylococcal foodborne intoxication is a gastrointestinal illness, caused by consumption of food contaminated with toxins produced by *Staphylococcus aureus*.

Annual Numbers: Between 1 and 5 cases per year.

Seasonal Distribution: There is no seasonal pattern of incidence.

Causative Agent: *Staphylococcus aureus* is a common bacterium found colonising the skin and nasal passageways. When introduced beneath the skin they can form focal, circumscribed infections including styes, abscesses, boils and carbuncles, or diffuse infections such as impetigo. *S. aureus* has the capacity to produce a range of enterotoxins (toxins that act within the intestine) that damage the mucosal endothelium making the mucosae more permeable to ions and water leading to vomiting and diarrhoea. Enterotoxins are stable at 100°C. Staphylococci replicate in food.

Reservoir: Human skin and nostrils; animal skin and nares.

Transmission: Food handlers who carry *staphylococci* on their skin and who handle food without washing their hands contaminate food by direct contact. *S. aureus* can also be found in unpasteurised milk and cheese products (staphylococcal mastitis being an important cause of transmission through milk). Unrefrigerated products that are touched by hand are at the greatest risk including: pastries, cakes, salads, sandwiches, all processed meats, all processed cheeses. *S. aureus* is salt tolerant and can grow in ham, sausages and salted beef. As *S. aureus* multiplies in food, they generate enterotoxins. Staphylococcal enterotoxins are heat-resistant and are not inactivated by cooking.

Outbreak Potential: Staphylococci have moderate outbreak potential if transmitted by food.

Incubation period: The incubation period for *S. aureus* food poisoning is between 2 and 4 hours (range 30 minutes to 8 hours).

Period of communicability: *S. aureus* food poisoning is not contagious.

Epidemiology: *S. aureus* is carried as a commensal in between one quarter and one half of the population.

Exposure-prone groups: those consuming high risk foods and food handlers.

Clinical Features: abrupt onset, severe cramping pain, nausea, vomiting, diarrhoea, hypotension and prostration. The duration of illness is 1-2 days. Complications are uncommon.

Clinical Management of Cases

Enteric precautions.

Admit to hospital if necessary.

The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Public Management of Cases

Obtain food history for three days prior to symptoms. Determine if linked cases. Food hygiene re-education is necessary for food handlers.

Public Health Management of Contacts

Clinical surveillance.

Exclusion: Until 48hr after first normal stool (if diarrhoeal presentation).

Microbiological Clearance: None

Notifiable: to the local [Medical Officer of Health](#).

16. Typhoid/Paratyphoid

(*Urgently Notifiable*)

Description: Classic typhoid fever is a serious illness, which untreated is likely to be life threatening. Antibiotics are very effective when administered in a timely fashion. More than 20 million cases a year are reported of whom 200,000 die but these are invariably in parts of the world with limited access to acute medical services and without access to frontline antimicrobial agents. The disease lasts several weeks and convalescence takes some time. Paratyphoid fever has a very similar clinical picture to typhoid but is generally milder and of shorter duration.

Annual Numbers: About 10 cases each of typhoid and paratyphoid per year.

Seasonal Distribution: There is no seasonal pattern of incidence.

Causative Agent: The causative agents are *Salmonella enterica* subsp. *enterica*, serovar Typhi (*Salmonella* Typhi) of which there is only one serotype and *Salmonella enterica* subsp. *enterica*, serovar Paratyphi (*Salmonella* Paratyphi), subtypes A and B and in extremely rare cases, C.

Reservoir: The only reservoir for *S. Typhi* and *S. Paratyphi* is the human gastrointestinal tract of cases carriers and other excretors.

Transmission

Usually via the faecal-oral route through ingestion of contaminated food or water.

Outbreak Potential: *S. Typhi* and *S. Paratyphi* have high outbreak potential whether transmitted by food or water.

Incubation period: The incubation period of typhoid is typically one to three weeks (range 3-60 days). The incubation period is dependent on the size of the inoculum. The incubation for paratyphoid is 1-10 days.

Infectivity: Cases are infectious when shedding, but infectivity is much greater when symptomatic. Untreated cases can excrete for many months. Carriage for more than one year is not uncommon in less developed countries. Infectivity starts in the first week of symptoms and continues until microbiological clearance. Ten percent of untreated cases are shedding at three months and between 2% and 5% of untreated cases will go on to become permanent carriers.

Epidemiology: In Ireland cases are generally imported from endemic countries. The bacterium is ingested (usually by eating or drinking contaminated food or water). Incidence of typhoid and paratyphoid are highest in South-central and South-eastern Asia and in Southern Africa. The remainder of Asia and Africa, along with Latin America and the Caribbean are medium endemicity areas.

Exposure-prone groups: International travellers returning from areas of high endemicity and food handlers.

Clinical Features

Fever, rigors, headache, cough, rash (rose spots in <20% of cases, undetectable in dark skinned people), variable gastro-intestinal symptoms: constipation (early); diarrhoea (late). Complications (generally in the 3rd week) include intestinal haemorrhage (2%), GI perforation (1-4%), disseminated intravascular coagulopathy (DIC) and renal failure in severe cases. Five to ten percent of cases relapse despite antibiotics.

Clinical Management of Cases

Enteric precautions.

Admission to hospital and strict isolation is advisable.

Fluoroquinolones are generally the drug of first choice but because of emerging antibiotic resistance it is prudent to ensure that antibiotic sensitivity studies are undertaken on all isolates. Choice of antimicrobial therapy should normally be made in consultation with a Consultant Microbiologist or Infectious Disease Physician, bearing in mind the balancing of risks and benefit (i.e. fluoroquinolones in children and the potential for reversible arthropathy). The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Typhoid and Paratyphoid are severe systemic illnesses and cases and contacts who are food handlers must not work with food until satisfactorily treated and microbiologically clear

Choice of antimicrobial therapy should normally be made in consultation with a Consultant Microbiologist or Infectious Disease Physician, bearing in mind the balancing of risks and benefit (i.e. fluoroquinolones in children and the potential for reversible arthropathy). The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Public Health Management of Cases

Obtain a complete food and three-week travel history (use the HPSC Enhanced Typhoid/Paratyphoid investigative form to guide history taking). Cases should undergo further investigation if no travel to an endemic country within the previous three weeks. Determine if linked cases. Food hygiene re-education is necessary for food handlers.

Public Health Management of Contacts

All household contacts and others with similar exposures to the case in the month prior to symptom onset should be screened. Contacts outside the home in risk groups should also be screened.

Vaccination: Typhoid vaccination is of limited effectiveness and should be reserved for:

- Travellers to countries in Africa, Asia, Central and South America and South East Europe, and to other areas where hygiene is likely to be poor.
- Laboratory workers handling specimens which may contain typhoid organisms

Typhoid immunisation is **not** recommended for contacts of a known typhoid carrier or for controlling common-source outbreaks.

Excreters/Carriers

All excreters/carriers identified should be given written hygiene advice.

Quinolone treatment for clearance should be undertaken under the guidance of an appropriate specialist. If, after several unsuccessful treatments, a patient continues to excrete, a risk assessment should be carried out with consideration given to:

- Safe arrangements for continuing in work or alternative occupations (e.g. re-deployment)
- Continuing need for strict hygiene both within the household and at work (see HPA Guidelines below).

Exclusion and Microbiological Clearance: The schema below describes the parameters for exclusion and microbiological clearance for typhoid and paratyphoid cases and contacts:

Cases

- For diagnosis of possible cases: ONE faecal sample ASAP and exclusions for all cases as per routine gastrointestinal '48 hours after last symptom' rule.
- For clearance of probable/confirmed cases in risk groups: THREE samples 48 hours apart, starting at least ONE week after completion of treatment. Consider exclusion or redeployment until clearance.
- No clearance necessary for cases not in risk group.

Contacts

- If the case's infection is likely to be travel-related: all co-travelling contacts require ONE faecal sample ASAP for screening but no exclusion unless symptomatic; all other non-travelling contacts require "warn and inform" information, but no screening samples or exclusion unless symptomatic. All contacts managed in the same way, irrespective of whether in a risk group.
- If the case's infection is not thought to be travel-related: contacts require "warn and inform" information and may require ONE faecal sample for screening purposes to investigate source.
- If any contacts have a positive faecal sample or become symptomatic, manage as a case with

appropriate clearance/exclusions depending on risk group or activities.

Resources: Cases, contacts and carriers should be managed in accordance with the HPA's Public Health Operational Guidelines for Typhoid and Paratyphoid (Enteric Fever) available at http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1317132464469.

Notifiable: **urgently** to the local [Medical Officer of Health](#).

17. Verocytotoxigenic *Escherichia coli* (VTEC) and Haemolytic Uraemic Syndrome (HUS)

(Urgently Notifiable)²⁰

Description: *Escherichia coli* are gram-negative rods that form part of the microbiota or normal flora of the lower GI tracts of vertebrates. They synthesise Vitamin K in the

Parents of small children should be advised on diagnosis that their child might continue to shed for extended periods and will not be able to return to childcare while still excreting VTEC

bowel and, through their sheer volume, displace other, pathogenic organisms from occupying the human GIT. VTECs were first identified as human pathogens

in 1982 and since then have evolved and spread to become one of the commoner and most serious IIDs in Europe and North America. VTEC produces a potentially serious, highly infectious diarrhoeal and systemic illness. In about 10% of cases it causes haemolytic uraemic syndrome (HUS) the commonest cause of renal failure in children.

Annual numbers: Between 200 and 250 cases per year. Ireland has the highest VTEC notification levels in the EU.

Seasonal Distribution: There a sustained peak in VTEC incidence from August until October.

Causative Agent: *E. coli* O157 is the most frequently implicated VTEC serogroup. Other examples include *E. coli* O26, O111, O103 and O145.

Reservoir: VTEC is a normal commensal in the gastrointestinal tract of ruminants, including cattle, sheep, goats and other farmed mammals. Rarely, it can cause disease in young ruminant animals.

Transmission:

Primary: VTECs are transmitted through ingestion of food or water contaminated with infected faeces and by direct contact with an animal carrier. It is likely that waterborne and person-to-person transmission accounts for more than 80% of cases in the US. In Ireland it is likely that less than a quarter of cases are directly attributable to foodborne spread.

Secondary: Person to person transmission is a secondary, but extremely significant, mode of transmission.

Incubation period: Medium: typically 3-4 days with a range of 1-8 days. Duration of illness is generally seven to 10 days.

Outbreak Potential: VTEC has high outbreak potential if transmitted through food and from person to person and very high to extremely high outbreak potential if transmitted through water.

Period of communicability: Patients are infectious from onset of symptoms until disappearance of viable bacteria from the stools, but are considerably more infectious whilst symptomatic. VTEC may be shed in the stool for several weeks following resolution of diarrhoea. Children tend to continue to shed for longer than adults. An asymptomatic carriage state is increasingly recognised, in which individuals who show no clinical signs of disease, nonetheless shed and can go on to infect others. This risk appears greatest in children under 5 years of age. In one documented instance a small child shed VTEC for more than 6 months being unable to return to school during this period.

Epidemiology: VTEC was initially considered almost solely a foodborne pathogen (this is still the case in a number of countries) but it has a marked propensity for person-to-person spread. Recently in Ireland, it has been identified in a number of waterborne outbreaks and is not infrequently found in untreated private well supplies. The inoculum is tiny, as few as 2 or 3

VTEC gastroenteritis is a serious illness – HUS complicates up to 10% of cases

organisms. Descriptive epidemiology of cases indicates that food is suspected in 12% of cases, animal contact is reported in 52% of cases and 43% of cases had potential exposure to a private well (as compared with 10% of the general population). It has a marked tendency to produce HUS (more than 90% of HUS cases are thought to be caused by VTEC and about 10% of cases of VTEC will go on to develop HUS, this risk being highest in children under the age of five). Most outbreaks are restricted to individual households but general outbreaks most commonly occur in crèches.

Exposure-prone groups: farming families, children in daycare, daycare staff, those consuming untreated, unprotected water (e.g. from wells and ground water), those exposed to contaminated food, food handlers, residents in institutions.

Pathogenesis: Verotoxin (similar to the Shiga toxin of *Shigella dysenteriae*) released by VTEC strains adheres to and disrupts the intestinal epithelium leading to a haemorrhagic colitis. There are verotoxin receptor cells in the renal epithelium (and to a lesser extent in the CNS), and toxin-mediated inflammation leads to thrombin and fibrin deposits in the microvasculature,

20. HUS alone (i.e. in the absence of bloody diarrhoea or other gastroenteric symptoms) should be assumed to be caused by VTEC and should be notified to the local Medical Officer of Health either as a **probable** case of VTEC if there is an epidemiological link to a known case of VTEC or as a **possible** case of VTEC if there is no such epidemiological link.

most notably in the kidneys, leading to thrombocytopenia, microvasculature thrombosis, thrombus formation, tissue oedema and acute renal failure.

Clinical Features: Abdominal pain which may often be severe (>90%), diarrhoea (severe in >60%) and haemorrhagic colitis (bloody diarrhoea in >25%). Fever is not a common finding in children and highly unusual in adults. In children headache (50%) and myalgia (25%) are prominent. At all ages anorexia is invariable. Haemolytic uraemic syndrome (HUS) develops in about 10% of cases, particularly in children and the elderly. In

Every case of HUS should prompt a search for VTEC; stool should be submitted for examination for toxin-producing *E. coli*.

the US, the hospitalisation rate for VTEC has been estimated to be 2-3%, while the case fatality rate is 8:10,000 cases. In Ireland, the hospitalisation rate

from national data is in excess of 40%. So close is the association between HUS and VTEC, that each case of HUS must be assumed to be caused by VTEC unless proven otherwise.

Management of Cases

Enteric precautions.

Individual cases should be referred to hospital as soon as early symptoms of HUS appear. In addition, paediatric and elderly patients should be admitted if the clinical picture suggests the need (i.e. copious diarrhoea indicating the onset of dehydration or heavy bleeding).

Obtain information on:

- food and water consumption for preceding 7 days
- recent travel
- recent contact with people with GI symptoms
- recent animal contact

In the case of children:

- information on attendance of crèches
- petting farms
- other risk factors.

The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category. HPSC has published extensive national expert guidance on the [management of VTEC infection](#). This document should be consulted for definitive advice on the management of VTEC infection and outbreaks. Information on the [management of VTEC infection in childcare facilities](#) is also available.

Food Hygiene Implications: Food hygiene re-education is necessary for food handlers.

Management of Contacts

Screen contacts if in risk groups.

Reinforce hygiene advice to contacts in particular hand washing. Children's handwashing in nurseries should be closely supervised.

Exclusion: All cases: Until 48hr after first normal stool. If case or contact is in a risk group, exclude until

microbiological clearance. It is important that parents of small children be alerted to the fact that such children can excrete for extended periods of time and will not be allowed to rejoin classes until microbiologically clear.

All cases of VTEC should be excluded as soon as confirmed. Cases in Risk Groups must not return to work/crèche until microbiological clearance is confirmed

Microbiological Clearance: Two consecutive negative stool samples taken at least 48 hours apart. In the case of symptomatic cases, both negative stool samples must have been taken after recovery from diarrhoea.

Resources: on VTEC are available at <http://www.hpsc.ie/hpsc/A-Z/Gastroenteric/VTEC>.

Notifiable: **urgently**, to the local [Medical Officer of Health](#).

Haemolytic Uraemic Syndrome (HUS) (Notifiable under VTEC)²¹

Description: HUS is a clinical syndrome characterised by a haemolytic anaemia, acute renal failure and thrombocytopenia. First described in 1955, it is today most frequently associated with diarrhoeal infection with VTEC. HUS is the commonest cause of acute renal failure in children. The diarrhoeal form most commonly affects children under the age of five and, unlike the non-diarrhoeal form without an infectious element, is generally associated with recovery of renal function.

Onset: the mean interval between onset of VTEC diarrhoea and onset of HUS is seven days (range 2-14 days).

Causative Agents: most commonly associated with VTEC and occasionally *Shigella dysenteriae* and very occasionally *Campylobacter* or HIV infection. Neuraminidase-producing organisms such as *Streptococcus pneumoniae* and *Clostridium butyricum* very occasionally produce HUS. Non-infectious causes include drugs (contraceptive pill and cyclosporine), malignancy, post partum and idiopathic.

Annual numbers: Between 15 and 20 VTEC associated HUS cases per year.

21. Cases of HUS (irrespective of the age of the patient) are notifiable under VTEC as "Possible cases of VTEC".

Clinical Features: As many as 95% follow infection with VTEC. Anaemia and uraemia usually present with weakness, lethargy and sleepiness. Irritability in children may be a presenting feature. There may be purpuric areas on the skin.

- **Renal:** microscopic haematuria is common but gross haematuria can occur. Albuminuria is common, renal failure varies from mild to that requiring dialysis.
- **Cardiovascular:** diarrhoeal associated HUS patients are normotensive. Hypertension can occur in the non-infectious form with ocular involvement including retinopathy and exudates. Heart failure can occur particularly in the post partum form. DIC is very rare.
- **CNS:** microvascular damage can lead to developmental retardation and focal motor deficit. Seizures are not uncommon.
- **GIT:** very occasionally GI perforation due to microvascular ischaemic infarction and, in children, intussusception.
- **Skin:** pallor and purpura.
- **General:** fatigue, irritability, low/absent urinary output, oedema and confusion.

Investigation: should be commenced when symptoms of HUS (renal failure)

- **RBC:** Anaemia is typical (Hb = 7-9g/L)
- **Platelets:** usually fall to below $50 \times 10^9/L$
- **Leucocytes:** often rise to $20-30 \times 10^9/L$
- **Clotting:** PT and APPT tend to be normal. FDPs and clotting time are raised.

Clinical Management: In a VTEC case, symptoms and signs of HUS (such as falling urinary output, weakness, lethargy, sleepiness, irritability, pallor, purpura, occasionally seizures) should prompt an urgent nephrological opinion. Supportive therapy is still the mainstay during the acute phase. Antibiotics should be avoided. Fluid replacement is necessity in patients who are volume depleted. Electrolyte imbalance should be corrected. Transfusion may be necessary if the anaemia is very severe. Dialysis is only needed in the more severe cases. The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category. happen

Public Health Investigation and Management:

Irrespective of the presence or otherwise of diarrhoea, all HUS cases should be investigated and managed from a public health perspective, as suspected cases of VTEC infection until proven otherwise. All cases of HUS should be reported to the local Department of Public Health.

Outcome: Spontaneous recovery is the rule. Children with HUS tend to less ill than adults, particularly the elderly, and adults require more aggressive therapy such as plasmapheresis and dialysis, more often than children. Infection-related HUS has a better prognosis than the non-infectious form.

After an average of four years after experiencing diarrhoea associated HUS, 9% of patients have died (most during the acute phase of illness), an additional 3% develop permanent end stage renal disease and 25% demonstrate renal sequelae. Severity of the acute illness, especially the presence of CNS symptoms, is strongly associated with worse long-term outcome.

In the elderly, the case fatality ratio is considerable higher than in children, possibly in excess of 50%.

Notifiable: **urgently**, to the local [Medical Officer of Health](#).

The cardinal features of HUS are

- **Falling urinary output**
- **Weakness**
- **Lethargy/malaise**
- **Sleepiness**
- **Pallor**
- **Purpura**
- **Epistaxis**
- **Oedema**

Appearance of such features in a case of VTEC (particularly if a child or elderly patient) should prompt an **urgent** paediatric/nephrological opinion.

18. Yersiniosis

(Notifiable)

Description: Yersiniosis is a gastrointestinal illness, caused by consumption of food contaminated with enteropathogenic *Yersinia* spp (including *Y. enterocolitica* and *Y. pseudotuberculosis*).

Annual Numbers: Between three and six cases per year.

Seasonal Distribution: Yersiniosis is more common in the winter months.

Causative Agent: *Yersinia* is a zoonotic bacterium found worldwide.

Reservoir: *Yersiniae* are associated with pigs (*Y. enterocolitica* colonises heavily the pharynx of pigs) and mammals and birds (*Y. pseudotuberculosis*).

Transmission: Transmission is by the faeco-oral route through contaminated food and water and through direct contact with infected people and animals. Bloodborne outbreaks of yersiniosis have been described in the literature. Pork is readily contaminated at slaughter and if consumed raw or insufficiently cooked may cause illness. *Yersinia* spp multiply at temperatures as low as 4°C so refrigeration offers little protection.

Outbreak Potential: *Yersinia* have moderate to high outbreak potential, particularly if transmitted by food.

Incubation period: The incubation period for *Yersinia* is typically 3-7 days (range 2-10).

Period of communicability: Secondary spread of *Yersinia* is uncommon. Shedding begins with onset of symptoms. Excretion typically lasts for up to two weeks but can occur for extended periods (up to three months, especially in children).

Epidemiology: Cases occur most commonly in children and young people under the age of 25. It is estimated that between 1% and 3% of the population carry *Yersinia* asymptotically.

Exposure-prone groups: those consuming high risk foods, food handlers, children, veterinarians and abattoir workers.

Clinical Features: *Y. enterocolitica* produces an enterocolitis with diarrhoea, fever and abdominal pain in a majority of cases (vomiting is seen in about 1/3 of cases). Illness generally lasts for 2-3 weeks. One quarter of children develop bloody diarrhoea. Post infective syndromes with reactive arthritis or erythema nodosum are well described. Occasionally, cases may present with a pharyngitis, an appendicitis-like syndrome in children or septicaemia in the elderly, the immunosuppressed and those with haemochromatosis. In 20% of paediatric cases, *Y. pseudotuberculosis* presents with mesenteric adenitis, fever and right iliac fossa pain and tenderness, regularly resulting in unnecessary appendectomy. In the past, outbreaks of yersiniosis have been identified as local increases in appendectomy rates. Enteritis and septicaemia are rare but erythema nodosum may occur.

Clinical Management of Cases

Enteric precautions.

Admit to hospital if necessary. Invasive disease and septicaemic cases should be treated with appropriate antimicrobials.

The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

Public Health Management of Cases

Obtain food history (especially pork products, undercooked meats and milk) for 10 days prior to onset of symptoms. Determine if linked cases. If presenting with appendicitis-like picture, determine if there is a local (or regional) increase in appendectomy rate suggestive of other, potentially linked cases.

Food Hygiene Implications: Food hygiene re-education is necessary for food handlers.

Public Health Management of Contacts

Clinical surveillance.

Exclusion: Until 48hr after first normal stool (if diarrhoeal presentation).

Microbiological Clearance: None

Notifiable: to the local [Medical Officer of Health](#).

APPENDIX 1: List of Notifiable Diseases (2011)²²

- Acute anterior poliomyelitis (Polio virus)
- Ano-genital warts
- Anthrax (*Bacillus anthracis*) all species in italics
- *Bacillus cereus* food-borne infection/intoxication (B. cereus)
- Bacterial meningitis (not otherwise specified)
- Botulism (*Clostridium botulinum*)
- Brucellosis (*Brucella* sp.)
- *Campylobacter* infection (*Campylobacter* sp.)
- Carbapenem-resistant enterobacteriaceae infection (invasive)
- Chancroid (*Haemophilus ducreyi*)
- Chickenpox — hospitalised cases
- Chikungunya disease
- Chlamydia trachomatis infection (genital) (*C. trachomatis*)
- Cholera (*Vibrio cholerae*)
- *Clostridium difficile* infection
- *Clostridium perfringens* (type A) food-borne disease (*C. perfringens*)
- Creutzfeldt Jakob disease
- nv Creutzfeldt Jakob disease
- Cytomegalovirus infection (congenital)
- Cryptosporidiosis (*Cryptosporidium parvum*)
- Dengue Fever
- Diphtheria (*Corynebacterium diphtheriae*)
- Echinococcosis (*Echinococcus* sp.)
- Enterococcal bacteraemia (*Enterococcus* sp. (blood))
- *Escherichia coli* infection (invasive) (*E. coli* (blood, CSF))
- Giardiasis (*Giardia lamblia*)
- Gonorrhoea (*Neisseria gonorrhoeae*)
- Granuloma inguinale
- *Haemophilus influenzae* disease (invasive) (*H. influenzae* [blood, CSF or other normally sterile site])
- Hepatitis A (acute) (Hepatitis A virus)
- Hepatitis B (acute and chronic) (Hepatitis B virus)
- Hepatitis C (Hepatitis C virus)
- Herpes simplex (genital) (Herpes simplex virus)
- Human immunodeficiency virus infection
- Influenza (Influenza A and B virus)
- *Klebsiella pneumoniae* infection (invasive)
- Legionellosis (*Legionella* sp.)
- Leptospirosis (*Leptospira* sp.) Listeriosis (*Listeria monocytogenes*)
- Leprosy
- Listeriosis
- Lyme disease
- Lymphogranuloma venereum
- Malaria (*Plasmodium falciparum*, vivax, ovale, malariae)
- Measles (Measles virus)
- Meningococcal disease (*Neisseria meningitidis*)
- Mumps (Mumps virus)
- Non-specific urethritis
- Noroviral infection (Norovirus)
- Paratyphoid (*Salmonella paratyphi*)
- Pertussis (*Bordetella pertussis*)
- Plague (*Yersinia pestis*)
- Q Fever (*Coxiella burnetii*)
- Rabies (Rabies virus)
- Respiratory syncytial virus infection
- Rotavirus infection
- Rubella (Rubella virus)
- Salmonellosis (*Salmonella enterica*)
- Severe Acute Respiratory Syndrome (SARS-associated coronavirus)
- Shigellosis (*Shigella* sp.)
- Smallpox (Variola virus)
- Staphylococcal food poisoning (Enterotoxigenic *Staphylococcus aureus*)
- *Staphylococcus aureus* bacteraemia (*S. aureus*-blood)
- Streptococcus group A infection (invasive) (*S. pyogenes* (blood, CSF or other normally sterile site))
- Streptococcus group B infection (invasive)
- *Streptococcus pneumoniae* infection (invasive) (*S. pneumoniae* (blood, CSF or other normally sterile site))
- Syphilis (*Treponema pallidum*)
- Tetanus (*Clostridium tetani*)
- Toxoplasmosis (*Toxoplasma gondii*)
- Trichinosis (*Trichinella* sp.)
- Trichomoniasis (*Trichomonas vaginalis*)
- Tuberculosis (*Mycobacterium tuberculosis* complex)
- Tularemia (*Francisella tularensis*)
- Typhoid (*Salmonella typhi*)
- Typhus (*Rickettsia prowazekii*)
- Verotoxigenic *Escherichia coli* infection
- Viral encephalitis
- Viral meningitis
- Viral haemorrhagic fevers (Lassa virus, Marburg virus, Ebola virus, Crimean-Congo haemorrhagic fever virus)
- West Nile fever
- Yellow Fever (Yellow Fever virus)
- Yersiniosis (*Yersinia enterocolitica*, *Yersinia pseudotuberculosis*)

22. (Notifiable infectious diseases are reportable to the local Medical Officer of Health under S.I. No. 452/2011 — Infectious Diseases (Amendment) Regulations 2011 see <http://www.irishstatutebook.ie/2011/en/si/0452.html> Case definitions for all infectious diseases can be found on the website of Health Protection Surveillance Centre at <http://www.hpsc.ie/hpsc/NotifiableDiseases/CaseDefinitions>.

Appendix 2: Hand Hygiene Guidelines for Healthcare Workers

(Adapted from Guidelines for [Hand Hygiene in Irish Health Care Settings 2005](#), HPSC)

Social Hand Hygiene

Use plain soap and warm water, or an alcohol hand rub product (which should **only** be used on **visibly clean hands**). When hands are visibly contaminated with dirt, soil or organic material, hands **must** be washed with warm water and soap. Social hand hygiene should be used:

- At the beginning and end of the work shift.
- Before and after each patient contact.
- After moving from a contaminated to a clean area during care of an individual patient.
- After removing gloves.
- After handling soiled equipment, materials or environment.
- Before preparing or handling food.
- After personal bodily functions such as blowing nose or using the lavatory.

Antiseptic Hand Hygiene

Use an antiseptic handwashing agent or alcohol hand rub product²³ (which should **only** be used on **visibly clean hands**). Antiseptic hand hygiene should be used:

- Before and after each patient contact in critical care units, with those who are immunocompromised/with large wounds/burns and before entering units/wards with such patients).
- After all contact with patients on transmission-based precautions and prior to leaving wards/rooms with such patients.
- When hands are inadvertently contaminated with a heavy microbial load such as foul or infectious material. (Always wash hands when visibly contaminated.)
- Before performing invasive procedures as part of an aseptic technique.

23. An alcohol-based product should only be used on visibly clean hands and is recognised as a superior hand hygiene product for almost every situation. Alcohol hand rub products with added emollient reduce the risk of dermatological side effects. Repeated use of alcohol-based products with added emollients may result in an excessive build up of emollient on the hands, and this may be reduced by periodic washing with soap and water.

APPENDIX 3: Symptoms and incubation periods for common IID pathogens

Organism (click to follow links)	Typical Signs and Symptoms	Incubation Period*	Duration of Illness
Bacteria			
<u><i>Campylobacter</i></u>	Diarrhoea, abdominal pain, fever, vomiting, bloody diarrhoea in half of cases.	1-10 days (typically 2-5 days).	2-10 days
<u><i>Listeria monocytogenes</i></u>	Tends to be a mild 'flu-like illness with fever, muscle aches and nausea and diarrhoea. In the elderly or immunocompromised (for example, due to cancer, diabetes or AIDS) it may be complicated by meningitis or septicaemia. If a pregnant woman contracts the infection, it can lead to miscarriage or still birth, or septicaemia or meningitis in the baby soon after delivery.	1 day to 3 months (typically about 3 weeks).	Variable
<u><i>Salmonella enterica</i> spp. (Non-typhoidal salmonellae)</u>	Diarrhoea, fever, abdominal cramps, vomiting, occasionally muscle cramps and headache.	12-72 hours	3-7 days
<u><i>Salmonella Typhi</i> and <i>Paratyphi</i> (Typhoid and Paratyphoid; Enteric Fever)</u>	Typhoid enteric fever is a severe illness with fever, headache, cough, constipation followed by diarrhoea, characteristic skin rash (rose spots), abdominal pain and confusion. Paratyphoid enteric fever is less severe. Paratyphoid can also produce a severe gastroenteritis with diarrhoea and vomiting.	1-3 weeks 1-10 days for paratyphoid gastroenteritis	Up to 3 months
<u><i>Shigella</i> spp.</u>	A wide variety of illness depending on the particular species, ranging from mild diarrhoea to severe illness with pain, watery diarrhoea (often with blood or mucus), fever, and collapse.	12-96 hours (can be up to one week).	1-2 weeks
<u>Verotoxigenic <i>E. coli</i> (VTEC)</u>	Can vary, from a mild illness with little or no symptoms, to moderate or severe bloody diarrhoea, with abdominal pain (haemorrhagic colitis). Vomiting and fever are uncommon.	1-8 days (typically 3-4 days).	5-10 days
<u><i>Vibrio cholerae</i> (Cholera)</u>	Severe watery diarrhoea, occasional vomiting. Dehydration can be life threatening.	6-48 hours	1-3 weeks
<u><i>Yersinia enterocolitica</i> and <i>Y. pseudotuberculosis</i></u>	Generally diarrhoea with some vomiting. May be some bloody diarrhoea. <i>Y. pseudotuberculosis</i> can produce appendicitis-like symptoms.	2-11 days (typically 4-7 days).	1-3 weeks, usually self-limiting
Protozoa			
<u><i>Cryptosporidium</i></u>	Diarrhoea (usually watery and with mucus), stomach cramps, upset stomach, slight fever.	1-28 days (typically 2-10 days).	Generally 2-4 weeks
<u><i>Giardia lamblia</i></u>	There may be no symptoms or diarrhoea, stomach cramps, flatulence and bloating.	7-10 days	Days to weeks
Viruses			
<u>Norovirus</u>	Nausea, vomiting, abdominal cramping, diarrhoea, fever, myalgia, and some headache. Diarrhoea is more prevalent in adults and vomiting is more prevalent in children.	15-50 hours	4-70 hours
<u>Rotavirus</u>	Watery diarrhoea, vomiting with mild fever. Commonest between 6 months and 2 years.	1-3 days	About a week

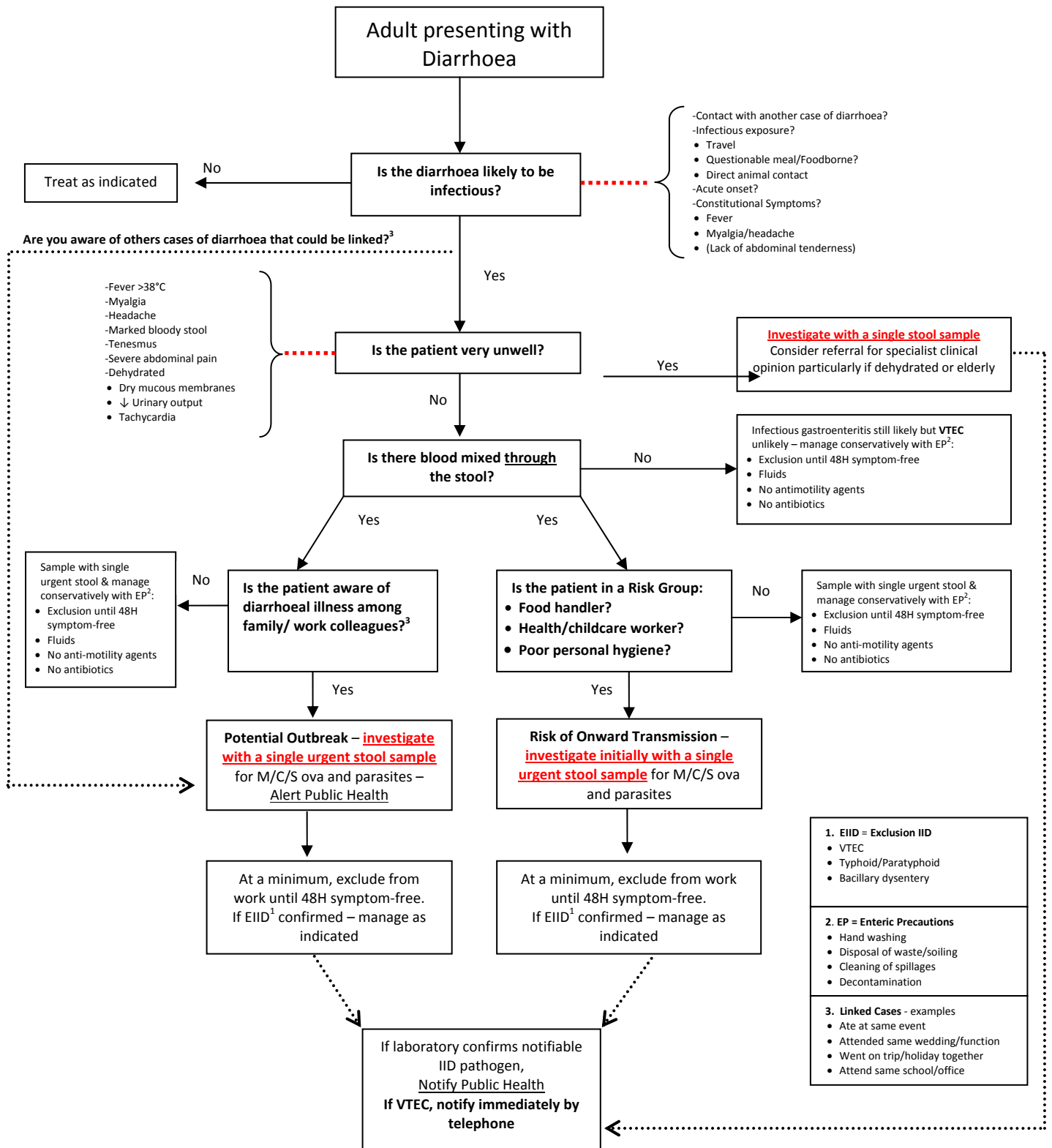
Appendix 4: Foods and other Exposures Associated with Specific Intestinal Pathogens²⁴

Pathogen	Associated foods
BACTERIA	
<i>Bacillus cereus</i>	Meats, milk, vegetables and fish (diarrhoeal form) Rice, potato and pasta (vomiting form)
<i>Campylobacter</i>	Undercooked poultry (especially chicken), person to person spread, pets, milk, cheese and untreated water
<i>Clostridium difficile</i>	Hospitalization, recent inpatient or outpatient antibiotic therapy
<i>Clostridium perfringens</i>	Beef, pork, poultry, home canned foods, gravy and processed meat products
Enterotoxigenic <i>E. coli</i>	Travellers to developing world
<i>Listeria</i>	Soft-ripened cheeses, pate, ice cream, raw vegetables, processed meat products, raw and cooked poultry, raw meats (all types), and raw and smoked fish
<i>Salmonella</i>	Raw meats, poultry, eggs, milk and dairy products, fish, shrimp, sauces and salad dressing, cake mixes, cream-filled desserts and toppings, peanut butter, cocoa, chocolate, ducks/ducklings and reptiles (terrestrial and aquatic)
<i>Shigella</i>	Salads, raw vegetables, milk and dairy products, poultry, untreated water and person to person spread
<i>Vibrio cholera</i>	Shellfish, inadequately cooked seafood and raw salad vegetables
VTEC	Beef, pork, fast foods, salad vegetables, beansprouts, untreated water, milk, processed meats and person to person spread
<i>Yersinia</i>	Meats (pork, beef) oysters, fish, raw milk and cheese
VIRUSES	
Norovirus	Shellfish and salad ingredients, untreated water, ice cubes, person to person spread and contaminated food handlers.
Rotavirus	Primarily person to person, infantile diarrhoea, infected food handlers and salads (rarely)
Adenovirus	Infantile diarrhoea
PROTOZOA	
<i>Giardia lamblia</i>	Contaminated water (possibly raw vegetables) and person to person
<i>Cryptosporidium</i>	Contaminated water (possibly raw vegetables) and person to person

24. US Food and Drug Administration: Bad Bug Book, 2011. Available at: <http://www.fda.gov/food/foodsafety/foodborneillness/foodborneillnessfoodborne pathogensnaturaltoxins/badbugbook/default.htm>.

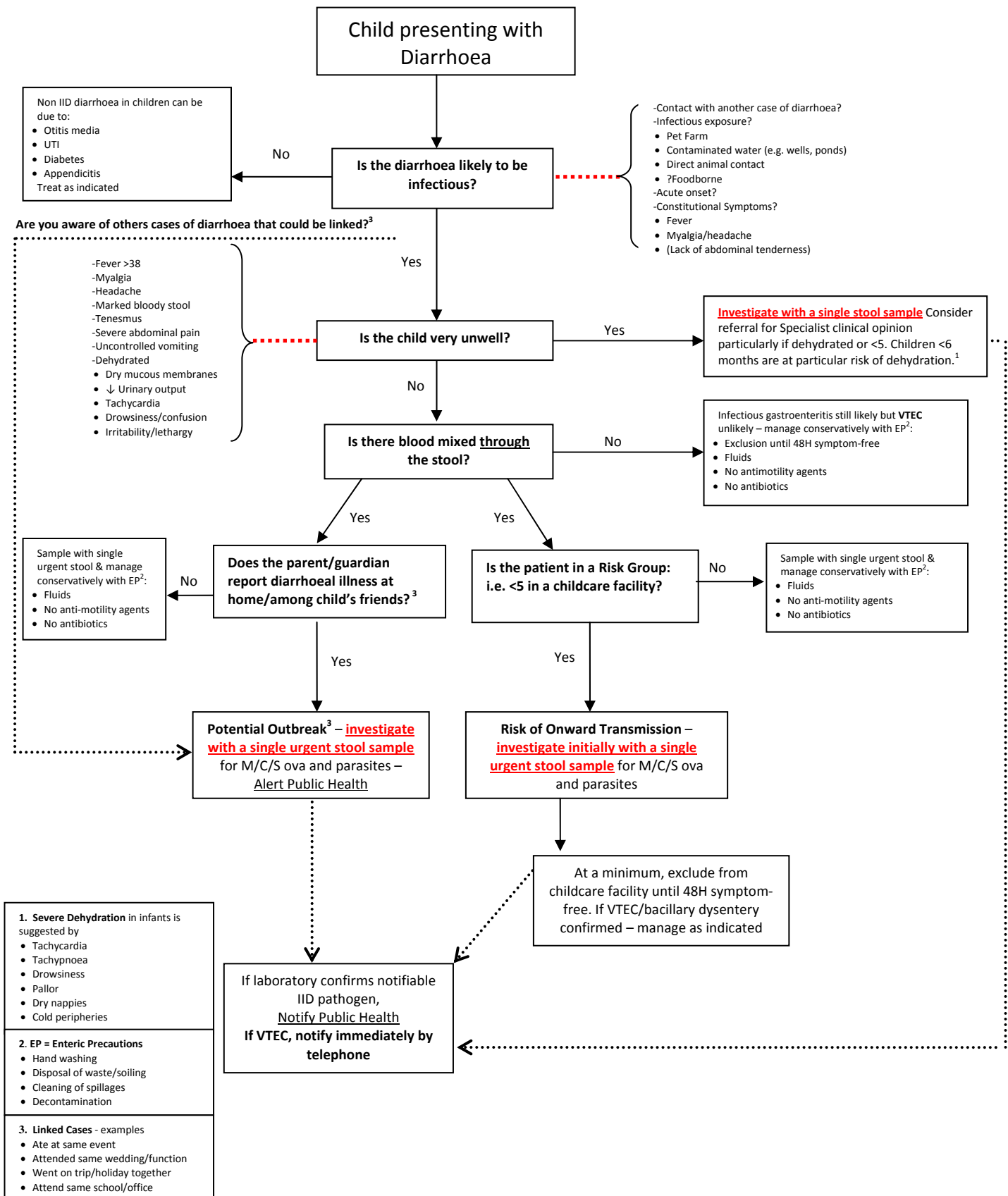
APPENDIX 5: Management of Acute Diarrhoea in Adults

INVESTIGATION OF ADULTS PRESENTING WITH ACUTE DIARRHOEA



APPENDIX 6: Management of Acute Diarrhoea in Children

INVESTIGATION OF CHILDREN PRESENTING WITH ACUTE DIARRHOEA



Appendix 7: Assessment of Degree of Dehydration in Children

Parameter ²⁵	No Dehydration	Mild Dehydration (>1 sign)	Severe Dehydration (>1 sign)
Alertness	Normal	Irritable or drowsy	Lethargic/poorly responsive
Eyes	Not sunken	Sunken	Sunken
Drinking	Normal	Drinks eagerly	Poor/weak drinking
Skin Pinch	Immediate return	Slow return (< 2 seconds)	Very slow return (> 2 seconds)

Assessment of Shock²⁶

The following suggest the onset of clinical shock in a child and are very sinister signs warranting immediate admission/intravenous fluid replacement:

- Decreased level of consciousness
- Pale or mottled skin
- Cold extremities
- Marked tachycardia and tachypnoea
- Weak peripheral pulses
- Prolonged capillary refill time and
- Hypotension

25. World Gastroenterology Organisation practice guideline: Acute diarrhea. Available at http://www.worldgastroenterology.org/assets/downloads/en/pdf/guidelines/01_acute_diarrhea.pdf

26. National Collaborating Centre for Women's and Children's Health. Diarrhoea and vomiting caused by gastroenteritis diagnosis, assessment and management in children younger than 5 years. RCOG, London: 2009.

Appendix 8: Clinical features of infection with selected diarrhoeal pathogens

Key: common: **O** = occurs, **V**= variable; not common: **A**= atypical, **N**= often not.

(Adapted from: World Gastroenterology Organisation Practice Guideline: Acute Diarrhoea, March 2008)

Clinical Features	Pathogens										
	<i>Shigella</i>	<i>Salmonella</i>	<i>Campylobacter</i>	<i>Yersinia</i>	Norovirus	<i>Vibrio</i>	<i>Cryptosporidium</i>	<i>Giardia</i>	<i>Entamoeba histolytica</i>	<i>Clostridium difficile</i>	VTEC
Abdominal pain						V	V		O	O	
Fever					V	V	V		O	O	A
Faecal evidence of inflammation				O		V	O		V		N
Vomiting and/or nausea		O	O	O		V	O	O	V		O
Haeme-positive stool	V	V	V	O		V				O	
Bloody stool	O	O	O	O		V			V	O	

APPENDIX 9: Stool Testing Instructions for Patients

(Courtesy of safefood)

What to do if your GP has asked you for a stool sample.

A stool test is often used to investigate diarrhoea and other gut problems. To collect the stool (bowel motion) specimen, follow the instructions below. It is important to follow the instructions carefully to give the laboratory and your doctor the best chance of finding out what is wrong.

1. First write your or the patient's name and date of birth, and the date and time of collection on the specimen jar prior to use. Check that these details match those on the laboratory request form.
2. The best way to collect the stool specimen is by placing a large clean disposable container, e.g. an empty ice cream or take-away container, cardboard kidney dish, inside the toilet bowl. The container does not have to be sterile but must be clean and dry.
3. Pass the stool into the container. Plastic wrap can be used to line the nappy of an infant.
4. Using the small scoop attached to the lid of the specimen jar or spatula provided, collect some of the stool from the container and transfer it to the jar. Be careful not to get any on the outside of the jar. You only need a small amount i.e. half-filling the jar is enough.
5. Screw the lid on tightly.
6. Put the jar into a plastic bag and make sure the bag is sealed.
7. Keep in a cool place but not in the fridge or near food.
8. Carefully dispose of soiled container in a sealed plastic bag.
9. Wash your hands thoroughly with soap and water.
10. Your doctor will tell you what to do with the sample so that it can be sent to the lab as soon as possible.
11. Ensure you have made an arrangement with your doctor about getting the result of your test. This will take 48-72 hours.



Sample Jar

Take Sample

Bag Sample

Wash Hands

APPENDIX 10: Management of Gastroenteritis – General Advice for Patients and Carers

(Courtesy of safefood)

Diarrhoea is a common problem, which affects most people at some point in their lives. Most cases are mild and clear up on their own, but if the diarrhoea lasts for more than a day or two you should ask your doctor for advice.

Good hygiene is the best way to prevent the spread of diarrhoea.

This includes frequent hand washing with soap and water, disinfection of toilet handle and seat, and disposal of soiled items. Do not share towels or face washers. Do not prepare food for others.

Remember to drink lots of fluid

Dehydration is the commonest problem with diarrhoea and it is important to drink plenty of fluids. The best advice is 'small amounts often' to make vomiting less likely. Water, or diluted fruit juice, are best. Strong sugary drinks or sports drinks should be avoided. Rehydration drinks are ideal as they have the right balance of salts and sugars.

Only use medication when advised by your GP or pharmacist

Drugs to stop the diarrhoea can be helpful but can also have side effects. They should not be given to children under 12 or given to anyone with blood in the diarrhoea. Antibiotics are not appropriate for most cases of diarrhoea. Only take medicine when advised by a health professional.

Tell your doctor if you are not better 3-4 days after your visit, or are getting worse

Diarrhoea usually settles quickly. If the vomiting and diarrhoea do not settle over 3-4 days, or you feel you are getting worse, with dehydration, bloody diarrhoea, or abdominal pain, it is important to see your GP again. This is especially important for young children and the elderly.

Avoid fatty or spicy foods for a day or two, but otherwise eat as able

The old advice to stop eating has changed and you should continue to eat normally, or whenever you feel ready. Plain foods are best, like rice, bread and pasta. It is probably best to avoid fatty or spicy foods until the diarrhoea settles.

Stay away from school or work until the diarrhoea stops

It is very important to stay away from crèche, school or work until your symptoms resolve and ideally for 48 hours afterwards. This is particularly important for those at high risk of spreading the infection to others, like people who work with ready to eat food, medical, nursing staff and those who work as carers and children under the age of five.

APPENDIX 11: Specific Advice for Patients with VTEC

What is VTEC?

Verotoxigenic *Escherichia coli* (or VTEC) are a type of bacterium (bug) that is found in the bowels of many farm animals. VTEC bugs produce a toxin (called verotoxin) that can cause a common and potentially serious infection of the bowel in humans. It is most common and serious in the elderly and small children, although anyone of any age can contract VTEC.

Can I go to work/School?

If you/your child have VTEC you should be off work/school. And you/your child should remain off work/school for at least two days after you/your child's bowel motions return to normal. It only takes a couple of VTEC bugs spread from one person to make another person ill. Sometimes, in the case of children under the age of five attending a crèche²⁵, or people whose work involves preparing food²⁷ or people who work in hospitals and residential homes or childcare facilities²⁵, your local public health physician may want to undertake further stool tests and in that case you would have to remain off work/school, until there had been a couple of stool samples that were clear of VTEC. Occasionally, in children, it can take a number of weeks (and occasionally months) for the bowel to clear out the VTEC bugs, before a child is allowed back to their crèche/childcare provider.

How do you catch VTEC?

VTEC is spread in a number of ways: by drinking water contaminated with the VTEC bug, by eating food (raw, or ready to eat) contaminated with the VTEC bug, by coming in close contact with someone who is suffering from VTEC infection (this is especially common in families with small children or where groups of young children come together (e.g. in crèches and play schools), by coming in contact with farm animals such as cattle and sheep (or by coming in contact with their faeces including slurry) or by touching objects (light switches, clothing, footwear, handles, TV remote controls, pens, cups, plates, cutlery, toys etc.) things that have been contaminated with VTEC (for example spread from contaminated water or food, dirty hands or farm animals' bowel motions).

What are the symptoms of VTEC?

Occasionally, some patients infected with VTEC develop no symptoms at all (these patients are called *asymptomatic*). Most people however do develop some symptoms. The main symptom is diarrhoea which can be quite heavy. In about one quarter of cases the diarrhoea is bloody (blood is mixed throughout the child's loose bowel motions and not just coating the surface of a solid stool), so bloody that it can stain clothes and bedding. The verotoxin from the VTEC damages the lining of the bowel which leads to the bloody diarrhoea. The diarrhoea generally comes on about 4 to 7 days after the person has taken the VTEC into their body. Patients often complain of abdominal cramps that can be quite painful. There is also loss of appetite and often a feeling like flu; heavy-limbed, headache, no energy and achy muscles.

How is VTEC diagnosed?

The VTEC bugs are detected in a stool sample by the laboratory. A GP, a Public Health Physician or an Environmental Health officer on suspecting that your/ your child's symptoms suggested the possibility of VTEC or on suspecting that you/your child has had close contact with someone with VTEC (e.g. with the items mentioned above) putting you/your child at greater risk of developing VTEC, will organise to send off a sample of your/your child's stool (bowel motions) for examination in the laboratory. Once VTEC is identified, this means you have VTEC infection.

Is there a treatment for VTEC?

The vast majority of cases of VTEC get better with no treatment. Drinking plenty of fluids is all that is needed. Antibiotics are not necessary (they can sometimes make the situation worse).

How do I protect my family and friends?

The most important thing to remember with VTEC is that regular handwashing markedly reduces the risk of spreading it to others. Hands should be washed with soap and running HAND HOT water especially:

- After using or cleaning the toilet
- After attending to anyone with diarrhoea or vomiting
- After touching anything contaminated by diarrhoea or vomiting
- After handling contaminated clothing or bedding (including nappies)

If you have been diagnosed as having VTEC, you should not prepare the family's food until you have been symptom-free for at least two days. While you are unwell, get someone else to cook for you.

27. These groups of people are known as Risk Groups (they have a higher risk of passing on VTEC to others)

What are the complications of VTEC Infection?

Most people with VTEC infection get better uneventfully. However, in Ireland, about 10% of patients (mainly the elderly and children under the age of 10) go on to develop a serious complication known as **HUS (Haemolytic Uraemic Syndrome)**. The toxin produced by VTEC that leads to the bloody diarrhoea can also damage the kidneys and occasionally the heart and nervous system, producing HUS. HUS often leads to temporary renal failure. In children the outlook is excellent but in the elderly, HUS can be a very serious complication. HUS generally develops about a week after the diarrhoea of VTEC starts but it can begin within 2-3 days or may not appear for up to a fortnight.

My child has VTEC, what should I look do?

If your child has been diagnosed as having VTEC, the outlook is excellent. If s/he goes on to develop HUS it is important that s/he would be seen in hospital as quickly as possible. The important thing to do is to contact your GP as soon as symptoms of HUS appear; then s/he can organise to have your child seen by a specialist (once a child or elderly person develops HUS, they may need to be given fluids by a drip – this helps protect the kidneys from further damage). In addition, if your child should develop blood in the stools, you should take your child to you local Emergency Department for urgent assessment. The majority of children who have VTEC infection and who go on to develop HUS and virtually all children who have VTEC infection and who develop bloody diarrhoea make a full recovery, but it is important to have your child assessed to ensure that they receive any necessary treatment.

What is HUS?

HUS is a disease that affects the blood. Red blood cells are destroyed in a process called “haemolysis”. The toxin makes the lining of small blood vessels “sticky” and they become clogged up with tiny clots. When red blood cells meet these clots they are split and broken. In the kidneys, the toxin damages the lining of the kidney’s blood filtration units leading to acute renal (or kidney) failure – the kidneys can no longer filter the blood or produce urine properly. In addition, the blood become less effective at clotting and bleeding takes place more easily.

What are the symptoms and signs that mean my child may be developing HUS?

In people who have VTEC Infection, HUS generally develops about seven days after the onset of diarrhoea (it ranges from two to 14 days). A child who is developing HUS will probably show some or all of the following:

- Feeling weak/tired (due to anaemia)
- Dry nappies/visiting the toilet to urinate (pee) less and less (due to renal failure)
- Urine (pee) may become pink or brown in colour (due to blood being passed in the urine).
- Small bruises in the skin (due to poor clotting of blood)
- Nosebleeds (due to poor clotting of blood)
- Pallor (due to anaemia - the child’s skin becomes pale, the inside of the eyelids look pale pink instead of normal red)
- Swelling of face hands, feet, tummy (due to water retention)

If I see these symptoms what should I do?

If your child develops any of the above symptoms, you should call your GP immediately and talk to her/him. If you cannot contact your GP you should call your local A/E Department and speak to the duty doctor telling her/him that your child has VTEC and that you were advised to contact a doctor if the symptoms of HUS (above) develop. If the staff in the A/E Department diagnose HUS, your child will be admitted for more blood, kidney and stool tests. They may decide to give fluids by a drip. For seriously ill children there are other, more specialised treatments that can be started in the hospital.

Will my child be ok?

The great majority of children with VTEC who go on to develop HUS recover fully and require only a short stay in hospital.

APPENDIX 12: Members of Working Group

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Dr Rose Fitzgerald	HSE-Midwest
Dr Peter Finnegan	HSE-North East
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Acknowledgements:

Professor Martin Cormican, University College Hospital Galway (UCHG) and National Salmonella, Shigella and Listeria Reference Laboratory (NSSLRL) , Galway

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