

FOOD- AND WATERBORNE DISEASES AND ZOOSES

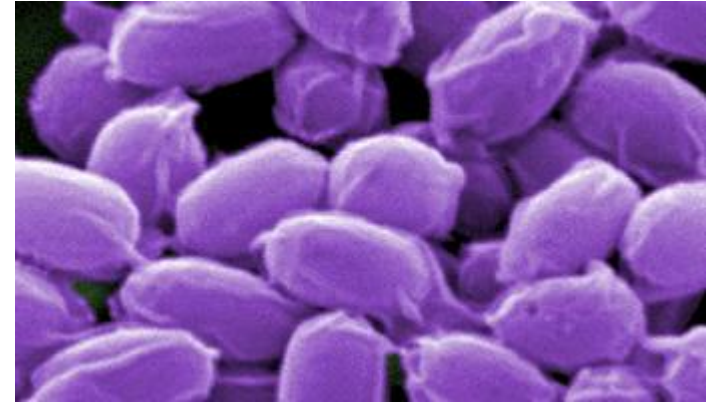
Kolářová M., EPI Autumn 2020

Food- and waterborne diseases and zoonoses

- Anthrax
- Botulism
- Brucellosis
- Campylobacteriosis
- Cholera
- Cryptosporidiosis
- Echinococcosis (hydatid disease)
- Shiga toxin/verocytotoxin-producing *Escherichia coli* (STEC/VTEC) infection
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- Trichinellosis
- Tularaemia
- Typhoid/paratyphoid fever
- Variant Creutzfeldt–Jakob disease (vCJD)
- Yersiniosis
- Rotaviruses
- Noroviruses
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Epidemiology of communicable diseases (ECDC)

Anthrax



- Anthrax is a zoonotic disease (could be transferred from animals to humans) caused by the spore-producing bacterium *Bacillus anthracis*.

Reservoirs are grass-eating animals, and
the spores can survive in the environment for decades.

Anthrax spores can be found in soil and animals, like cows, can then acquire the infection while grazing.

Transmission - Humans can catch the spores * by eating contaminated or insufficiently cooked meat, through contaminated flies that bite, * by a having a break in the skin and then being in contact with contaminated animal skins, bones, wool, hair or tusks or by breathing in spores (e.g., in wool sorting, bonemeal or hide processing factories).

Humans may acquire the infection after exposure to spores, and symptoms appear one to seven days (up to 60 days) later.

Anthrax - Case definition

Clinical Criteria Any person with at least one of the following clinical forms:

Cutaneous anthrax At least one the following two: — Papular or vesicular lesion; — Depressed black eschar with surrounding oedema.

Gastrointestinal anthrax — Fever or feverishness; AND at least one of the following two: — Severe abdominal pain; — Diarrhoea.

Inhalational anthrax — Fever or feverishness; AND at least one of the following two: — Acute respiratory distress; — Radiological evidence of mediastinal widening.

Meningeal/meningoencephalitic anthrax — Fever; AND at least one of the following three: — Convulsions; — Loss of consciousness; — Meningeal signs.

Anthrax septicaemia

Laboratory Criteria At least one of the following two: — Isolation of *Bacillus anthracis* from a clinical specimen — Detection of *Bacillus anthracis* nucleic acid in a clinical specimen Positive nasal swab without clinical symptoms does not contribute to a confirmed diagnosis of a case.

Epidemiological Criteria At least one of the following three epidemiological links: — Animal to human transmission; — Exposure to a common source; — Exposure to contaminated food/drinking water.

Case Classification

A. Possible case NA

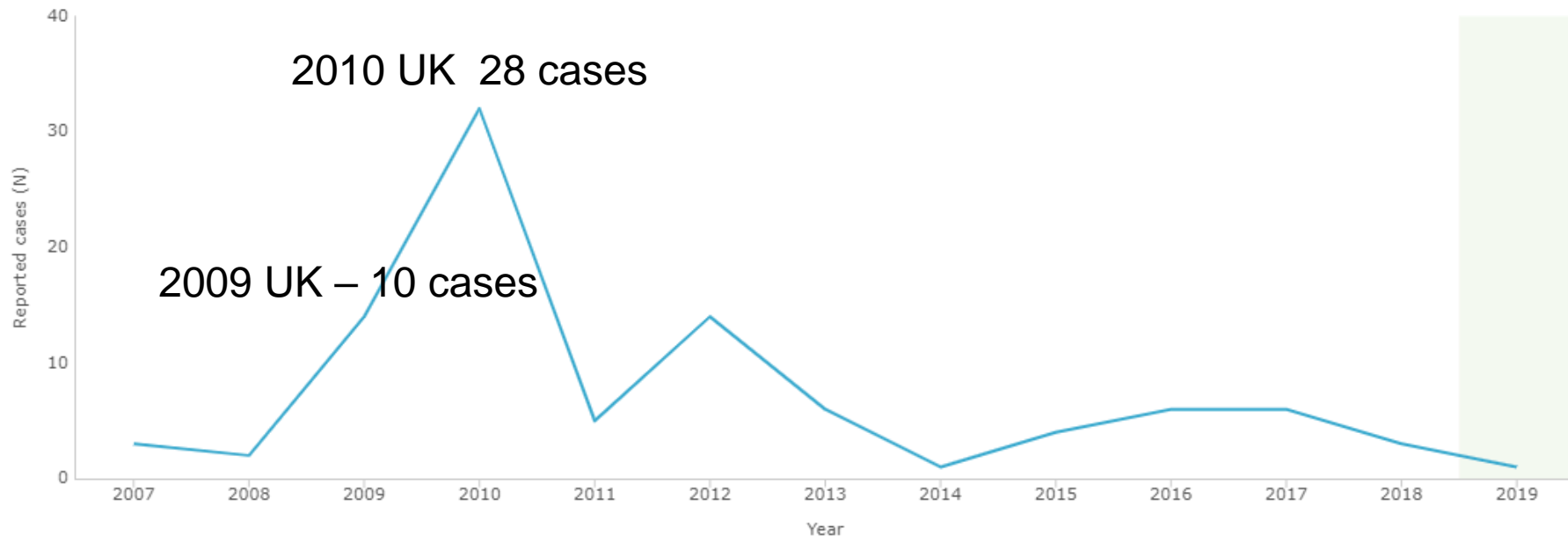
B. Probable case Any person meeting the clinical criteria with an epidemiological link 6.7.2018 L 170/10 Official Journal of the European Union EN

C. Confirmed case Any person meeting the clinical and the laboratory criteria

Note: If the national surveillance system is not capturing clinical symptoms, all laboratory-confirmed individuals should be reported as confirmed cases.

ANTRAX

The disease is endemic in several regions of the world, including southern and eastern Europe



Clinical presentations and symptoms depend on how the anthrax was acquired by infected person:

- Close physical contact with infected livestock or contaminated dead animal products can cause anthrax affecting the skin also known as **cutaneous anthrax**.

This is the most common form of the disease. A small pointed and inflamed elevation appears on the skin, usually on the face, hands or forearms. Over 2–3 days, this ulcerates to become a dry, black, painless scab, surrounded by a ring of small cysts. This is always accompanied by substantial swellings containing fluid, which extend a long way from the scab. The scab dries and falls off within 1–2 weeks, with little scarring. Patients with cutaneous anthrax usually recover, provided they receive prompt treatment with antibiotics.

- Swallowing anthrax can cause **gastrointestinal anthrax**, the form most common in children.

Gastrointestinal anthrax can affect either the upper throat or the intestines. The form affecting the throat usually starts with a flu-like illness with a high temperature, followed by throat ulcers and a visible swelling of the neck. The form affecting the intestines causes ulcers in the bowel, leading to nausea and vomiting, loss of appetite and high fever with abdominal pain, vomiting blood and bloody diarrhoea, (may progress to blood infection and death).

- Anthrax which is breathed in causes **inhalational anthrax** (with 75% death rate) .

This illness comes in two phases beginning with non-specific mild fever, malaise, muscle aches, dry cough and chest pain; disorientation is also common. Within 1–6 days, the illness progresses to the second phase with fever, acute shortness of breath, a harsh, grating sound when breathing and blue-tinged skin, rapidly leading to respiratory failure, shock, a drop in body temperature and death, if untreated.

Anthrax

Complications

Complications are rare in **cutaneous anthrax** although secondary infections are possible.

Gastrointestinal and inhalational anthrax can lead to inflammation of the brain: a flu-like illness, sometimes with an intense headache, rapidly progresses to seizures, delirium and coma, with collapse and sometimes death.

People most at risk

Those most at risk of cutaneous anthrax are butchers, farmers, vets or people working in the animal hide industry.

An outbreak of anthrax infection in heroin users

Prior to 2009, only one case of anthrax had ever been reported in a heroin user worldwide.

An outbreak of anthrax infection in heroin users in Scotland was reported in December 2009, continuing into 2010 with **a total of 55 cases including 21 deaths** from the UK, mainly Scotland and London area, and Germany.

A link between the Scottish and German cases could not be confirmed. The outbreak was officially declared over at the end of December 2010.

In contrast to the more common routes of transmission, injection with contaminated heroin was the confirmed route for these cases.

Control options are limited by the lack of knowledge about drug distribution routes, low compliance of patients with authorities, and the high case fatality of this threat.

An outbreak of anthrax infection in heroin users

In response to this outbreak, ECDC, together with the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) and EUROPOL, coordinated a risk assessment at European level and produced a joint threat assessment in 2010.

Awareness was increased through alerting Member States via the Early Warning Response System (EWRS), and protocols for handling patients, corpses and samples were shared to ensure bio-safety.

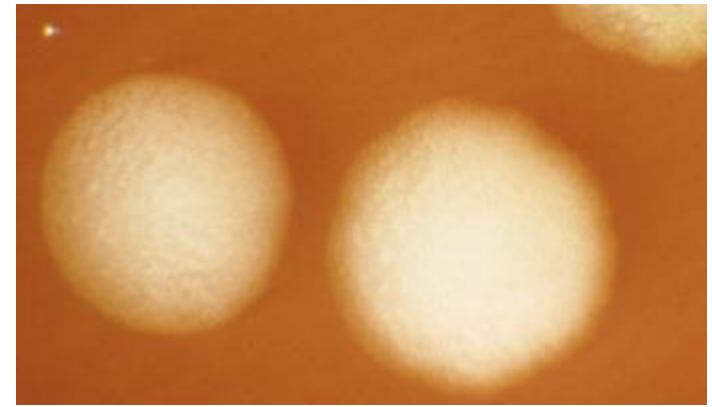
No cases were reported in the UK in 2011, although cases re-emerged in 2012, with 12 reported across northern Europe.

- Antibiotic treatment is effective if given at an early stage.
- Control measures include the correct disposal of dead animal: disinfection, decontamination and disposal of contaminated materials and decontamination of the environment.
- Protective equipment must be used by workers.
- Vaccination of exposed animals and humans is required.

Vaccination is recommended for vets, abattoir workers, those working with animal hides or furs, laboratory workers and armed forces in areas of high risk of exposure. Animals can be vaccinated to prevent them from being infected and passing the spores onto humans.

- Anthrax-related bioterrorist threats have been investigated in Europe. The agent was not confirmed, but a preparedness and response programme for attacks by biological and chemical agents (BICHAT) was developed in 2002 by the European Commission.

Botulism



Botulism is a serious paralytic illness caused by a nerve toxin produced by the bacterium *Clostridium botulinum*. The disease may occur after eating foods containing the toxin or due to development of the spores within the intestine of young children or within wounds.

Food botulism is the dominating form of the disease, and paralytic symptoms generally appear after an incubation period of 12–36 hours (up to several days) after consumption of the toxin-containing food. The symptoms may be very severe, and require intensive-care treatment and the administration of an anti-toxin. Even where these are available, between 5 and 10 % of the patients die.

Due to the extremely high potency of the toxin, botulism is included among the potential bio-terrorist threats. Following laboratory accidents, the toxin has also caused symptoms on inhalation, with a substantially reduced incubation period.

Botulismus - Case definition

Clinical Criteria:

Any person with at least one of the following clinical forms:

Food-borne and wound botulism At least one of the following two:

- * Bilateral cranial nerve impairment (for example, diplopia, blurred vision, dysphagia, bulbar weakness);
- * Peripheral symmetric paralysis.

Infant botulism - Any infant with at least one of the following six:

- * Constipation; * Lethargy; * Difficulty in sucking or feeding; * Ptosis; * Dysphagia; * General muscle weakness.

The type of botulism usually encountered in infants (< 12 months of age) can affect children also over 12 months of age and occasionally adults, with altered gastrointestinal anatomy and microflóra.

Laboratory Criteria: At least one of the following three: — Isolation of BoNT-producing clostridia (for example, *Clostridium botulinum*, *C. baratii*, *C. butyricum*) for infant botulism (stool) or wound botulism (wound); — Detection of botulinum neurotoxins in a clinical specimen; — Detection of genes encoding for botulinum neurotoxins in a clinical specimen.

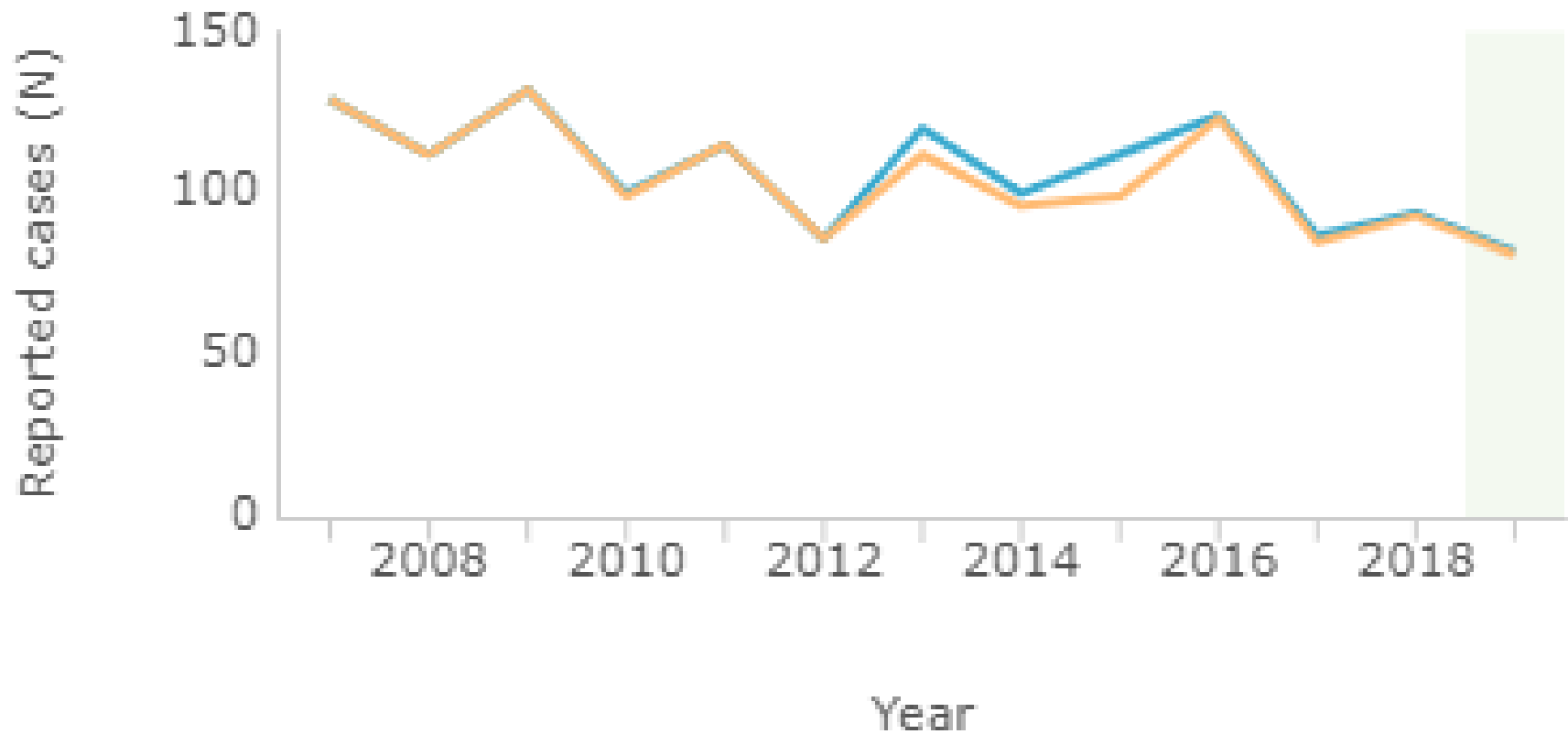
Epidemiological Criteria: At least one of the following two epidemiological links:

- Exposure to a common source (for example, food, sharing of needles or other devices);
- Exposure to contaminated food/drinking water.

Case Classification

- Possible case NA
 - Probable case Any person meeting the clinical criteria with an epidemiological link
 - Confirmed case Any person meeting the clinical and the laboratory criteria
- 6.7.2018 L 170/11 Official Journal of the European Union EN

Botulismus



Botulism

Symptoms

Botulism causes paralysis by affecting the nerves which allow the brain to stimulate muscles and part of the central nervous system. It initially affects the nerves in the skull and may cause blurred vision, difficulty swallowing, double vision, stammering or stuttering, vocal disturbance, drooping eyelids, facial weakness and weakness of the tongue. Weakness in the neck and arms follows, after which the respiratory and lower body muscles are affected. Respiratory problems may be severe enough to need ventilation in hospital. Other symptoms may include dry mouth, urinary problems and dysfunction of the stomach, intestines, heart and blood vessels. Patients do not usually have a fever, and have no loss of sensory functions or awareness. Botulism caught from food usually affects the stomach and intestines, causing nausea, vomiting, constipation, diarrhoea and abdominal cramps. Botulism in a wound causes inflammation around the wound, followed by low blood pressure and circulatory collapse. Patients with wound botulism often look and feel quite well before deteriorating dramatically over a few hours. Babies with botulism may have constipation, lethargy, feeding difficulties, floppy muscles, increased drooling and a weak cry.

Botulism

Ways to catch botulism

Botulism spores are widespread in the environment and can be found in dust, soil, untreated water and the digestive tracts of animals and fish. Foods that have led to botulism outbreaks have included the following: meat products, such as sausage and cured ham; canned, vacuum-packed, smoked or fermented fish products; vegetables preserved by canning or stored in oil; baked potatoes; honey; and cheese. Many outbreaks have occurred due to home-preserved foods. Intestinal or infant botulism usually takes place after swallowing botulinum spores, sometimes from food, which then produce toxins in the gut. Wound botulism usually happens from inoculating botulinum spores which then grow in the inoculation wound and produce toxins.

Botulism

People most at risk

Rates of botulism in the EU are generally low, with around 200 cases each year (0.03 cases per 100 000 people). The highest levels of cases over the past 10 years have been reported from Poland and Lithuania. Wound botulism in intravenous drug users is now the most common type of botulism in some European countries, such as the UK and Ireland. Infant botulism, which is very rare in Europe, usually affects children younger than two, with most being under six months old.

Botulism

Diagnosis

Laboratory tests can detect botulinum toxin in faeces, serum, stomach contents, a swab from a wound or in samples from contaminated food.

- **Treatment**

Patients need to be admitted to hospital for investigation and treatment. Botulinum antitoxin is available and reduces the length of illness and fatality rates, but may have serious side effects.

Treatment can be given based on a doctor's diagnosis of symptoms, without waiting for laboratory confirmation. Wound botulism can be treated with antibiotics and surgery to remove dead tissue.

Botulism

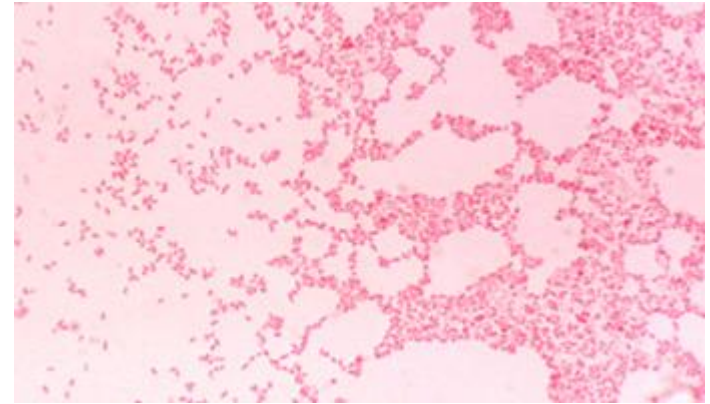
How to avoid getting botulism

There is no routine vaccination against botulism. Care should be taken when canning food, either commercially or at home, and when preserving fish, meat and vegetables to make sure botulinum is destroyed before storage. Do not eat food from containers that are obviously bulging (which could be caused by gas from the botulinum) or containers that are damaged. Avoid tasting food that might be spoiled. Keep food that has not been completely processed in the fridge. Boiling food for ten minutes before eating it would inactivate the toxin in home-canned foods. Potential botulism cases should get urgent medical response and investigation. Prevention work with intravenous drug users is also important.

What to do if you have botulism

Person-to-person spread is unlikely but it is sensible for carers and laboratory staff to wear personal protective equipment like gloves and goggles. Patients and their contacts do not need to stay away from work if they are well enough. People who have acquired botulism from contaminated food should be asked to give a history of everything they have eaten in the past five days before they became ill, especially canned or preserved foods..

Brucellosis

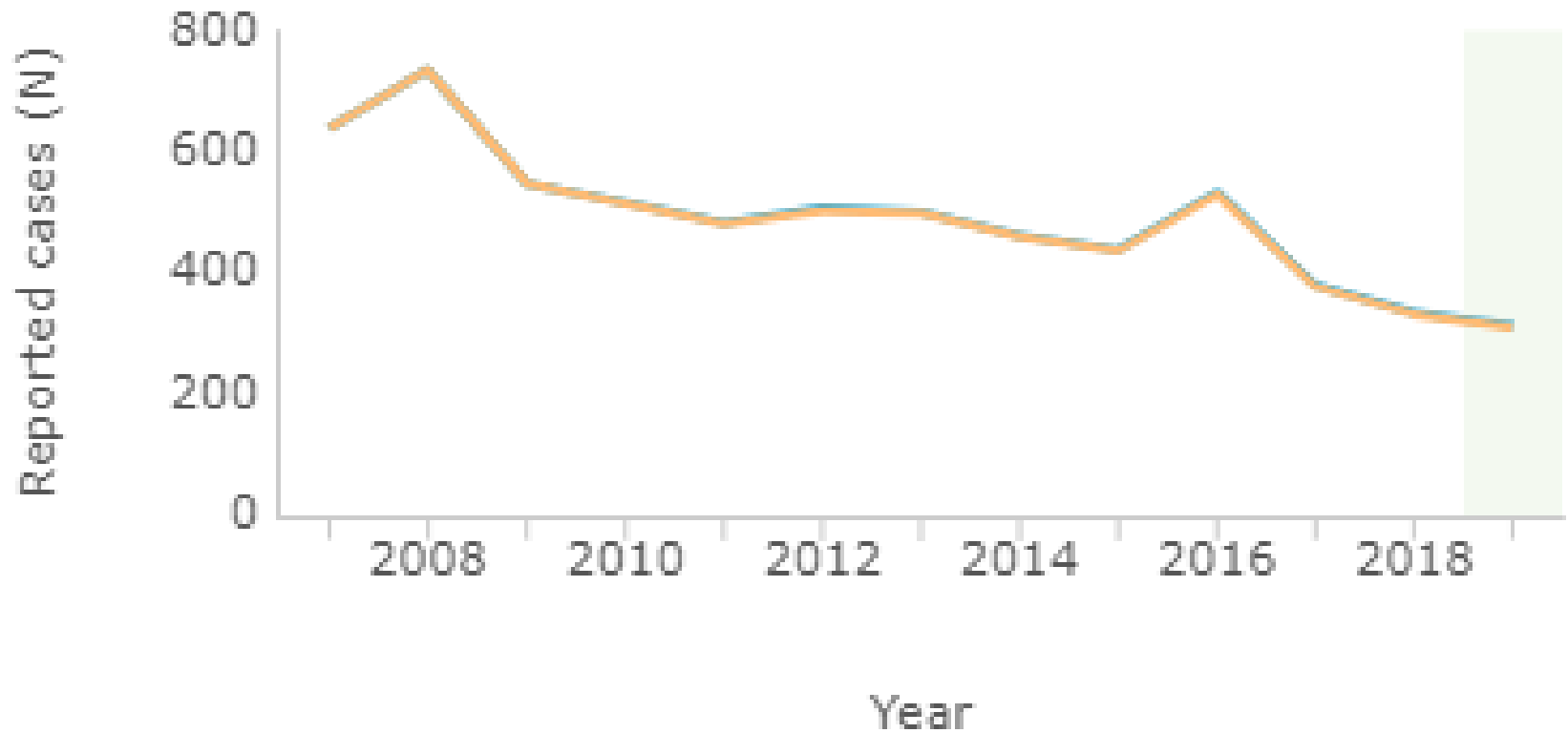


Brucellosis is an infection caused by Brucella bacteria. The common reservoirs for Brucella bacteria that may infect humans are cattle, dogs, sheep, goats, and pigs. Brucellosis occurs worldwide but the Mediterranean region has been particularly affected. Humans become infected by direct or indirect contact with animals or with contaminated animal products (including unpasteurised milk and dairy products) or by the inhalation of aerosols.

After an incubation period of five to 60 days, symptoms may appear either acutely or insidiously. Untreated, the disease may become chronic. The various symptoms are both general (fever, weakness, joint pain) and organ-specific (including infections in the brain infection and heart valves). Untreated, brucellosis can lead to death. Prolonged antibiotic treatment is usually effective.

Control measures include animal vaccination and/or test-and-slaughter of infected animals, as well as pasteurisation of milk and dairy products.

Brucellosis



BRUCELLOSIS – Case definition

Clinical Criteria:

Any person with fever

And at least one of the following *seven*: — Sweating (profuse, malodorous, specially nocturnal); — Chills; — Arthralgia; — Weakness; — Depression; — Headache; — Anorexia.

Laboratory Criteria: At least one of the following three:

- Isolation of human pathogenic *Brucella* spp. from a clinical specimen;
- Human pathogenic *Brucella* specific antibody response (Standard Agglutination Test, Complement Fixation, ELISA);
- Detection of human pathogenic *Brucella* spp. nucleic acid in a clinical specimen.

Epidemiological Criteria: At least one of the following five epidemiological links:

- Exposure to contaminated food/drinking water;
- Exposure to products from a contaminated animal (milk or milk products);
- Animal to human transmission (contaminated secretions or organs for example, vaginal discharge, placenta);
- Exposure to a common source;
- Laboratory exposure.

Case Classification:

- Possible case NA
- Probable case Any person meeting the clinical criteria with an epidemiological link
- Confirmed case Any person meeting the clinical and the laboratory criteria

Campylobacteriosis

Campylobacteriosis is a diarrhoeal disease caused by *Campylobacter bacteria*, found in animals such as poultry, cattle, pigs, wild birds and wild mammals.

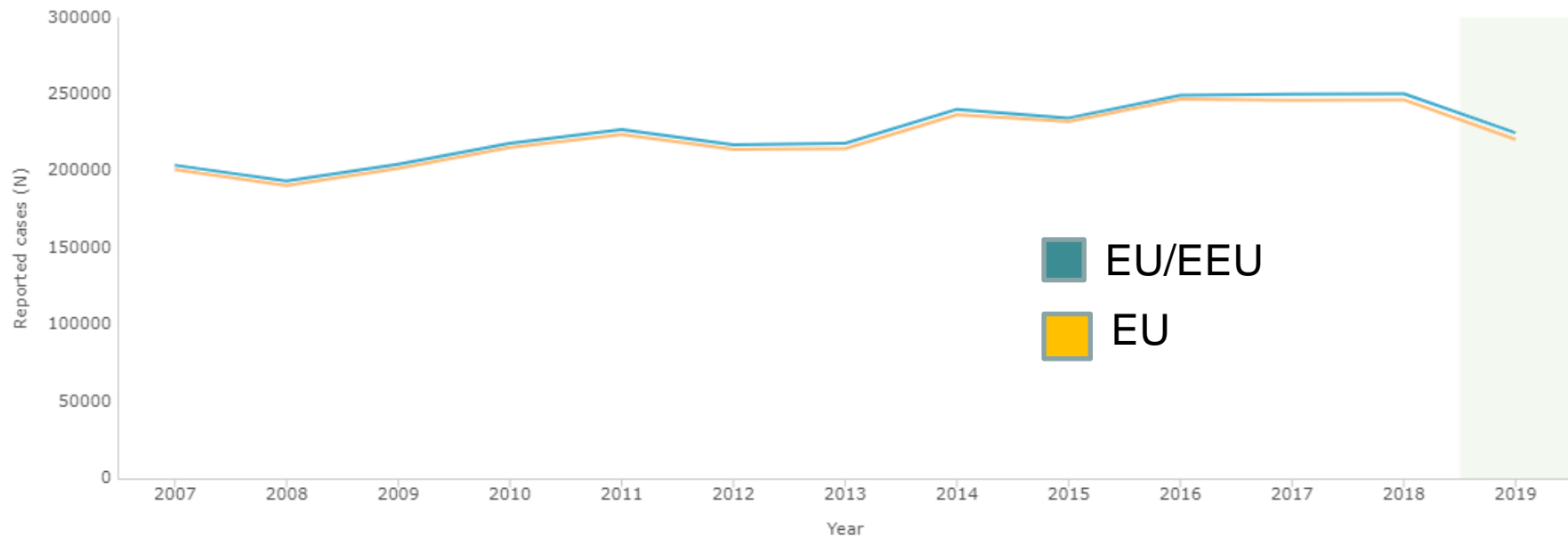
The most frequent way of getting infected is through the consumption of contaminated food (mainly poultry) or water. Other risk factors include swimming in natural surface-waters and direct contact with infected animals.

After an incubation period of 2–5 days (range 1–10 days) common symptoms are severe abdominal pain, watery and/or bloody diarrhoea and fever. Usually, symptoms last for a few days and the disease is self-limiting but occasionally they will persist and result in hospitalisation. Antimicrobial therapy is seldom needed.

Campylobacter infection has been associated with complications such as later joint inflammation (5–10% of cases) and, on rare occasions, Guillain-Barré syndrome (a temporary but severe paralysis that may be total).

As a prophylactic measure, control of Campylobacter colonisation in poultry is important, as well as hygienic processing of meat, and the protection and control of private drinking water supplies.

Campylobacteriosis



CAMPYLOBACTER ENTERITIS

Case definition

Clinical Criteria:

Any person with at least one of the following three:

— Diarrhoea; — Abdominal pain; — Fever.

Laboratory Criteria: At least one of the following two:

— Isolation of human pathogenic *Campylobacter* spp. from a clinical specimen;

— Detection of *Campylobacter* spp. nucleic acid in a clinical specimen.

Note: Antimicrobial susceptibility testing of *Campylobacter* spp. should be performed on a representative subset of isolates

Epidemiological Criteria: At least one of the following *five* epidemiological links: — Animal to human transmission; — Human to human transmission; — Exposure to a common source; — Exposure to contaminated food/drinking water; — Environmental exposure.

Case Classification

A. Possible case NA

B. Probable case Any person meeting the clinical criteria with an epidemiological link

C. Confirmed case Any person meeting the clinical and the laboratory criteria

Note: If the national surveillance system is not capturing clinical symptoms, all laboratory-confirmed individuals should be reported as confirmed cases.

Antimicrobial resistance The results of antimicrobial susceptibility tests must be reported according to the methods and criteria agreed between ECDC and Member States as specified in the EU protocol for harmonised monitoring of antimicrobial resistance in human *Salmonella* and *Campylobacter* isolates

Campylobacteriosis

- **Symptoms**

Campylobacter infection can vary from people who have no symptoms at all to those who are severely ill. Most people with symptoms have diarrhoea, abdominal pain and fever. Before these symptoms patients may have fever, headache, malaise and muscle pain. About a quarter of cases have vomiting or blood in their stools.

- **Complications**

Complications include arthritis (inflamed joints), Guillain-Barré Syndrome (which causes weakened muscles), and a type of kidney failure known as haemolytic uraemic syndrome (HUS). Some types of Campylobacter infection can lead to bacteria in the blood, meningitis, infected blood vessels and abscesses. Some types can also lead to more severe disease in people with chronic conditions, like diabetes.

Campylobacteriosis

- **Ways to catch Campylobacteriosis**

Campylobacteriosis comes from animals including poultry, cattle, pigs, wild birds, mammals and domestic pets. It is usually acquired from eating or drinking contaminated food and water; nevertheless, it can also be caught directly from animals or, rarely, from person to person through contact with infected faeces. Drinking raw or inadequately pasteurised milk has caused outbreaks of campylobacteriosis and cases have also been caused by birds pecking at milk in foil-topped bottles. Untreated surface water in community water supplies or failures in water treatment and contaminated water in open-topped tanks have also caused campylobacteriosis. People have also been infected through drinking from streams when trekking or canoeing. Contact with animals on farm visits and with infected pets, especially puppies, can be a risk factor for children younger than five years of age. Person-to-person spread can happen, although it is unusual, and is most likely from children who have diarrhoea or are not toilet-trained.

- **People most at risk**

Campylobacteriosis is common in Europe. All ages are affected but most cases are in children aged younger than four years and in young adults. Infections occur throughout the year but are most common from June to October. People at increased risk of Campylobacter infection include those working with farm animals or meat, travellers abroad (it is a common cause of travellers' diarrhoea), gay men and family contacts of cases. Patients with HIV may be ill for longer and suffer recurrent infections.

Campylobacteriosis

- **Diagnosis**

Laboratory tests on stool samples can be used to diagnose Campylobacteriosis, as well as blood tests.

- **Treatment**

Most cases settle after 2–3 days of diarrhoea and 80–90% settle within a week. Most people only need treatment to relieve their symptoms and keeping hydrated is important for those with diarrhoea.

However, some cases can be more prolonged or severe. Antimicrobial therapy to treat Campylobacter is not often needed but is available for severe infections or those particularly at risk.

Campylobacteriosis

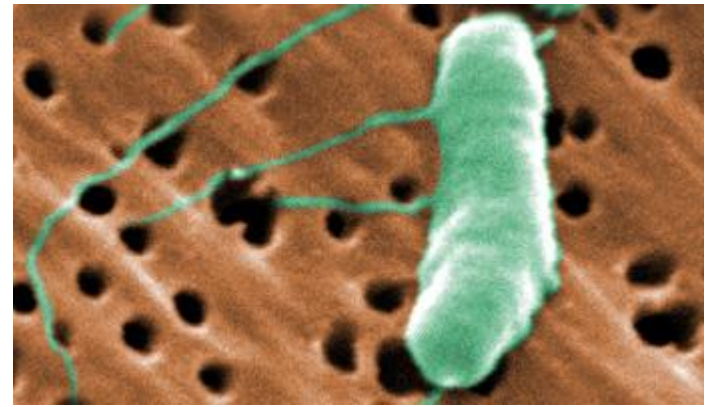
- **How to avoid getting Campylobacteriosis**

There is currently no vaccine against Campylobacter infection. Drinking pasteurised milk and chlorinated drinking water is important in preventing contamination. Good hygiene in commercial and domestic kitchens—especially avoiding cross-contamination—is important as is cooking meat properly, especially poultry. Conventional disinfectants are active against Campylobacteriosis. Doorstep milk should be protected against birds and it is important to wash hands carefully after contact with faeces, nappies, meat or animals, including on farm visits.

- **What to do if you have Campylobacteriosis**

Food handlers, healthcare workers and children younger than five years should stay away from work, nursery or daycare until 48 hours after symptoms have stopped. Food handlers and healthcare workers should continue to observe careful hygiene measures, especially hand washing.

Cholera



Cholera is an acute diarrhoeal infection caused by the bacterium *Vibrio cholerae* of serogroups O1 or O139. Humans are the only relevant reservoir, even though *Vibrios* can survive for a long time in coastal waters contaminated by human excreta.

Consumption of contaminated water and food, especially seafood eaten under-cooked, results in infection. After a short incubation period of less than five days, the typical symptoms might develop, characterised by vomiting and watery diarrhoea. In most cases, though, symptoms are mild or absent and infected individuals become carriers with no symptoms.

With timely treatment (fluid replacement and antibiotics), less than 1% of patients with symptoms die. The disease has not been endemic in Europe for a long time, and thanks to high hygiene standards the potential for imported cases to generate further ones is low.

CHOLERA – Case definition

Clinical Criteria:

Any person with at least one of the following two:

- Diarrhoea;
- Vomiting.

Laboratory Criteria: — Isolation of *Vibrio cholerae* from a clinical specimen AND

- Demonstration of O1 or O139 antigen in the isolate AND
- Demonstration of cholera-enterotoxin or the cholera-enterotoxin gene in the isolate

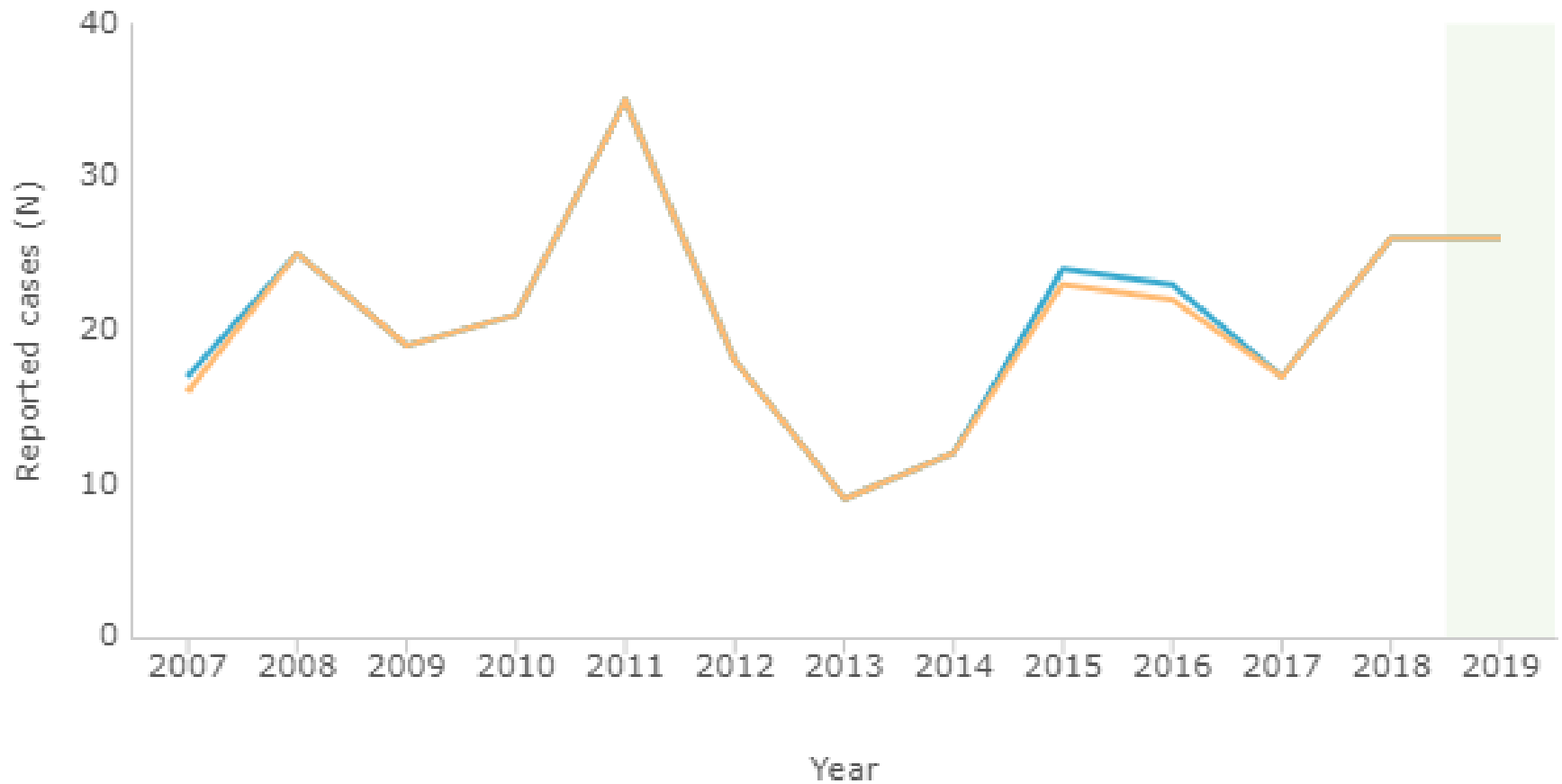
Epidemiological Criteria: At least one of the following four epidemiological links:

- Exposure to a common source;
- Human to human transmission;
- Exposure to contaminated food/drinking water;
- Environmental exposure.

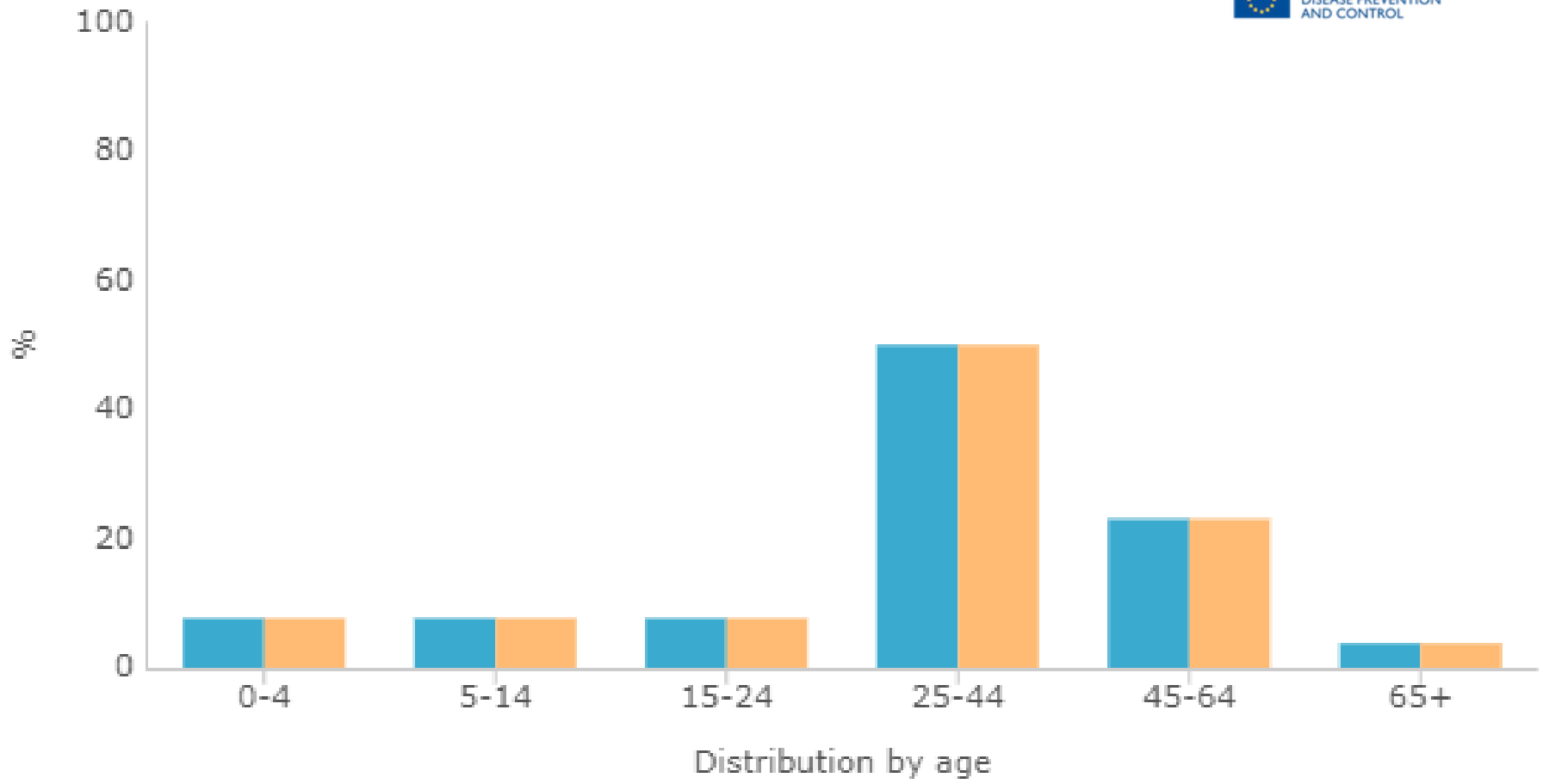
Case Classification

- A. Possible case NA B.
- B. Probable case Any person meeting the clinical criteria with an epidemiological link
- C. Confirmed case Any person meeting the clinical and the laboratory criteria;

Cholera



Cholera



Cholera is an acute intestinal infection caused by ingestion of food or water contaminated with the bacterium *Vibrio cholerae*. It is a disease of poverty, closely linked to poor sanitation and lack of clean drinking water. It has a short incubation period of a few hours to five days, and is characterized in the majority of cases by acute, profuse watery diarrhoea lasting from one to a few days. In its extreme form, cholera can be rapidly fatal.

- The disease occurs in both endemic and epidemics patterns. Cholera incidence worldwide has increased steadily since 2005 with outbreaks affecting several continents.
- Further, its impact can be dramatic in areas where basic environmental infrastructures are disrupted or have been destroyed and provision of potable water and sanitation is challenging.
- As such, acute humanitarian emergencies are a particular risk factor for cholera outbreaks.
- The annual burden of cholera has been estimated at 1.3 to 4.0 million cases and 21 000 to 143 000 deaths worldwide (2017).

- Cholera cases have continued to be reported in eastern Africa, the Horn of Africa and the Gulf of Aden over the past few months.
- Cholera outbreaks have also been reported in the western and southern part of Africa and in some areas of Asia.
- Despite the high number of cholera outbreaks reported worldwide, few cases are reported each year among returning EU/EEA travellers. The risk of cholera infection in travellers visiting countries with ongoing outbreaks remains low, although sporadic infections among EU/EEA travellers are possible.
- In 2018, 26 cases were reported in EU/EEA Member States, while 17 and 23 cases were reported in 2017 and 2016, respectively. All cases had travel history to cholera-affected areas.
- The risk of further transmission of *Vibrio cholerae* within the EU/EEA is very low.

- According to the WHO, vaccination should be considered for travellers at higher risk, such as emergency and relief workers who are likely to be directly exposed.
- Vaccination is generally not recommended for other travellers.
- Travellers to cholera-endemic areas should seek advice from travel health clinics to assess their personal risk and apply precautionary sanitary and hygiene measures to prevent infection. These can include drinking bottled water or water treated with chlorine, carefully washing fruit and vegetables with bottled or chlorinated water before consumption, regularly washing hands with soap, eating thoroughly cooked food and avoiding the consumption of raw seafood products.

Cholera

- **Diagnosis**

Cholera can be confirmed by testing a sample of a patient's stools in a laboratory. Rapid tests are also being developed, which do not need to be done in laboratories –. However, where there are outbreaks of large numbers of cases, laboratory tests would not be carried out on all patients and doctors would be able to diagnose patients based on their diarrhoea and vomiting symptoms.

- **Treatment**

As previously mentioned, if cholera is not treated, up to 50% of people who have it can die. However, as long as treatment is given, this is reduced to around 1% of cases. Rapidly rehydrating patients is the most important treatment for cholera. The majority of cases can be rehydrated by drinking Oral Rehydration Salt solution. Severely dehydrated patients will need intravenous fluids and may also be treated with antibiotics. Using anti-diarrhoeal drugs is not recommended in patients with cholera. Infection control measures are important with cholera patients, because the bacteria are highly infectious. Patients in hospital or being cared for at home should be isolated and strict hygiene measures implemented to reduce the risk of spreading the infection.

Cholera - vaccination

- Currently there are three WHO pre-qualified oral cholera vaccines (OCV):

*Dukoral®, *Shanchol™, and *Euvichol®.

All three vaccines require two doses for full protection.

* Dukoral® is mainly used for travellers. Two doses of Dukoral® provide protection against cholera for 2 years.

* Shanchol™ and Euvichol® are essentially the same vaccine produced by two different manufacturers. Two doses of Shanchol™ and Euvichol® provide protection against cholera for 3 years, while a single dose provides short term protection.

Shanchol™ and Euvichol® are the vaccines currently available for mass vaccination campaigns through the Global OCV Stockpile, which is supported by Gavi, the Vaccine Alliance.

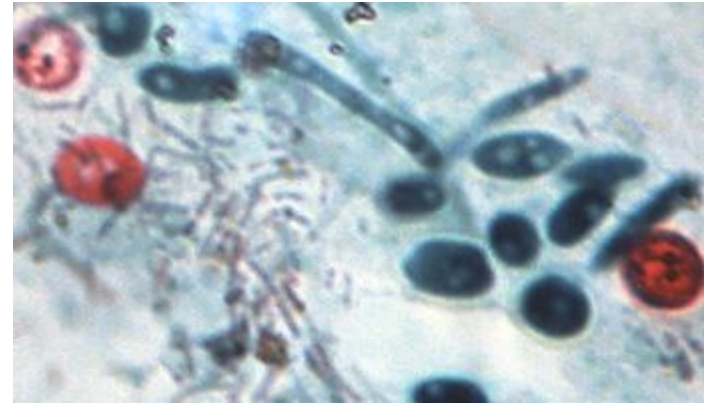
More than 20 million doses of OCVs have been used in mass vaccination campaigns.

The campaigns have been implemented:

- in areas experiencing an outbreak,
- in areas at heightened vulnerability during humanitarian crises, and
- among populations living in highly endemic areas, known as “hotspots”.

A mix of live, killed and conjugated vaccines are in development that have the potential of providing longer term protection with an easier-to-administer schedules.

Cryptosporidiosis



- Cryptosporidia are intestinal parasites infecting a variety of animals (e.g. cattle, sheep, rodents, cats and dogs, but also birds, fish and reptiles). Human infections occur due to *Cryptosporidium parvum*, a species that also affects domestic animals.

In humans, infections without symptoms are common. Especially healthy individuals, may, after an incubation period averaging one week, get a diarrhoea that spontaneously resolves over a couple of weeks. By contrast, patients with impaired immune system may develop profuse, life-threatening, watery diarrhoea that is very difficult to treat with currently available drugs.

Person-to-person or animal-to-person disease transmission occurs mainly through contaminated water and food. *Cryptosporidium* eggs (oocysts) can survive for months in moist soil or water and survive harsh environmental conditions (e.g. heat, cold, droughts) for extended periods of time.

Outbreaks have been reported in hospitals, day-care centres, within households, among bathers (affecting participants in water sports in lakes and swimming pools), and in municipalities with contaminated public water supplies. Water distribution systems are particularly vulnerable to contamination with *Cryptosporidium*, which can survive most disinfection procedures such as chlorination

Cryptosporidiosis

- **Symptoms**

The most common symptom of cryptosporidiosis is acute, watery diarrhoea. Pain in the abdomen may also occur, along with other symptoms like malaise, headache and fever. The disease is usually self-limiting, but can last up to 14 days and can cause significant weight loss. In humans, the illness can vary in severity from no symptoms at all to those who suffer from persistent diarrhoea, with up to 40% of cases suffering a return of diarrhoea after recovering from the initial illness.

- **Complications**

In children, especially in developing countries, cryptosporidiosis can cause persistent diarrhoea and lead to wasting and stunted growth. People whose immune systems are deficient, including patients with HIV and AIDS, can also develop a more severe and persistent infection.

Cryptosporidiosis

Ways to catch cryptosporidiosis

Cryptosporidium parasites can be caught by swallowing infected water (either drinking water or through leisure activities), eating contaminated food, direct contact with animals carrying the germs, or passed from person to person by direct contact. Drinking water is a frequent source of infection and causes outbreaks around the world. This occurs where water is contaminated with sewage or waste water overflow, or if there has been a technical failure at a water treatment plant. Person-to-person infection is also common and *Cryptosporidium* can be easily spread in households, nurseries and schools. Changing nappies has been identified as a significant risk factor. In Europe international travel, contact with another case, contact with cattle, use of swimming pools and toileting of children younger than five years have all been shown to be risk factors for contracting cryptosporidiosis.

Cryptosporidiosis

People most at risk

Cryptosporidiosis occurs worldwide but is a leading cause of persistent diarrhoea in tropical, developing areas, particularly in children and people with HIV infection. Everyone is susceptible to the infection but the highest numbers of cases are found in children, with those aged younger than two years at the most risk.

Cryptosporidiosis

Diagnosis

Cryptosporidiosis can be confirmed by carrying out laboratory tests on a sample of faeces from an infected patient.

- **Treatment**

In most generally healthy people, treatment may not be necessary for cryptosporidiosis as it is usually self-limiting. As with all illness causing diarrhoea, it is important to monitor patients to make sure they do not become dehydrated. Drugs are available that may be used to treat patients who develop persistent diarrhoea.

Cryptosporidiosis

How to avoid getting cryptosporidiosis

Good quality drinking water, swimming pool hygiene and general hygiene measures are all important in preventing cryptosporidiosis. Good hand-washing, taking care when preparing food and carefully disposing nappies are all important in limiting the spread of infection. People whose immune systems are compromised should avoid contact with animals with diarrhoea and young pets, and avoid swallowing water when swimming. If drinking water supplies are affected, water should be boiled before drinking.

- **What to do if you have cryptosporidiosis**

Children who have cryptosporidiosis symptoms should stay away from schools or daycare centres until 48 hours after the diarrhoea has stopped. If you have had cryptosporidiosis, you should avoid using public swimming pools for two to three weeks after you have recovered from the symptoms.

Echinococcosis



Echinococcosis is a zoonotic disease (transmitted from animals to humans) caused by the larval stage (hydatid cyst) of tapeworms. Eggs are excreted in the faeces of infected dogs and foxes and can be ingested by humans either by close contact with these animals or through contaminated food.

- The most common location of cysts is the liver, but cysts may develop in almost any organ, including lungs, kidneys, spleen, nervous tissue, etc, years after the ingestion of the echinococcus eggs. In the case of cystic disease, symptoms usually appear due to the large size of the cysts. Cysts in the lungs invades tissues in a cancer-like fashion and if untreated always leads to death.
- Patients are treated with surgery and the specific anti-helminthic drugs. The disease occurs in areas where dogs have access to animal inner organs, usually of sheep and cattle (intermediate hosts), containing cysts. The lung form is restricted to northern countries, where foxes abound.
- Poor hand hygiene, close contact with infected animals and consumption of undercooked, unwashed food contaminated with echinococcus eggs (e.g. vegetables) are all risk factors.

-

Echinococcosis

Symptoms

People who are infected with echinococcosis usually do not have any symptoms. Symptoms are usually caused when the cysts formed by the infection restrict or compress other parts of the body. Cysts can also leak and cause secondary bacterial infection in the body, abscesses or immune reactions. People get echinococcosis by swallowing the eggs of parasites after eating contaminated food. The eggs hatch into tapeworms in the person's intestines and these pass through the membranes lining the body and get into the circulation. The tapeworms turn into cysts in the intestines and bowels which can grow and multiply, especially in the liver or lungs. However, it can also spread beyond the liver to any organ including the brain, heart and bones.

- **Complications**

Complications can include various diseases of the liver and the parts of the body around the liver. If cysts leak or rupture, they can cause allergic reactions which are sometimes severe.

Echinococcosis

Ways to catch echinococcosis

People get echinococcosis by swallowing the eggs of parasites when they eat contaminated food or drink water contaminated with the faeces of animals which have been infected with the tapeworm. The infection is most often spread from dogs, wolves and foxes but can also come from sheep, goats, cattle, camels and horses. Infected humans do not excrete eggs.

- **People most at risk**

The parasites that cause echinococcosis are found all over the world. Studies have shown that the infection tends to more often affect older people rather than children. Dog owners and people who work with sheep, goats or cows can be more at risk.

Echinococcosis

Diagnosis

Most of the time, untreated cysts remain undetected and are often found by chance when other complaints are being investigated. X-rays and ultra-sound scans can detect the cysts caused by echinococcosis and a biopsy can detect the infection.

- **Treatment**

Usually, treatment is only offered to those who are suffering symptoms as a result of the cysts caused by echinococcosis. These can either be treated surgically, by chemotherapy or by using ultrasound scans to guide a doctor to remove the cyst fluid using a needle.

- **How to avoid getting echinococcosis**

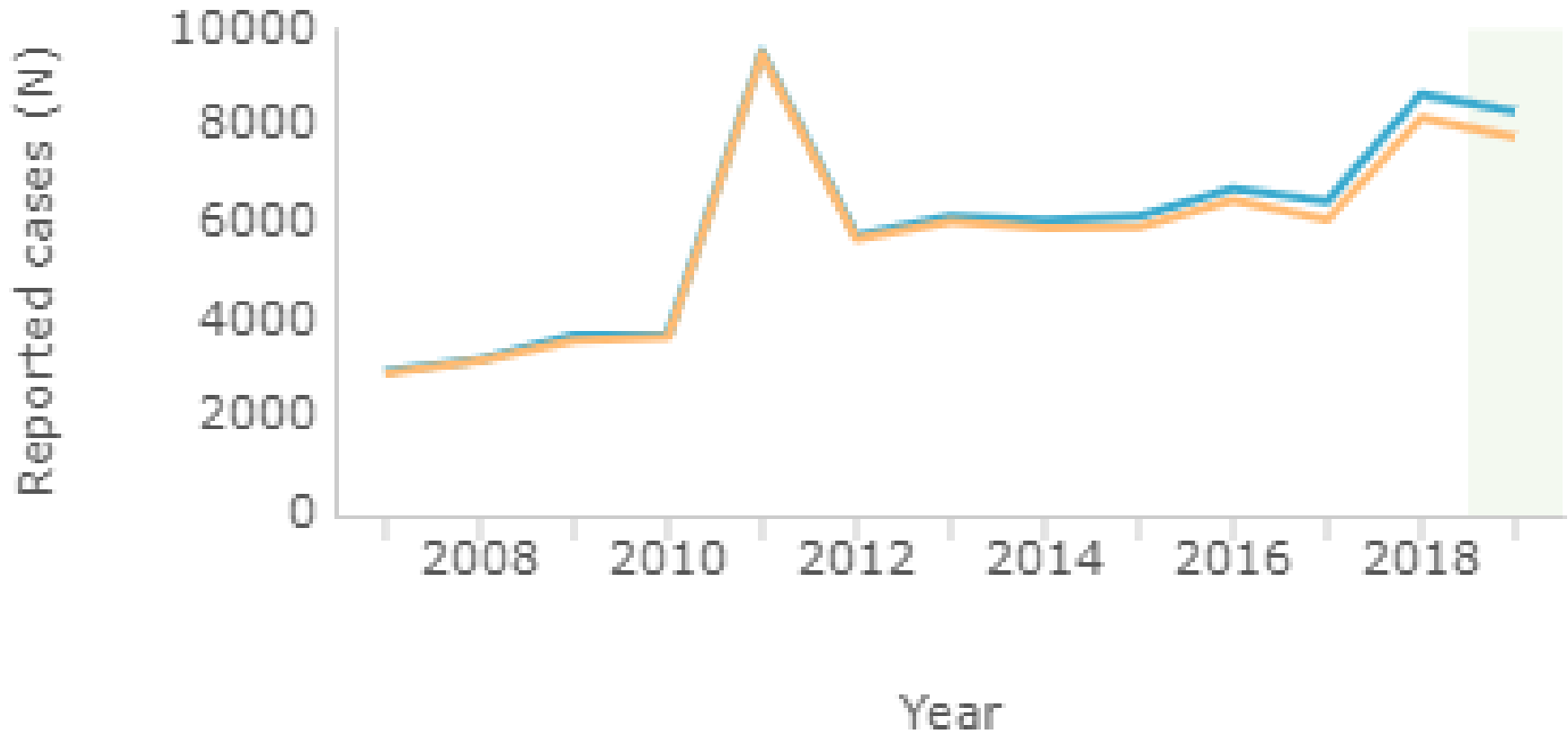
Good hygiene measures are important to avoid getting echinococcosis. Vaccines are available for animals to reduce the risk of their spreading the parasite to humans.

Escherichia coli (E.coli)

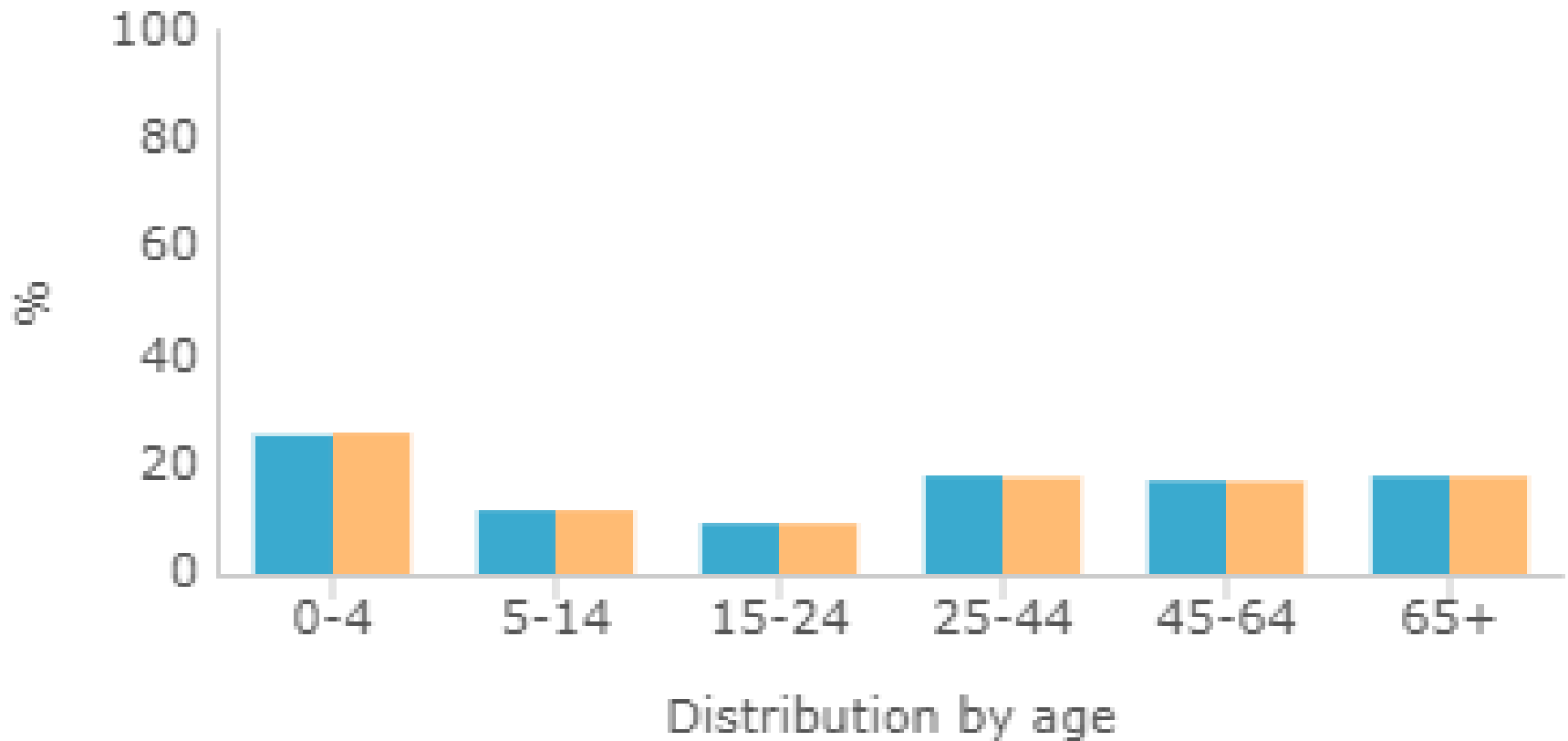


Escherichia coli (E.coli) are very common bacteria in the gastrointestinal tract, and part of the normal bacterial flora. However, some E.coli strains are able to produce a toxin that could produce serious infection. The main reservoir of such E.coli strains is grass-feeding animals, cattle in particular. Their meat might become contaminated by faecal matter due to poor processing methods during slaughter, and their faeces might end up contaminating other foods (e.g. milk, vegetables) and water.

Escherichia coli (E.coli)



Escherichia coli (E.coli)



Escherichia coli (E.coli)



Humans acquire the infection by consuming contaminated food or water. Following an incubation period of about 3–4 days, a variety of gastrointestinal symptoms appear, ranging from mild to severe bloody diarrhoea, mostly without fever. However, about 8% of patients (children under five years old and the elderly being the most susceptible) may develop “haemolytic uraemic syndrome” (HUS), characterised by acute kidney failure, bleeding and neurological symptoms. Antibiotic therapy is not helpful (it might even favour HUS development). The death rate of HUS is about 3–5%.

Vero/shiga toxin-producing *Escherichia coli* (VTEC/STEC) infection

Shiga toxin-producing *E. coli* (STEC) is a group of pathogenic *Escherichia coli* strains capable of producing Shiga toxins, with the potential to cause severe enteric and systemic disease in humans. The full serotype is usually defined by determining both O and H antigens. There are around 200 different *E. coli* O serotypes producing Shiga toxin, of which over 100 have been associated with human disease. Two major Shiga toxin types (Stx1 and Stx2) have been associated with strains causing human disease. While the serotype O157:H7 is considered as clinically the most important, it is estimated that up to 50% of STEC infections are caused by non-O157 serotypes. STEC is of public health concern because of the potential for outbreaks and the risk of serious complications. Haemolytic uremic syndrome (HUS) is considered as the most common cause of acute renal failure in European children. Even if the clinical presentation of non-O157 STEC infections may vary, they can be as virulent as O157:H7 infections.

Shiga toxin-producing E. coli (STEC)

Transmission of STEC infection mainly occurs through contaminated food or water and contact with animals. Person-to-person transmission is also possible among close contacts (families, childcare centres, nursing homes, etc). A wide variety of food has previously been implicated in outbreaks as suspected sources, including raw (unpasteurised) raw milk and cheese, undercooked beef, a variety of fresh produce (e.g. sprouts, spinach, lettuce), unpasteurised apple cider, etc. Recently an outbreak of STEC O157 infections in Canada and the USA was linked to walnuts, thus new sources continue to be identified. Various types of animals, in particular cattle and other ruminants, can be healthy carriers of human-pathogenic STEC that can be spread to humans through faecal contamination.

Escherichia coli (E.coli)

Shiga toxin-producing E. coli (STEC)

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Escherichia coli (E.coli)

The infective dose is very low. The incubation period ranges from three to eight days. The typical presentation of infections with STEC is acute gastroenteritis, often accompanied with mild fever and sometimes vomiting. The typically bloody diarrhoea is in most cases mild and self-limiting and most people recover within five to seven days. Around 15% of children diagnosed with STEC O157 infection develop the severe complication of HUS; this proportion is much lower among adults, and this proportion in outbreaks of non-O157 outbreaks is not well documented. The severity of STEC diarrhoea is determined by several factors, including the E. coli serotype, the type of Shiga toxin produced and other virulence characteristics of the bacteria. The patient's age and the infecting dose also play an important role. Children under the age of 5 years are at higher risk of developing clinical disease when infected, and infants are at increased risk of death from dehydration and septicaemia.

- While the confirmation methods of O157 STEC infection are well established, this is not always the case for infections caused by STEC non-O157 serotypes. Therefore, underreporting of non-O157 STEC infections is very likely, and their importance for clinical disease in humans is insufficiently understood.

Escherichia coli (E.coli)

The treatment of STEC infections is mainly based on rehydration, while antibiotic treatment is often contraindicated as it may activate Shiga toxin release and therefore cause clinical deterioration with a potential evolution to HUS.

- STEC infections in humans are under epidemiological surveillance in the EU and in 2009 there were 3 573 reported cases of which about half were caused by the STEC O157:H7 serotype.
- Since 2008, eight cases of STEC O104 have been reported in the EU, by Austria (one case in 2010), Belgium (two cases in 2008), Denmark (one case in 2008), Norway (three cases in 2009), and Sweden (one case in 2010); three of these cases were imported. In addition, between 2004 and 2009, Austria and Germany reported some positive findings of STEC O104 in food or animals. However, the suggested outbreak strain of serotype STEC O104:H4 has been rarely reported worldwide.

Shiga toxin-producing E. coli (STEC)

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- The treatment of STEC infections is mainly based on rehydration, while antibiotic treatment is often contraindicated as it may activate Shiga toxin release and therefore cause clinical deterioration with a potential evolution to HUS.
- STEC infections in humans are under epidemiological surveillance in the EU and in 2009 there were 3 573 reported cases of which about half were caused by the STEC O157:H7 serotype.

Prevention measures

All humans and animals carry the bacteria called *Escherichia coli* (*E. coli*) in their intestines – they are part of our normal flora and usually harmless. However, there are particular strains of *E. coli* that are capable of producing toxins. These strains are called STEC/VTEC (shiga toxin or verotoxin –producing *E. coli*) or EHEC (enterohaemorrhagic *E. coli*), and their toxins have the potential to cause severe, bloody diarrhoea, which may in some cases result in an acute kidney failure requiring intensive care. There are several different strains of STEC and their identification can be used to more precisely find the source of a particular outbreak.

Prevention measures

Transmission of STEC infection mainly occurs through eating or handling contaminated food and contact with infected animals. Further person-to-person transmission is possible among close contacts (families, childcare centres, nursing homes, etc). A wide variety of food has previously been implicated in outbreaks as sources of infection, including undercooked beef and other meat, unpasteurized milk, a variety of fresh produce (e.g. cucumber, sprouts, spinach, and lettuce), unpasteurized apple juice and cheese. A very small number of STEC bacteria are sufficient to cause infection in humans.

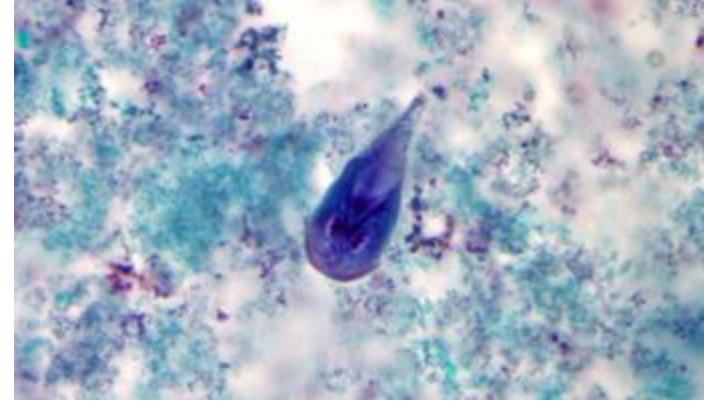
Good personal hand hygiene

- Wash your hands properly with soap, rinse carefully and dry using disposable kitchen towel or a textile towel (to be washed regularly at 60°C):
- before preparing, serving, or eating food
- after using the toilet or changing nappies (diapers)
- after handling raw vegetables, roots or meat
- after contact with farm animals or after visiting a farm
- after any contact with faeces from household pets

Food handling

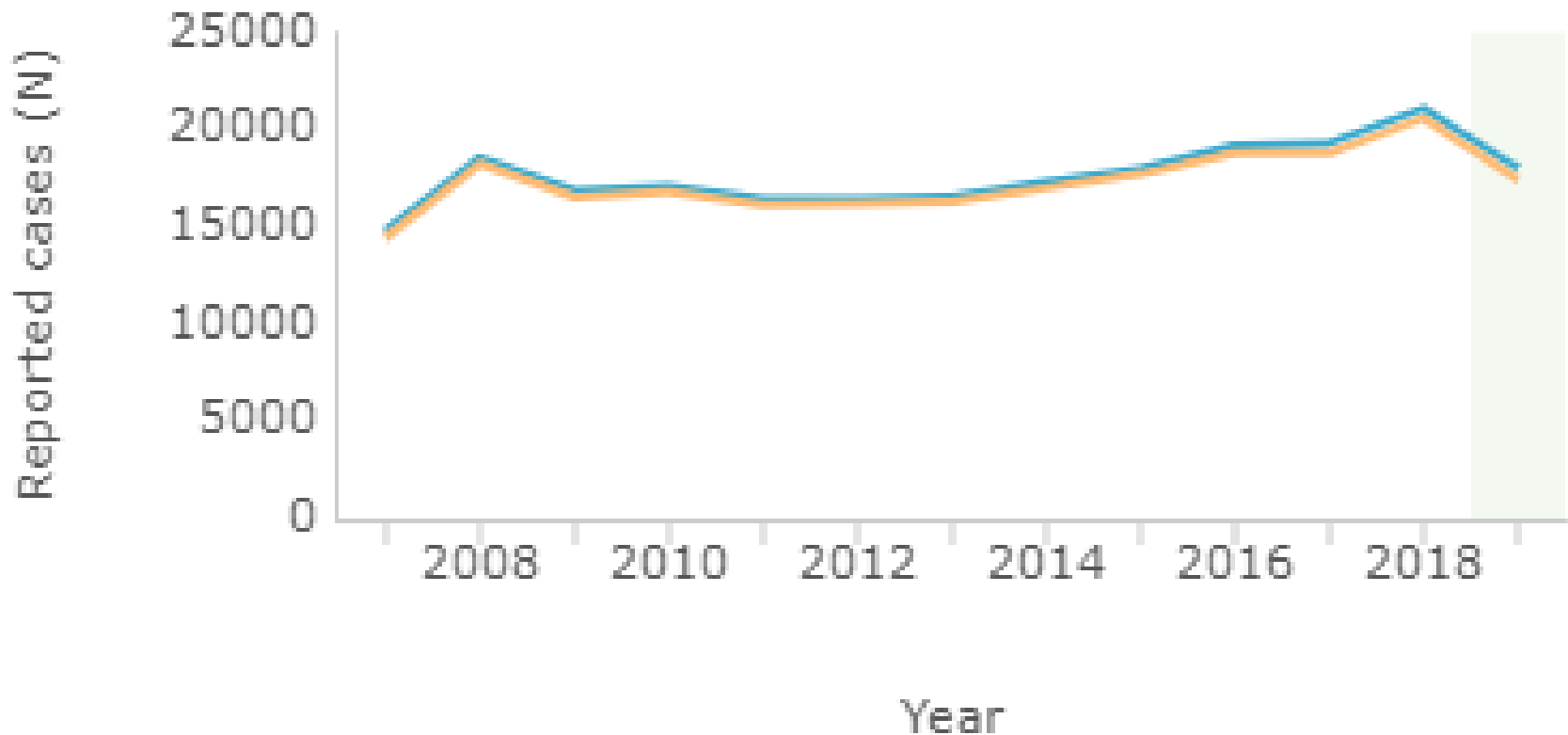
- *Any person with diarrhoea or vomiting should restrain from handling food*
- *Meat, including minced meat, should be thoroughly cooked*
- *All fruits with skin should be peeled and then rinsed under running potable water*
- *All vegetables should be washed properly under running potable water, especially those that will not be cooked before consumption*
- *Peel all root vegetables and rinse them under running potable water*
- *Thorough cooking of vegetables and meat destroys disease causing bacteria and viruses*
- *Avoid cross contamination i.e. spreading bacteria from a raw food item to a ready-to-eat or cooked food item, by for example, using separate cutting boards for raw meat and cooked meat or fresh vegetables and wash the cutting board with soap in between the handling of raw and ready-to-eat food.*

Giardiasis

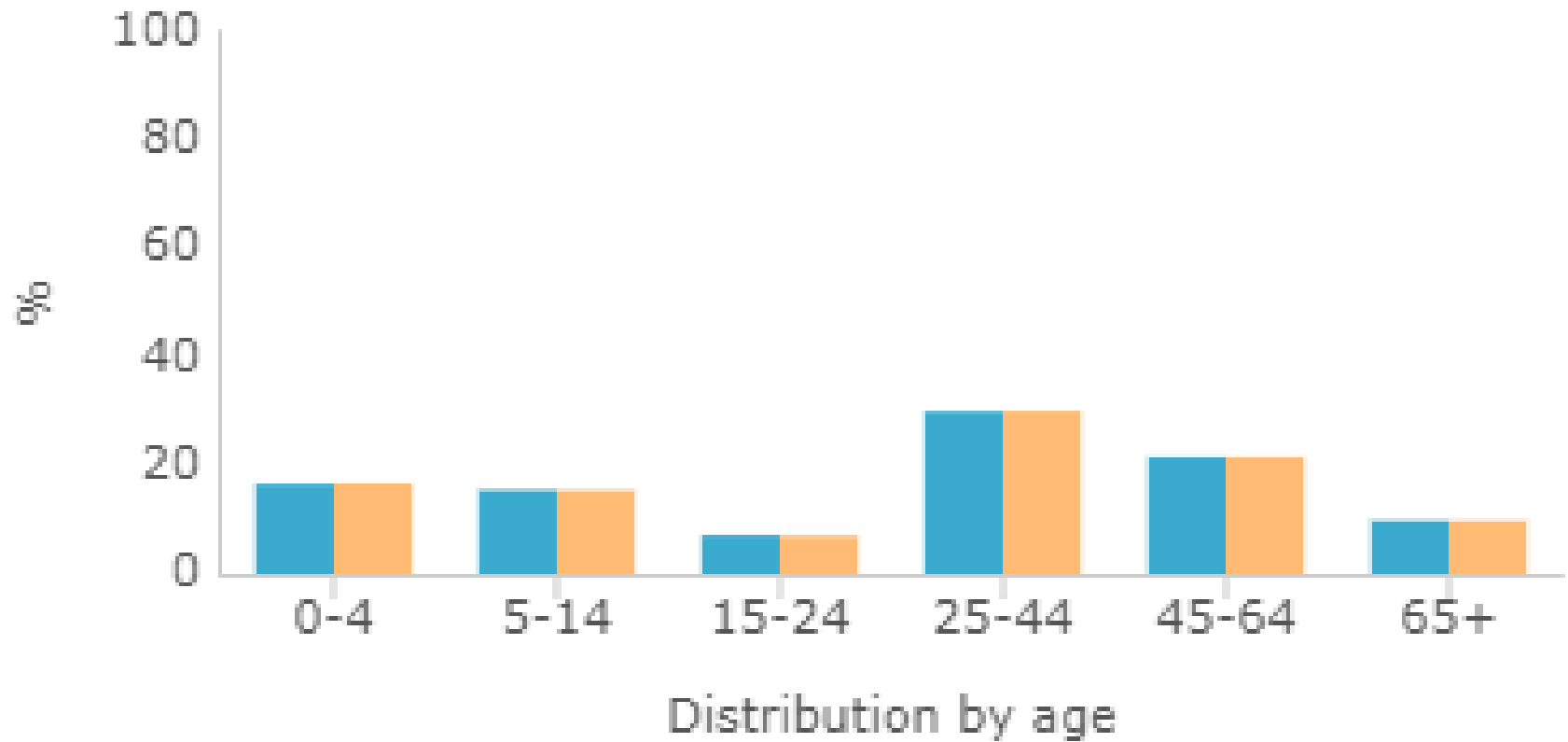


Giardia lamblia (*Giardia intestinalis* and *Giardia duodenalis* are synonyms) is a cyst-producing parasite, able to settle in the human and animal bowel. The parasites could cause disease equally in humans and animals such as dogs, cats, cows and sheep. In the environment, major reservoirs of the parasite are contaminated surface waters.

Giardiasis



Giardiasis



Giardiasis

Symptoms

People who have swallowed *Giardia* cysts sometimes have no symptoms; this is particularly common in children. For those who have symptoms, the most common are diarrhoea, malaise, flatulence, foul-smelling and greasy stools, abdominal cramps, bloating, nausea, loss of appetite and weight loss. Prolonged diarrhoea, weight loss and not absorbing nutrients from food passing through the intestines are particular symptoms of giardiasis.

- **Complications**

Symptoms can occasionally be very severe, especially in young children or pregnant women. Symptoms can be acute, chronic—lasting some time—or relapsing, clearing up and then recurring.

Giardiasis

Ways to catch giardiasis

Giardiasis is caught by swallowing parasites or their cysts from infected faeces, either directly or through contaminated food or water. Consumption of contaminated recreational or drinking water appears to be the most common source. Direct person-to-person transmission, again through contact with infected faeces, is the other main source of infection. Foodborne outbreaks have happened, usually linked to infected food handlers or their contacts.

- **People most at risk**

Most cases happen in children aged 0–4, followed by those aged 5–14 and then adults aged 25–44. Cases happen throughout the year, with slight peaks in spring and autumn. Higher rates of infection are seen in refugees, people living in institutions, travellers abroad, gay men and people whose immune systems are compromised.

Giardiasis

Diagnosis

Giardiasis can be diagnosed by looking at samples from stools under a microscope and by other laboratory tests.

- **Treatment**

Antimicrobial treatment is available for giardiasis.

Giardiasis

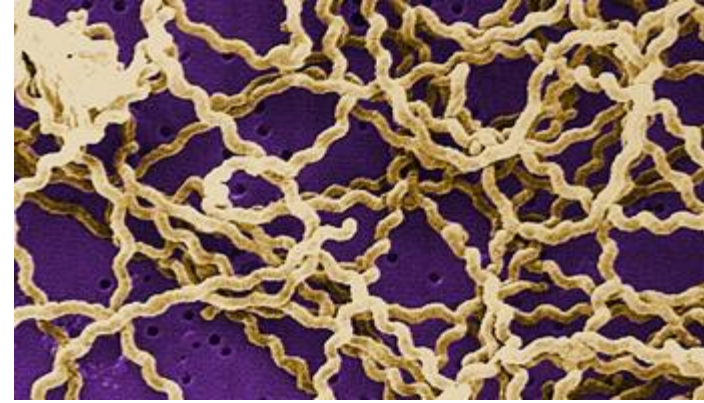
How to avoid getting giardiasis

Normal water treatment processes should be effective in removing *Giardia* cysts from drinking water. Good personal and food hygiene, especially hand washing, are important in preventing the spread of giardiasis, especially in institutions like nurseries or care homes. There is no vaccine to protect humans against giardiasis, although a vaccine may be available for pets.

- **What to do if you have giardiasis**

Food handlers, healthcare workers and affected nursery children should stay at home until 48 hours after their symptoms have ceased in order to avoid spreading the infection.

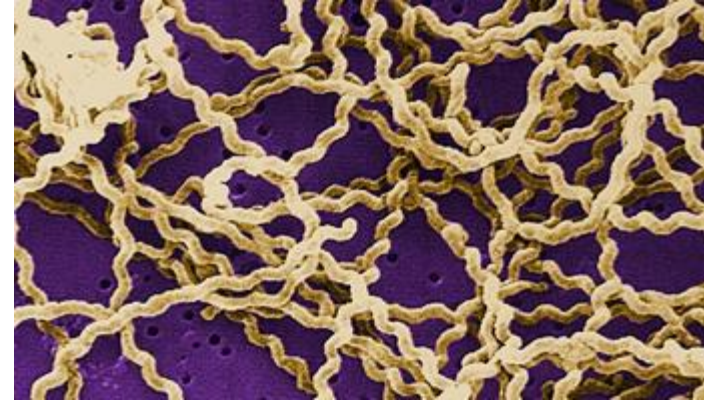
Leptospirosis



Leptospirosis is a zoonotic disease caused by *Leptospira* bacteria. Although more common in tropical areas of the world, the disease is also present in temperate areas, including Europe. Different species of domestic and wild animals act as maintenance hosts. Humans acquire leptospirosis either from direct contact with the urine of infected animals, or from contact with material contaminated by it, such as water or soil. After exposure, the incubation period ranges between two and 30 days (with an average of 10 days). The clinical presentation is variable. Fever, muscle ache and eye infection are very frequent. Liver, kidney, lung, heart, and more rarely brain involvement and bleeding characterise the most serious clinical presentations. Timely antibiotic treatment is effective, and the death rate is low, but does increase with advancing age and may reach up to 20% or more in complicated cases with severe disease.

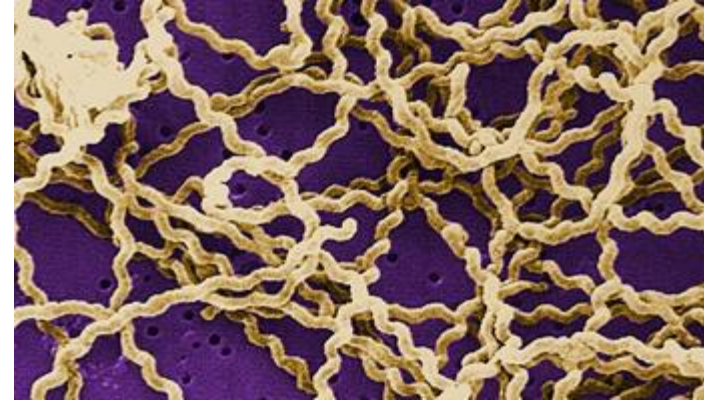
- Preventive measures include controlling rodent populations, avoiding contaminated areas and covering cuts and abraded skin when operating in the environment. Immunisation of persons at occupational risk of exposure has been carried out in some countries (Italy, France, Spain).
-

Leptospirosis



- **NAME AND NATURE OF INFECTING ORGANISM** Leptospirosis is a zoonosis occurring worldwide, caused by pathogenic spirochaetes of the genus *Leptospira*. Pathogenic leptospire live in the kidneys of a large variety of mammalian species and are excreted into the environment with the urine. Indirect infection through contact with leptospire secreted into the environment is probably the main route of acquiring leptospirosis. Pathogenic leptospire survive longer in a warm and humid environment. Therefore, the disease is particularly prevalent in wet tropical and subtropical regions. The bacterium is sensitive to dry conditions, extreme temperatures and detergents. Currently nearly 300 serovars have been identified, divided into 25 serogroups. Seven main pathogenic species are known.
- Leptospirosis is the most widespread and most prevalent zoonotic disease. The disease is (re-) emerging globally and numerous outbreaks have occurred worldwide during the past decade. In Europe, leptospirosis occurs mainly in the Mediterranean and East European regions.

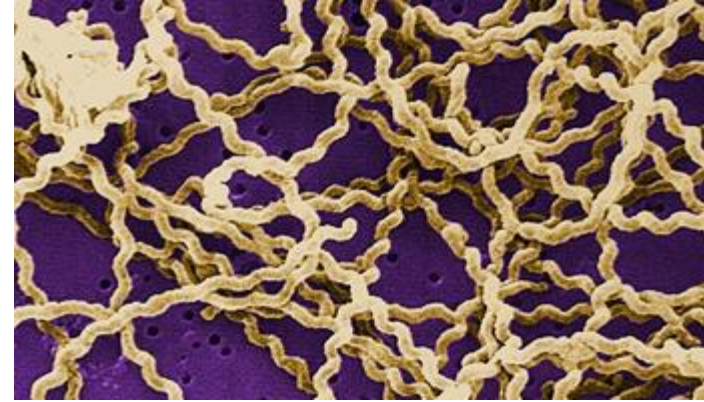
Leptospirosis



• 2. CLINICAL FEATURES

- The incubation period varies from 2 to 30 days, with an average of 7–10 days. Leptospirosis varies from mild to severe clinical presentation, and may cause potentially fatal conditions such as Weil's syndrome and the emerging Severe Pulmonary Haemorrhagic Syndrome (SPHS). Generally, leptospirosis is an acute biphasic illness: the first phase (4–9 days) presents with an abrupt onset of a flu-like illness, with a severe headache, chills, muscle aches, and vomiting, while in the second phase the patient develops fever, jaundice, abdominal pain and diarrhoea. In severe cases there may be organ failure. If untreated, recovery may take several months.

Leptospirosis



- **3. TRANSMISSION**

- **3.1 Reservoir**

- About 160 mammalian species have been identified as natural carriers of pathogenic leptospire. These include feral, semi-domestic and farm and pet animals as important infection sources. The infectious period of natural hosts can be lifelong. Accidental hosts can act as intermediate infection source, and may shed leptospire for days or months.

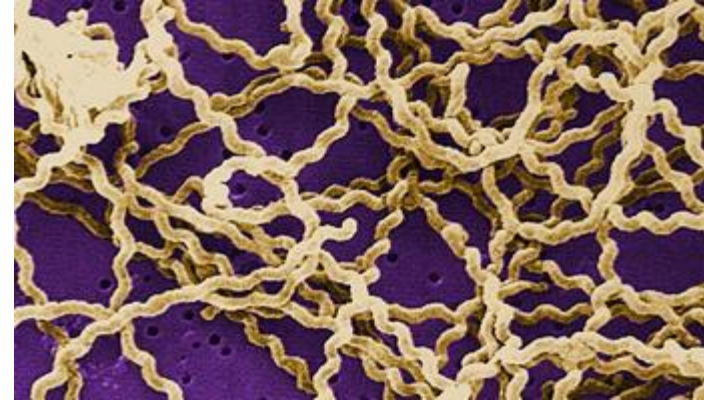
- **3.2 Transmission mode**

- The route of transmission is via broken skin and through mucous membranes of eyes, mouth and nose (consumption, inhalation). Transmission through water-weakened skin is controversial. Transmission may also occur via sexual contact and mother's milk. In-uterus transmission can lead to reproductive failures such as abortion.

- **3.3 Risk groups**

- The risk of acquiring leptospirosis is associated with contact with animals and thus with occupations such as farmers, veterinarians and sewer workers. Case severity is associated with physical condition and increasing age. Leptospirosis as a recreational disease in travellers is increasing in Western countries.

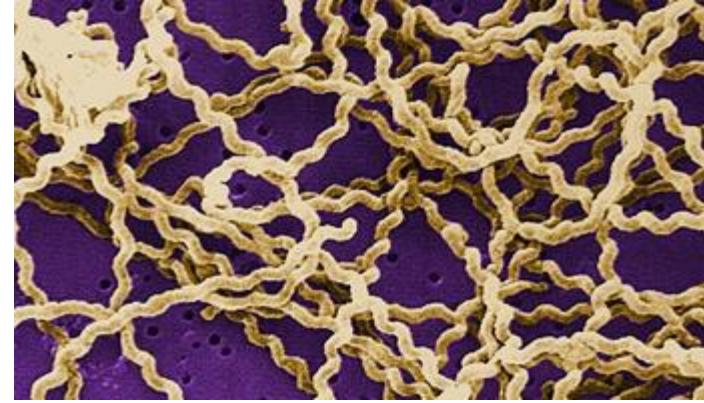
Leptospirosis



. PREVENTION MEASURES

- Prevention and control mainly focus on the identification and reduction of the infection source and the prevention of penetration of leptospire into the accidental host. Prevention of transmission can be achieved by wearing protective clothing. Prophylactic treatment with doxycycline is protective to some extent. Vaccination is available in a limited number of countries, but currently not considered as a generally applicable option.**
- Improving water and food storage conditions, increasing public awareness about the disease and infection risks, as well as the control of rodents, may reduce the risk of transmission. Infection risk from domestic animals can be reduced by vaccination or treatment of carriers. Both approaches should be combined with herd management. Vaccines are available for cattle, dogs and pigs, and provide a short-term serovar-specific protection.**

Leptospirosis



- **5. DIAGNOSIS**

- **The confirmation of a clinically suspected leptospirosis case is usually done through culturing and the Microscopic Agglutination Test (MAT); both are quite laborious and require well-equipped laboratories with experienced staff. Several rapid tests for humans are currently available, mainly for screening purposes, and results must be confirmed by standard tests.**

- **6. MANAGEMENT AND TREATMENT**

- **Early diagnosis is critical in the treatment of patients with leptospirosis. In severe cases, high doses of intravenous penicillin are recommended, but Jarish-Herxheimer reactions may occur. In less severe cases, oral antibiotics such as amoxicillin, ampicillin, doxycycline or erythromycin are administered. Third generation cephalosporins and quinolone antibiotics also seem to be effective.**

Listeriosis



- Listeriosis is a disease caused by *Listeria monocytogenes*. The disease primarily causes problems in pregnant women, newborns, and adults with a weakened immune system. Listeria bacteria are ubiquitous in the environment, and food-borne outbreaks have been detected worldwide. Many animals carry the bacteria in their faeces.
- After exposure (via contaminated food) most healthy adults do not develop any symptoms, except in the case of pregnant women. After an incubation period of about three weeks pregnant women may suffer from a self-limiting influenza-like illness which may affect the uterus. In that case, it can lead to death of the foetus and consequent abortion or to a dramatic picture of congenital listeriosis in the newborn. In addition, listeriosis in adults with weakened immune system and the elderly may lead to meningitis, brain infection, and severe blood infection. All clinical presentations are treatable with prolonged courses of antibiotics, but the prognosis of the most serious ones is poor.
- Control measures should be aimed at the farm and food-processing level, in order to prevent contamination of food products. Preventive measures include providing appropriate information for consumers on how to minimise the risk of ingesting food contaminated by Listeria.
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Listeriosis



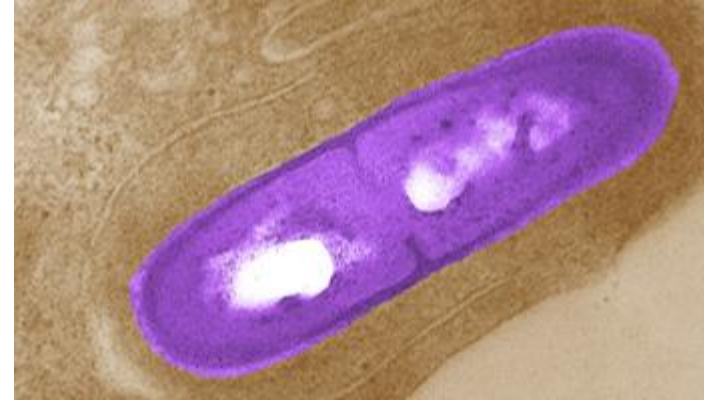
- **Symptoms**

Listeriosis can cause a range of symptoms. Some patients can have no symptoms at all. Previously well, non-pregnant people often get symptoms of acute gastroenteritis—inflammation of the stomach and intestines. This can cause headache, fever, abdominal pain, sleepiness, nausea and diarrhoea. Fatigue, aching muscles, painful joints, vomiting and a sore throat may also occur.

- **Complications**

Listeriosis can also cause serious illness, most often in those with long-term health conditions, the elderly, or people whose immune systems are compromised. Severe symptoms can include the following: blood poisoning; inflammation of the brain and its lining; abscesses; inflammation of the lining of the heart; and infected or inflamed joints. Pregnant women who get the infection may only have mild illness, but can suffer miscarriage, premature delivery or stillbirth. Newborn babies can also suffer from severe symptoms, including meningitis, which can lead to death.

Listeriosis



- **Ways to catch listeriosis**

The bacteria that cause listeriosis are widespread in the environment and can be found in soil, surface water, vegetation and a range of wild and domestic animals. Most humans catch the infection by eating contaminated food. The bacteria can grow at low temperatures and are tolerant of salt and therefore can survive in processed, preserved and refrigerated foods. Foods that have been associated with spreading listeriosis include the following: processed meat and fish, cold meats and hot dogs; dairy products, such as soft cheese, butter and milk, especially if unpasteurised; and pre-prepared salads, sandwiches and salads. Other sources of infection include direct contact from animals or the environment. Pregnant women can pass the infection to their babies during birth or through the placenta.

- **People most at risk**

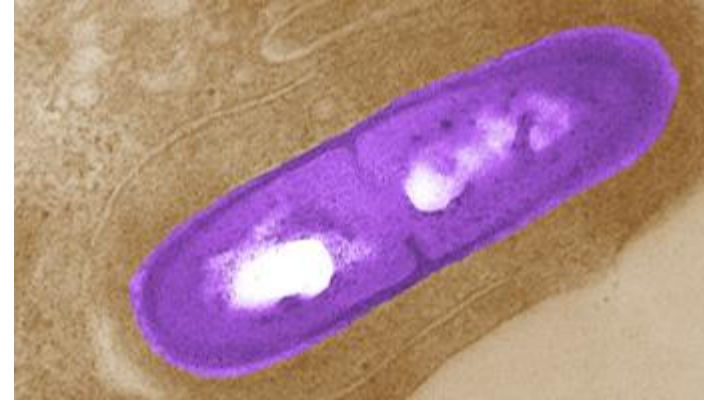
Reported cases in Europe are highest among those over 65 and children younger than four.

Listeriosis



- **Diagnosis**
Laboratory tests are carried out on samples of blood or cerebrospinal fluid to diagnose the infection. Laboratory tests are also carried out on food and environmental samples to look for *Listeria*.
- **Treatment**
Antibiotics can be used to treat patients.

Listeriosis



- **How to avoid getting listeriosis**
Pasteurising dairy products is important as the process kills *Listeria*. Cook-chill and ready-to-eat foods should not be stored for too long and should be thoroughly reheated before serving. Raw vegetables, fruits and salads should be thoroughly washed before eating. Pregnant women and people whose immune systems are compromised are advised to avoid soft cheeses, pâté and pre-packed salads, contact with pregnant or newborn animals and silage. Hand washing is effective at reducing the risk of gastroenteritis from many organisms and may be made even more effective by using antibacterial soap. There is no vaccine against listeriosis.

Salmonellosis (non-typhi, non-paratyphi)

Enteric infections due to *Salmonella* bacteria are generally referred to by the term 'salmonellosis' when they are due to *Salmonella* species other than *Salmonella typhi* and *Salmonella paratyphi*.

Various animals (especially poultry, pigs, cattle, and reptiles) can be **reservoirs** for *Salmonella*, and humans generally **become infected by eating poorly cooked, contaminated food.**

By **humans** - the incubation period and the symptoms depend on the amount of bacteria present in the food, the immune status of the person and the type of *Salmonella*.

In general, 12 to 36 hours after the consumption of contaminated food, a clinical picture characterised by fever, diarrhoea, abdominal pain, nausea and vomiting may appear. Symptoms usually last for a few days.

Due to the effects of dehydration, hospital admission may sometimes be required.

In the elderly and otherwise weak patients death sometimes occurs. Elderly patients are also more prone to developing severe blood infection.

In addition, post-infectious complications, such as reactive joint inflammation occur in about 10% of the cases.

SALMONELLA ENTERITIS

Case definition

Clinical Criteria:

Any person with at least one of the following four: — Diarrhoea — Fever — Abdominal pain — Vomiting

Laboratory Criteria:

At least one of the following two:

- Isolation of *Salmonella* (other than *S. Typhi* or *S. Paratyphi*) in a clinical specimen
- Detection of nucleic acid from *Salmonella* (other than *S. Typhi* or *S. Paratyphi*) in a clinical specimen

Note: Antimicrobial susceptibility testing of *Salmonella enterica* should be performed on a representative subset of isolates

Epidemiological Criteria:

At least one of the following five epidemiological links: — Human to human transmission — Exposure to a common source — Animal to human transmission — Exposure to contaminated food/drinking water — Environmental exposure

Case Classification

- Possible case NA
- Probable case Any person meeting the clinical criteria with an epidemiological link
- Confirmed case Any person meeting the clinical and the laboratory criteria

Antimicrobial resistance The results of antimicrobial susceptibility tests must be reported according to the methods and criteria agreed between ECDC and Member States as specified in the EU protocol for harmonised monitoring of antimicrobial resistance in human *Salmonella* and *Campylobacter* isolates

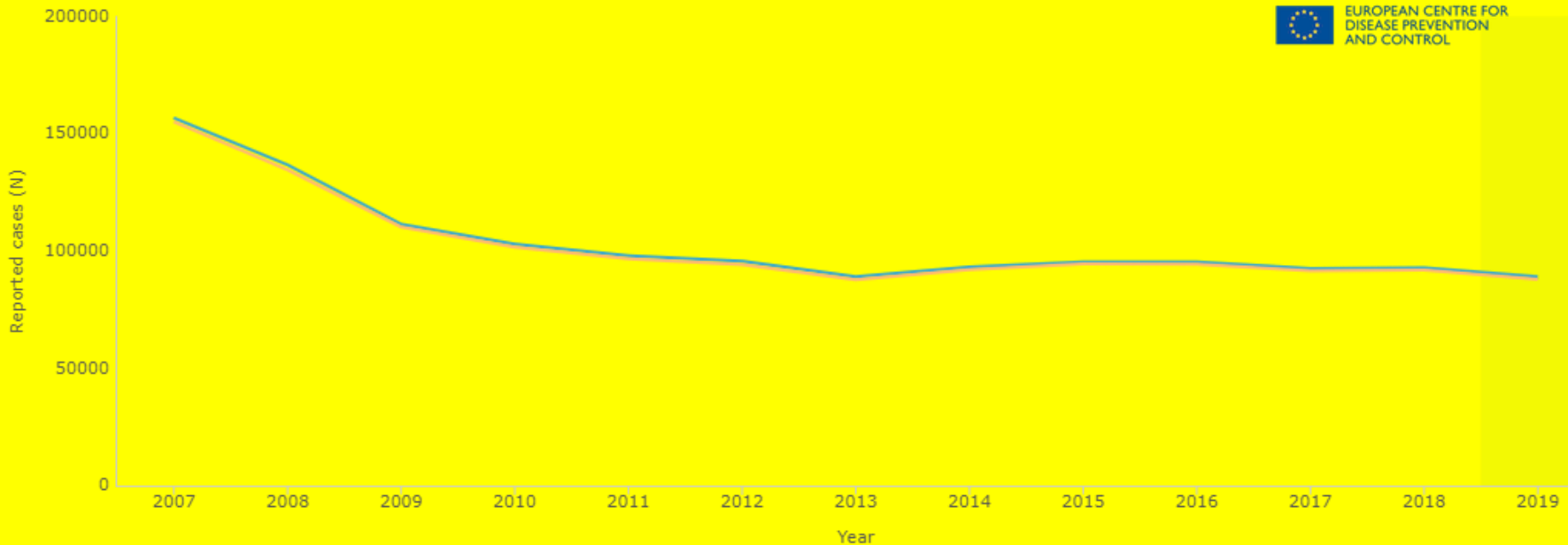
Salmonellosis

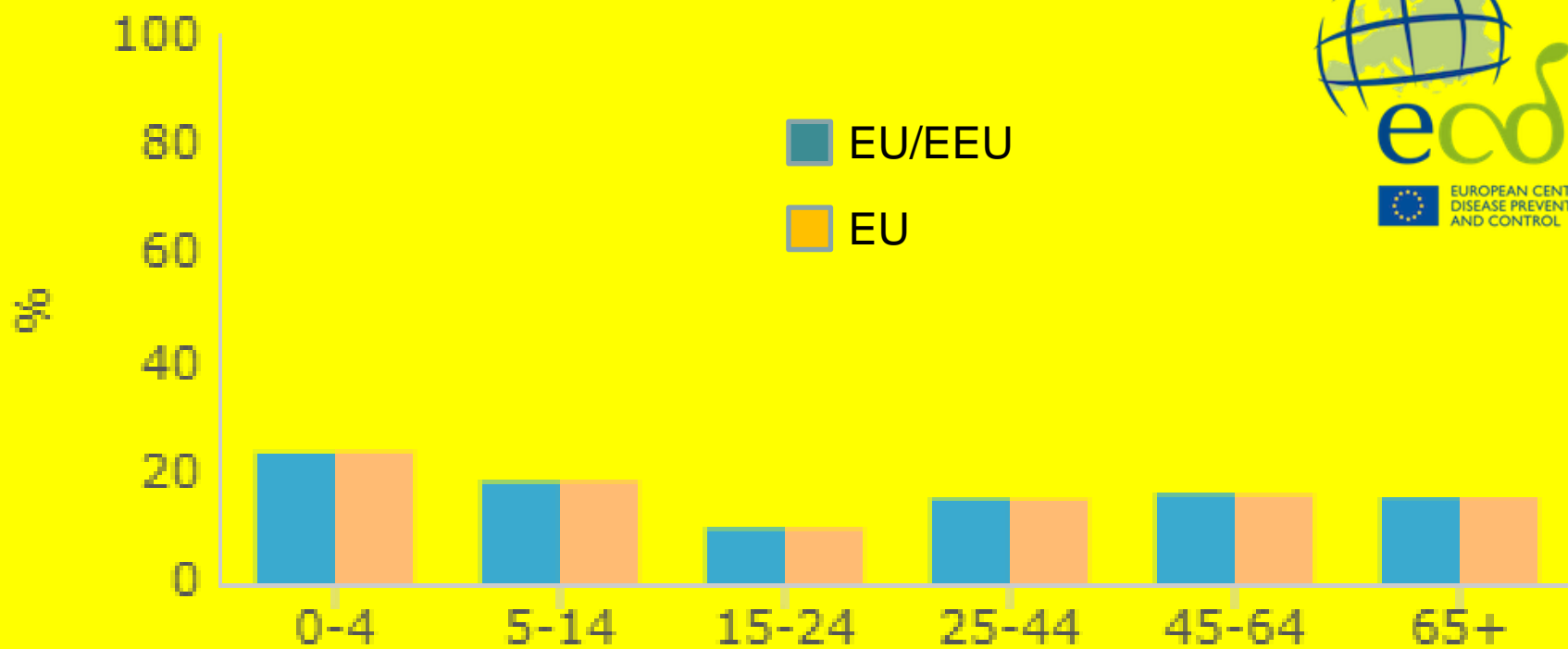
Diarrhoea-causing *Salmonellae* are present worldwide.

Prophylactic measures are aimed at all stages of food supply, from * production to * distribution and * consumption.



EUROPEAN CENTRE FOR
DISEASE PREVENTION
AND CONTROL





Distribution by age

Table 2.3.13. *Salmonella* serotypes most frequently reported from EU and EEA/EFTA countries and percentage change, 2008–09

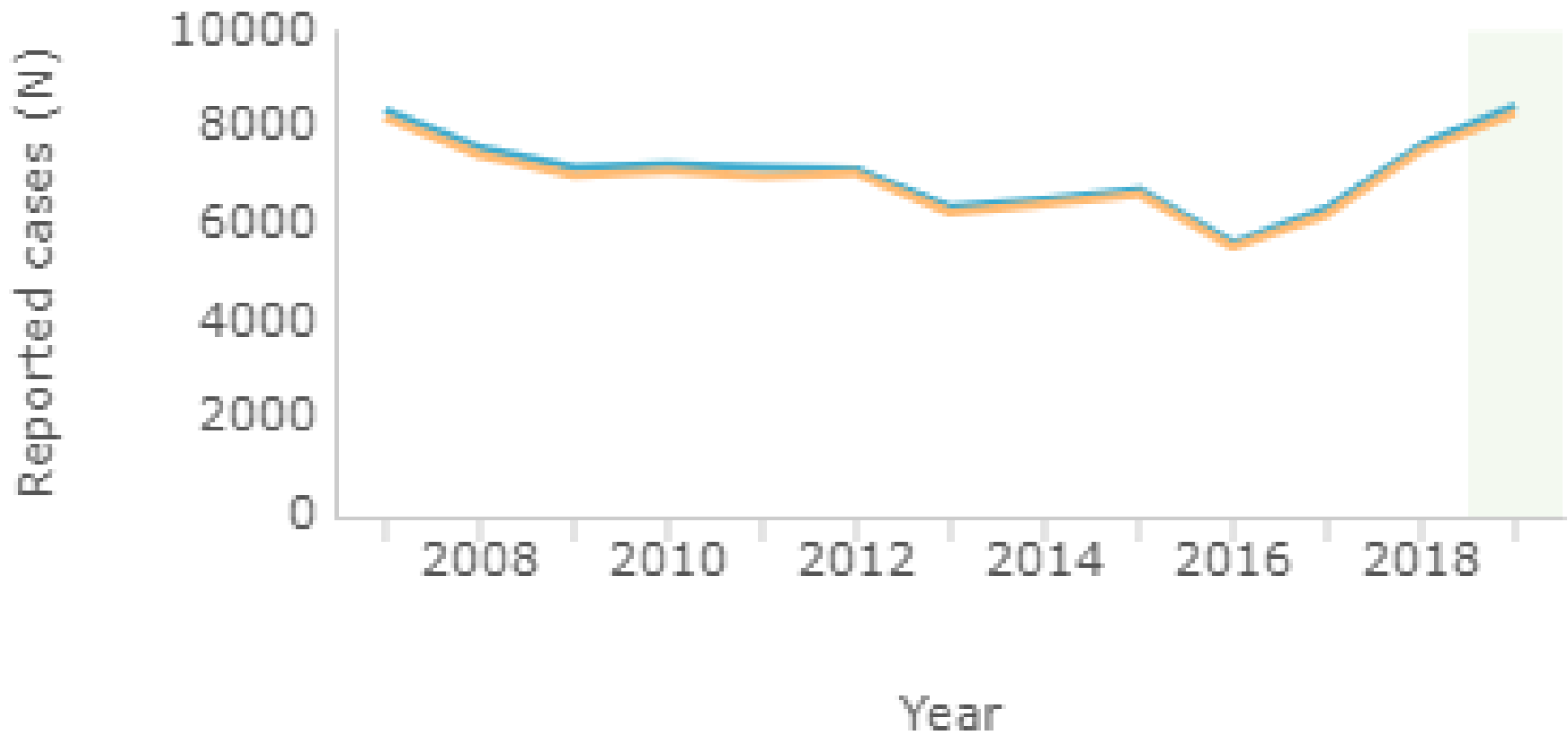
Serotype	2008	2009	Percentage change
Enteritidis	70 936	53 951	-24 %
Typhimurium	27 170	23 990	-12 %
Infantis	1 378	1 632	18 %
Newport	838	788	-6 %
Virchow	935	774	-17 %
Derby	662	675	2 %
Hadar	545	513	-6 %
Saintpaul	444	473	7 %
Kentucky	518	469	-9 %
Stanley	619	456	-26 %

Source: Country reports: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, Spain, United Kingdom.

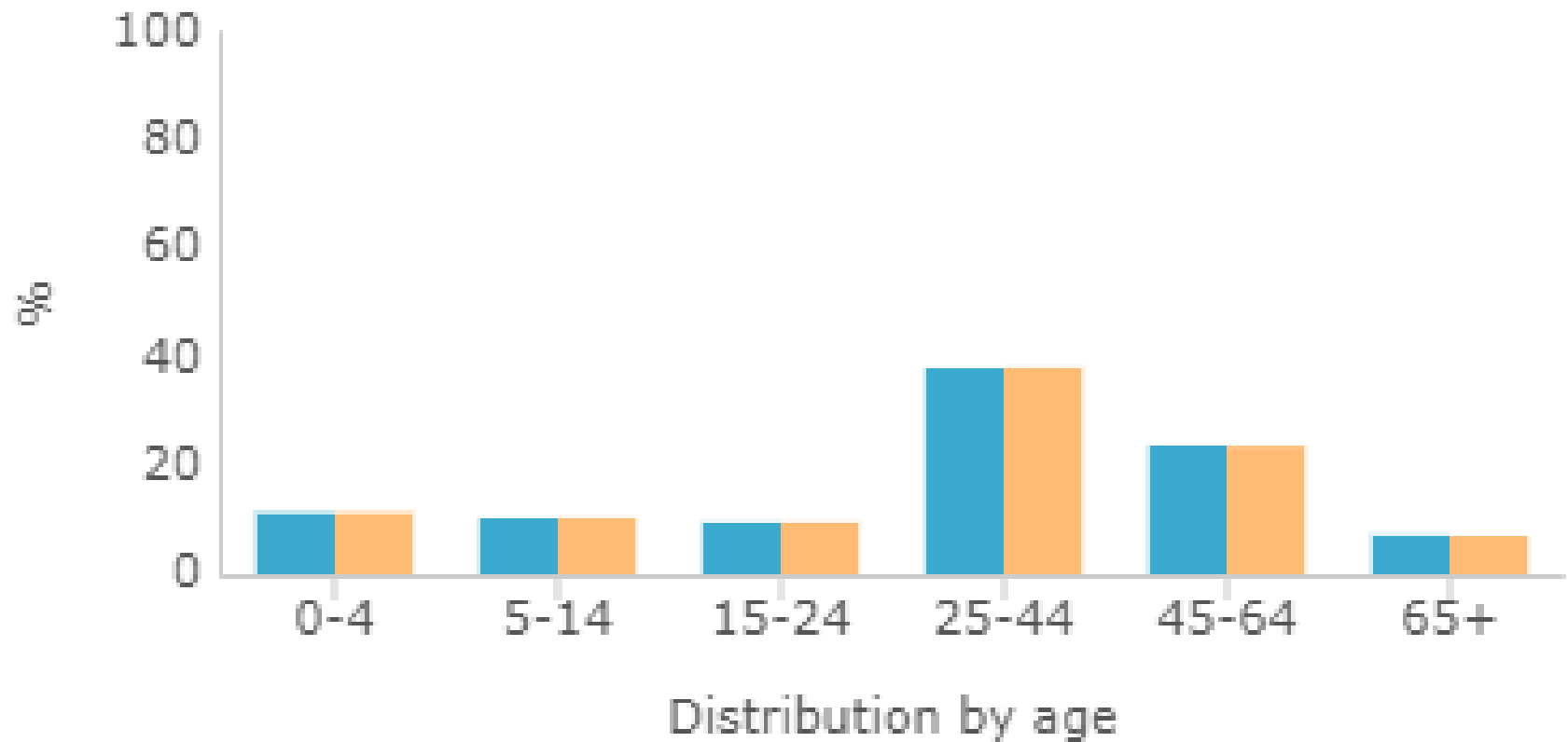
Shigellosis

- Shigellosis is a gastrointestinal infection caused by one of four species of *Shigella* bacteria: *Shigella sonnei*, *S. flexneri*, *S. boydii* and *S. dysenteriae*.
- ***S. sonnei***: Most common symptoms are diarrhoea (which is sometimes bloody), abdominal pain and cramps, and fever. Nausea and/or vomiting, loss of appetite, headache or malaise can also occur.
- ***S. flexneri***: Also causes diarrhoea, abdominal pain and cramps, and fever but is often more severe than *S. sonnei* infection. Inflammation and ulceration of the lower part of the bowel is also common and illness can be prolonged and more severe.
- ***S. boydii***: Can cause diarrhoeal diseases of varying severity, but mostly are similar to those caused by *S. sonnei*.
- ***S. dysenteriae***: This species causes more severe disease than other forms of shigellae with higher death rates. Inflammation and ulceration of the lower part of the bowel occurs in most cases, displaying itself as bloody stools.
- **Complications**
- Complications of *S. flexneri* can include reactive arthritis and Reiter's syndrome (inflammation of the urethra, conjunctivitis and inflamed joints). Complications of *S. dysenteriae* can include an enlarged colon due to toxins, haemolytic uraemic syndrome (HUS)—which is a type of kidney failure, blood clots and sepsis (invasion of the body by toxins).

Shigellosis



Shigellosis



SHIGELLOSIS - Case definition

Clinical Criteria:

Any person with at least one of the following four:

— Diarrhoea, — Fever, — Vomiting, — Abdominal pain

Laboratory Criteria:

For a confirmed case: — Isolation of *Shigella* spp. from a clinical specimen

For a probable case: — Detection of *Shigella* spp. nucleic acid in a clinical specimen

Note: Antimicrobial susceptibility testing of *Shigella* should be performed, if possible

Epidemiological Criteria: At least one of the following four *epidemiological* links:

— Human to human transmission — Exposure to a common source — Exposure to contaminated food/drinking water — Environmental exposure

Case Classification:

A. Possible case NA

B. Probable case Any person meeting the clinical criteria with an epidemiological link OR Any person meeting the clinical criteria and laboratory criteria for a probable case

C. Confirmed case Any person meeting the clinical and the laboratory criteria for a confirmed case

Antimicrobial resistance The results of antimicrobial susceptibility tests must be reported according to the methods and criteria agreed between ECDC and Member States.

Shigellosis is caught by swallowing material contaminated by faeces, either via the hands or on objects which have been in contact with faeces. Infection can also be caught from contaminated food and water. Food-related outbreaks are often caused by infected food handlers and salad items; both are common ways of spreading the infection. Waterborne infection can occur by ingesting drinking or recreational water. Outbreaks most often occur in daycare centres and schools, residential institutions, restaurants, camps, microbiology laboratories and hospitals.

- **People most at risk**

- Shigellosis is largely a disease of children, with the highest number of cases reported in children younger than five. Infection occurs most frequently in the summer. People at highest risk include those attending daycare, travellers abroad and men who have sex with men.

- **Diagnosis**

- Laboratory testing on samples of faeces from infected patients is used to diagnose shigellosis.

- **Treatment**

- Rehydration therapy is given to people who are ill with shigellosis to stop them from becoming dehydrated. Severe illness is treated with antibiotics.

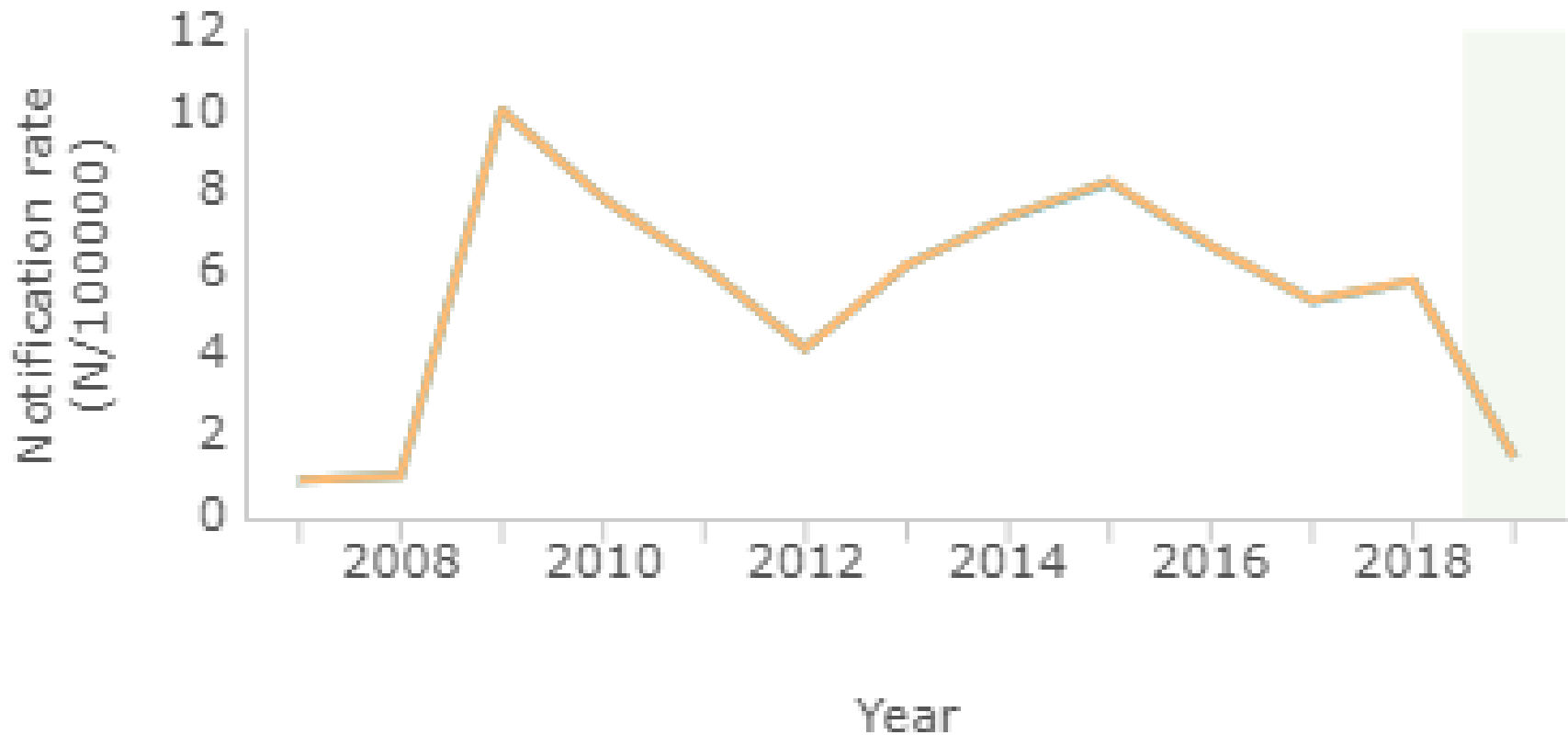
- Safe disposal of faeces and the protection and treatment of drinking and swimming water are important to prevent people from getting shigellosis.
- Hand-washing, especially after using the toilet or changing babies' nappies and before preparing or eating food, reduces the risk.
- Care with food and water while travelling abroad is also important.
- There is no vaccine currently available to prevent *Shigella* infection.

Toxoplasmosis (congenital)

- Toxoplasmosis is an infection caused by the parasite *Toxoplasma gondii*. Cats are the reservoir of the parasite. They excrete cysts in the environment, able to infect many other animals, and humans can become infected either by ingesting the cysts (by direct contact with cats or through food or water contaminated by cat faeces), or by eating poorly cooked meat containing cysts, especially pork and mutton.
- Usually toxoplasmosis goes with no symptoms in humans (and animals), but healthy individuals may experience swollen lymph glands. However, it may also cause life-threatening disease in individuals with impaired immune defence.
- During pregnancy the infection can affect the foetus.

- Pregnant women, also without symptoms, may transmit the infection to the foetus, which can result in abortion, still-birth, perinatal death (due to disseminated toxoplasmosis), or congenital infection with severe malformation affecting the eyes and the brain. Infection in individuals with impaired immunity tends to seriously affect the central nervous system, but also other organs may be affected. Such patients may require prolonged (sometimes life-long) therapy.
- The *Toxoplasma* cysts can survive in the environment for a long time, contaminating fruit and vegetables, and cysts in meat remain infective as long as the meat is edible.

Toxoplasmosis (congenital)



CONGENITAL TOXOPLASMOSIS

Case definition

Clinical Criteria:

Not relevant for surveillance purposes

Laboratory Criteria:

At least one of the following four:

- Demonstration of *Toxoplasma gondii* in body tissues or fluids
- Detection of *Toxoplasma gondii* nucleic acid in a clinical specimen
- *Toxoplasma gondii* specific antibody response (IgM, IgG, IgA) in a newborn — Persistently stable IgG *Toxoplasma gondii* titres in an infant (< 12 months of age)

Epidemiological Criteria: NA

Case Classification:

- A. Possible case NA
- B. Probable case NA
- C. Confirmed case - Any infant meeting the laboratory criteria

Typhoid and Paratyphoid Fever

- Typhoid and paratyphoid fevers are systemic diseases caused by the bacteria *Salmonella typhi* and *Salmonella paratyphi*, respectively. Humans are the only reservoir for *Salmonella typhi* (which is the most serious), whereas *Salmonella paratyphi* also has animal reservoirs. Humans can carry the bacteria in the gut for very long times (chronic carriers), and transmit the bacteria to other persons (either directly or via food or water contamination).

TYPHOID AND PARATYPHOID FEVERS

Case definition

Clinical Criteria:

Any person with at least one of the following two:

- Onset of sustained fever OR
- At least two of the following four:
 - Headache
 - Relative bradycardia
 - Non-productive cough
 - Diarrhoea, constipation, malaise or abdominal pain

Laboratory Criteria:

At least one of the following two: — Isolation of *Salmonella* Typhi or Paratyphi from a clinical specimen — Detection of *Salmonella* Typhi or Paratyphi nucleic acid in a clinical specimen

Epidemiological Criteria:

At least one of the following three epidemiological links: — Exposure to a common source — Human to human transmission — Exposure to contaminated food/drinking water.

Case Classification:

- Possible case NA
- Probable case Any person meeting the clinical criteria with an epidemiological link
- Confirmed case Any person meeting the clinical and the laboratory criteria

- Typhoid fever is a life-threatening infection caused by the bacterium *Salmonella Typhi*. It is usually spread through contaminated food or water.
- An estimated 11–20 million people get sick from typhoid and between 128 000 and 161 000 people die from it every year.
- Symptoms include prolonged fever, fatigue, headache, nausea, abdominal pain, and constipation or diarrhoea. Some patients may have a rash. Severe cases may lead to serious complications or even death.
- Typhoid fever is a life-threatening infection caused by the bacterium *SalmonellaTyphi*. It is usually spread through contaminated food or water. Once *SalmonellaTyphi* bacteria are eaten or drunk, they multiply and spread into the bloodstream.

- Salmonella Typhi lives only in humans.
- Persons with typhoid fever carry the bacteria in their bloodstream and intestinal tract.
- Symptoms include prolonged high fever, fatigue, headache, nausea, abdominal pain, and constipation or diarrhoea.
- Some patients may have a rash. Severe cases may lead to serious complications or even death.
- Typhoid fever can be confirmed through blood testing.

- **Epidemiology, risk factors, and disease burden**
- Improved living conditions and the introduction of antibiotics resulted in a drastic reduction of typhoid fever morbidity and mortality in industrialized countries. In developing areas of Africa, the Americas, South-East Asia and the Western Pacific regions, however, the disease continues to be a public health problem.
- WHO estimates the global typhoid fever disease burden at 11-20 million cases annually, resulting in about 128 000–161 000 deaths per year.
- Typhoid risk is higher in populations that lack access to safe water and adequate sanitation. Poor communities and vulnerable groups including children are at highest risk.

- **Treatment**

- Typhoid fever can be treated with antibiotics. As resistance to antibiotics has emerged including to fluoroquinolones, newer antibiotics such as cephalosporins and azithromycin are used in the affected regions. Resistance to azithromycin has been reported sporadically but it is not common as of yet.
- Even when the symptoms go away, people may still be carrying typhoid bacteria, meaning they can spread it to others through their faeces.
- It is important for people being treated for typhoid fever to do the following:
- Take prescribed antibiotics for as long as the doctor has prescribed.
- Wash their hands with soap and water after using the bathroom, and do not prepare or serve food for other people. This will lower the chance of passing the infection on to someone else.
- Have their doctor test to ensure that no *Salmonella Typhi* bacteria remain in their body.

Typhoid fever is common in places with poor sanitation and a lack of safe drinking water. Access to safe water and adequate sanitation, hygiene among food handlers and typhoid vaccination are all effective in preventing typhoid fever.

Two vaccines have been used for many years to protect people from typhoid fever:

- an injectable vaccine based on the purified antigen for people aged over 2 years
- a live attenuated oral vaccine in capsule formulation for people aged over 5 years

These vaccines do not provide long-lasting immunity and are not approved for children younger than 2 years old.

- A new typhoid conjugate vaccine, with longer lasting immunity, was prequalified by WHO in December 2017 for use in children from the age of 6 months.

All travelers to endemic areas are at potential risk of typhoid fever, although the risk is generally low in tourist and business centres where standards of accommodation, sanitation and food hygiene are high. Typhoid fever vaccination should be offered to travelers to destinations where the risk of typhoid fever is high.

The following recommendations will help ensure safety while travelling:

- Ensure food is properly cooked and still hot when served.
- Avoid raw milk and products made from raw milk. Drink only pasteurized or boiled milk.
- Avoid ice unless it is made from safe water.
- When the safety of drinking water is questionable, boil it or if this is not possible, disinfect it with a reliable, slow-release disinfectant agent (usually available at pharmacies).
- Wash hands thoroughly and frequently using soap, in particular after contact with pets or farm animals, or after having been to the toilet.
- Wash fruits and vegetables carefully, particularly if they are eaten raw. If possible, vegetables and fruits should be peeled.

Rotavirus infections

Rotaviruses are the single most important cause of severe diarrhoeal illness in infants and young children worldwide. By the age of five years most children irrespective of socioeconomic setting will have been infected at least once. While infected, many children will be in need of medical attention due to extensive fluid loss.

- Rotavirus infections are not notifiable in most EU/EEA MSs with the exception of Germany. Hence, no EU/EEA-wide epidemiological or laboratory surveillance is conducted.
- As documented in burden of disease studies mortality is very low in EU/EEA countries (<0.2 per 100,000 children younger than 5 years) while hospitalisations in the pre-vaccine era range from 300 to 600 per 100,000 children less than 5 years of age (1-2% of each birth cohort).

Rotavirus infections are vaccine-preventable following the EU/EEA approval of two oral, live attenuated rotavirus vaccines in 2006 for use in infants (6, 7). WHO recommends use of rotavirus vaccines in all infants (8) and EU/EEA countries that have introduced rotavirus vaccines into their national/regional immunization programmes have noted a significant reduction in number of children seeking medical attention for rotavirus infection.

Rotaviruses - Clinical features and sequelae

- Fever
- Vomiting
- Diarrhoea
- Extensive nausea and vomiting in some children result in difficulties in providing oral rehydration and severe fluid loss in need of medical attention.
- Complications include febrile seizures/seizures due to electrolyte disturbances but no residual sequelae due to seizures have been reported.
- Severe dehydration may lead to shock and death if not corrected. This is rarely seen in the EU/EEA where access to health care and rehydration is available for all. However, if cases only come to the attention of health care after significant fluid loss a limited number of deaths are reported each year.
- With symptomatic treatment, including rehydration, symptoms are commonly relieved within 3 to 8 days.

Norovirus infection

- Noroviruses belong to the *Caliciviridae* family and they are well known as causing “winter-vomiting disease” or “stomach-flu” referring to their rapid spread in human populations especially during winter months. Noroviruses are relatively resistant in the environment: they can survive freezing as well as high temperatures (up to 60°C). The viruses survive long periods on different surfaces. Steam cooking of shellfish may allow them to survive. It is important to notice that the viruses can survive in up to 10 ppm chlorine, well in excess of levels routinely present in public drinking water systems (less than 2 ppm).

Norovirus infection

- Norovirus cause gastrointestinal illness to humans. Norovirus infection can cause vomiting, diarrhoea, and stomach pain. Less common symptoms are low fever, chills and headache. Vomiting can be sudden and frequent resulting in remarkable fluid loss. Death is rare but remains as a risk especially for elderly or persons with weakened immune system.

Recovery occurs usually in one or two days. The incubation period ranges between 12 and 48 hours. Sometimes, symptoms can be milder and last for a week but no long-term adverse health effects have been reported.

-

Norovirus infection

- Noroviruses are highly contagious and 10-100 viral particles may be sufficient to infect an individual. They are transmitted primarily through the faecal-oral route, either by consumption of contaminated food or water, or by spreading directly from person to person. Vomiting creates effectively aerosols with high content of virus particles, which enter the oral mucosa or contaminate surfaces. The virus survives long on different surfaces and thus, environment may serve as a source of new infections. During one single outbreak of norovirus gastroenteritis, several modes of transmission usually occur. Even though the incubation period is relatively short (15-50 h), since the infective dose is very small, and asymptomatic shedding does occur, the origin of the outbreak is often difficult to confirm. For example, initially food or water borne transmission is often followed by secondary person-to-person transmissions to close contacts. Virus shedding usually starts with the onset of symptoms (mainly vomiting and diarrhea) and may continue for 2 weeks after recovery.

Norovirus infection

- As the immunity may only last a few months and is strain-specific, and given their genetic variability, infection can happen several times in a lifetime and affects individuals of all ages. Susceptibility to infection is probably genetically determined. According to recent studies, persons of blood group O are at greatest risk for infection. Many different food items have been associated with norovirus outbreaks. Raspberries and oysters have caused several national and international outbreaks. In principle, any food item may become contaminated if handled by infected person or if washed or humidified with contaminated water. Norovirus infections spread effectively from person to person in community settings like hospitals, schools, day care centers and nursing homes. Several outbreaks have been recorded in cruise ships, which provide an ideal closed setting for the spread of infection.