

# Foodborne diseases

The entrance gate of these infections is the mucous membrane of the digestive tract, a person can be infected by any food.

## Alimentary diseases

- **Typical:** typical onset (ingestion of infected food) and typical manifestations ( diarrhea , fever , vomiting ) = salmonellosis , shigellosis , etc.
- **Atypical:** typical occurrence but not typically manifested = typhoid fever , tick-borne encephalitis after ingestion of infected goat's milk products, botulism .

## Susceptibility

- Especially small children and older individuals ( dehydration occurs very quickly ).

## Occurrence

- Globally, especially in the tropics and subtropics and landscapes with low hygiene standards, seasonality is typical in developed countries (frequent salmonellosis in summer).

## Originators

- Pathogenic, conditionally pathogenic and toxicogenic micro-organisms transmitted through food can cause serious diseases.
- Enzyme systems of microorganisms contaminating food cause - **changes in its composition, disrupt its structure, worsen its hygienic quality, lead to the formation of toxic metabolic products, lead to alimentary infections and toxicosis.**

## Etiology of foodborne diseases

- can be **BACTERIAL x VIRAL x PARASITIC**

## Epidemic incidence

It is directly related to non-observance of hygienic principles in the production and handling of food:

- when transporting, storing and serving food, especially in communal dining,
- in case of faults in the water supply.

### According to the method of food contamination:

- **primary infections:** sick animals or products from them were used in food production,
- **secondary infections:** germs got into the food during treatment, processing and further handling.

## Bacterial infections

### Salmonellosis

- Cause: bacteria of the genus Salmonella .
- The most common cause of alimentary diseases in our conditions.
- Source of food of animal origin (meat, dairy products, eggs).

Salmonella are resistant to external influences, they survive in frozen food for several months, they do not tolerate high temperatures, they are reliably eliminated by boiling, or at least 65 °C for 15-20 minutes.

**Symptoms of the disease:** incubation period of 12-24 hours, then chills, fever, convulsions, headache, diarrhea , vomiting.

- symptoms are caused by thermostable endotoxin.

Food is usually contaminated **primarily** or **secondarily** . If the products are insufficiently heat-treated, improperly stored or consumed without further heat treatment, they apply to the transmission of the disease.

### Shigellosis = bacillary dysentery

- Originator: genera of bacteria of the Enterobacteriaceae family.
- A microorganism sensitive to the action of the external environment.
- Transmission from person to person by contaminated hands, objects, uncooked food (vegetables, fruit fertilized with infected fertilizer).

**Symptoms of the disease:** incubation period of 2-3 days, then symptoms typical of an acute diarrheal disease (fever, tenesmus , diarrhea, vomiting).

## Campylobacter enteritis

- Cause: Campylobacter jejuni.
- A disease similar to salmonellosis.
- Poultry is the reservoir of infection, the source of infection can also be a person excreting the microorganism through feces.
- A related microorganism, **Helicobacter pylori** is considered one of the etiological agents of ulcer disease.

According to the SZÚ, the most frequently reported foodborne infection in 2010.<sup>[1]</sup>

## Cholera

- Caused by: Vibrio cholerae .
- Transmission most often through drinking water contaminated with faeces or infected food. The source of infection is a sick person.
- The incubation period is several hours to days, the disease is manifested by watery diarrhea, cramping pains and vomiting.

## Typhoid fever

- Cause: Salmonella Typhii.
- Infection through food and contaminated water, the incubation period is 7 to 14 days, then it manifests itself in high fever, headaches, malaise, rash, abdominal pain, and complications are often associated with this. One of them is inflammation of the gallbladder, which leads to bacillus carriage (film: "Beware of the visitor!").

## Other negative health effects of bacterial foodborne pathogens

Bacterial alimentary diseases - anthroozoonoses - have, in addition to the occurrence of acute diarrheal diseases, another negative effect on the health of the population. Bacterial contamination of food has been shown to be involved in the transmission of antibiotic resistance in humans.

- *This was confirmed by the report of the European Food Safety Authority ( EFSA (<http://www.efsa.europa.eu/>) ) and the European Center for Disease Control ( ECDC (<http://ecdc.europa.eu/en/home>) ) from July 2011. The mechanism is applied as another (side) effect in the etiopathogenesis of individual cases of human anthroozoonoses. This is a situation where the foodborne disease agent was not sufficiently devitalized by heat treatment before consumption, and vital resistant strains of bacteria subsequently caused infection in humans. The actual incidence of the main anthroozoonoses (salmonellosis, campylobacteriosis) proves that the routes of transmission of zoonotic agents to humans have not yet been interrupted. Campylobacteriosis is currently the most common recorded cause of diarrheal diseases in humans, the incidence of campylobacteriosis even exceeded the long-term high incidence of salmonellosis.<sup>[2][3]</sup> E.g. in Campylobacter spp. resistance to ciprofloxacin in humans was found in the range of 20.9% to 76.5% of the tested isolates. In chicken farms, ciprofloxacin resistance ranged from 1% to 92% for C. jejuni serotype and 63% to 97% for C. coli serotype, depending on location. Data are based on surveillance from 2009. It is noteworthy that although ciprofloxacin is rarely used to treat human campylobacteriosis, the prevalence of resistant strains in humans is far too high.<sup>[2][3]</sup>*

**Prevention is the same as the general principles of the fight against the occurrence of alimentary diseases.** The transmission of atb-resistant strains of bacteria cannot, of course, occur if the pathogenic bacteria are sufficiently devitalized by heat treatment, i.e. under the influence of a temperature of at least 75 degrees C in all parts of the dishes. It is also important to prevent cross-contamination, i.e. direct or indirect contact of cooked food with raw food. These two basic principles are part of the general principles of preventing foodborne illness in humans.<sup>[2][3]</sup>

## Alimentary intoxication [ edit | edit source



For more information see Enterotoxigenesis.



For more information see Enterotoxins.

They are caused by toxic products of microorganisms.

- **Staphylococcal enterotoxigenesis .**
- **Alimentary intoxication caused by Clostridium perfringens .**
- **Alimentary intoxication caused by Bacillus Cereus .**

*Botulism* (caused by: Clostridium botulinum)

- The anaerobic sporulating microorganism is found in the intestinal tract of animals, is maintained in soil and water, and produces a neurotoxin.
- Transmission of infection by ingestion of salted or preserved foods containing Cl. Botulinum without sufficient

heat treatment.

*Symptoms of poisoning* : Incubation period 12–18 hours, then headaches , vomiting, constipation, double vision, problems speaking and swallowing up to paralysis of the respiratory muscles.

*Prevention* : observance of technological principles in the preparation of cured meats and preserves and their proper storage, additional boiling before consumption, addition of pickling salts t

## General principles for the prevention of foodborne illness in humans

The general principles of foodborne disease prevention in humans were formulated in the so-called Five Keys of Safe Eating (World Health Organization, 2001). The Czech text was prepared by the Institute of Agricultural and Food Information in 2001:

1. Keep it clean.
2. Separate raw and cooked foods.
3. Cook food thoroughly.
4. Keep food at safe temperatures.
5. Use safe water and raw materials. <sup>[4]</sup>

## Viral infections

 For more information see *Diarrheal diseases of viral etiology*.

- Foods of animal origin are usually contaminated *primarily* (intravitaly), from contaminated animals, or *secondarily* during the production process and during handling of finished products.
- These include: viral hepatitis ; **infections caused by adenoviruses, reoviruses, enteroviruses, myxoviruses, parainfluenza viruses; tick-borne encephalitis virus** (milk-infected domestic animals).

## Alimentary protozoan infections and parasitosis

 For more information see *Overview of intestinal helminthiasis*.

### Amoebiasis

- Originator: element *Entamoeba histolytica* .
- The source of infection is an infected person, transmission via the fecal-oral route.
- It is manifested by diarrhea and involvement of the large intestine, with the possibility of perforation and peritonitis and transition to the chronic stage, liver involvement is manifested by hepatitis or abscess - most often occurs in the tropics and subtropics.

### Enterobiosis

- Origin: parasite of human tapeworm (children's tapeworm, *Enterobius vermicularis*)
- Common in children of preschool and school age.
- The source of infection is an infected individual, the entrance gate is the mouth (self-infection, contaminated food, dust, toys).

**Symptoms** : itching in the perianal area, frequent diarrhea, abdominal pain, loss of appetite, restlessness in children, insomnia, bedwetting.

### Taeniosis

Taeniosis is a parasitic disease caused by various helminths. Man is either a transient or a definitive host.

1. **Taenia saginata** – contamination by ingestion of insufficiently heat-treated beef or veal containing beans,
  - *manifestations* : colicky abdominal pain, loss of appetite, sometimes asymptomatic.
2. **Taenia solium** – infection when eating pork or eating tapeworm eggs,
  - *manifestations* : similar, when the egg is infected, lumps are formed and various organs are affected ( cysticercosis ).

### Ascariasis

- Cause: parasite roundworm (*Ascaris lumbricoides*).
- The source of infection is a sick person or soil contaminated with eggs, transmission occurs through ingestion of contaminated, insufficiently prepared food or contaminated soil.
- Clinical picture: depends on the number of roundworms in the intestine, **pulmonary phase** (cough, chest pain, fatigue, fever), **intestinal phase** (abdominal pain, vomiting, diarrhea, obstructive ileus and jaundice in more severe cases ).

### Trichinellosis

- Cause: parasite *Trichinella spiralis* = spiral worm.
- The source of infection is mainly insufficiently heat-treated pork.

The disease usually has a two-phase course:

- **intestinal phase** – multiplication of larvae and penetration into the intestinal wall (catarrh, diarrhea, abdominal pain, hives, swelling),
- **muscle phase** – larvae settle in striated muscles (fever, muscle pain, muscle function disorders, or lung complications).

Prevention consists of regular inspections of meat at slaughterhouses, careful kitchen preparation and, of course, vaccination : against hepatitis A , typhoid , cholera , poliomyelitis .

## Links

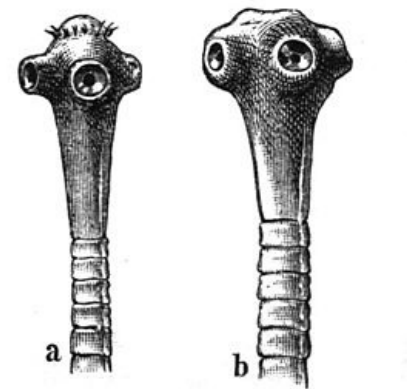
## Reference

1. Státní zdravotní ústav. *Vybrané infekční nemoci v ČR v letech 2001-2010 - absolutně* [online]. [cit. 2011-08-14]. <<http://www.szu.cz/publikace/data/vybrane-infekcni-nemoci-v-cr-v-letech-1998-2007-absolutne>>.
2. SUKOVÁ, Irena. *Zpráva o rezistenci k hlavním antibiotikům u lidí i zvířat* [online]. Informační centrum bezpečnosti potravin, ©2011. The last revision 2011-08-17, [cit. 2012-01-04]. <<http://www.bezpecnostpotravin.cz/zprava-o-rezistenci-k-hlavnim-antibiotikum-u-lidi-i-zvirat.aspx>>.
3. EFSA, ECDC. *European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from animals and food in the European Union in 2009* [online]. European Food Safety Authority, ©2011. [cit. 2012-01-04]. <<http://www.efsa.europa.eu/en/efsajournal/doc/2154.pdf>>.
4. Leták „Pět klíčů k bezpečnému stravování“ ([http://www.who.int/foodsafety/publications/consumer/5keys\\_czech.pdf](http://www.who.int/foodsafety/publications/consumer/5keys_czech.pdf)) (velikost 116 kB)

## Sources

- DOSTÁL, Václav. *Infektologie*. 1. edition. Praha : Karolinum, 2005. pp. 218-220. ISBN 80-246-0749-2.
- BENCKO, Vladimír. *Hygiena : Učební texty k seminářům a praktickým cvičením*. 2. edition. Praha : Karolinum, 1998. 185 pp. pp. 54 - 58. ISBN 80-7184-551-5.

ws: Nákazy přenášené alimentární cestou (<https://www.wikiskripta.eu/index.php?curid=14301>)



a) Long-limbed tapeworm head (*Taenia solium*), b) Defenseless tapeworm head (*Taenia saginata*)