FOOD- AND WATERBORNE DISEASES AND ZOONOSES

Kolářová M., EPI Autumn 2019

3. Food- and waterborne diseases and zoonoses

- Anthrax
- Botulism
- Brucellosis
- Campylobacteriosis
- Cholera
- Cryptosporidiosis
- Echinococcosis (hydatid disease)
- Shiga toxin/verocytotoxin-producing *Escherichia coli* (STEC/VTEC) infection
- Giardiasis
- Hepatitis A
- Leptospirosis
- Listeriosis
- Noroviruses
- Salmonellosis
- Shigellosis
- Toxoplasmosis (congenital)
- Trichinellosis
- Tularaemia
- Typhoid/paratyphoid fever
- Variant Creutzfeldt–Jakob disease (vCJD)
- Yersiniosis

There were only minor fluctuations in reported cases of three main zoonotic diseases in the European Union (EU) last year compared with 2016.

The number of reported cases of salmonellosis and campylobacteriosis has remained stable over the past five years, although listeriosis continues to rise.

Campylobacteriosis

Active surveillance through the Foodborne Diseases Active Surveillance Network (FoodNet) indicates that about 14 cases per 100,000 people are diagnosed each year.

Many more cases go undiagnosed or unreported.

CDC estimates that *Campylobacter* infection affects more than 1.5 million people in the United States every year.

Campylobacter infections increased by 13% in 2014, when compared with 2006-2008.

Use of culture-independent tests (CIDTs) to diagnosis *Campylobacter* infection increased by 14% in 2014, typically replacing traditional culture-based methods.

Campylobacteriosis is common in Europe.

- **In the European Union (EU)**

Cases of **campylobacteriosis** decreased slightly in 2017 compared with 2016 (246 158 from 246 917),

but it is still the most commonly reported zoonotic disease in the EU.

- The highest occurrences were detected in chicken meat (37.4%) and turkey meat (31.5%).

Infections occur throughout the year but are most common from June to October.

CAMPYLOBACTERIOSIS (*Campylobacter* spp.) – Case definition

Clinical Criteria

- Any person with at least one of the following three:
- — Diarrhoea
- — Abdominal pain
- — Fever

Laboratory Criteria

- — Isolation of *Campylobacter* spp. from stool or blood
- Differentiation of *Campylobacter* spp. should be performed if possible

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 and with an epidemiological link
- C. **Confirmed case**
- Any person meeting the clinical and the laboratory criteria

Etiologic agent

Campylobacter is a gram-negative, microaerophilic genus of bacteria of the family *Campylobacteriacae*.

There are more than 20 species of *Campylobacter*, not all of which cause human illness.

Approximately 90% of human illness is caused by one species, ***Campylobacter jejuni***. Less common species, such as *C. coli*, *C. upsaliensis*, *C. fetus* and *C. lari*, also cause infection.

- *Campylobacter jejuni* grows best at 37˚C to 42˚C, the approximate body temperature of a bird (41˚C to 42˚C), and seems to be well-adapted to birds, which carry the bacteria without becoming ill.

These bacteria are fragile.

They cannot tolerate drying.

Freezing reduces the number of *Campylobacter* bacteria on raw meat.

Campylobacteriosis

Source are animals such as:

poultry, cattle, pigs, wild birds and wild mammals.

Transmission:

Most cases of *Campylobacter* infection occur after someone eats raw or undercooked poultry or eats another food that has been contaminated by raw or undercooked poultry.

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 though 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.

Person-to-person spread can happen, although it is unusual, and is most likely from children who have diarrhoea or are not toilet-trained.

Susceptibility:

All ages are affected but most cases are in children aged younger than four years and in young adults.

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.

Most people who get *Campylobacter* infection recover completely within two to five days, although recovery can take up to 10 days.

Campylobacter infection can result in long-term consequences such as arthritis, irritable bowel syndrome (IBS), or Guillain-Barré syndrom (GBS).

CDC estimates about 1 in every 1,000 reported *Campylobacter* illnesses leads to GBS.

A confirmed case is the isolation of *Campylobacter* spp. from a clinical specimen.

A probable case is the detection of *Campylobacter* spp. in a clinical specimen using a culture-independent diagnostic test (CIDT), such as a polymerase chain reaction test.

Campylobacteriosis - prevention

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.

Human with 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.

Salmonellosis

CDC estimates that approximately 1.35 million illnesses and 420 deaths occur due to non-typhoidal Salmonella annually in the United States.

FoodNet reports that the annual incidence of *Salmonella* infection in the United States was 15.2 illnesses per 100,000 individuals.

Compared to 2010-2012, the incidence of non-typhoidal *Salmonella* infection showed a 9% decrease in 2013.

In the European Union (EU)

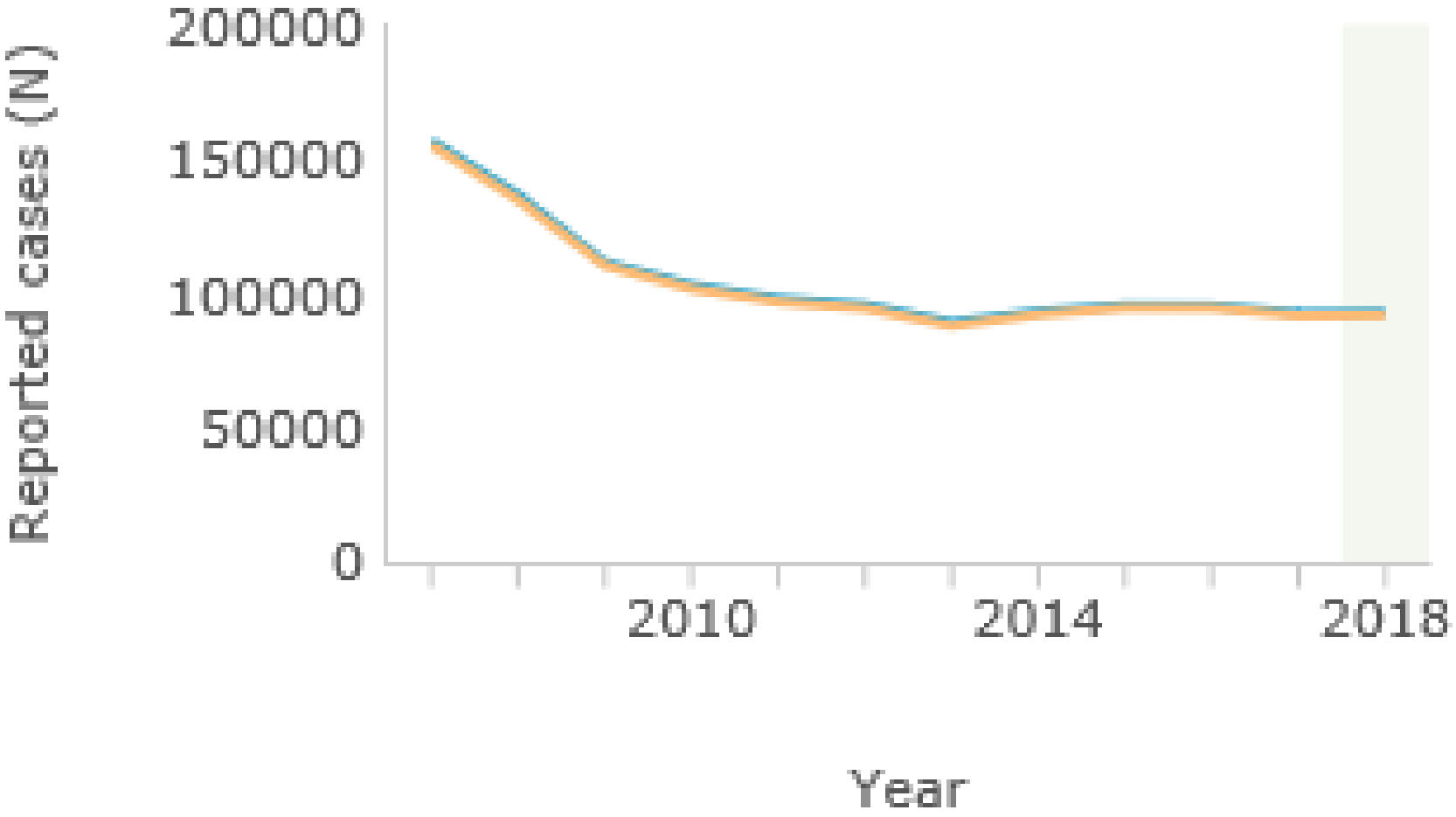
After several years of decline, **salmonellosis** cases in the EU have flattened out.

In 2017 the number fell slightly from 94 425 to 91 662,

but the downward trend that began in 2008 has stalled in recent years.

- *Salmonella Enteritidis* is the most commonly reported type of *Salmonella* in humans, causing one in seven food-borne outbreaks.

EU/EEFA


Reported cases (N)
200000
150000
100000
50000
0
2010
2014
2018
Year

Etiologic agent

The genus *Salmonella* is a member of the family *Enterobacteriaceae.*

Like other Enterobacteriaceae, Salmonellae are Gram-negative, rod-shaped bacilli.

The genus *Salmonella* can be divided into two species (*S. enterica* and *S. bongori*), based on their **phenotypic** profile. S*. enterica* can be further divided into six subspecies using their phenotypic profile.

The most common serotypes of *Salmonella* that cause human infection are Enteritidis, Typhimurium, Newport, and Javiana.

These *Salmonella* serotypes account for about half of culture-confirmed *Salmonella* isolates reported by public health laboratories.

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	1378	1632	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.

SALMONELLOSIS (*Salmonella* spp. other than *Salmonella typhi* and *Salmonella paratyphi*) – Case definition

Clinical Criteria

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

Laboratory Criteria

- Isolation of *Salmonella* (other than *Salmonella typhi* and *Salmonella paratyphi*) from stool, urine, body site (e.g. infected wound) or any normally sterile body fluids and tissues (e.g. blood, CSF, bone, synovial fluid, etc.)

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

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

Source.

Salmonella live in the intestinal tracts of humans and other animals, including poultry and other birds, amphibians, and reptiles. *Salmonella* may be found in the feces of some animals, and people can become infected if they do not wash their hands after contact with animals or animal feces.

Many animals can carry *Salmonella* germs but appear perfectly healthy and clean.

Transmission:

Salmonella is usually transmitted to humans by eating foods contaminated with small amounts of animal feces. Contaminated foods usually look and smell normal. They are often foods of animal origin, such as beef, poultry, milk, fish, or eggs, but any food, including vegetables and fruit or processed foods, may become contaminated.

Foods can also be contaminated in the kitchen. Drippings from raw meat or poultry can contaminate surfaces and other foods in the refrigerator or shopping cart. When raw meat or poultry are prepared with a cutting board and knife without being washed thoroughly between uses, they can contaminate other foods.

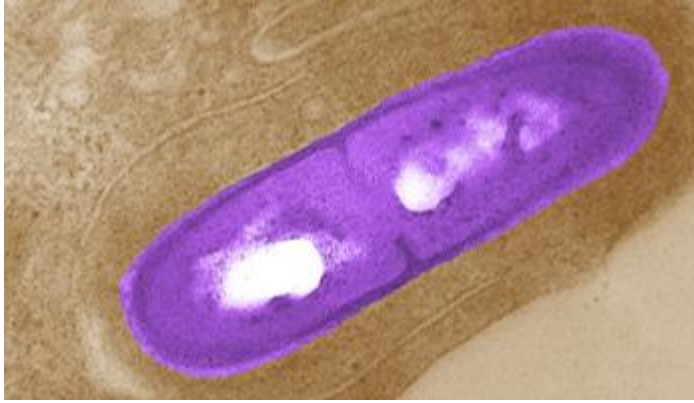
When preparing raw meat or poultry, food handlers can transfer *Salmonella* on their hands to other foods if they do not wash their hands between food preparation steps. Food handlers who do not wash their hands with soap after using the bathroom can also contaminate food with *Salmonella*.

Salmonella infection is more common in the summer months (June, July, and August) than winter.

Susceptibility:

- Children under 5 years old are the most likely to get a *Salmonella* infection.
- Infants who are not breast fed are more likely to get a *Salmonella* infection.
- Children who are 5 years old and younger, adults over 65 years old, and people with weakened immune systems are the most likely to have severe infections.
- Certain medications (for example, medications to reduce stomach acid) can increase the risk of *Salmonella* infection

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.

-

- **In the European Union (EU)**
- Cases of **listeriosis** decreased slightly

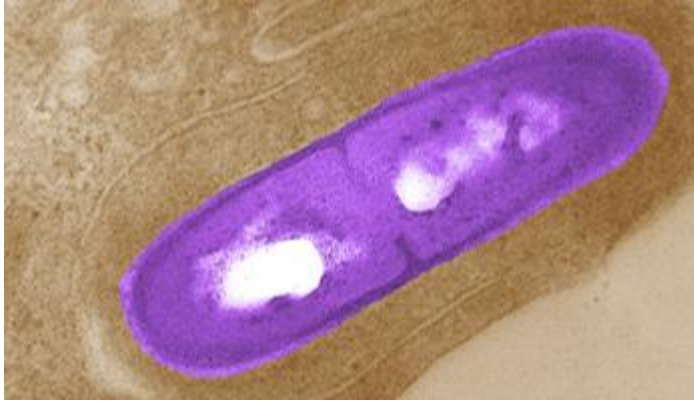
in 2017: 2 480 infections were reported, against 2 509 in 2016.

However, the trend has been upward over the past five years.

The group most affected by the disease in 2017 was the elderly, particularly those over 84. In this age group, the listeriosis fatality rate was 24%, while overall in the EU, the infection was fatal for one in every 10 patients.

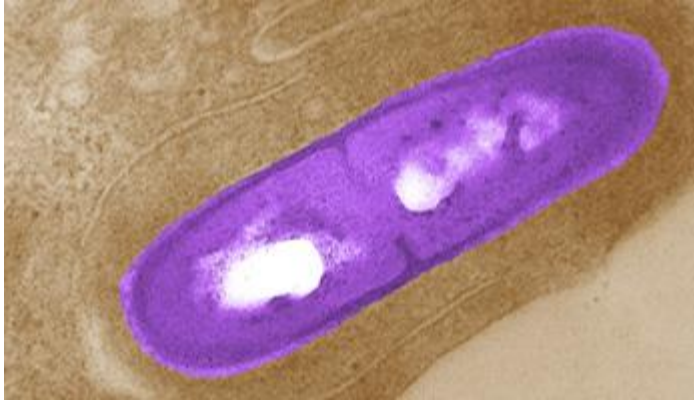
The highest levels of *Listeria monocytogenes* were detected in fish and fishery products (6%), followed by ready-to-eat salads (4.2%).

Listeriosis



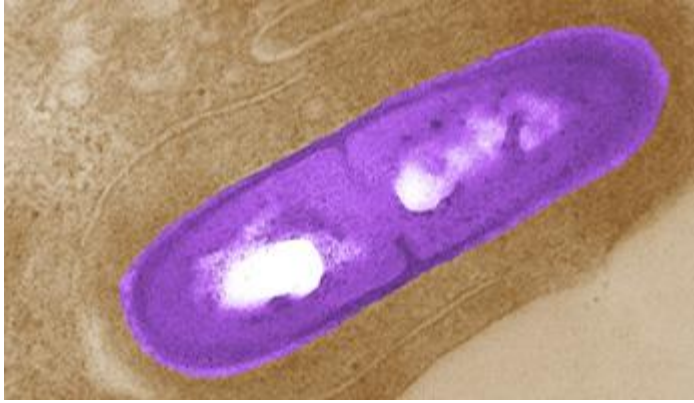
- **Symptoms**
  Listeriosis can cause a range of symptoms. Some patients can have no symptoms at all. Previously well, non-pregnant people often get symptoms of acute gastroenteritis—inflammation of the stomach and intestines. This can cause headache, fever, abdominal pain, sleepiness, nausea and diarrhoea. 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



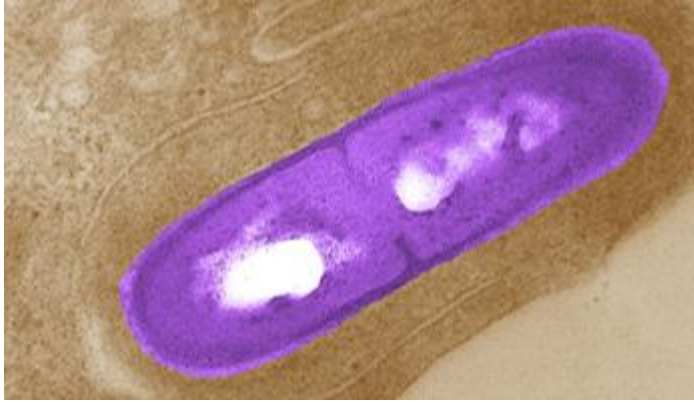
- **Ways to catch listeriosis**
  The bacteria that cause listeriosis are widespread in the environment and can be found in soil, surface water, vegetation and a range of wild and domestic animals. Most humans catch the infection by eating contaminated food. The bacteria can grow at low temperatures 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



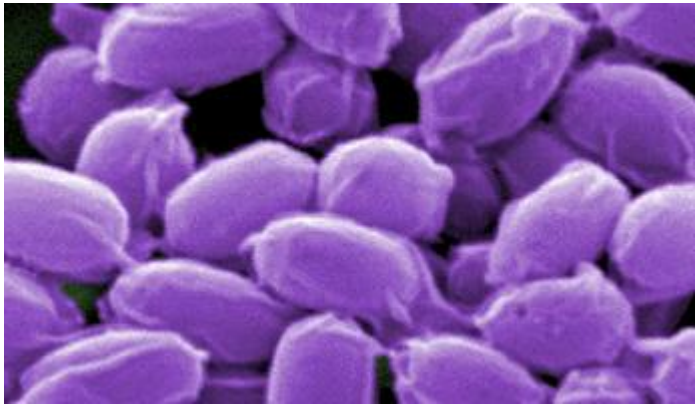
- **Diagnosis**
  Laboratory tests are carried out on samples of blood or cerebrospinal fluid to diagnose the infection. Laboratory tests are also carried out on food and environmental samples to look for *Listeria*.
- **Treatment**
  Antibiotics can be used to treat patients.

Listeriosis



- **Prevention:**
  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.

Antrax



- **Anthrax is…**
  …a disease that humans can catch from animals. It causes serious illness. It used to be largely occupationally related but has also been used deliberately in bio-terrorist attacks.

ANTHRAX (*Bacillus anthracis*) – 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

- — 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 and with an epidemiological link
- C. **Confirmed case**
- Any person meeting the clinical and the laboratory criteria

Antrax

Symptoms

The symptoms depend on how the anthrax was acquired by the 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. Anthrax which is breathed in causes **inhalational anthrax**. 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.

Antrax

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.

Antrax

Ways to catch anthrax

Anthrax spores can be found in soil and animals, like cows, can then acquire the infection while grazing. 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). Anthrax has also been deliberately released as a bio-terrorist weapon.

People most at risk

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

Antrax

Diagnosis

Anthrax can be detected by doing laboratory tests on specimens from an infected person.

Treatment

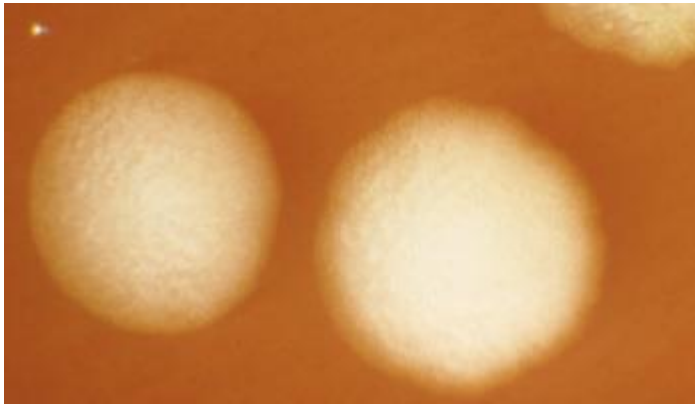
Anthrax can be treated with antibiotics. Respiratory support in an intensive care unit (ICU) is likely to be necessary for cases of inhalational anthrax.

How to avoid getting anthrax

Vaccines are available that protect against anthrax.

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.

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.

BOTULISM (*Clostridium botulinum*) - 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 (e.g. diplopia, blurred vision, dysphagia, bulbar weakness)
- — Peripheral symmetric paralysis
- *Infant botulism*
- Any infant with at least one of the following six:
- — Constipation
- — Lethargy
- — Poor 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 microflora

Laboratory Criteria

- At least one of the following two:
- — Isolation of *Clostridium botulinum* for infant botulism (stool) or wound botulism (wound) (isolation of *Clostridium botulinum* in stool of adults not relevant for the diagnosis of food-borne botulism)
- — Detection of botulinum toxin in a clinical specimen

Epidemiological Criteria

- At least one of the following two epidemiological links:
- — Exposure to a common source (e.g. food, sharing of needles or other devices)
- — Exposure to contaminated food/drinking water
- **Case Classification**
- A. **Possible case** NA
- B. **Probable case**
- Any person meeting the clinical criteria and with an epidemiological link
- C. **Confirmed case**
- Any person meeting the clinical and the laboratory criteria

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

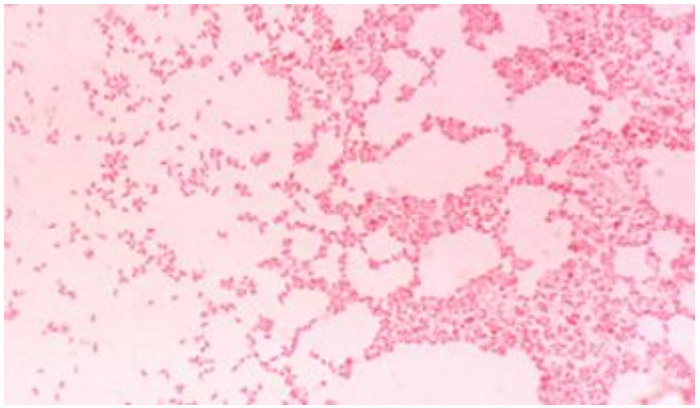
How to avoid getting botulism

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 (*Brucella* spp.) – Case definition

Clinical Criteria

- Any person with Fever
- And at least one of following seven:
- — Sweating (profuse, malodorous, specially nocturnal)
- — Chills
- — Arthralgia
- — Weakness
- — Depression
- — Headache
- — Anorexia

Laboratory Criteria

- At least one of the following two:
- — Isolation of *Brucella* spp. from a clinical specimen
- — *Brucella* specific antibody response (Standard Agglutination Test, Complement Fixation, ELISA)

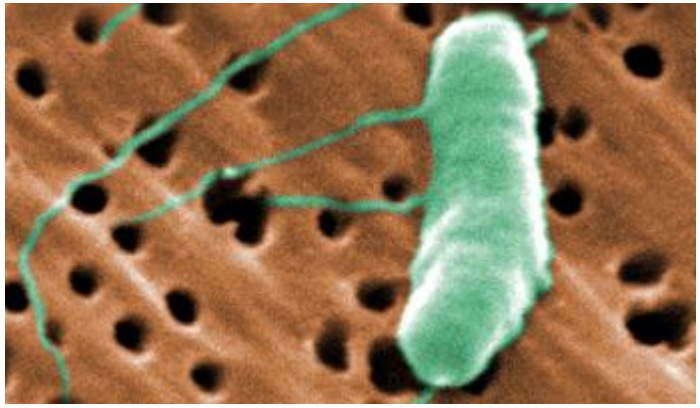
Epidemiological Criteria

- At least one of the following four 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 e.g. vaginal discharge, placenta)
- — Exposure to a common source

Case Classification

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

Cholera



Cholera is an acute diarrhoeal infection caused by the bacterium Vibrio cholera 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.

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CHOLERA (*Vibrio cholerae*) – 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. **Probable case**
- Any person meeting the clinical criteria and with an epidemiological link
- C. **Confirmed case**
- Any person meeting the clinical and the laboratory criteria

Cholera

an illness caused by bacteria called *Vibrio cholerae*. It causes diarrhoea and can lead people to become severely dehydrated very quickly, which can be fatal. It is a major public health problem in many parts of the world and a threat to Europeans travelling to these areas.

- **Symptoms**
  Cholera can range in severity from a mild illness which may show no symptoms through to very severe symptoms. The first signs are nausea and discomfort in the abdomen, followed by sudden watery diarrhoea and vomiting. Vomiting tends to disappear after around 12 hours, although the diarrhoea may continue. Cholera often causes people to painlessly loose large amounts of liquid stools – often called “rice water” stools because of their appearance. People with cholera often have extremely painful muscle cramps.

Cholera

- **Complications**
  If cholera is untreated, severe dehydration and “hypovolemic” shock can happen, which leads to symptoms including sunken eyes, wrinkled skin, a very fine and scarcely perceptible pulse, undetectable blood pressureand reduced levels of consciousness. Severe untreated cholera can cause kidney failure and, in 50% of cases, death. In children, a condition called hypoglycaemia (low blood sugar) can occur which can be severe and cause convulsions and coma. In pregnant women, cholera can cause miscarriages and premature birth.

Cholera

- **Ways to catch cholera**
  Cholera is mostly a waterborne disease. It is caught by swallowing water that has been contaminated with bacteria. It also possible to catch the disease by eating contaminated seafood or food that became contaminated by being handled or prepared by someone with the disease. Fruit and vegetables have also been contaminated when land has been irrigated with raw sewage.
- **People most at risk**
  Cholera occurs mainly in countries with inadequate sanitation and lack of clean drinking water, or where there have been wars or natural disasters. The most common risk factors for cholera are water source contamination, heavy rainfall and flooding and population dislocation. It is most common in South East Asia, particularly the Indian sub-continent, although outbreaks have happened often where it has spread to other parts of the world. The disease is currently also common in several countries in sub-Saharan Africa and Latin America. It affects all ages but children are at the highest risk for acquiring severe disease.

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

- **How to avoid getting cholera**
  In areas where cholera is more common, improved sanitation and water supplies and food hygiene measures are important in reducing the spread of cholera. Water should be chlorinated or boiled before it is considered safe to drink. Although this is a low risk, travellers to countries where cholera is more common should be aware of the possibility of contracting it and drink only boiled or mineral water.

- A vaccine is available that is effective against cholera.

Vaccine against cholera

A vaccine consisting of killed whole-cell V. cholerae O1 in combination with a recombinant B-subunit of cholera toxin (WC/rBS) has been marketed since the early 1990s.

This killed vaccine is well tolerated and confers high-level (85– 90%) protection for 6 months after the second immunization in all vaccinees aged more than 2 years.

Three years after immunization the level of protection is still about 50% in vaccinees who were 5 years or older at the time of vaccination.

Vaccine against cholera

Primary immunization consists of two oral doses 7–14 days apart for adults and children aged 6 years and over.

For children aged 2–5 years, three doses are recommended. Intake of food and drinks should be avoided for 1 hour before and after vaccination.

If the second dose is delayed for more than 6 weeks, vaccination should be restarted.

Following primary immunization, protection against cholera may be expected after about 1 week.

Booster doses are recommended after 2 years for adults and children aged 6 years or more, and every 6 months for children aged 2–5 years.

The vaccine is not licensed for children under 2 years of age.

Vaccine against cholera

In studies of travellers to countries or areas reporting cholera outbreaks, WC/rBS was found also to induce approximately 50% short-term protection against diarrhoea caused by enterotoxigenic Escherichia coli (ETEC).

TYPHOID/PARATYPHOID FEVER (*Salmonella typhi/paratyphi*) - Case definition

Clinical Criteria

- Any person with at least one of the following two:
- — Onset of sustained fever
- — At least two of the following four:
- — Headache
- — Relative bradycardia
- — Non-productive cough
- — Diarrhoea, constipation, malaise or abdominal pain
- Paratyphoid fever has the same symptoms as typhoid fever, however usually a milder course

Laboratory Criteria

- — Isolation of *Salmonella typhi* or *paratyphi* from 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

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

Currently, two typhoid vaccines of demonstrated safety and efficacy are available on the international market:

- The oral vaccine based on the live, attenuated mutant strain of S. typhi Ty21a (Ty21a vaccine), is supplied in enteric coated capsules. In Australia and Europe, three tablets are given on days 1, 3, and 5; this series is repeated every year for individuals travelling from nonendemic to endemic countries, and every 3 years for individuals living in countries or areas at risk. In North America, four tablets are given on days 1, 3, 5, and 7 and revaccination is recommended only after 7 years (Canada) or 5 years (USA) for all, regardless of typhoid fever risk in the country or area of residence. The duration of protection following Ty21a immunization is not well defined and may vary with vaccine dose and possibly with subsequent exposures to S. typhi (natural booster).
- The injectable Vi capsular polysaccharide vaccine (ViCPS vaccine) is given intramuscularly in a single dose. Protection is induced about 7 days after the injection. In countries or areas at risk, the protective efficacy 1.5 years after vaccination is about 72%; after 3 years it is about 50%. The vaccine is licensed for individuals aged >2 years. To maintain protection, revaccination is recommended every 3 years.

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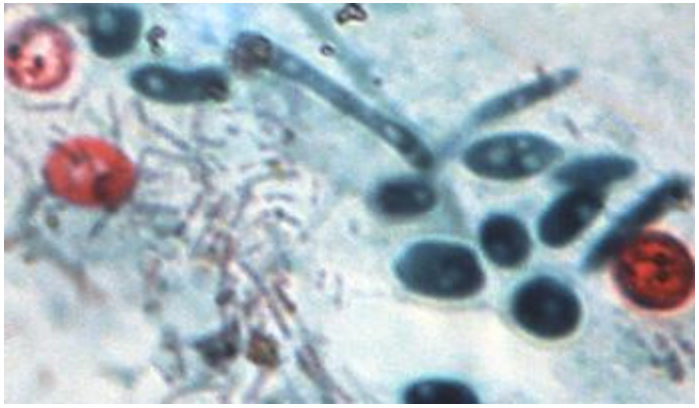
A combined typhoid/hepatitis A vaccine is also available in some countries.

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 (*Cryptosporidium* spp.) – Case definition

Clinical Criteria

- Any person with at least one of the following two:
- — Diarrhoea
- — Abdominal pain

Laboratory Criteria

- At least one of the following four:
- — Demonstration of *Cryptosporidium* oocysts in stool
- — Demonstration of *Cryptosporidium* in intestinal fluid or small-bowel biopsy specimens
- — Detection of *Cryptosporidium* nucleic acid in stool
- - Detection of *Cryptosporidium* antigen in stool

Epidemiological Criteria

- 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

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

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 (*Echinococcus* spp.) – Case definition

Clinical Criteria

- Not relevant for surveillance purposes

Diagnostic Criteria

- At least one of the following five:
- — Histopathology or parasitology compatible with *Echinococcus multilocularis* or *granulosus* (e.g. direct visualisation of the protoscolex in cyst fluid)
- — Detection of *Echinoccocus granulosus* pathognomonic macroscopic morphology of cyst(s) in surgical specimens
- — Typical organ lesions detected by imaging techniques (e.g. computerised tomography, sonography, MRI) AND confirmed by a serological test
- — *Echinococcus* spp. specific serum antibodies by high-sensitivity serological test AND confirmed by a high specificity serological test
- — Detection of *Echinococcus multilocularis* or *granulosus* nucleic acid in a clinical specimen

Epidemiological Criteria NA

Case Classification

- A. **Possible case** NA
- B. **Probable case** NA
- C. **Confirmed case**
- Any person meeting the diagnostic criteria

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.

SHIGA TOXIN/VEROCYTO-TOXIN PRODUCING *ESCHERICHIA COLI* INFECTION (STEC/VTEC) – Case definition

Clinical Criteria

- *STEC/VTEC diarrhoea*
- Any person with at least one of the following two:
- — Diarrhoea
- — Abdominal pain
- *HUS*
- Any person with acute renal failure and at least one of the following two:
- — Microangiopatic haemolytic anaemia
- — Thrombocytopenia

Laboratory Criteria

- At least one of the following four:
- — Isolation of an *Escherichia coli* strain that produces Shigatoxin (Stx) or harbours *stx1* or *stx2* gene(s)
- — Isolation of non-sorbitol-fermenting (NSF) *Escherichia coli* O157 (without Stx or *stx* gene testing)
- — Direct detection of *stx1* or *stx2* gene(s) nucleic acid (without strain isolation)
- — Direct detection of free Stx in faeces (without strain isolation)
- Only for HUS the following can be used as laboratory criterion to confirm STEC/VTEC:
- — *Escherichia coli* serogroup-specific (LPS) antibody response
- Isolation of an STEC/VTEC strain and additional characterisation by serotype, phage type, *eae* genes, and subtypes of *stx1/stx2* should be performed if possible

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

- A. **Possible case of STEC-associated HUS**
- Any person meeting the clinical criteria for HUS
- B. **Probable case of STEC/VTEC**
- Any person meeting the clinical criteria and with an epidemiological link
- C. **Confirmed case of STEC/VTEC**
- Any person meeting the clinical and the laboratory criteria

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 0104:H4 has been rarely reported worldwide.

Shiga toxin-producing E. coli (STEC)

- 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.
- 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.

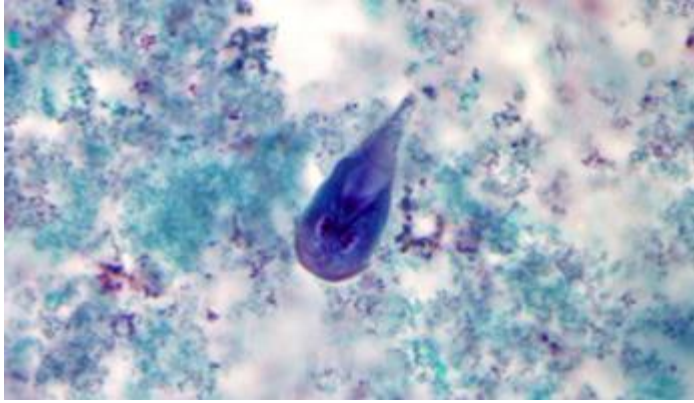
Good personal hand hygiene

- 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 (*Giardia lamblia*) – Case definition

Clinical Criteria

- Any person with at least one of the following four:
- — Diarrhoea
- — Abdominal pain
- — Bloating
- — Signs of malabsorption (e.g. steatorrhoea, weight loss)

Laboratory Criteria

- At least one of the following two:
- — Demonstration of *Giardia lamblia* cysts or trophozoites in stool, duodenal fluid or small-bowel biopsy
- — Demonstration of *Giardia lamblia* antigen in stool

Epidemiological Criteria

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

Case Classification

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

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

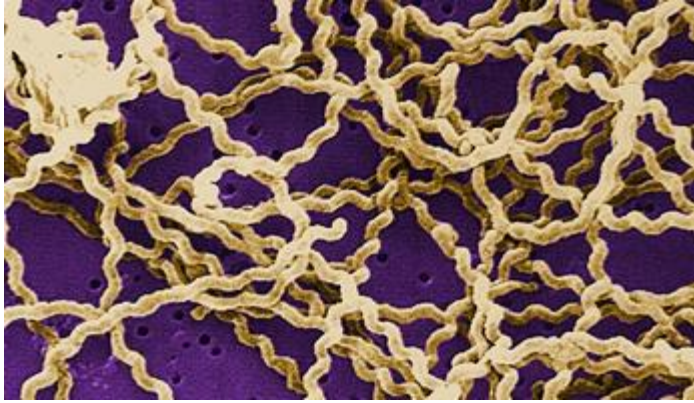
How to avoid getting giardiasis

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 (*Leptospira* spp.) – Case definition

Clinical Criteria

- Any person with
- — Fever
- OR
- At least two of the following eleven:
- — Chills
- — Headache
- — Myalgia
- — Conjunctival suffusion
- — Haemorrhages into skin and mucous membranes
- — Rash
- — Jaundice
- — Myocarditis
- — Meningitis
- — Renal impairment
- — Respiratory symptoms such as haemoptysis

Laboratory Criteria

- At least one of the following four:
- — Isolation of *Leptospira interrogans* or any other pathogenic *Leptospira* spp. from a clinical specimen
- — Detection of *Leptospira interrogans* or any other pathogenic *Leptospira* spp. nucleic acid in a clinical specimen
- — Demonstration of *Leptospira interrogans* or any other pathogenic *Leptospira* spp. by immunofluorescence in a clinical specimen
- — *Leptospira interrogans* or any other pathogenic *Leptospira* spp. specific antibody response

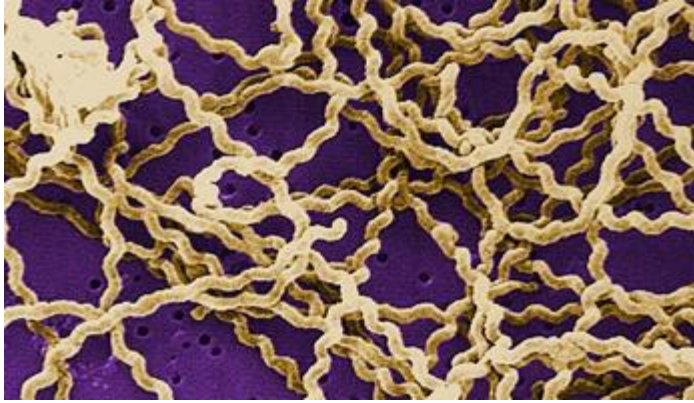
Epidemiological Criteria

- At least one of the following three epidemiological links:
- — Animal to human transmission
- — Environmental exposure
- — Exposure to a common source

Case Classification

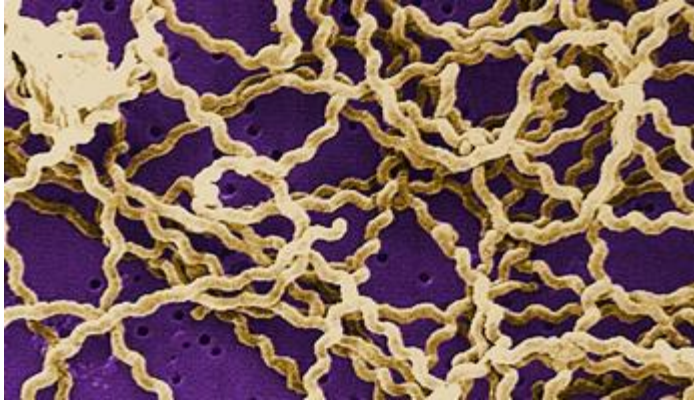
- A. **Possible case** NA
- B. **Probable case**
- Any person meeting the clinical criteria and with an epidemiological link
- C. **Confirmed case**
- Any person meeting the clinical and the laboratory criteria

Leptospirosis



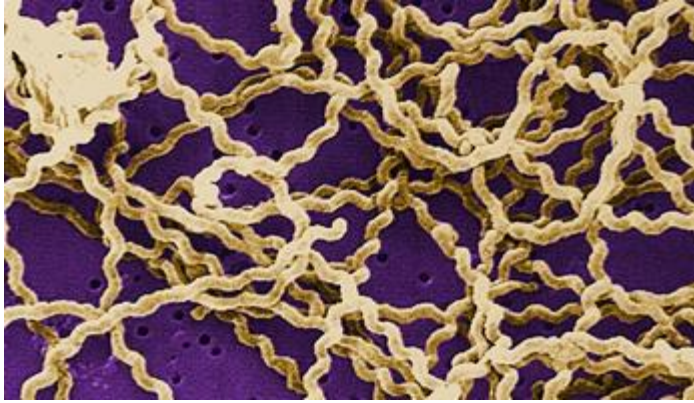
- **NAME AND NATURE OF INFECTING ORGANISM** Leptospirosis is a zoonosis occurring worldwide, caused by pathogenic spirochaetes of the genus *Leptospira*. Pathogenic leptospires live in the kidneys of a large variety of mammalian species and are excreted into the environment with the urine. Indirect infection through contact with leptospires secreted into the environment is probably the main route of acquiring leptospirosis. Pathogenic leptospires 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



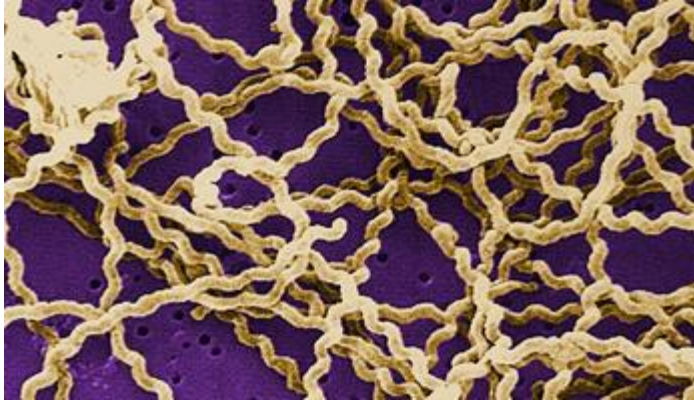
- **2. CLINICAL FEATURES**
- The incubation period varies from 2 to 30 days, with an average of 7–10 days. Leptospirosis varies from mild to severe clinical presentation, and may cause potentially fatal conditions such as Weil's syndrome and the emerging Severe Pulmonary Haemorrhagic Syndrome (SPHS). 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



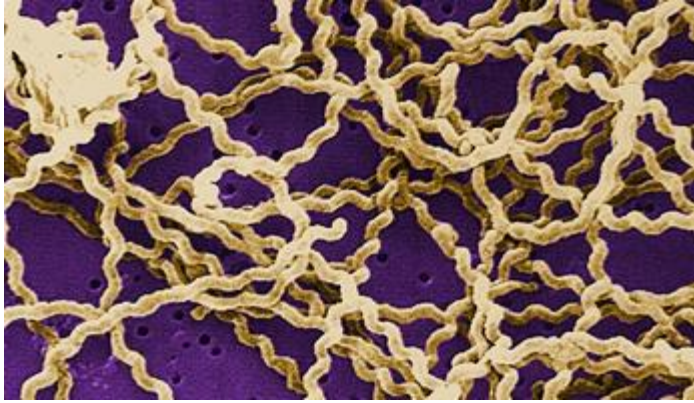
- **3. TRANSMISSION**
- **3.1 Reservoir**
- About 160 mammalian species have been identified as natural carriers of pathogenic leptospires. These include feral, semi-domestic and farm and pet animals as important infection sources. The infectious period of natural hosts can be lifelong. Accidental hosts can act as intermediate infection source, and may shed leptospires 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



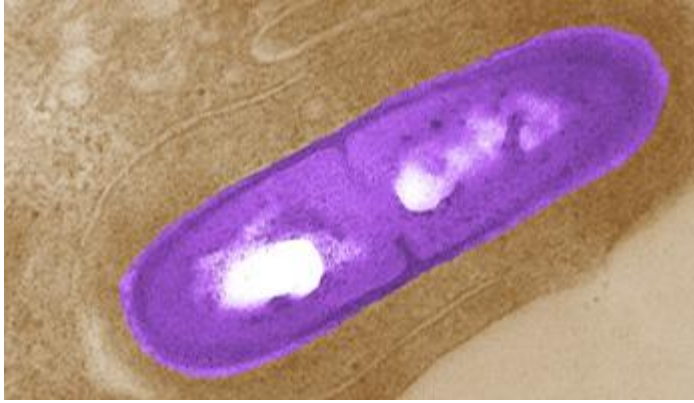
- **. PREVENTION MEASURES**
- **Prevention and control mainly focus on the identification and reduction of the infection source and the prevention of penetration of leptospires into the accidental host. Prevention of transmission can be achieved by wearing protective clothing. Prophylactic treatment 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



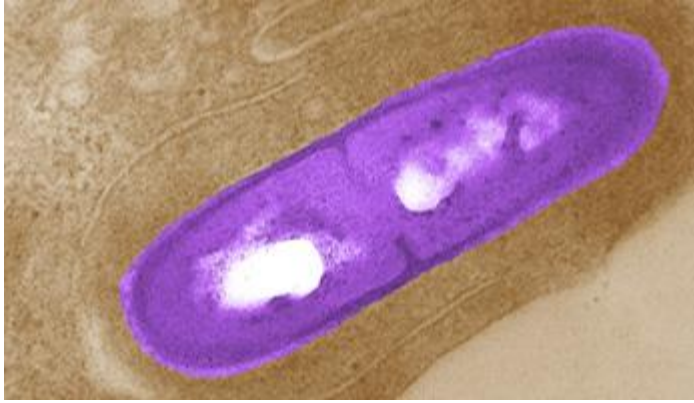
- **5. DIAGNOSIS**
- **The confirmation of a clinically suspected leptospirosis case is usually done through culturing and the Microscopic Agglutination Test (MAT); both are quite laborious and require well-equipped laboratories with experienced staff. Several rapid tests for humans are currently available, 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 amoxycillin, ampicillin, doxycycline or erythromycin are administered. Third generation cephalosporins and quinolone antibiotics also seem to be effective.**

Listeriosis



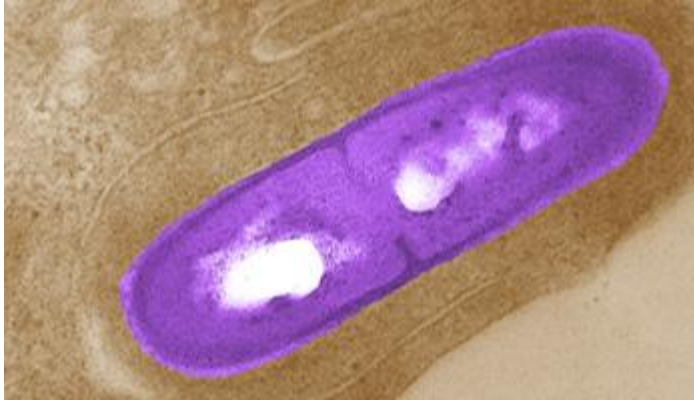
- Listeriosis is a disease caused by *Listeria monocytogenes*. The disease primarily causes problems in pregnant women, newborns, and adults with a weakened immune system. Listeria bacteria are ubiquitous in the environment, and food-borne outbreaks have been detected worldwide. Many animals carry the 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.
-

Listeriosis



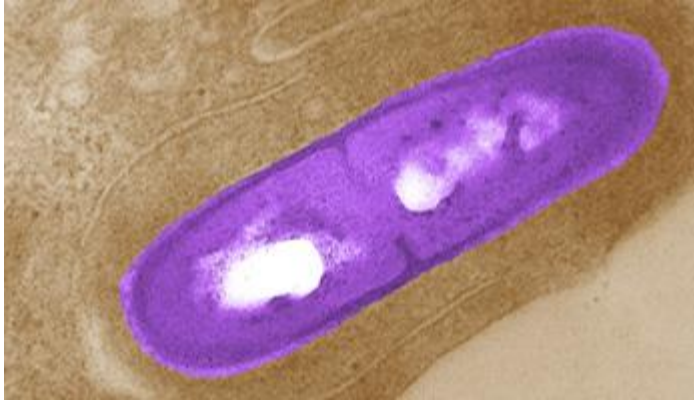
- **Symptoms**
  Listeriosis can cause a range of symptoms. Some patients can have no symptoms at all. Previously well, non-pregnant people often get symptoms of acute gastroenteritis—inflammation of the stomach and intestines. This can cause headache, fever, abdominal pain, sleepiness, nausea and diarrhoea. 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



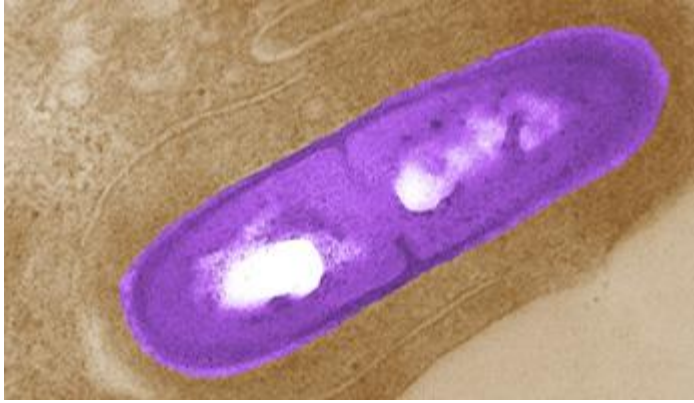
- **Ways to catch listeriosis**
  The bacteria that cause listeriosis are widespread in the environment and can be found in soil, surface water, vegetation and a range of wild and domestic animals. Most humans catch the infection by eating contaminated food. The bacteria can grow at low temperatures 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.

Shigellosis

- In 2009, the confirmed case rate of shigellosis in Europe was 1.63 cases per 100 000 population.
- Shigellosis continues to be most prevalent in children under five years old.
- Travel-associated cases, predominantly to regions outside of EU/EEA, were more frequently reported than indigenous cases.

SHIGELLOSIS (*Shigella* spp.) – Case definition

Clinical Criteria

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

Laboratory Criteria

- — Isolation of *Shigella* spp. from a clinical specimen

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

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

Table 2.3.14. Number and rate of shigellosis cases reported in EU and EEA/EFTA countries, 2006–09

Country	2009					2008		2007		2006	
	National Coverage	Report type	Total cases	Confirmed cases and notification rate		Confirmed cases and notification rate		Confirmed cases and notification rate		Confirmed cases and notification rate	
				Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Austria	Y	C	80	80	0.96	120	1.44	136	1.64	77	0.93
Belgium	Y	C	348	348	3.26	418	3.92	330	3.12	-	-
Bulgaria	Y	A	754	751	9.87	1094	14.32	1072	13.96	879	11.39
Cyprus	Y	C	2	2	0.25	1	0.13	0	0.00	2	0.26
Czech Republic	Y	C	178	177	1.69	227	2.19	331	3.22	276	2.69
Denmark	Y	C	106	106	1.92	90	1.64	-	-	-	-
Estonia	Y	C	52	52	3.88	69	5.15	114	8.49	53	3.94
Finland	Y	C	118	118	2.22	124	2.34	112	2.12	74	1.41
France	Y	C	1042	1042	1.62	517	0.81	827	1.30	-	-
Germany	Y	C	617	617	0.75	575	0.70	867	1.05	814	0.99
Greece	Y	C	37	37	0.33	19	0.17	49	0.44	26	0.23
Hungary	Y	C	42	42	0.42	43	0.43	62	0.62	73	0.72
Ireland	Y	C	71	71	1.60	63	1.43	43	1.00	53	1.26
Italy	-	-	-	-	-	-	-	-	-	-	-
Latvia	Y	C	68	66	2.92	102	4.49	73	3.20	73	3.18
Lithuania	Y	A	37	37	1.10	81	2.41	150	4.43	0	0.00
Luxembourg	Y	C	18	18	3.65	9	1.86	8	1.68	13	2.77
Malta	Y	C	1	1	0.24	3	0.73	0	0.00	0	0.00
Netherlands	Y	C	465	438	2.66	343	2.09	359	2.19	248	1.52
Poland	Y	A	30	21	0.06	31	0.08	53	0.14	30	0.08
Portugal	Y	C	3	3	0.03	7	0.07	12	0.11	1	0.01
Romania	Y	C	414	414	1.93	371	1.72	733	3.40	559	2.59
Slovakia	Y	C	404	370	6.84	446	8.26	525	9.73	436	8.09
Slovenia	Y	C	42	42	2.07	44	2.19	39	1.94	36	1.80
Spain	Y[a]	C	216	216	0.47	133	-	119	-	148	-
Sweden	Y	C	469	469	5.07	596	6.49	470	5.16	429	4.74
United Kingdom	Y	C	1568	1568	2.56	1595	2.61	1746	2.87	1425	2.36
EU total	-	-	**7182**	**7106**	**1.62**	**7121**	**1.78[b]**	**8230**	**2.10[b]**	**5725**	**1.79[b]**
Iceland	Y	C	2	2	0.63	3	0.95	2	0.65	0	0.00
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-
Norway	Y	C	153	153	3.19	134	2.83	148	3.16	138	2.97
Total	-	-	**7337**	**7261**	**1.63**	**7258**	**1.79[b]**	**8380**	**2.11[b]**	**5863**	**1.81[b]**

Source: Country reports. Y: Yes; N: No; A: Aggregated data report; C: Case-based report; –: No report; U: Unspecified. (a) Surveillance system changed to full national coverage in 2009 compared to previously estimated coverage of 25 % of the population. (b) Rates calculated excluding the Spanish data.

Toxoplasmosis (congenital)

- Toxoplasmosis remains a rare disease in EU and EEA/EFTA countries.
- In 2009, 26 congenital toxoplasmosis cases were reported by 18 EU countries.
- Nine EU countries do not conduct surveillance for toxoplasmosis.

TOXOPLASMOSIS, CONGENITAL (*Toxoplasma gondii*) - 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

Toxoplasmosis (congenital)

Toxoplasmosis is an infection with the protozoan parasite *Toxoplasma gondii*. Cats are the primary host for the parasite, and humans are infected by ingestion of the oocysts. Toxoplasmosis is mild or without symptoms for most individuals, but infection in early pregnancy can result in stillbirth, abnormality or severe illness in the newborn baby.

Toxoplasmosis (congenital)

Epidemiological situation in 2009

In 2009, 27 congenital toxoplasmosis cases (26 confirmed) were reported by 18 EU Member States. Ten countries reported zero cases (Table 2.3.15). While the United Kingdom reported the most cases, Hungary and Slovenia had the highest confirmed case rates (0.06 and 0.05 per 100 000 population). The overall EU confirmed case rate was 0.01 per 100 000 population, which is the same as the previous three years.

Table 2.3.15. Number and rate of congenital toxoplasmosis cases reported in EU and EEA/EFTA countries, 2006–09

Country	2009					2008		2007		2006	
	National Coverage	Report type	Total cases	Confirmed cases and notification rate		Confirmed cases and notification rate		Confirmed cases and notification rate		Confirmed cases and notification rate	
				Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Austria	Y	C	1	1	0.01	0	0.00	1	0.01	-	-
Belgium	-	-	-	-	-	-	-	-	-	-	-
Bulgaria	Y	C	0	0	0.00	-	-	-	-	-	-
Cyprus	Y	C	0	0	0.00	0	0.00	0	0.00	-	-
Czech Republic	Y	C	2	2	0.02	2	0.02	1	0.01	2	0.02
Denmark	-	-	-	-	-	-	-	-	-	-	-
Estonia	Y	C	0	0	0.00	0	0.00	0	0.00	0	0.00
Finland	Y	C	0	0	0.00	0	0.00	1	0.02	0	0.00
France	-	-	-	-	-	-	-	-	-	-	-
Germany	-	-	-	-	-	-	-	-	-	-	-
Greece	-	-	-	-	-	-	-	-	-	-	-
Hungary	Y	C	6	6	0.06	1	0.01	-	-	1	0.01
Ireland	Y	C	0	0	0.00	2	0.05	2	0.05	6	0.14
Italy	-	-	-	-	-	-	-	-	-	-	-
Latvia	Y	C	0	0	0.00	0	0.00	0	0.00	0	0.00
Lithuania	Y	A	0	0	0.00	0	0.00	0	0.00	0	0.00
Luxembourg	Y	C	0	0	0.00	0	0.00	0	0.00	0	0.00
Malta	Y	C	0	0	0.00	0	0.00	0	0.00	-	-
Netherlands	-	-	-	-	-	-	-	-	-	-	-
Poland	Y	C	3	3	0.01	8	0.02	8	0.02	7	0.02
Portugal	-	-	-	-	-	-	-	-	-	-	-
Romania	Y	C	3	2	0.01	-	-	-	-	-	-
Slovakia	Y	C	0	0	0.00	0	0.00	2	0.04	1	0.02
Slovenia	Y	C	1	1	0.05	0	0.00	2	0.10	2	0.10
Spain[a]	N	C	1	1	-	1	-	0	-	1	-
Sweden	-	-	-	-	-	0	0.00	0	0.00	-	-
United Kingdom	Y	C	10	10	0.02	5	0.01	3	0.00	0	0.00
EU Total	**-**	**-**	**27**	**26**	**0.01[b]**	**19**	**0.01[b]**	**20**	**0.01[b]**	**20**	**0.01[b]**
Iceland	-	-	-	-	-	0	0.00	0	0.00	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-
Norway	-	-	-	-	-	-	-	-	-	-	-
Total	**-**	**-**	**27**	**26**	**0.01[b]**	**19**	**0.01[b]**	**20**	**0.01[b]**	**20**	**0.01[b]**

Source: Country reports. Y: Yes; N: No; A: Aggregated data report; C: Case-based report; –: No report; U: Unspecified. (a) Surveillance system currently estimated to cover 25 % of the total population. (b) Rates calculated excluding the Spanish data.

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.
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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 that 2 ppm).

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 asympomatic 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 0 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.