

# Bacterial and viral gastrointestinal infections

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# Acute gastroenteritis

- Acute gastroenteritis is an inflammatory infection of the stomach and gut
- Gastrointestinal infections encompass a wide variety of symptoms and recognized infectious agents
- The most common symptoms associated with acute gastroenteritis are nausea, vomiting and diarrhoea
- Estimates are that over 1.8 million children still die each year (more than 6000/day) due to GI infections
- Diarrhoea is estimated to account for 18% of all death in children younger than 5 years
- The second most common infections in developed countries (after respiratory infections)
- *Clostridium difficile* infection is still serious problem in many well-developed countries – it is a typical hospital-acquired infection



## Gastrointestinal infections in CR 2008-2019

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Campylobacter</b>	20 175	20 371	21 164	18 811	18 412	18 389	20 903	21 102	24291	24508	23780	23169
<b>Salmonella</b>	11 009	10 805	8 622	8 752	10 507	10 280	13 633	12 739	11912	11779	11359	13314
<b>Shigella</b>	229	178	450	164	266	257	92	88	70	168	145	134
<b>Bacterial other</b>	3 305	3 178	3 343	4 607	5 168	5 797	6 763	8 146	7563	7371	8116	8137
<b>Viral</b>	6 639	6 066	8 517	9 955	6 877	7 778	9 438	18 858	9491	9986	9694	12056
<b>Food poisoning</b>	84	106	100	381	14	203	177	793	127	3	237	38

# Gastrointestinal infections

- bacterial
- viral
- parasitic

# Bacterial GI infections

- transmission of pathogenic microbes
  - zoonosis
  - human
- food-poisoning

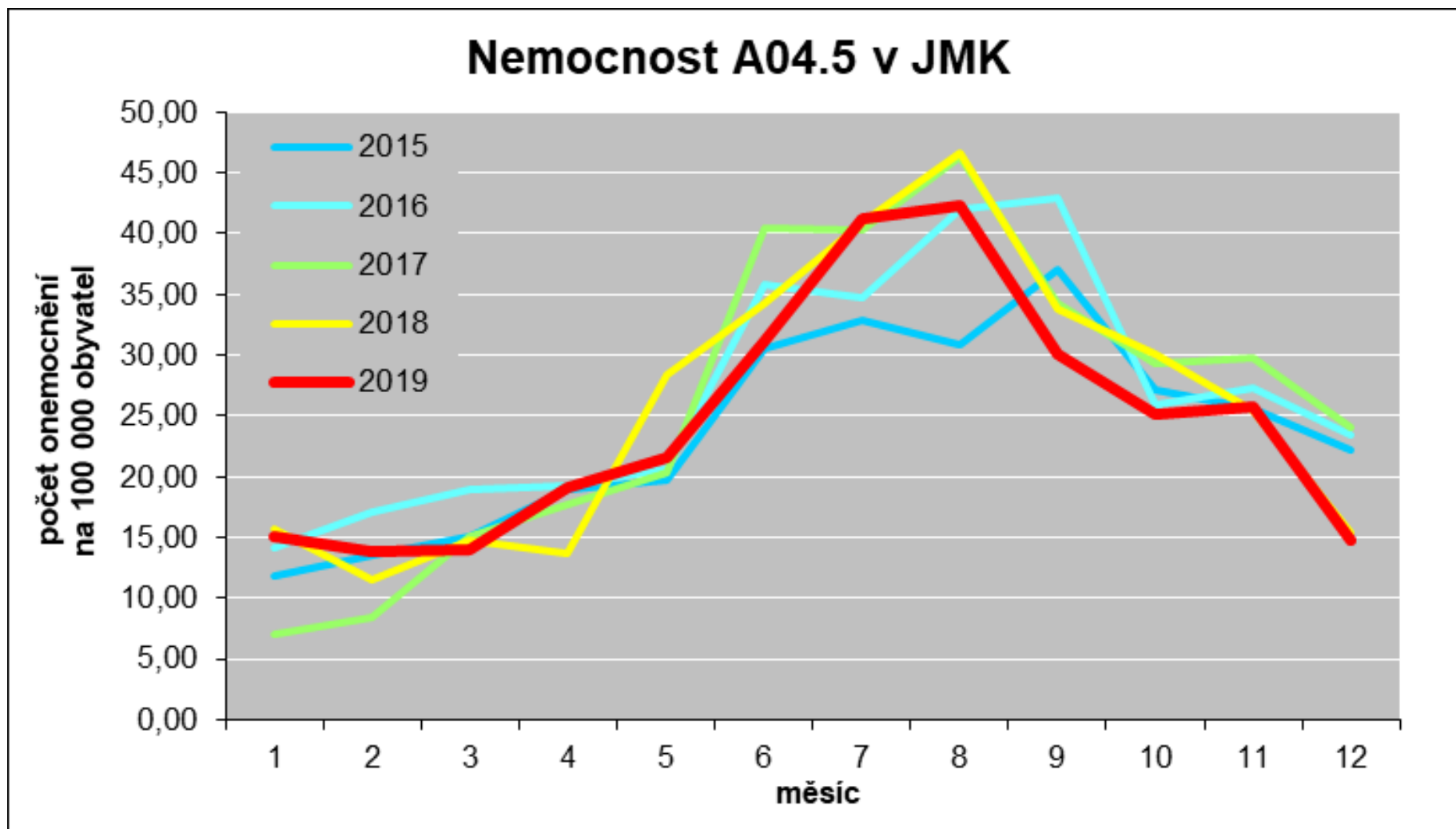
# Zoonosis

- campylobacteriosis (*C. jejuni*)
- salmonellosis (*S. Enteritidis*)
- yersiniosis (*Y. enterocolitica*)
- EHEC (*E. coli*)

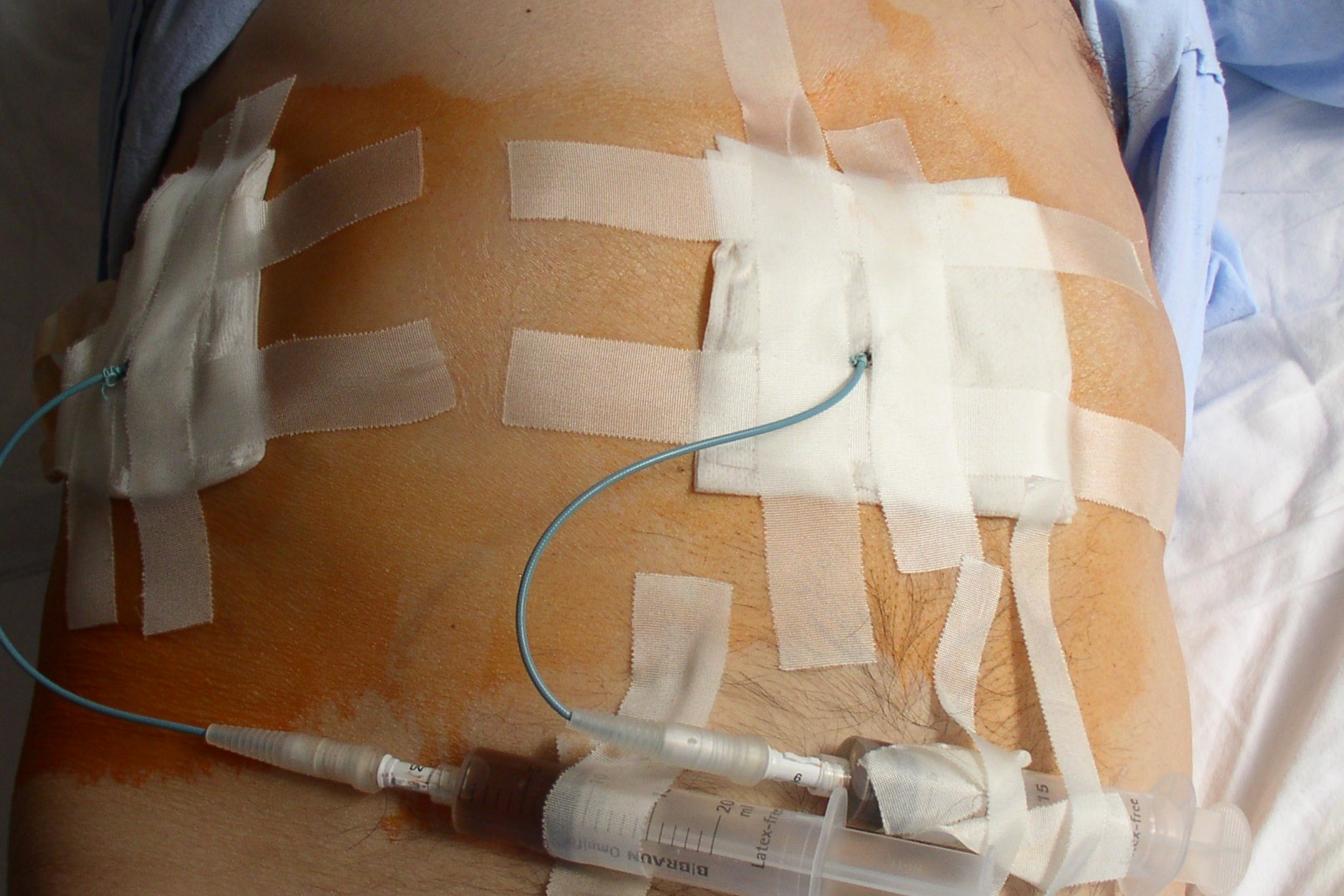
# Campylobacteriosis

- now the most common zoonosis in CR a many other European countries (especially undercooked poultry)
- *Campylobacter jejuni*
- clinical course – from inaparent to serious acute enterocolitis with right lower abdominal quadrant pain, fever, and bloody diarrhoea
- sepsis is possible in IS patients
- reactive arthritis, erythema nodosum, Guillain-Barré syndrome – possible immune-mediated complications
- rehydration, diet, complicated forms: macrolides, doxycycline, cotrimoxazole, for septic forms: 3<sup>rd</sup> generation cephalosporins, carbapenems, aminoglycosides

# Campylobacteriosis in Southern Moravia 2015-2019









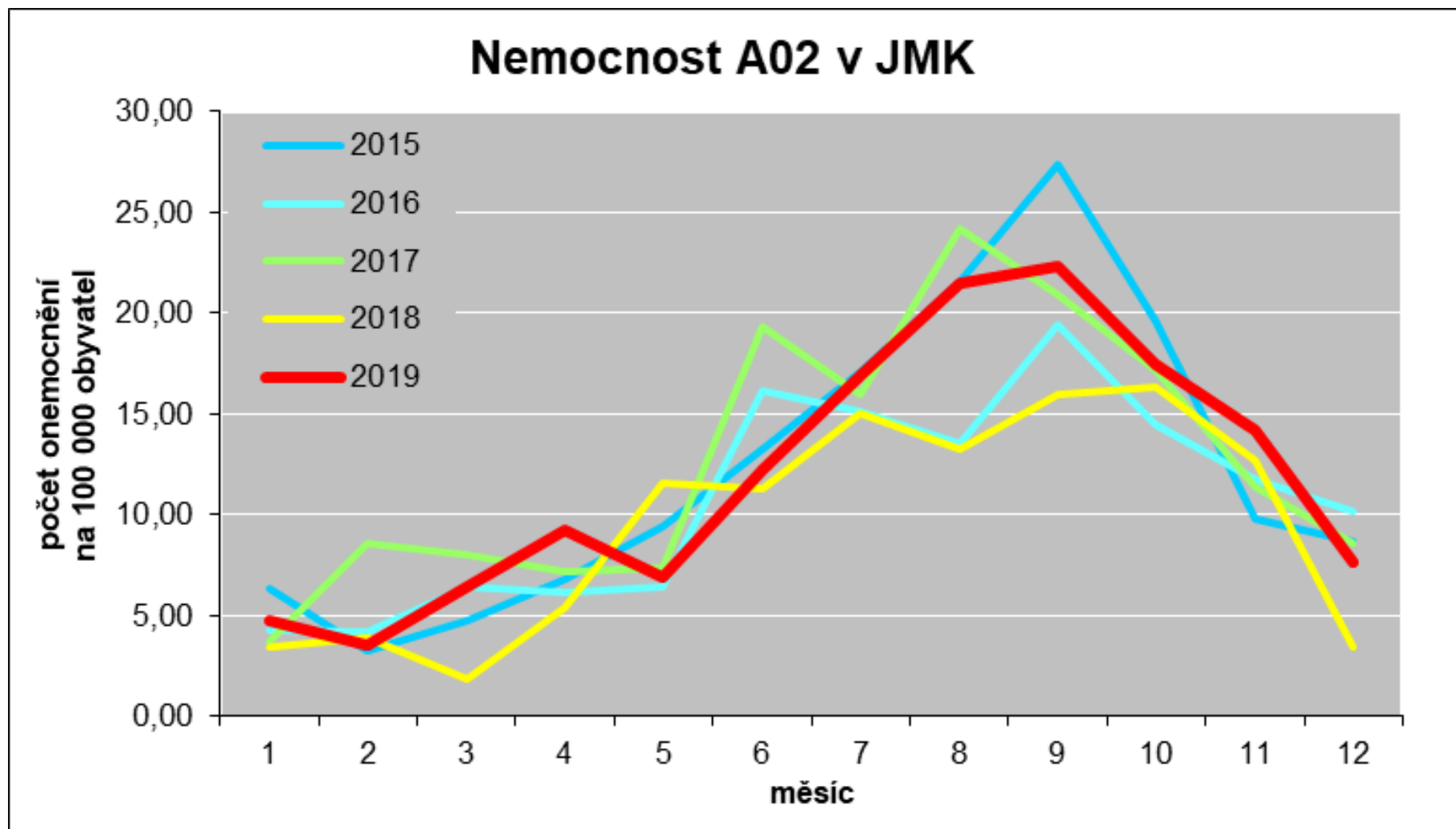
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# Salmonellosis

- the second most common zoonosis in CR and most European countries
- at present in CR minimally 90 % cases caused by *S. Enteritidis*, rarely *S. Typhimurium*
- according to the current *Salmonella* nomenclature system of CDC and WHO the full taxonomic designation *Salmonella enterica* subspecies *enterica* serotype Enteritidis (Typhimurium) can be shortened to *Salmonella* Enteritidis (Typhimurium)
- gastroenteritidis
- enterotoxin production and active penetration into intestinal epithel
- septic form (extraintestinal abscesses) in IS patients
- reactive arthritis, erythema nodosum, Guillain-Barré syndrome – possible immune-mediated complications
- rehydration, diet, complicated forms: cotrimoxazole, ampicillin, aminoglycosides, 3<sup>rd</sup> generation cephalosporins

# Salmonellosis in Southern Moravia 2015-2019



# Yersiniosis

- worldwide zoonosis, relatively more common in Northern Europe
- *Yersinia enterocolitica*
- more often in winter
- fever, diarrhea, often bloody, syndrome of the lower right quadrant (mesenteric lymphadenitis)
- complication: sepsis, metastatic abscesses (esp. liver)
- reactive arthritis, erythema nodosum, Guillain-Barré syndrome - possible immune-mediated complications
- rehydration, diet, complicated forms: cotrimoxazole, doxycycline, aminoglycosides, and 3<sup>rd</sup> generation cephalosporines

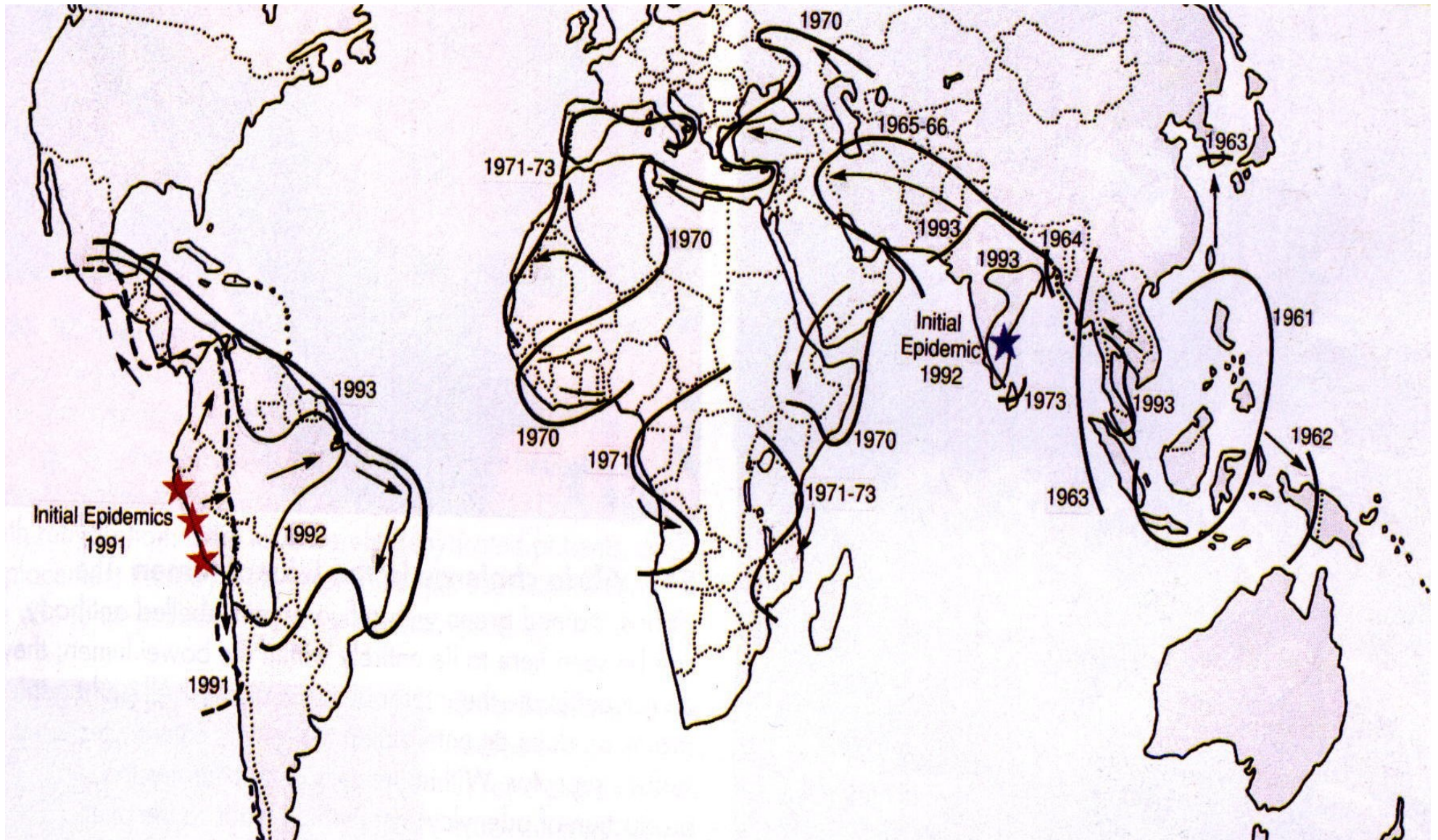
# Human bacterial infections

- cholera
- shigellosis
- *E.coli* enterocolitis (except for EHEC – zoonosis)
- *Clostridium difficile* infection

# Cholera

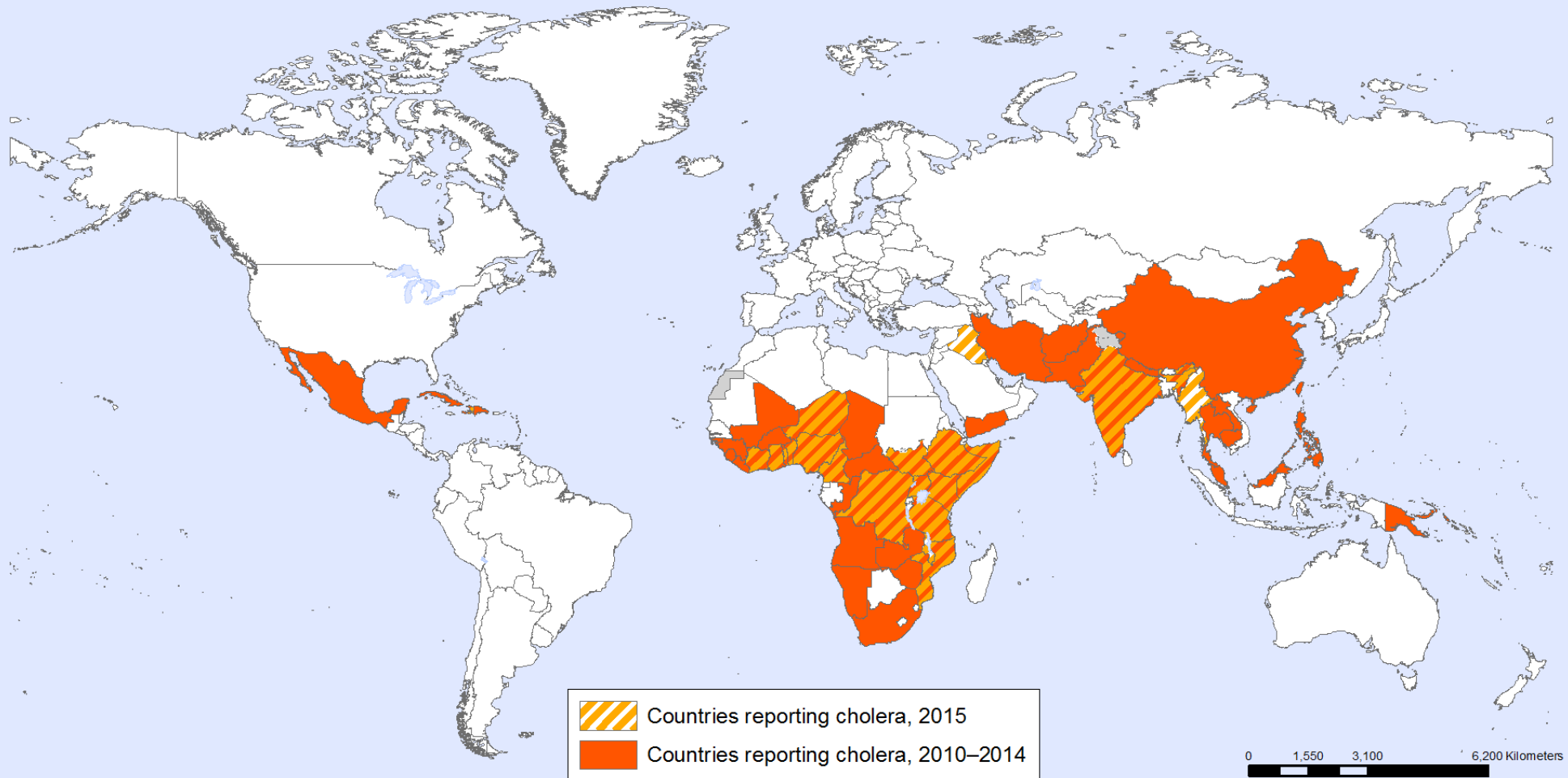
- Historically endemic in South and South-East India
- *Vibrio cholerae* faecally contaminated water – drinking water, undercooked animals from this water
- boiling destroys this bacteria
- at least 7 cholera pandemics worldwide during last 200 years
- 1st-6th pandemics - classic type (1817-1923)
- 7th pandemic - biotyp El Tor (since 1960s)
- 8th pandemic - O139 Bengal (since 1992)
- Cholera is now endemic in more than 50 countries
- There an estimated 3 to 5 million cholera cases , resulting in approximately 100 000 death each year

# Cholera – 7th and 8th pandemics





## Countries reporting cholera, 2010–2015



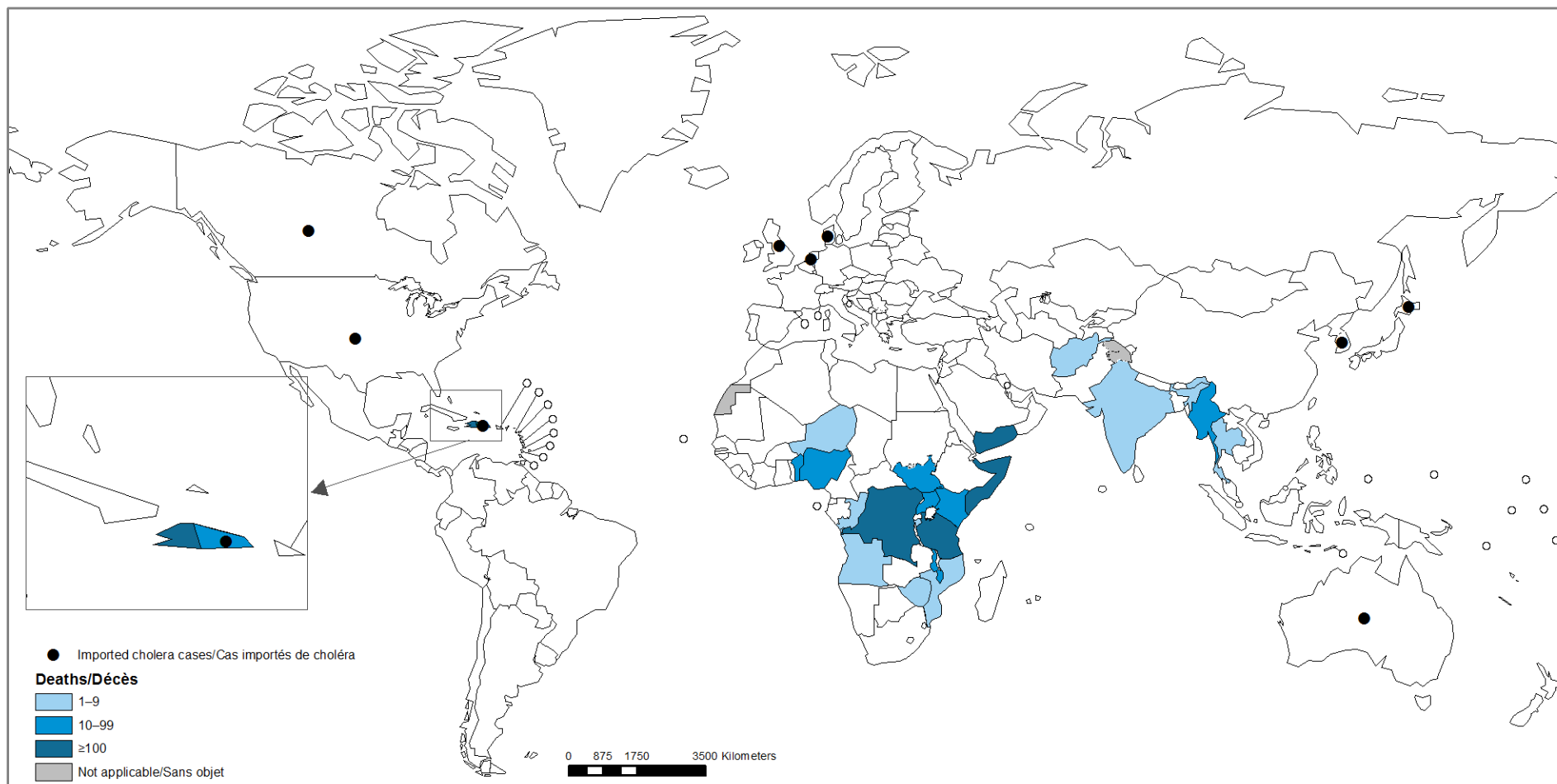
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Data Source: World Health Organization  
Map Production: Information Evidence  
and Research (IER)  
World Health Organization



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## Countries reporting cholera deaths and imported cases in 2016 Pays ayant déclaré des décès dus au choléra et des cas importés en 2016



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

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Data Source: Control of Epidemic Diseases Unit  
World Health Organization

Map Production: Information Evidence and Research (IER)  
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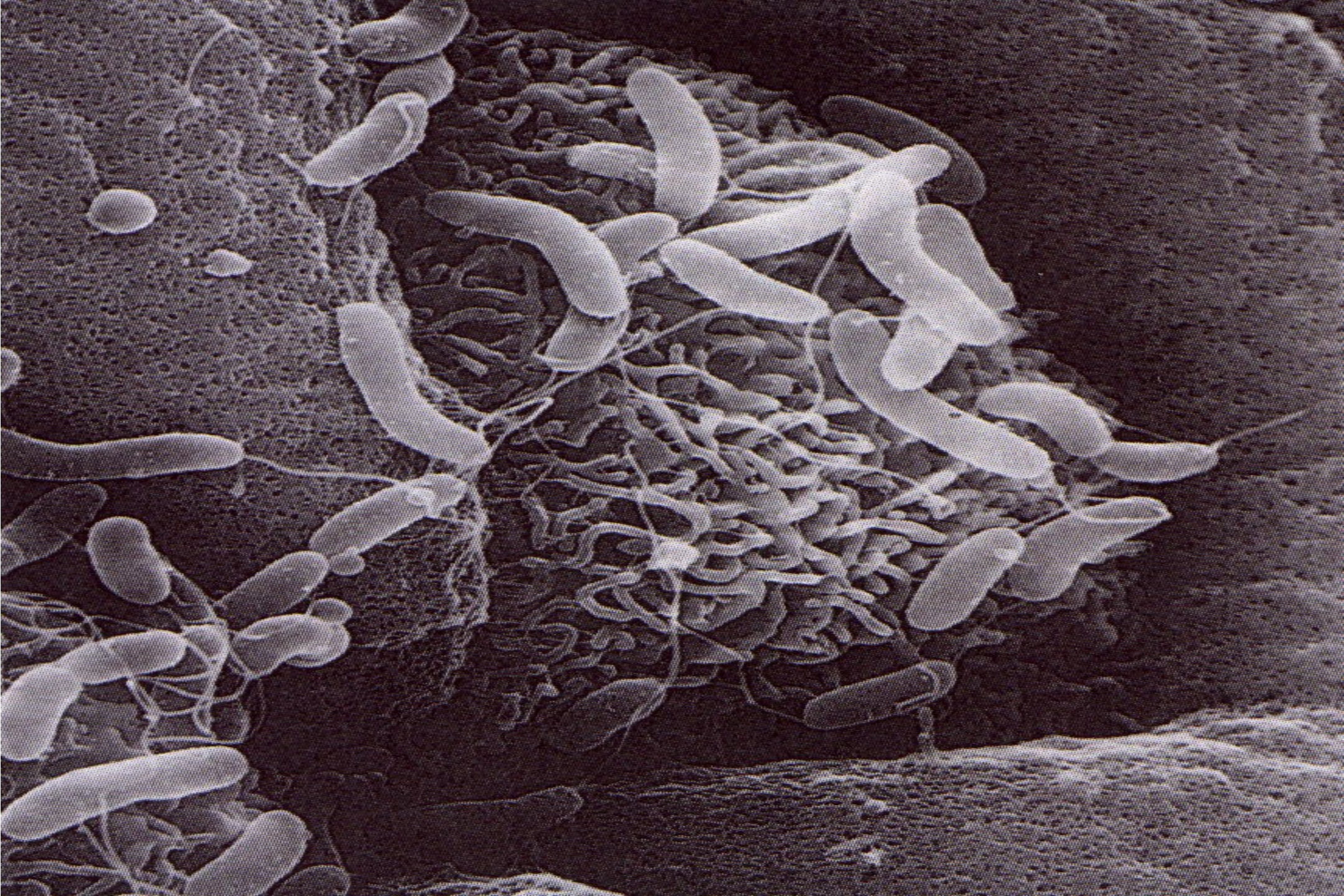
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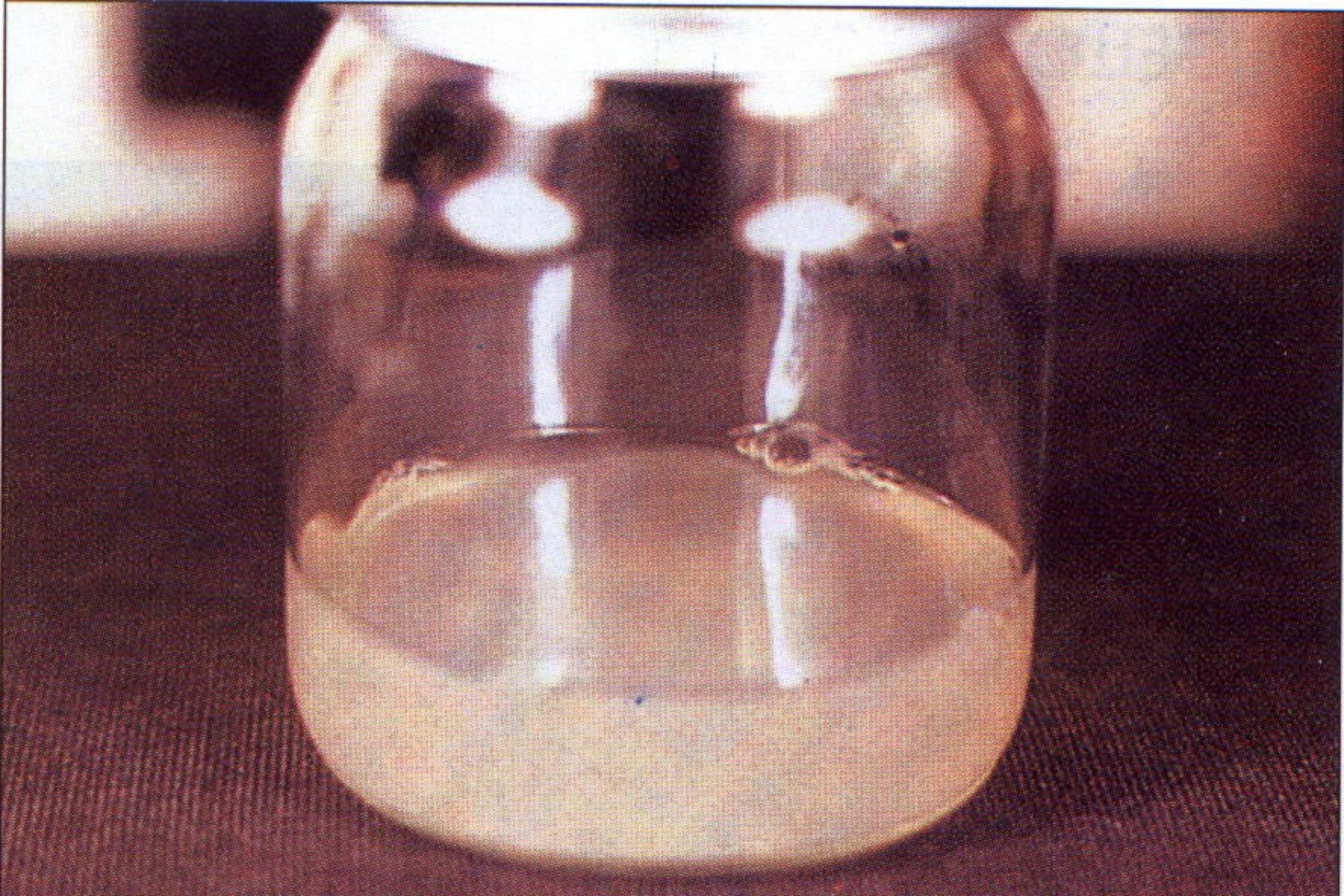


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# Cholera

- enterotoxin production - profuse diarrhea, vomiting and rapid dehydration (especially when is the infection caused by classic type)
- the collection of stool by special swabs and culture
- the necessity of quick rehydration
- antibiotics – above all epidemiological significance (cotrimoxazole, doxycycline, ampicillin, chloramphenicol, or fluoroquinolones)
- vaccination available (combined vaccine with ETEC), not generally recommended – low efficacy, short duration of protection





# Shigellosis

- one of the most contagious intestinal infections
- associated with poor hygiene conditions – war conflicts, natural catastrophes
- *Shigella sonnei*, *S. flexneri*
- colitis (tenesmus, often mucus, pus, and blood in stool)
- rehydration, diet, complicated forms: cotrimoxazole, ampicillin, chloramphenicol, or fluoroquinolones

## *E. coli* enterocolitis

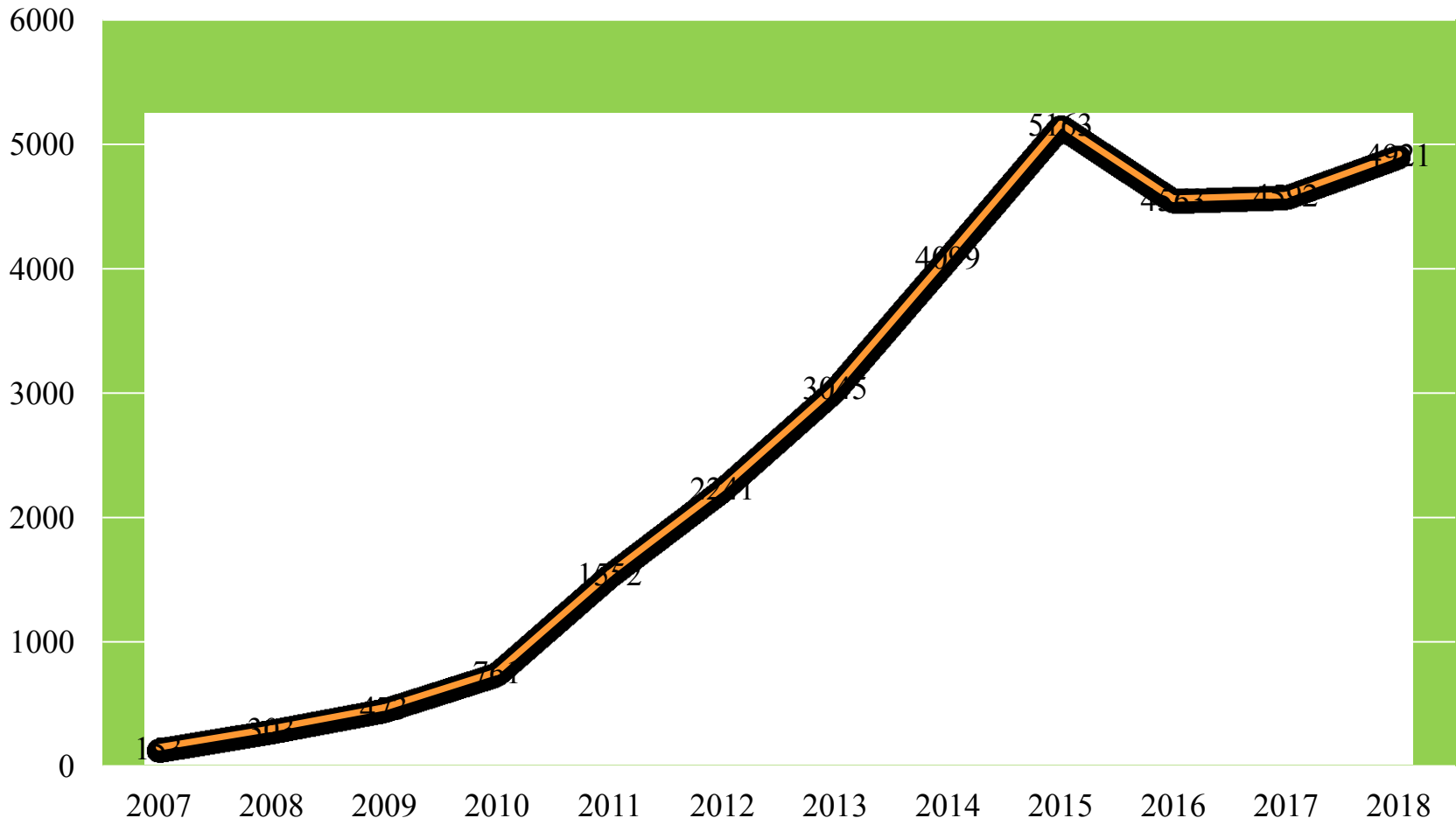
- Enterotoxigenic - ETEC
- Enteroinvasive - EIEC
- Enteropathogenic - EPEC
- Enterohemorrhagic - EHEC
- Enteroagregative - EAEC
- Diffuse adherent

## *Clostridium difficile* infection (CDI)

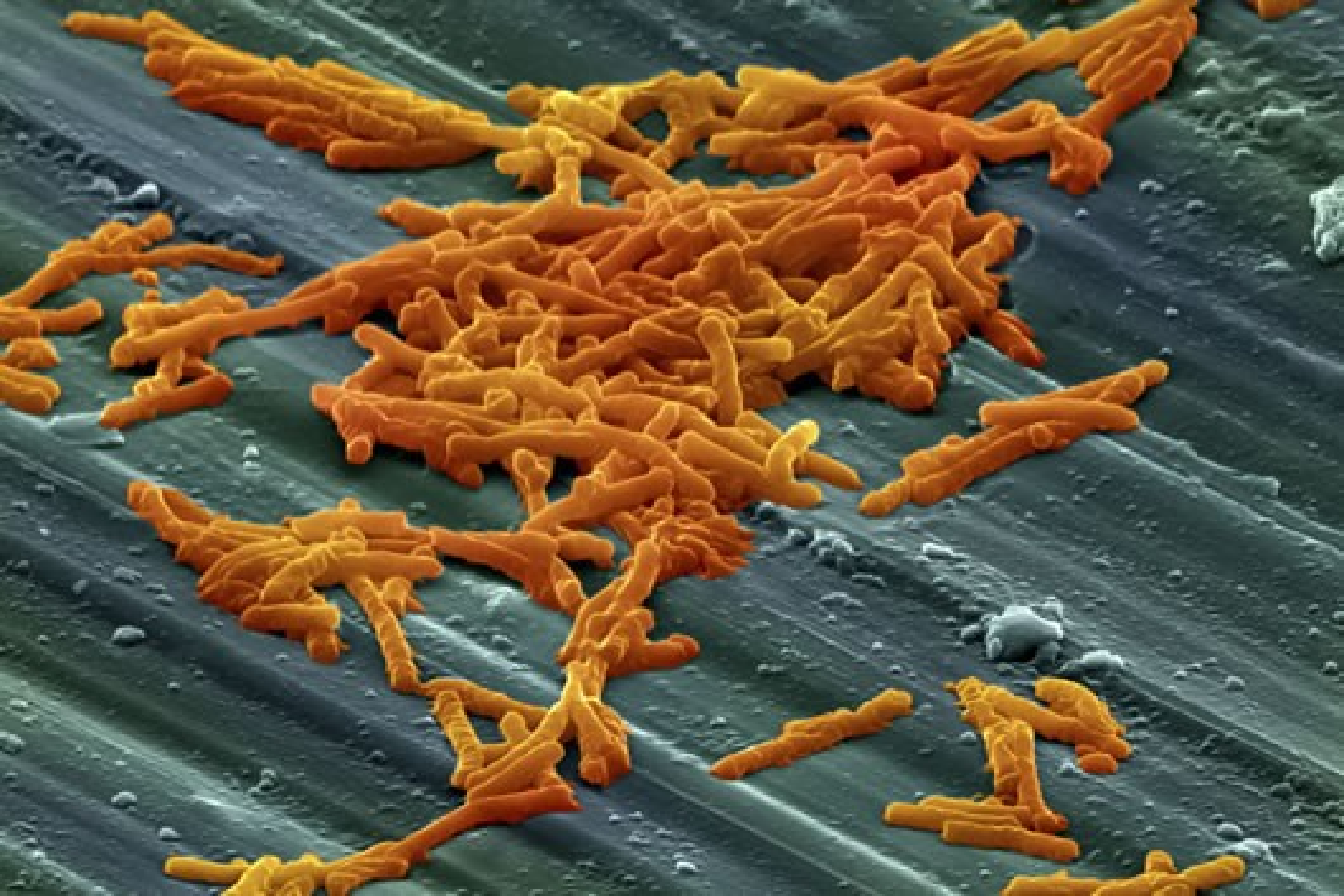
- *C. difficile* - G+ anaerobic spore-forming bacteria
- spores survive for many months outside an organism – extremely resistant
- common nosocomial infections in developed countries
- development of vegetative forms in the colon
- production of exotoxins (usually both at once)
  - toxin A (enterotoxin – necrotic)
  - toxin B (cytotoxin)
  - binary toxin (unknown mechanism)



# CDI in CR 2007-2018



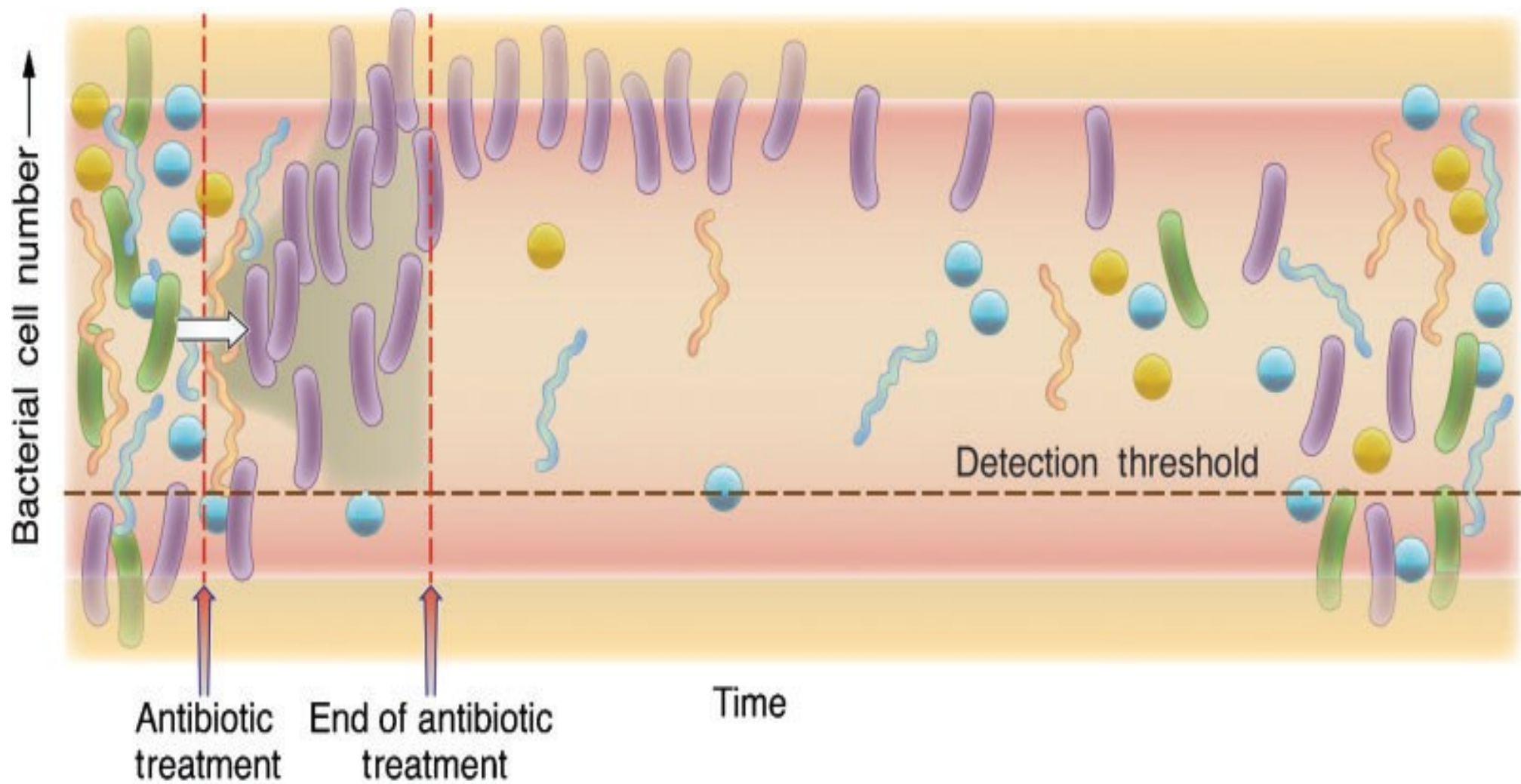
Source: Epidat, ISIN





## Important factors for CDI

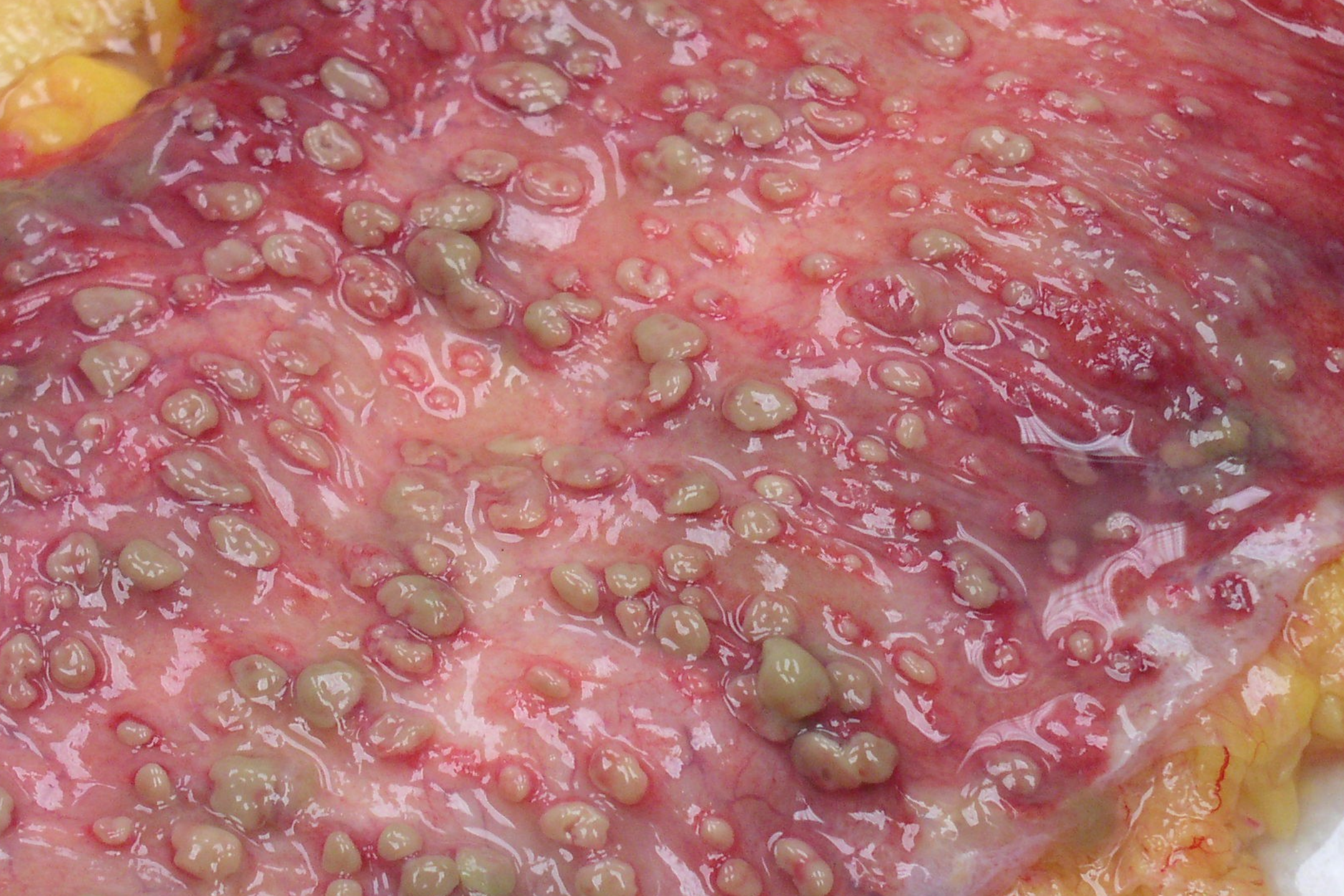
- presence of toxigenic strain of *C.difficile*
- antibiotic treatment – aminopenicilins, cephalosporins, lincosamides...
- less frequently without antibiotic treatment – oncologic patients
- age  $\geq$  65 years, comorbidities, IS
- function of GI tract – peristalsis, only parenteral nutrition, disturbances of mucous immunity



## CDI – clinical forms

- a) asymptomatic carriers (2-3 % of adults, in children much more, prevalence is increasing with the length of hospitalization - 10-25 % or more)
- b) uncomplicated colitis (diarrhea, fever, no pseudomembranes)
- c) pseudomembranous colitis - PMC (sepsis, leucocytosis, abdominal pain, and bloody stool)
- d) toxic megacolon (paresis and necrosis of the gut, possible perforation, infectious shock)

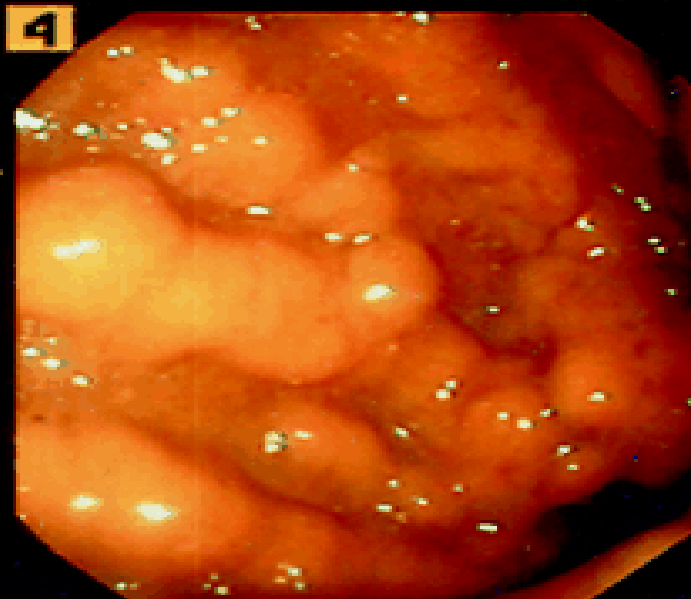
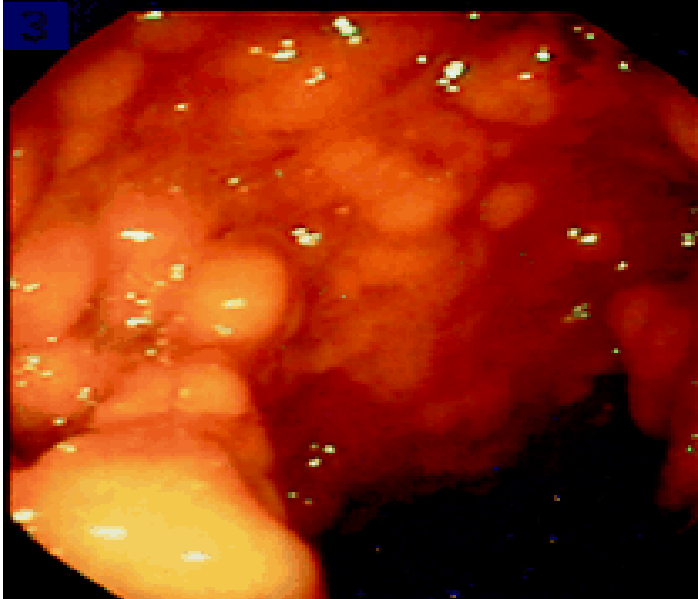
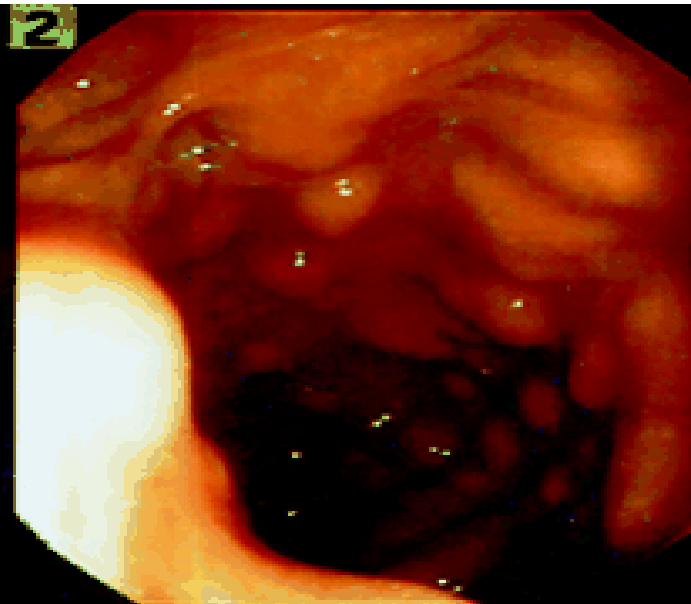
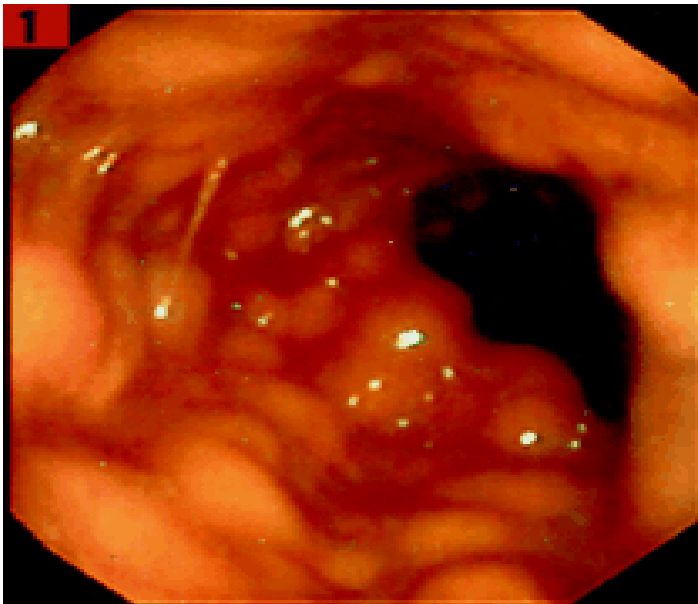






# Diagnosis of CDI

- antibiotics in history
- clinical findings
- microbiological testing – detection of toxins (ELISA), specific antigen (GDH), culture, cytotoxic test, PCR
- coloscopy (pseudomembranes)
- ultrasound, CT – auxilliary methods – thickness of the wall of the gut



# CDI therapy

- termination of initial ATB therapy
- colitic diet, rehydration, rehabilitation
- do not use antimotility drugs - danger of toxic megacolon
- pharmacotherapy – 10-14 days
- vancomycin 4 × 125 mg oral
- fidaxomicin 2 × 200 mg oral
- faecal bacteriotherapy – faecal transplant
- colectomy

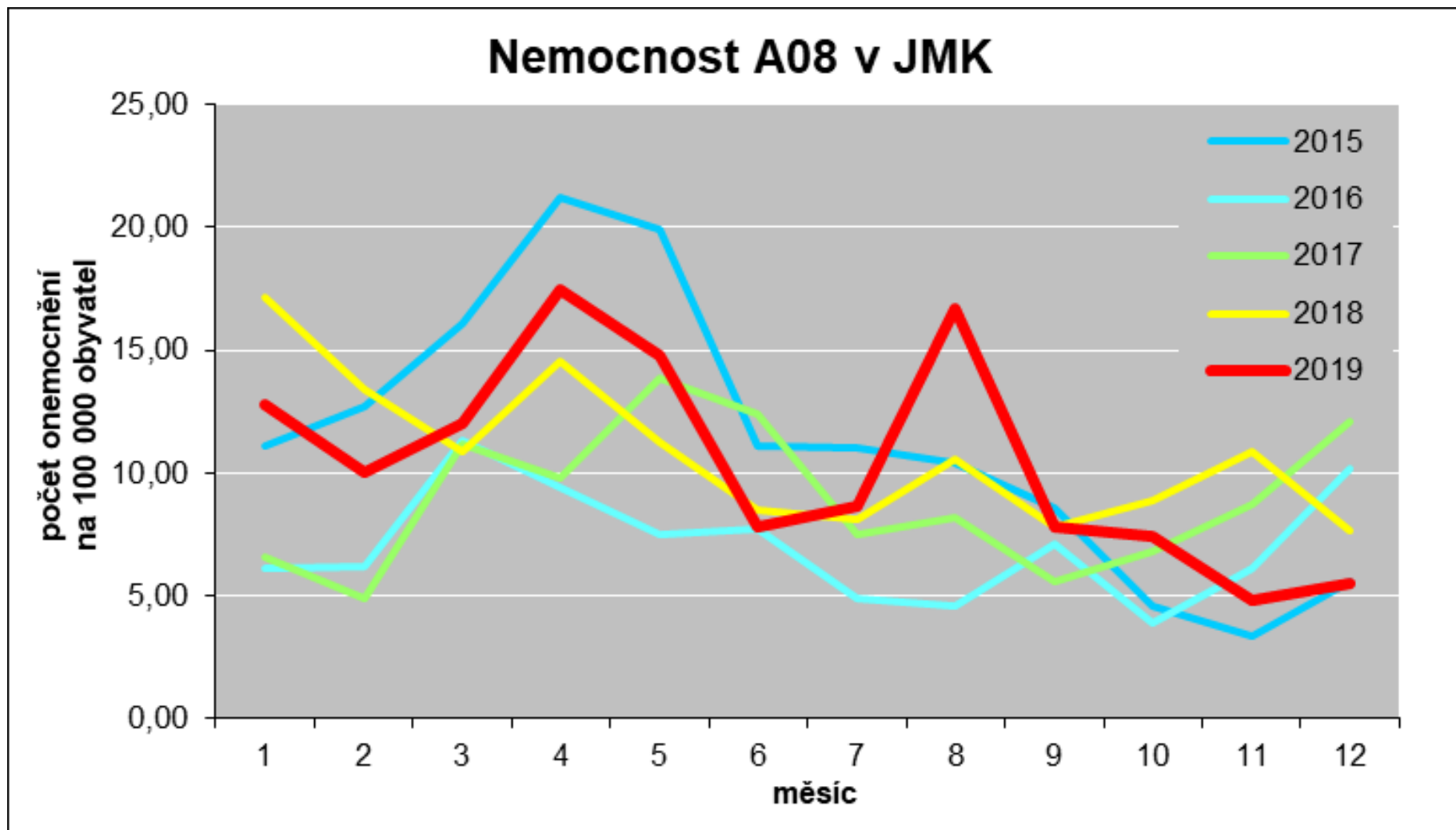
# Food poisoning

- with short incubation period (1-6 hours)-thermostabile toxins – nausea, vomiting
- *Staphylococcus aureus*
- *Bacillus cereus*
- with long incubation period (6-18 hours)- termolabile toxins - diarrhoea
- *Bacillus cereus*
- *Clostridium perfringens* type A
  
- absence of fever, small outbreaks
- rehydration, diet

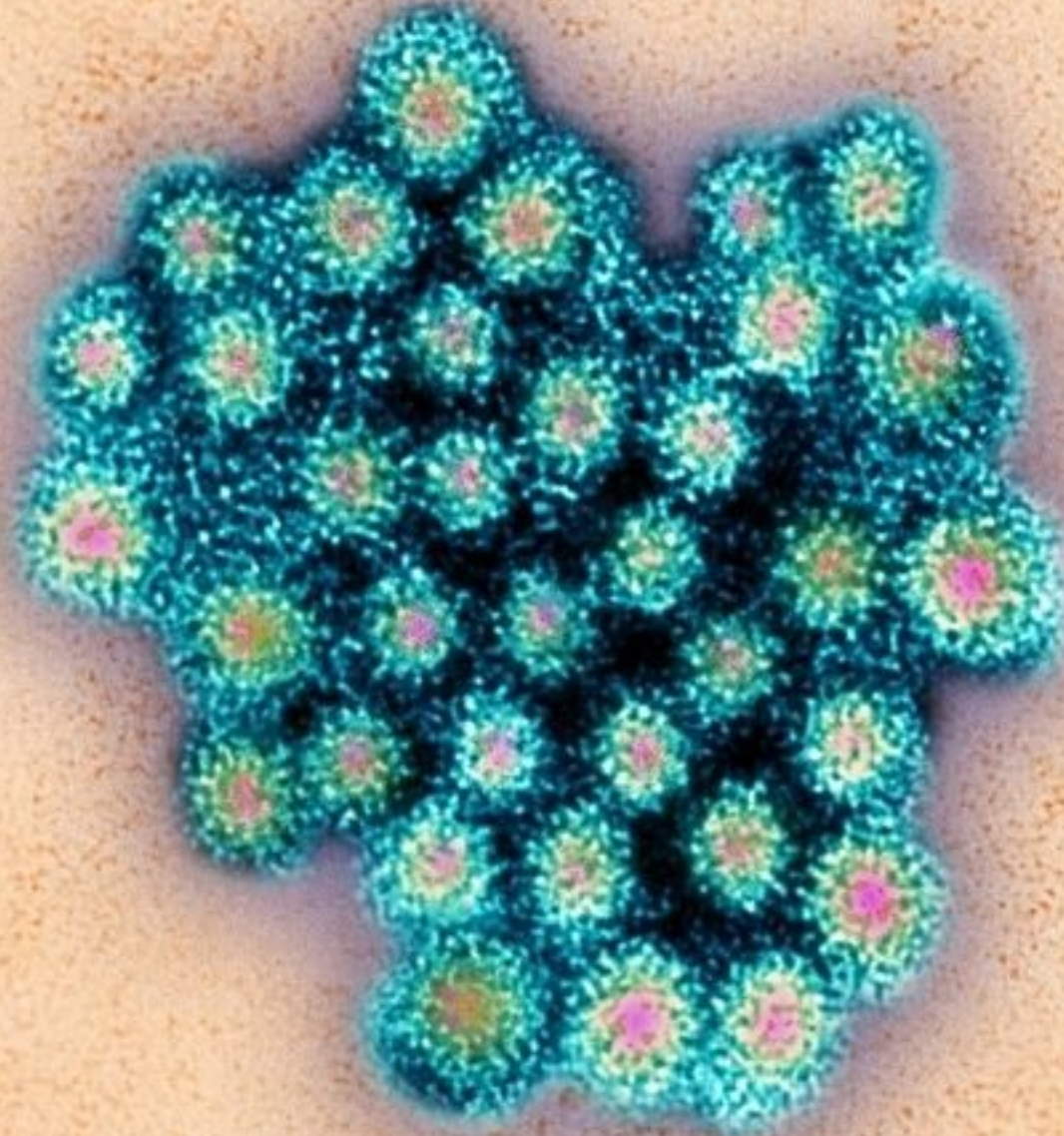
# Viral gastroenteritis

- noroviruses (Norwalk, Norwalk-like virus) – older children, adults
  - rotaviruses (small children- 6-24 months, seniors) – fecal-oral, air-borne infection, vaccine available
  - adenoviruses
  - astroviruses
  - coronaviruses
- 
- symptomatic therapy

# Viral GI infections in Southern Moravia 2015-2019



# Norovirus



# Incubation periods of GI infections

Pathogen	Incubation period
Campylobacter	1-7 days
Salmonella	6-48 hours
Yersinia	4-10 days
Shigella	1-5 days
Clostridium difficile	3-30 days
Staphylococcus aureus	1-6 hours
Bacillus cereus termostabile toxin	1-6 hours
Bacillus cereus termolabile toxin	8-16 hours
Clostridium perfringens A	8-16 hours
Rotavirus	1-2 days
Adenovirus	1-2 days
Norovirus	18-72 hours





***Thank you for your attention!***

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