Gastrointestinal infections

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Alimentary infections

- contaminated food, drinks
- infections of digestive tract

Usual symptomatology

- diarrhea
  - watery (gastroenteritis)
  - with mucus, blood (enterocolitis)
- abdominal pain, cramps
- nausea, vomiting

- systemic, extraintestinal signs
  - fever, malaise, myalgia, dehydration

Possible causes

Bacteria

Viruses

Parasites

Bacterial toxins

Non-infection origin:

- dietary mistake
- drugs, poison
- acute abdomen

- non-specific inflammation
- tumors

Specimens collection

Rectal swab	• culture
Stool	• antigen (*C. difficile, H. pylori)* • microscopy (parasites), EM (viruses) • culture • virus isolation • PCR
Serum	• antibodies

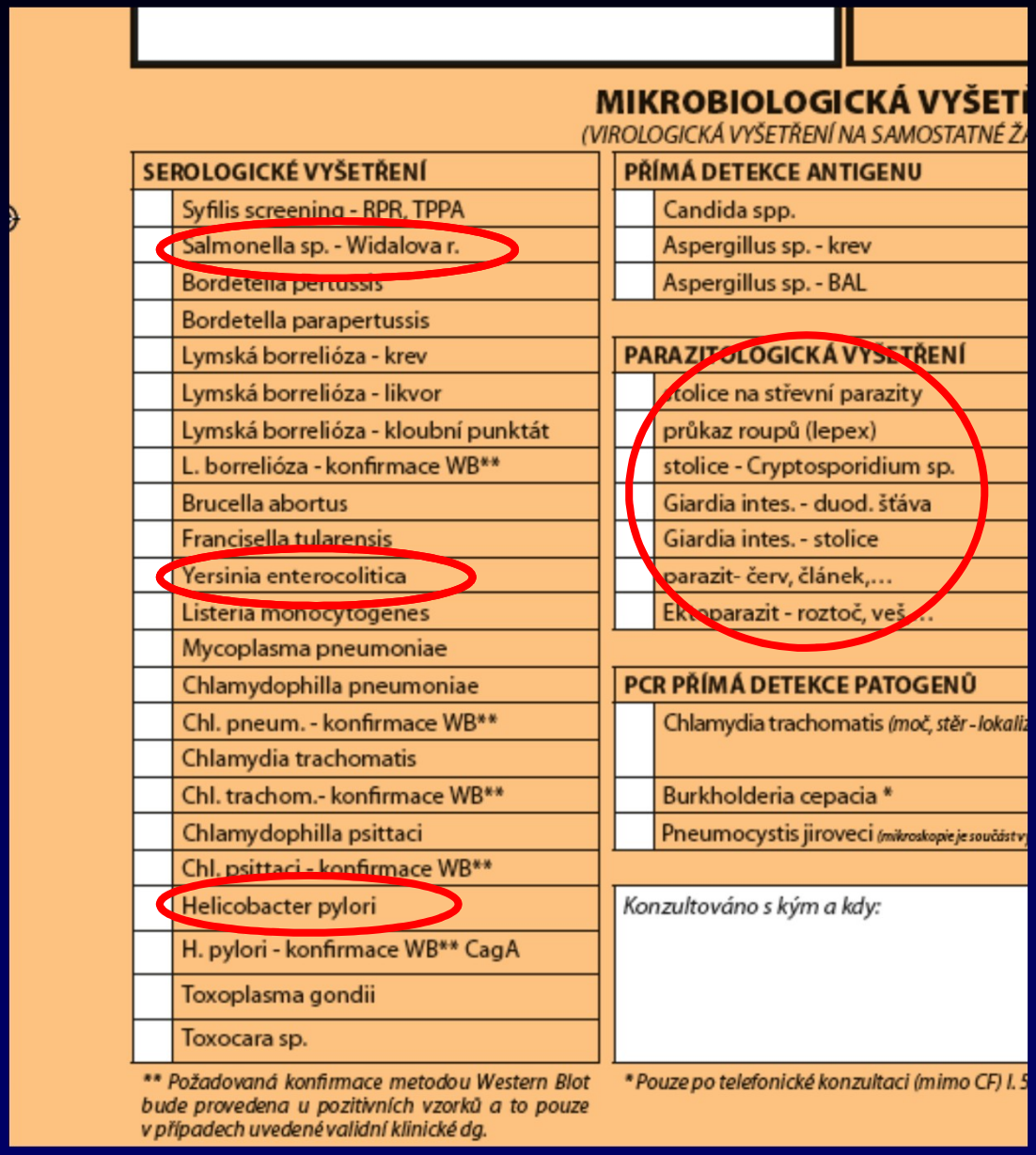
Specimens collection

Tape – perianal region
- microscopy (pinworm)

stomach biopsy
- *H. pylori* (urease test, culture)

Peritoneal liquid, pus

Blood cultures



MIKROBIOLOGICKÁ VYŠETŘ

(VIROLOGICKÁ VYŠETŘENÍ NA SAMOSTATNÉ ŽÁ

SEROLOGICKÉ VYŠETŘENÍ	
	Syfilis screening - RPR, TPPA
	Salmonella sp. - Widalova r.
	Bordetella pertussis
	Bordetella parapertussis
	Lymská borrelióza - krev
	Lymská borrelióza - likvor
	Lymská borrelióza - kloubní punktát
	L. borrelióza - konfirmace WB**
	Brucella abortus
	Francisella tularensis
	Yersinia enterocolitica
	Listeria monocytogenes
	Mycoplasma pneumoniae
	Chlamydophilla pneumoniae
	Chl. pneum. - konfirmace WB**
	Chlamydia trachomatis
	Chl. trachom.- konfirmace WB**
	Chlamydophilla psittaci
	Chl. psittaci - konfirmace WB**
	Helicobacter pylori
	H. pylori - konfirmace WB** CagA
	Toxoplasma gondii
	Toxocara sp.

*** Požadovaná konfirmace metodou Western Blot bude provedena u pozitivních vzorků a to pouze v případech uvedené validní klinické dg.*

PŘÍMÁ DETEKCE ANTIGENU	
	Candida spp.
	Aspergillus sp. - krev
	Aspergillus sp. - BAL

PARAZITOLOGICKÁ VYŠETŘENÍ	
	stolice na střevní parazity
	průkaz roupů (lepex)
	stolice - Cryptosporidium sp.
	Giardia intes. - duod. šťáva
	Giardia intes. - stolice
	parazit- červ, článek,…
	Ektoparazit - roztoč, veš …

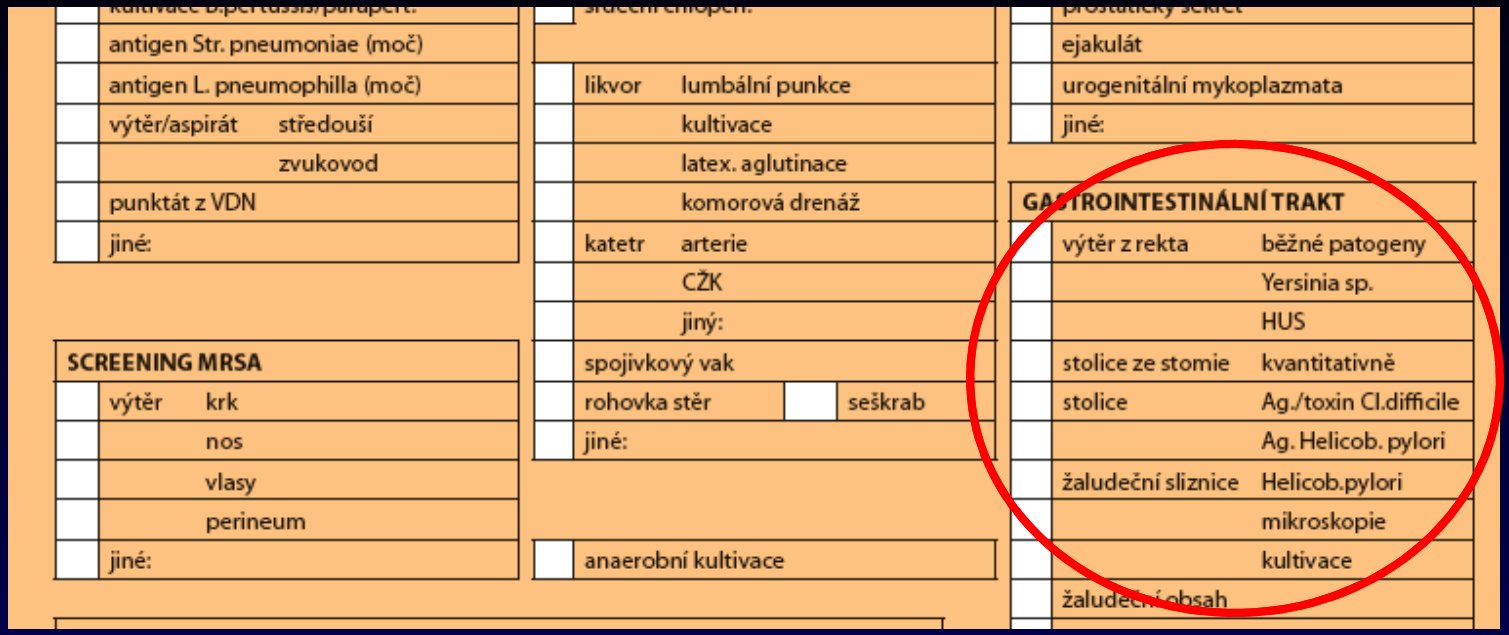
PCR PŘÍMÁ DETEKCE PATOGENŮ	
	Chlamydia trachomatis *(moč, stěr - lokaliz*
	Burkholderia cepacia *
	Pneumocystis jiroveci *(mikroskopie je součástv*

Konzultováno s kým a kdy:

** Pouze po telefonické konzultaci (mimo CF) l. 5*

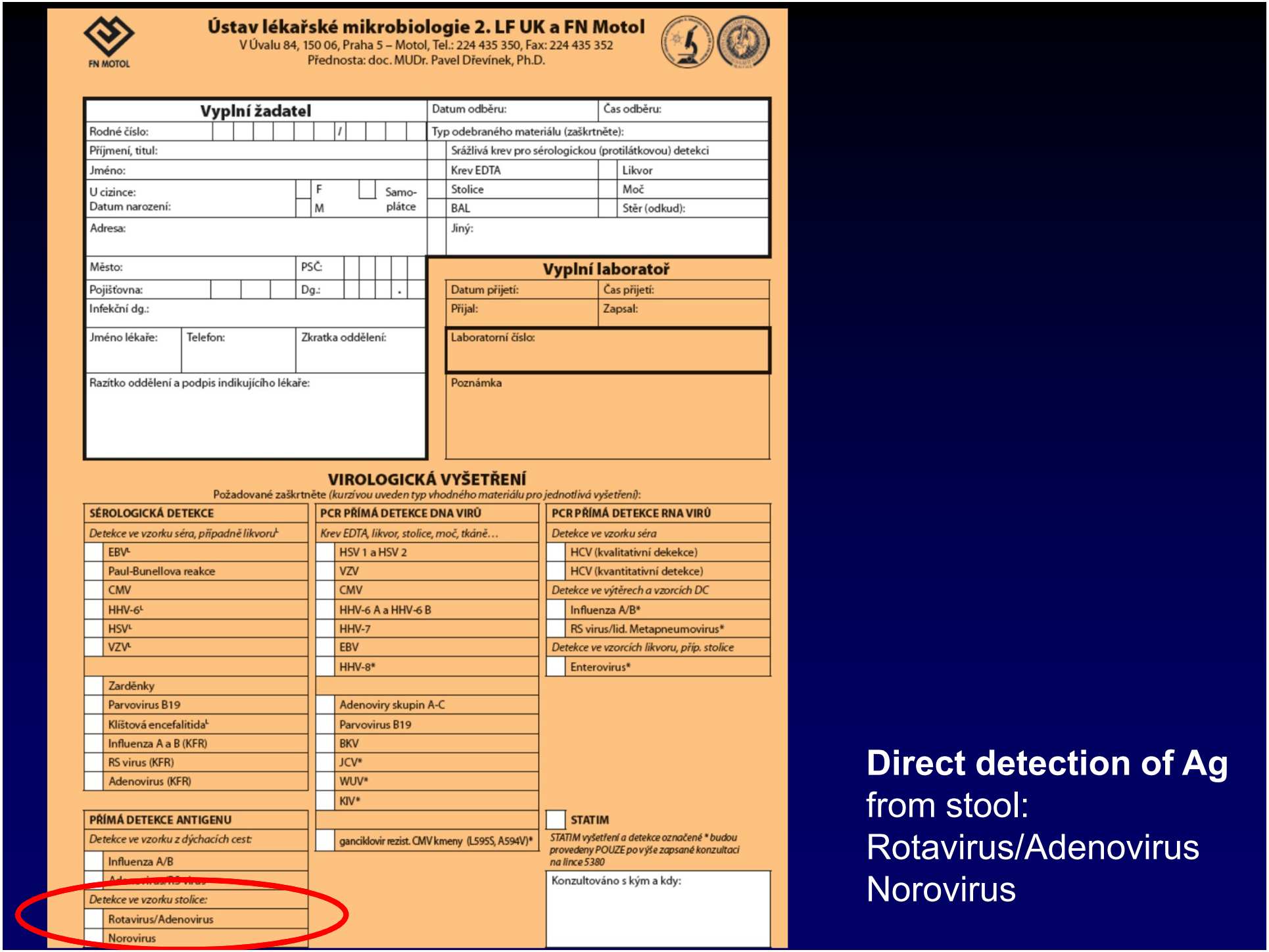
Parasitology examination

stool for gut parasites
pinworm – tape
stool – Cryptosp. sp.
Giardia
....



Gatrointestinal tract

rectal swab	usual pathogens Yersinia sp. HUS
stool	Ag/toxin C. diif Ag H. pylori
stomach biopsy	



Ústav lékařské mikrobiologie 2. LF UK a FN Motol
V Úvalu 84, 150 06, Praha 5 – Motol, Tel.: 224 435 350, Fax: 224 435 352
Přednosta: doc. MUDr. Pavel Dřevínek, Ph.D.

FN MOTOL

Vyplní žadatel

Rodné číslo: / | Datum odběru: | Čas odběru:
Příjmení, titul: | Typ odebraného materiálu (zaškrtněte):
Jméno: | ☐ Srážlivá krev pro sérologickou (protilátkovou) detekci
U cizince: Datum narození: ☐ F ☐ M ☐ Samoplátce | ☐ Krev EDTA ☐ Likvor | ☐ Stolice ☐ Moč | ☐ BAL ☐ Stěr (odkud): | ☐ Jiný:
Adresa:
Město: | PSČ:
Pojišťovna: | Dg.:
Infekční dg.:
Jméno lékaře: | Telefon: | Zkratka oddělení:
Razítko oddělení a podpis indikujícího lékaře:

Vyplní laboratoř

Datum přijetí: | Čas přijetí:
Přijal: | Zapsal:
Laboratorní číslo:
Poznámka

VIROLOGICKÁ VYŠETŘENÍ

Požadované zaškrtněte *(kurzívou uveden typ vhodného materiálu pro jednotlivá vyšetření)*:

SÉROLOGICKÁ DETEKCE
Detekce ve vzorku séra, případně likvoru[L]
- ☐ EBV[L]
- ☐ Paul-Bunellova reakce
- ☐ CMV
- ☐ HHV-6[L]
- ☐ HSV[L]
- ☐ VZV[L]
- ☐ Zarděnky
- ☐ Parvovirus B19
- ☐ Klíštová encefalitida[L]
- ☐ Influenza A a B (KFR)
- ☐ RS virus (KFR)
- ☐ Adenovirus (KFR)

PŘÍMÁ DETEKCE ANTIGENU
Detekce ve vzorku z dýchacích cest:
- ☐ Influenza A/B
- ☐ [illegible]

Detekce ve vzorku stolice:
- ☐ Rotavirus/Adenovirus
- ☐ Norovirus

PCR PŘÍMÁ DETEKCE DNA VIRŮ
Krev EDTA, likvor, stolice, moč, tkáně…
- ☐ HSV 1 a HSV 2
- ☐ VZV
- ☐ CMV
- ☐ HHV-6 A a HHV-6 B
- ☐ HHV-7
- ☐ EBV
- ☐ HHV-8*
- ☐ Adenoviry skupin A-C
- ☐ Parvovirus B19
- ☐ BKV
- ☐ JCV*
- ☐ WUV*
- ☐ KIV*
- ☐ ganciklovir rezist. CMV kmeny (L595S, A594V)*

PCR PŘÍMÁ DETEKCE RNA VIRŮ
Detekce ve vzorku séra
- ☐ HCV (kvalitativní dekekce)
- ☐ HCV (kvantitativní detekce)

Detekce ve výtěrech a vzorcích DC
- ☐ Influenza A/B*
- ☐ RS virus/lid. Metapneumovirus*

Detekce ve vzorcích likvoru, příp. stolice
- ☐ Enterovirus*

☐ **STATIM**
*STATIM vyšetření a detekce označené * budou provedeny POUZE po výše zapsané konzultaci na lince 5380*

Konzultováno s kým a kdy:

Direct detection of Ag
from stool:
Rotavirus/Adenovirus
Norovirus

Note: bowel is not sterile

anaerobic species

Bacteroides fragilis
Bifidobacterium bifidum
Lactobacillus
Clostridium perfringens
….

enterobacteria

Escherichia coli
Enterobacter
Klebsiella
Proteus
….

Staphylococcus aureus
Enterococcus faecalis
Pseudomonas aeruginosa
….

Microbiome studies: > 1,000 species

Nosocomial intestinal infections

Peritonitis (secondary)

- rupture of the bowel
- surgery

• Enterobacteria: *E. coli, Klebsiella, Proteus …*
• Anaerobes! – remember for right antibiotic choice
(+ metronidazol, clindamycin;
piperacillin tazobactam; carbapenems)

Enterotoxicosis – food poisoning

Staphylococcus aureus

- with production of ST enterotoxin (ca. 40% of S. aureus) A-E on food
- rapid onset of the disease (1 - 6 hrs after consumption), no fever
- cuture can be negative

Enterotoxicosis – food poisoning

Bacillus cereus

- Two types of enterotoxin
    - ST enterotoxin causing vomiting
        - production on food (rice, pasta)
        - rapid onset
    - LT enterotoxin causing diarrhea
        - production in the gut
        - food contamination (meat, gravy)
        - symptoms 8 - 16 hrs after consumption

Toxicosis – food poisoning

Clostridium botulinum

- botulotoxin A, B, E

= neurotoxin which inhibits release of acetylcholine

→ muscle paralysis (cranial nerves)

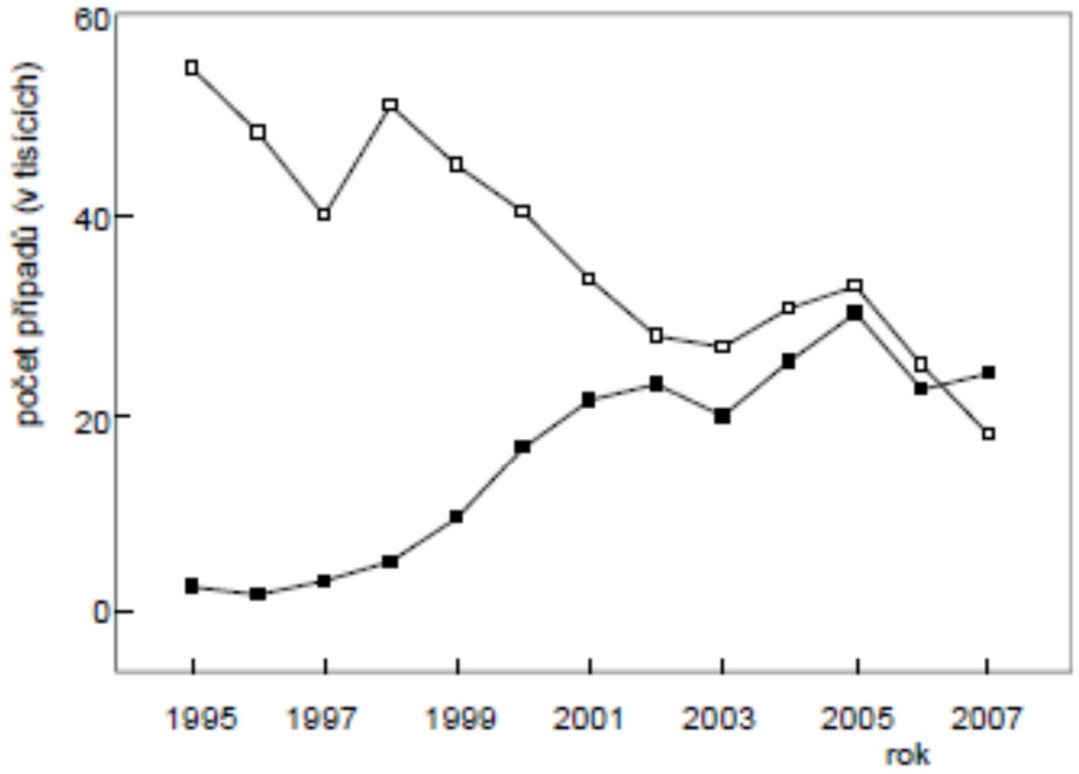
typical signs: diplopia, mydriasis, ptosis, dysphagia, hypomimia, constipation (parasympathetic nerves)

food contaminated with spores

- toxin produced in food
- onset 6 to 72 hrs after meal

- production in the gut rarely (infants)

Gut infection of bacterial origin



Obr. 1. **Počet případů onemocnění způsobené bakteriemi rodu *Campylobacter* a *Salmonella* v České republice v letech 1995 až 2007;** ■ kampylobacteriózy, □ salmonelózy, zdroj: http://www.szu.cz/data/infekce-v-cr

2016:

salmonela	11 900
campylobacter	24 300

Gut infection of bacterial origin

Salmonella enterica ssp. enterica

- non-typhoidal salmonella (S. Enteritidis)
  - incubation period over 12 hrs (1 to 2 days)
  - watery diarrhea, fever, vomiting - cholera nostras
  - zoonosis, on food (eggs, mayonnaise, ice cream…or water)
  - extraintestinal complications (rarely; joint infections, cholecystitis, ostemyelitis, infectious aneurysm)

Dg.
- rectal swab and culture
- serotype determination with agglutination

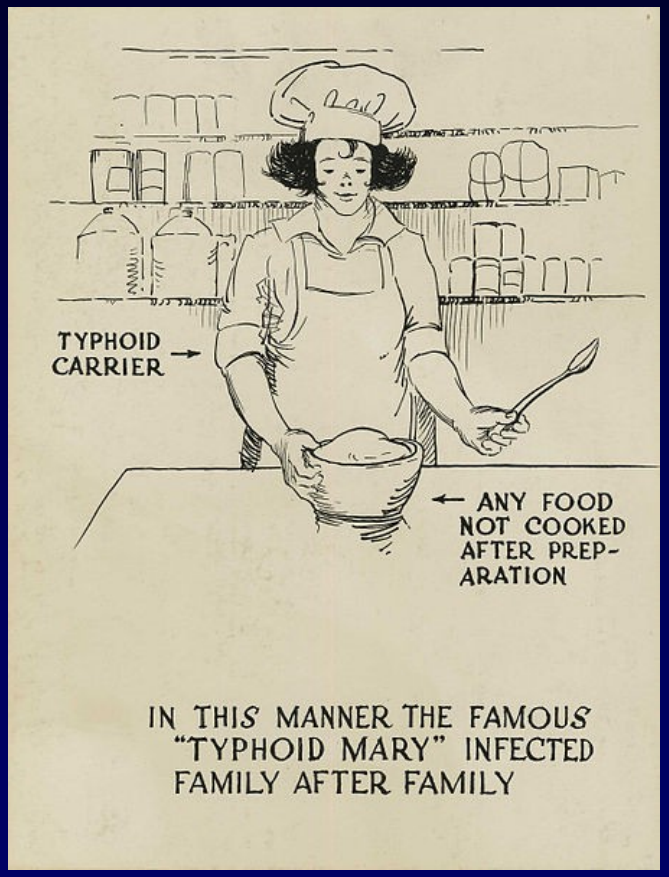
Gut infection of bacterial origin

Salmonella enterica ssp. enterica

- typhoid fever (S. Typhi)
  O 9,12, V_i, d
  - systemic disease, bacteraemia
    - headache, fever (febris continua)
    - hemorrhage, bile ducts
    - contaminated water,
      or food with human faeces
    - typhoid carriers
    - vaccine: oral, i.m. (Ag Vi)

    - Dg. blood culture (urine)
      indirect dg. Widal reaction

    - Therapy: quinolones
      cotrimoxazol
      ampicillin
      chloramphenicol



Gut infection of bacterial origin

Campylobacter jejuni, C. coli

- zoonosis, in food, in water (from gut of animals; chicken)
- extraintestinal infections rarely, such as
  parainfectious neurological complications (Guillain-Barre syndrome)

Dg.
- rectal swab + transport medium
- stool
  special culture conditions

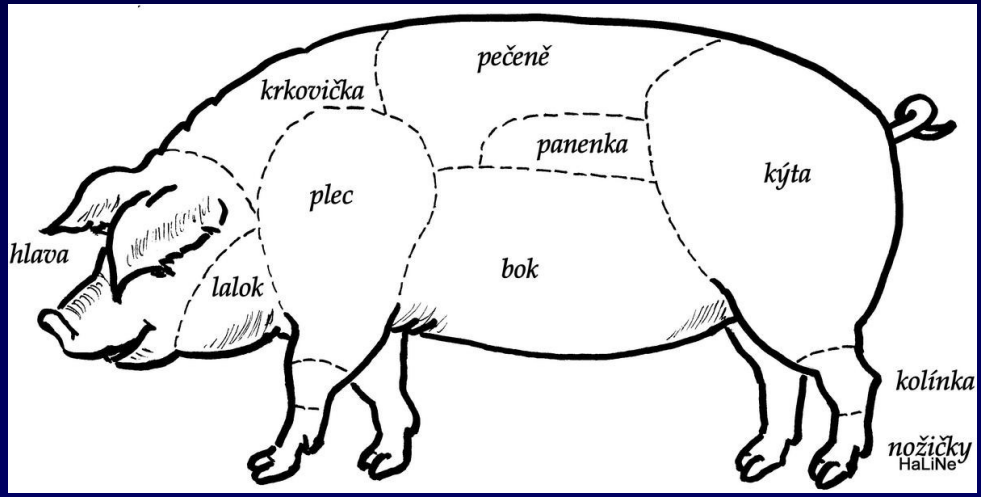
Th:
- macrolides if needed

Gut infection of bacterial origin

Yersinia enterocolitica

- enterocolitis, terminal ileum
- mesenterial lymphadenitis (lower right abdomen sympomatology)
- zoonosis, on food (pork)

" It's a pity you're not having an appendix operation - I'm rather good at that !! "



Th:
- cotrimoxazol

Gut infection of bacterial origin

Shigella sonnei, S. flexneri, S. dysenteriae, S. boydii

= bacillary dysentery
- disease of „dirty hands“
- no animal reservoir
- some *S. dysenteriae* produce shiga toxin (stx)

Th:
- cotrimoxazol

Gut infection of bacterial origin

Escherichia coli

- EPEC: newborn diarrhea (until 1 year of age)

- ETEC: traveler's diarrhea (toxin close to cholera toxin)
  (Delhi belly, Hong Kong dog, Casablanca crud, Montezuma's revenge)

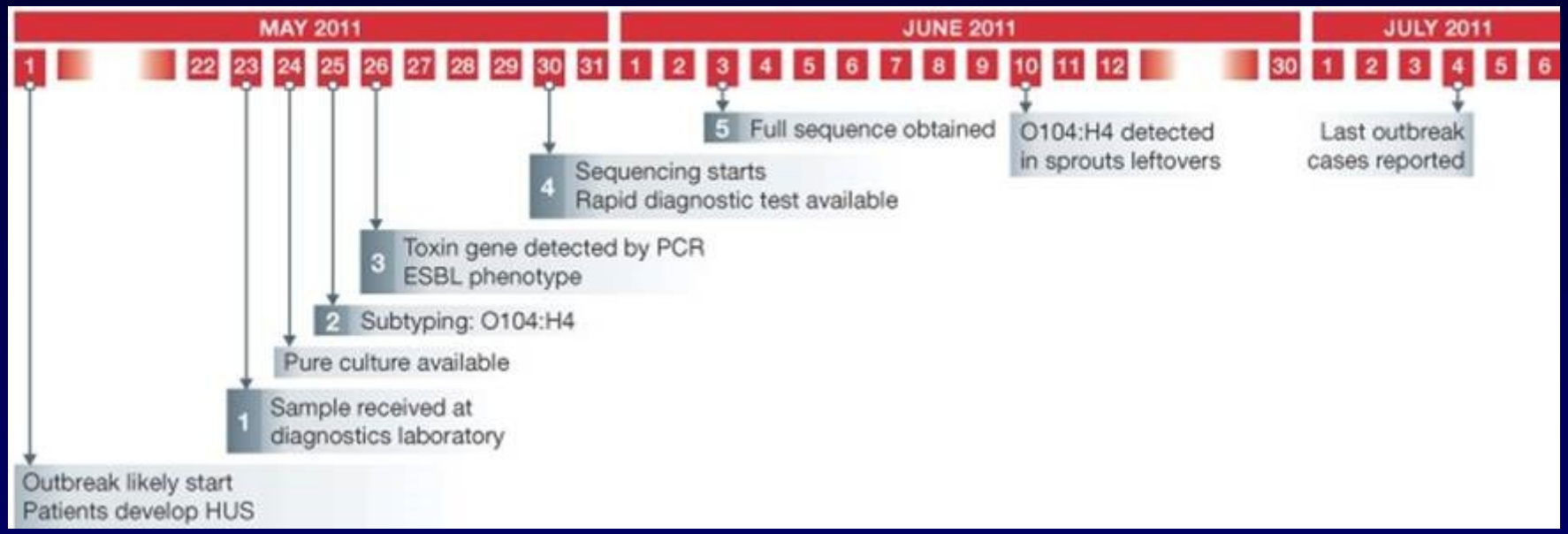
- EIEC: analogy to shigellosis

- STEC (VTEC)
  - EHEC O157:H7; O26 etc.
    - colitis and haemolytic-uremic syndrome (children < 5 years)
      (hemolytic anaemia, thrombocytopenia, renal failure)
    - toxin stx1 or 2 (entero-, nefro-, cyto- , neuro- toxicity)
    - hamburgers, milk, farms

Epidemic *E. coli*

- *E. coli* O104:H4 ~ (EHEC, EAEC), STEC

May 2011 Germany

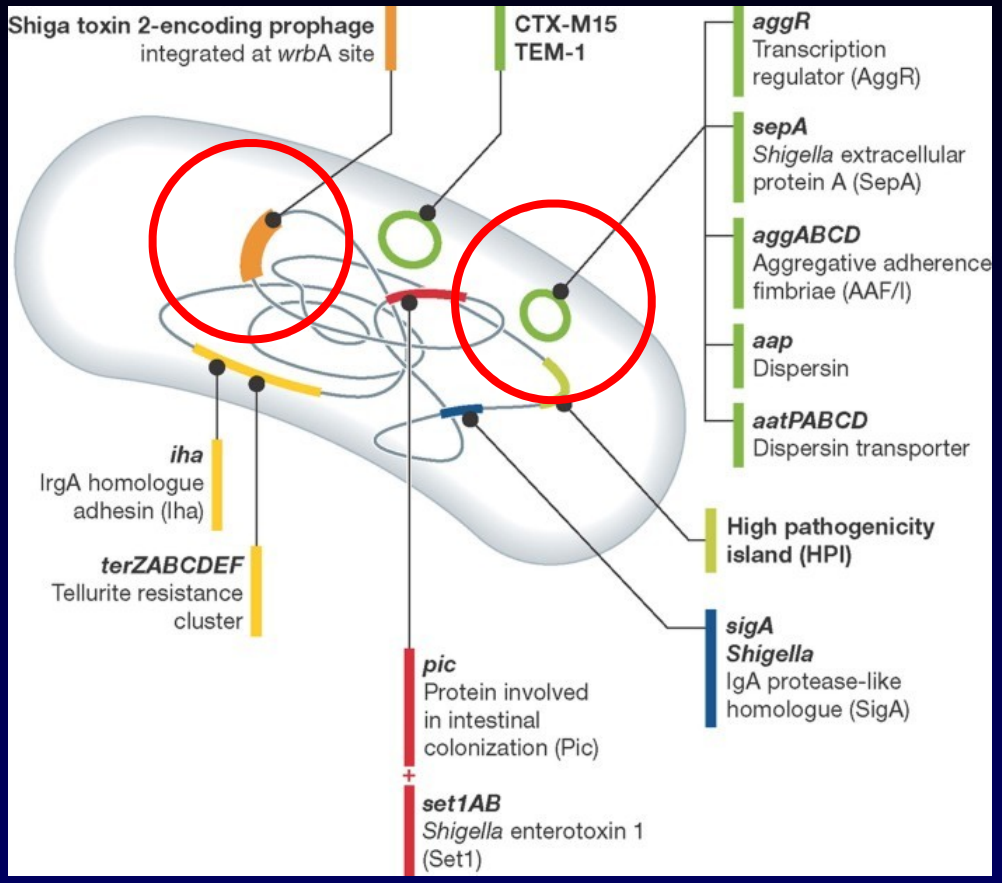


3,842 cases

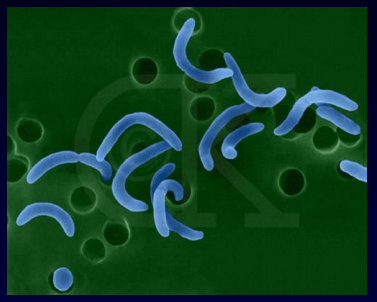
- 2,987 GI 18 deaths
- 855 HUS 35 deaths

- adhesion on plasmid
  (from EAEC)

- shiga-like toxin on prophage
  (from „classic“ EHEC)



Gut infection of bacterial origin

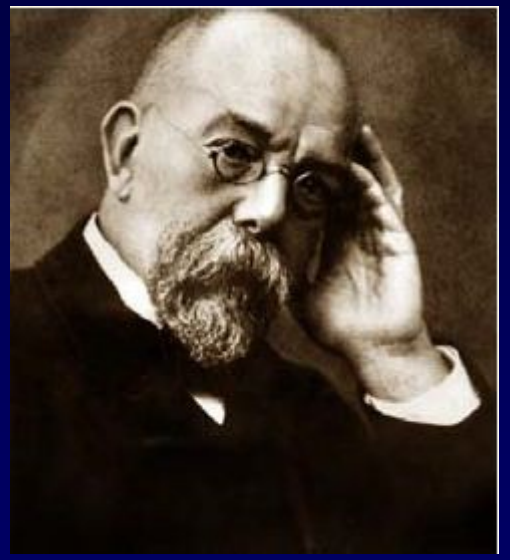


Vibrio cholerae

- O1 biotype classical, biotype El Tor
- non-O1 (O139 Bengal)

- cholera toxin (choleragen), non-invasive bacterium
- watery diarrhea, with no blood
- contaminated water and food with human faeces
- no animal reservoir

- Robert Koch and outbreaks
  in Egypt, India, Hamburg



Robert Koch
1843 - 1910

Gut infection of bacterial origin - others with toxins

Vibrio parahaemolyticus
- ST enterotoxin

Clostridium perfringens, type A
- LT enterotoxin
- food (meat) contaminated with spores
- effect 8 - 16 hrs after consumption

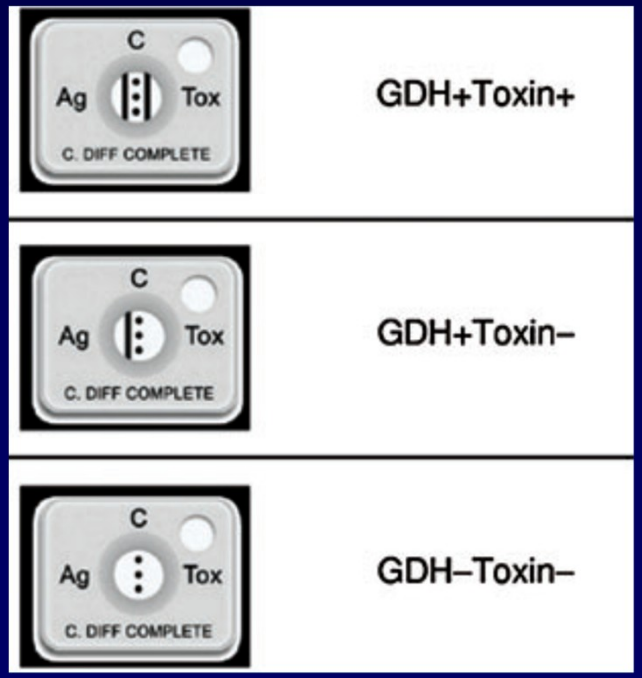
Bacillus cereus
- Two types of enterotoxin
    - ST enterotoxin causing vomiting
        - production on food (rice, pasta)
        - rapid onset
    - LT enterotoxin causing diarrhea
        - production in the gut
        - food contamination (meat, gravy)
        - symptoms 8 - 16 hrs after consumption

Nosocomial intestinal infections

Clostridium difficile

- CDI: from colitis to pseudomembranous enterocolitis
- associated with ATB therapy (cephalosporins, clindamycin, quinolons...)
- pathogenic are strains with production of toxins: toxin A a/or B

- rapid dg. *C. difficile*: enzyme GDH + toxins; PCR
- culture

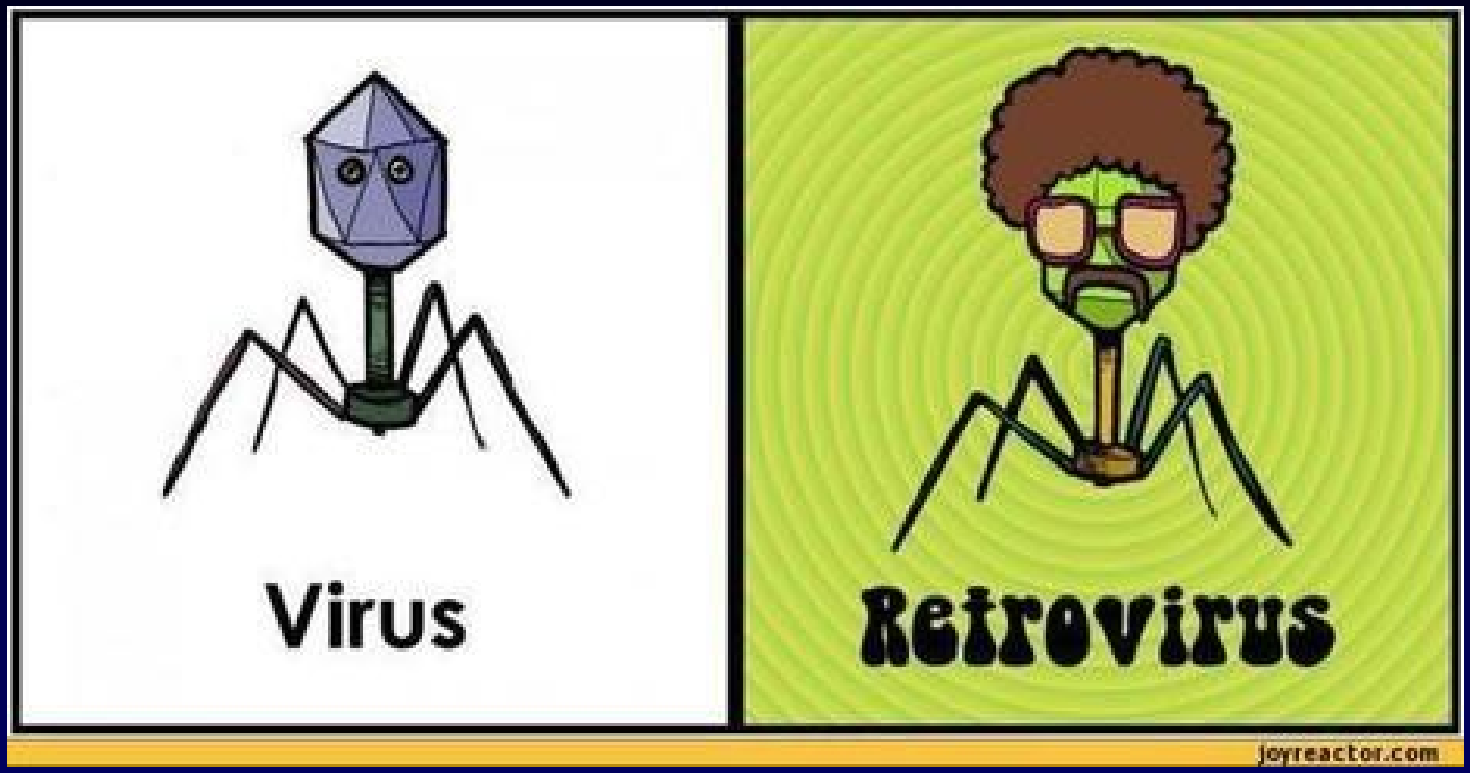


Nosocomial intestinal infections

Clostridium difficile

- therapy: metronidazol p.o., i.v.
  or vancomycin p.o.
  or fidaxomicin p.o.

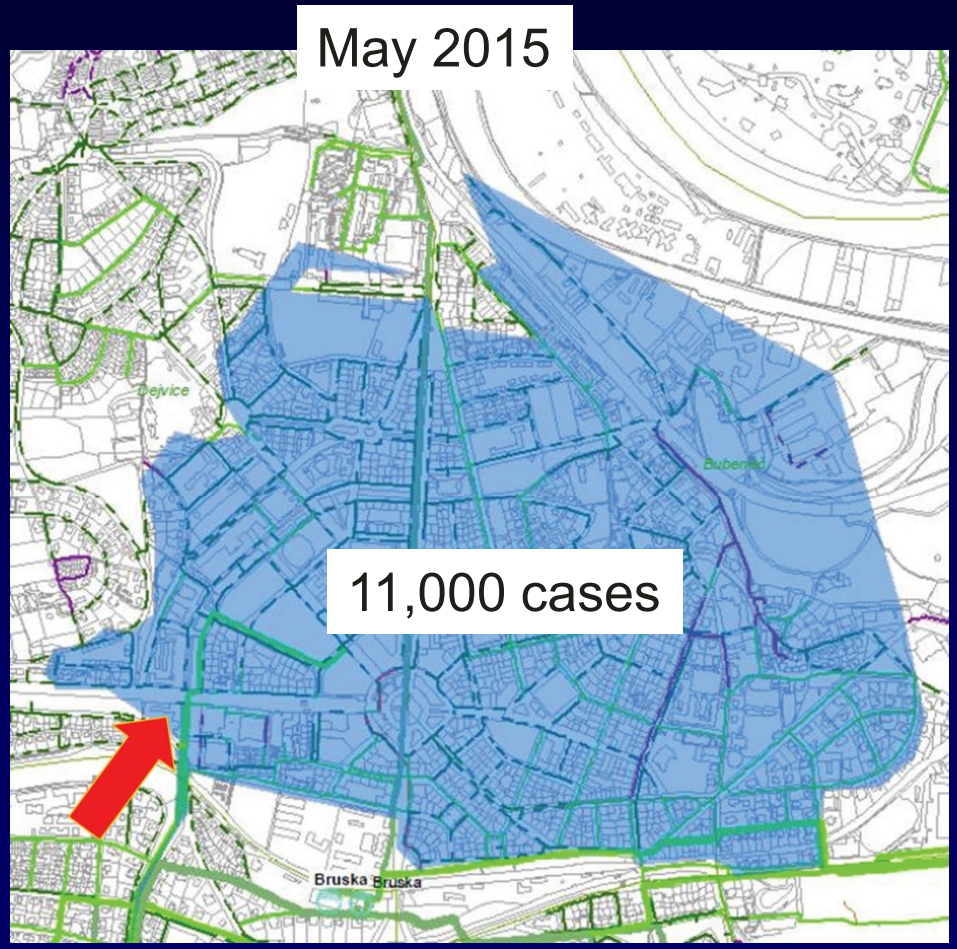
faecal microbiota transplant

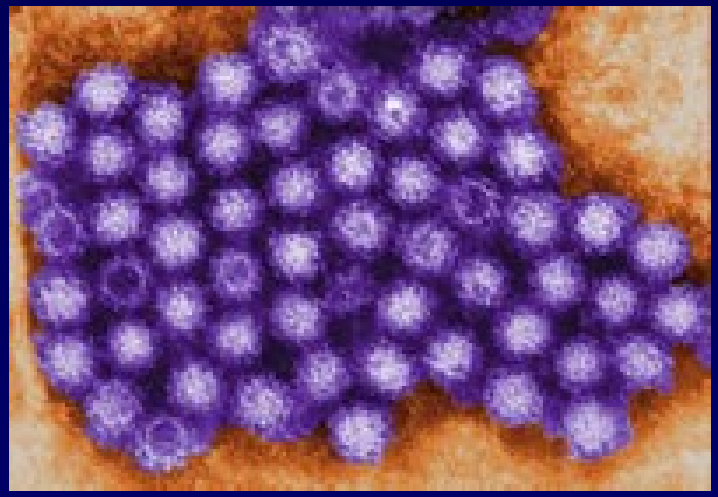

Virus
Retrovirus
joyreactor.com

Viral gastroenteritis

Caliciviruses: Norovirus (prototype Norwalk)

- epidemic gastroenteritis at any age





Viral gastroenteritis

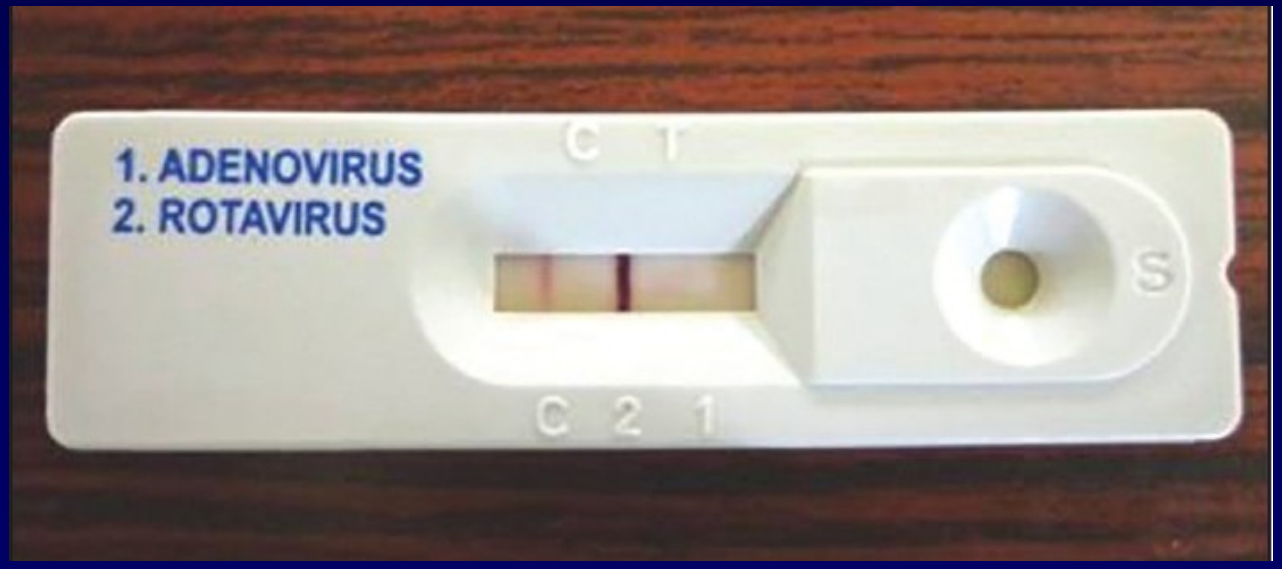
Rotaviruses

- in children, typically in winter
- dg.: Ag in stool, EM
- option for oral vaccination

Adenoviruses

- serotypes 40, 41

Astroviry



Alternative to „classical“ diagnostics

PCR (single agents)
Clostridium difficile

PCR Panels
Salmonella and Shigella
Campylobacter
Clostridium difficile toxin B
Aeromonas hydrophila
Yersinia spp.
Shiga and Shiga-like Toxin 1 and 2
Sapovirus
Rotavirus A
Norovirus genogroup I
Norovirus genogroup II
Human adenovirus group F and G
Human astrovirus
Giardia lamblia
Cryptosporidium

PCR Panels
Salmonella
Campylobacter
Shigella
shiga toxin produkující E. coli

Protozoa

Giardia intestinalis

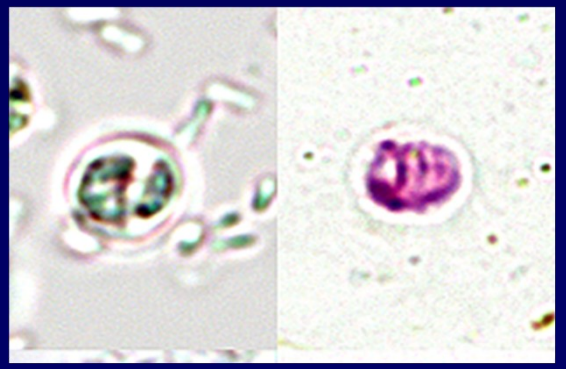
- dg.: cysts in stool, PCR
  trophozoits in duodenal juice
- malabsorption, steatorhea

Entamoeba histolytica

- dg.: cysts in stool, **PCR**
- amoebic dysentery (“walking”);
  extraintestinal complications (liver)

Cryptosporidium parvum

- dg.: cysts in stool, PCR



Helminths

Tapeworms

- *Taenia saginata*: beef, cysticercus

- *Taenia solium*:
  1. pork, cysticercus
  2. contaminated water (food), eggs

Enterobius vermicularis (pinworm)
Ascaris lumbricoides (roundworm)

- eggs

Gastrointestinal tract as a port of entry

Unpasteurized milk:
- *Listeria monocytogenes* (cheese)
- *Mycobacterium bovis*

Not only through gut:
- *Coxiella burnetii*
- *Brucella spp.*

Water:
- enteroviruses
- virus hep A (direct contact)
- virus hep E

Not only through gut:
- *Francisella tularensis*
- *Leptospira* spp.

Meat:
- Toxoplasmosis (or oocysts)
- Toxocariasis
- Trichinellosis