INSELSPITAL
Universitätsklinik für
Viszerale Chirurgie und Medizin

Bible Class
Bacterial GI-Infection

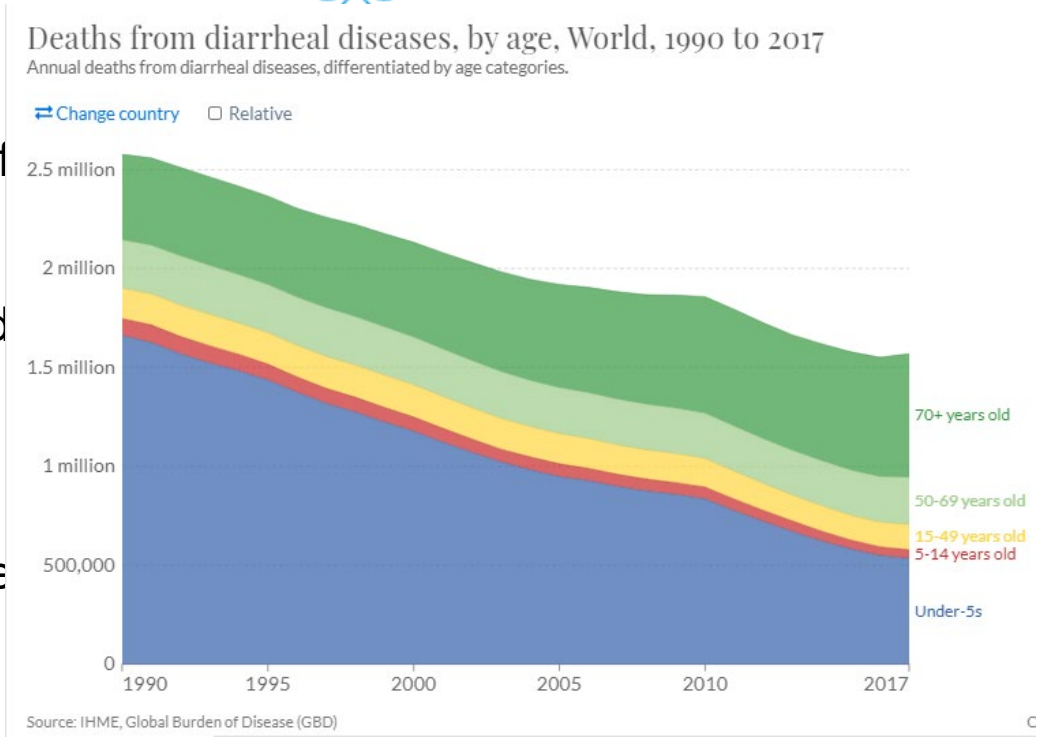
25.08.21, M. Knecht

Epidemiology

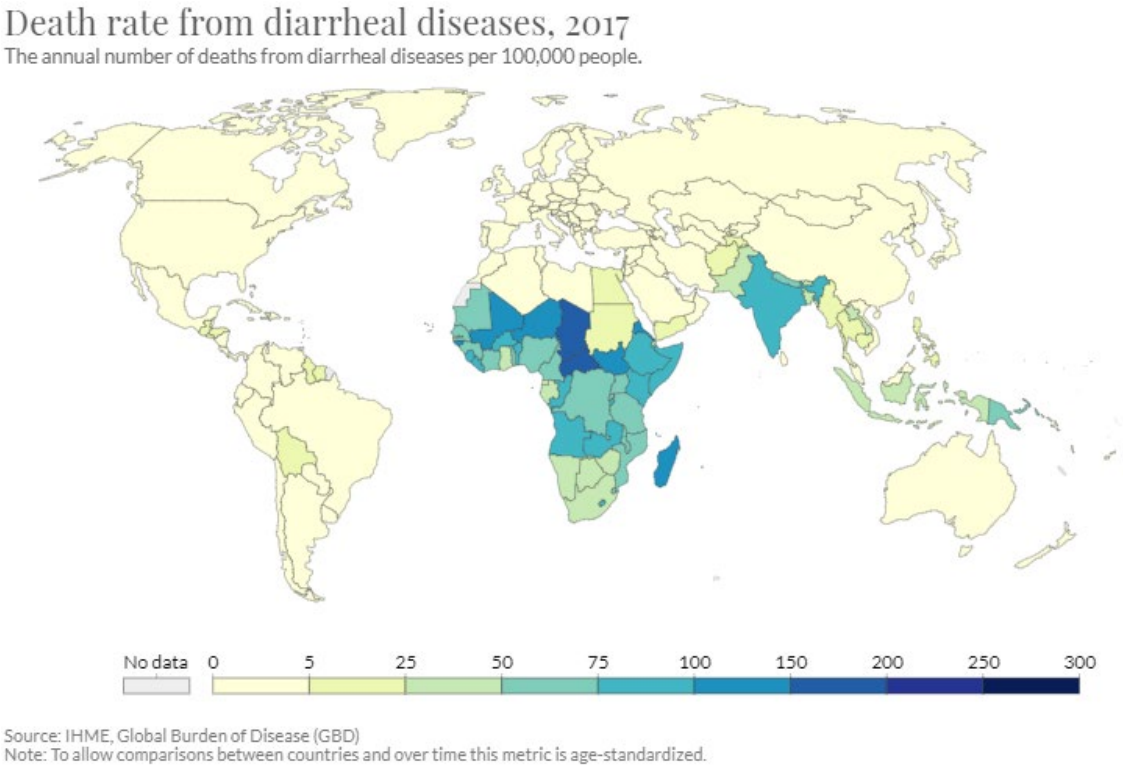
Epidemiology

World Health Organization

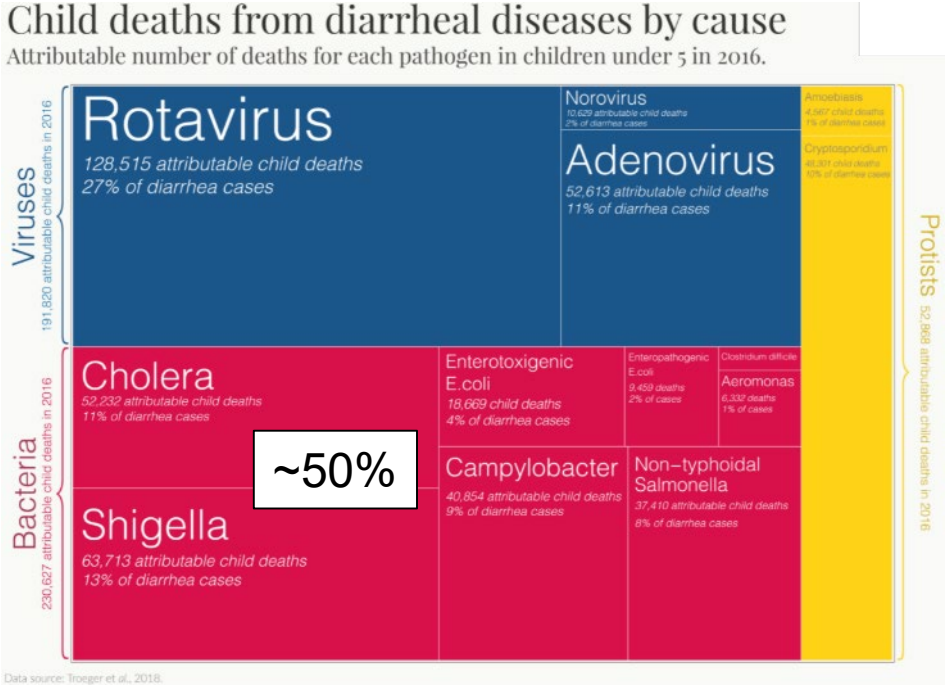
- 1.7 billion af
- 1.6 million d
  - Still third
- High numbe

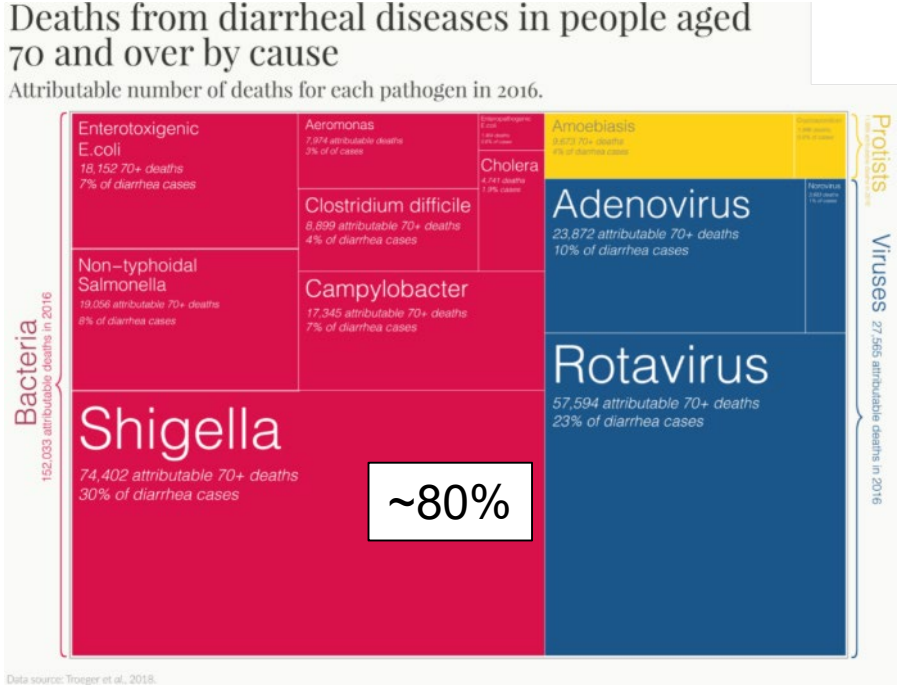


Epidemiology



Epidemiology





Transmission

Transmission

- Oral ingestion of bacteria, lesser degree via nose, eye, rectum
- Contaminated food, liquids, surfaces
  - Fecal-oral route
- Sexual intercourse

Transmission

- Contact with sick person (while vomiting, sharing food/utensils, caring for them, shaking hands)
- Not washing hands after u before eating or preparing food

Transmission

Raw seafood (esp. oysters)	Vibrio spp, Listeria
Raw eggs	Salmonella
Undercooked meat or poultry	Salmonella, Campylobacter, STEC, Clostridium perfringens, Yersinia, Listeria
Unpasteurized milk/cheese	Salmonella, Campylobacter, Listeria, E.coli, Yersinia
(Homemade) canned goods	Clostridium botulinum
Fruits, vegetables, leafy greens	E.coli (STEC), Salmonella, Shigella, Listeria

Risk factors for transmission

- Age
- Food handling
- Occupation (e.g. healthcare, day care center)
- Hygiene/poor sanitation

Susceptibility factors

- Antibiotic therapy
- PPI
- Immunosuppression

- Pregnancy
- Age (<5y and >65y)
- Hospitalisation
- IBD

Symptoms

General symptoms

- Nausea and vomiting
- Diarrhea
  - Watery, most likely small-bowel pathogens
  - Bloody (dysentery), most likely large-bowel
- Abdominal discomfort/pain

- Fever
- Less often septicemia

Classical germs, incubation and complications

Food intoxication

Charateristics

- Short incubation period
- Short and selftlimiting disease
- Dominantely vomiting

B. cereus

- Transmission via rice/pasta (Toxin I) or meat/vegetables/milk (Toxin II)

	Incubation	**Classic symptoms**	**Natural course**	**complications**
Enterotoxin I (pre-formed Cereulide)	0.5 – 6h	Nausea, vomiting	selflimiting	Rarely ALF
Enterotoxin II (live cells or spores)	6 – 24h	Cramps, diarrhea	Selflimiting in 1-2d	Opportunistic systemic infection

Staph. aureus

- Proliferation of bacteria in diary- or egg-products (interrupted cold chain)
  - E.g. pudding, mayo, soft ice

	Incubation	Classic symptoms	Natural course	Complications
Enterotoxins (A-E)	1 – 6h	Nausea, vomiting, cramps and diarrhea	Selflimiting in 1-2d	Rarely severe courses with hospitalization Pneumonia or ARDS (inhalation)

Clostridium perfringens

- Proliferation mostly via contaminated meat/poultry (commercial)
- Ingestion of live cells, sporulating in small intestine

	Incubation	**Classic symptoms**	**Natural course**	**Complications**
Enterotoxin	6 – 24h	Cramps and watery diarrhea Less vomiting	Selflimiting in 1-2d	Rarely severe courses

Clostridium botulinum (Botulism)

- Spores survivi
- Germinate and
- Incubation tim

Clostridium botulinum

- Initially GI-symptoms: nausea, vomiting, diarrhea, later constipation

- Dominantely neurological: paresis of cranial nerves (double vision, dysarthria/-phagia), peripheral paresis (respiration!)

- Infant botulism: floppy child

Clostridium botulinum

- Detection of toxins
- Treatment with antitoxins (Armee-Apotheke), supportive care (often ICU)
- 1-2 cases in CH/year, mortality rate 5-10%

Enteric infection

Campylobacter jejuni et coli

- 7000 - 8000 cases/y in CH
- Incubation time 2 - 6d

- Often asymptomatic
- Early flu-like symptoms
- Later watery-mushy diarrhea (bloody infrequent), abdominal pain, fever, my-/arthralgia

- Late complication: GBS, arthritis (Reiter), meningitis

Salmonella

- 1200 – 1500 cases/y in CH of Salmonella enterica
- High germ load necessary (10^5 – 10^6) in enteric salmonellose
- Low in (para)typhus (10^2 – 10^3)

Salmonella

x	Incubation	Symptoms	Complication
Enteric	5 – 72 h	- Flu like - Watery diarrhea - Mild fever	- Perforation, hemorrhage - Sepsis and shock - Focal seeding in most organs (heart, aorta, gallblader..) - Continous excretion
(Para)typhus	1 – 3 w	- General symptoms - Diarrhea, smt. bloody - High fever - Pathognomonic roseola	

Reactive arthritis as sequelae

Yersinia enterocolica und pseudotuberculosis

- Incubation typically 1-10d

- Often uncharacteristic
- Febrile enteritis/enterocolitis, smt. with pharyngitis
- Pseudoappendicitis with mesenterial lymphadenitis

- Sequelae: Reactive arthritis or erythema nodosum

Listeria monocytogenes

- 80 cases in CH
- Mostly patients with impaired immune function (newborns, elderly, pregnancy)

- Incutabion 6h – 10d

- Mild febrile illness with/without watery diarrhea
  - Meningoencephlaitis, pneumonia, sepsis, miscarriage/infection of the baby

Vibrio cholera

- Worldwide 3 – 5 million cases (WHO), in CH rarely single cases after travel
- Incubation time 0.5 – 5d

- Mostly mild, but some with massive, rice-water like diarrhea for 4-6d

- Complications: Hypovolema/Dehydration with shock, AKI, electrolyte imbalance

Clostridioides difficile

- 123‘000 cases anually in europe, no data for switzerland
- Incubation 2 – 3d

- Non-severe course: Mild watery diarrhea and cramping
- Severe: Increase in stool frequency, pain, heart rate, temperature, sometimes blood/pus ins tool
  - Lab. Criteria: WBC >15 G/L, creatinin >133umol/L
- Fulminant: Severe + hypotension/shock/ileus/megacolon

E. coli

x	Incubation	Classic symptoms	Complications
ETEC	1 – 3 d	Watery diarrhea (cholera-like toxin)	None
EAEC	8 - 52 h	Watery diarrhea Smt. Fever/vomiting	Shiga-toxin! (05/2011 Germany)
EPEC	1 – 7 d	More severe watery diarrhea	Protracted diarrhea with malnutrition and dehydration
EIEC (Shigella like)	3 – 4 d	Severe watery to bloody diarrhea, cramping, fever	
EHEC (STEC O157)	3 – 4 d	Mostly watery (!) diarrhea, 10-20% bloody	HUS (7d after diarrhea)

Shigella

- 200-300 cases/y in CH, decreasing
- Incubation time 1 – 4d; highly infectious (<100 organisms sufficient)

- Fever, nausea, vomiting and bloody/putrid diarrhea (1/3 watery)
- Complication:
  - Toxic megacolon, perforation, rarely pneumonia, myocarditis
  - HUS in Shiga toxin–producing strains, particularly Sd1

- Sequelae: Reactive arthritis, glomerulonephritis

So what now?

History

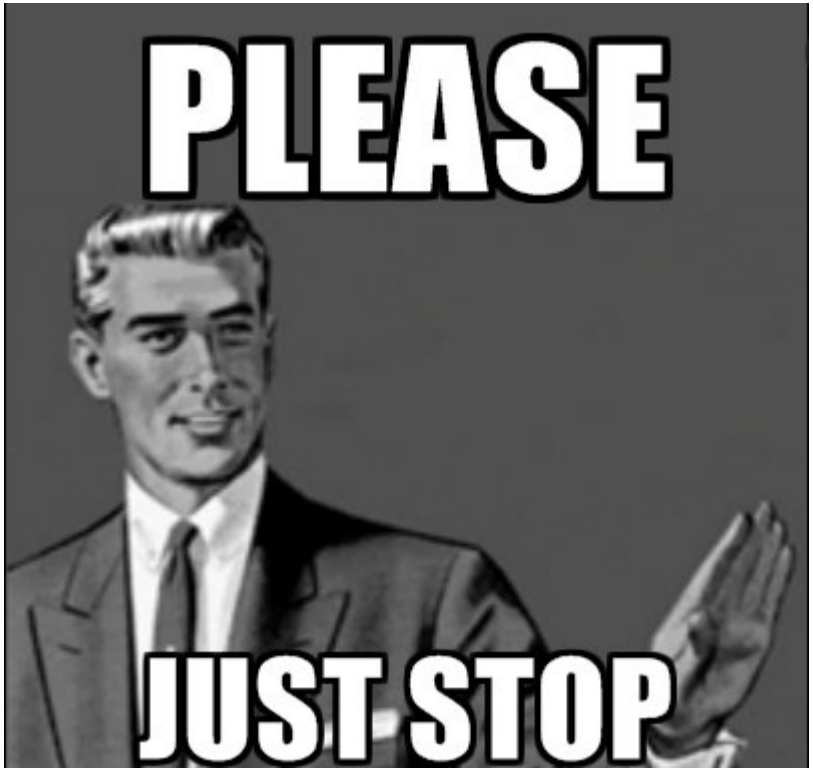
- Duration, intensity, bloody stools, add. Symptoms (neurological?)
- Focus on environmental history? Travel? Ingested foods? Sexual contacts?
- Medication (current or past)
- Work

Signs

- Fever? Dehydratation? Signs of shock? Abdominal tenderness? Paresis?

Whom to test

- No routine test for every patient!



- Fever/sepsis
- Bloody or mucoid stools
- Severe cramps/tenderness
- Persistent diarrhea >14d after travel
- Immunosuppression or relevant comorbidities (esp. IBD)
- Post-antibiotic or nosocomial
- Old age
- Indication for potential/known epidemic outbreak
- Risk of spreading (e.g. food industry)

- Perform stool analysis for Salmonella, Shigella, Campylobacter, Yersinia, C. difficile, and STEC
- Rectal swab
- if needed stool and blood cultures

- Calprotectin of no value
- Serological testing only if post-enteric HUS with negativ stool culture

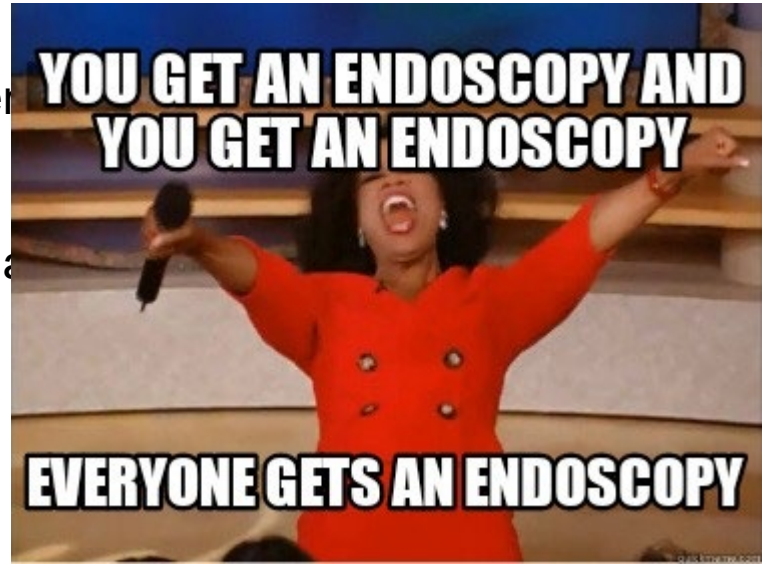
Special circumstances

- Specific testing for botulism and listeria according to clinical presentation

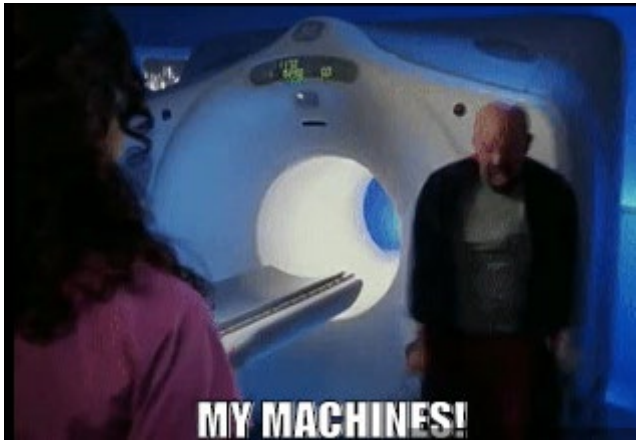
- Test for vibrio if
  - large volume rice water stools
  - exposure to salty or brackish waters
  - consumption of raw or undercooked shellfish
  - travel to cholera-endemic regions within 3 days prior to onset of diarrhea

Endoscopic evaluation

- HIV-/AIDS-patie
- Patients with an



Radiology



- Ultrasound/CT/MRI
- Detection of complication
  - Vascular: aortitis, mycotic aneurysms
  - Abdominal: peritonitis, perforation, toxic megacolon
  - Other foci of infection (sp. invasive Salmonella enterica or Yersinia)

Treatment

General measures

General measures

- Drink plenty of fluids (water, sports drinks, juices, soup, crackers)

- Hygiene (handwashing, disinfectant)
- Use own toilet

- Vomit in plastic bags if not in toilet, clean u

- Do not help prepare or serve food

Rehydration

- Oral rehydrati
- NG-tube if nec
- IV fluids in sev us and/or failure of ORS

ORS composition recommended by WHO and UNICEF

	Original ORS	Low osmolarity ORS*
Glucose, anhydrous	20	13.5
Sodium chloride	3.5	2.6
Trisodium citrate	2.9	2.9
Potassium chloride	1.5	1.5

Values are in grams to be dissolved in 1 litre of water before use.

Symptomatic therapy

- MCP, domperidon, ondansetron if not able to tolerate ORS
- Loperamide only in watery diarrhea (consider in travelers diarrhea)
- Analgetics according to WHO
  - No NSAIDs
  - CAVE Opioids and buscopan in toxic megacolon/ileus

Antibiotics

Treatment

- Watery diarrhoe does not need antibiotics, especially if >14d
  - No therapy of contacts
- Focus on hydration
- Consideration in travelers diarrhea, severe illness/fever, immunocompromised and in risk of cholera (azithromycin)

Treatment

- With dysentery antibiotics not mandatory, but often necessary
  - Asymptomatic contacts do not need therapy

- Start empiric therapy in
  - Age <3mt or >65y
  - Immunocompetent with fever/severe illness (possibility of shigella)
  - Immunosuppression
  - Travellers with fever/sepsis

Treatment

- Empiric azithromycin 1x500mg for 3 days
  - 2nd line ciprofloxacin 2x500mg for 3 to 5 days

- Severe illness broad-spectrum antibiotics

Treatment

- Always treat shigella, clostridoides, listeria
- Salmonella, Campylobacter, Yersinia, Vibrio, E.coli only if severe course or no improvement

- No antibiotics in STEC
- Asymptomatic patients only if Salmonella typhi or high-risk setting

Treatment of clostridioides, 1st episode

	Non-severe	Severe	Fulminant
USA	Metronidazol 3x500mg p.o. 10d (only low risk pat.) Vancomycin 4x125mg p.o. 10d Or Fidaxomicin 2x200mg p.o. 10d	Vancomycin 4x125mg p.o. 10d or Fidaxomicin 2x200mg p.o. 10d	Vancomycin 4x500mg p.o. 10d (in ileus enema) + Metronidazol 3x500mg i.v. Surgery
CH (IFIK)	Metronidazol 3x500mg p.o. 10d		

Treatment of clostridioides, recurrences

	1st recurrence	2nd or more
CH/USA	Vancomycin 4x125mg p.o. 10d after Metronidazol Add. Tapering to 1x125mg or 125-500mg eod for 3w (after Vanco/Fidaxo) Fidaxomicin 2x200mg (after V/M)	FMT

Treatment of clostridioides

- Vancomycin in breastfeeding and pregnancy

- Consider
  - Bezlotuxumab (Zinplava ®) during antibiotics to preven recurrence
  - Suppressive oral Vanco to prevent further recurrences
  - Pre-emptive Vanco to antibiotics when high risk of recurrence

Costs?

Antibiotics	CHF
Metronidazol	43.35
Vancomycin	245.50
Fidaxomicin	1896.75
Bezlotuxumab	4369.55

Prophylaxis

May be considered in travelers with

- High risk of infectious diarrhea or

Others

Varia

- Probiotics with variable effect, may be considered especially post-antibiotic

- Zink supplementation in children -5y if malnutrition is present

Whom to follow-up

Follow-up

- For most people no F/U recquired
- Contagiosity markedly reduced after 48h symptom-free

- Control after cessation of diarrhea in high-risk settings (patient care, food)
  - (Para)typhus and non-typhoidal Salmonella, STEC, Shigella, Cholera

Proctitis and STD

Transmission

- Anal receptive intercourse
  - Lesser degree toys and digital contact
  - Also vaginal infection (e.g. chlamydia)

Risk factors

- HIV seropositivity
- Known or past STDs
- Traumatic sex (toys, fisting, chemsex and others)

Symptoms

- Often asymptomatic!

Proctitis

Anorectal pain, itch and discharge

Constipation
Incomplete defacation
Tenesmus
Anorectal bleeding

Proctocolitis

Small volume diarrhea

Bloody stool
Abdominal pain

Enteritis

Large watery diarrhea
Nausea, vomiting
Fever
Malaise
Weight loss

Germs

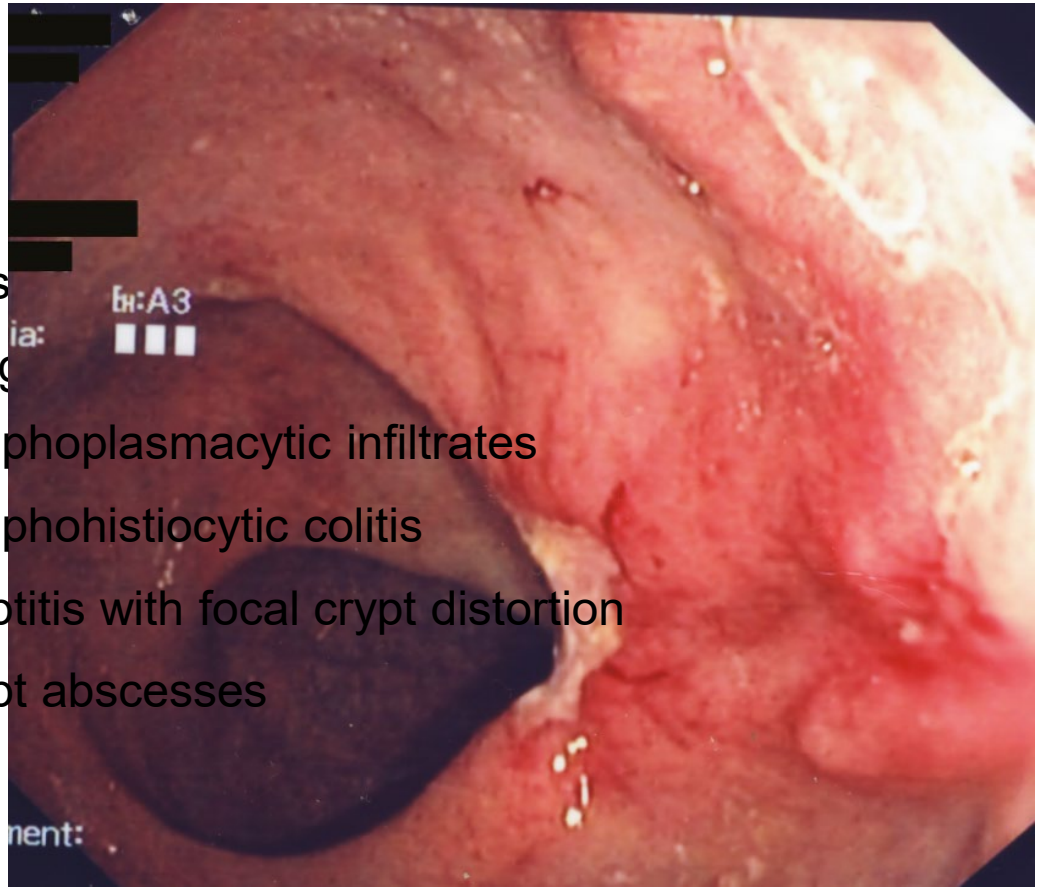
Causes of distal proctitis	Causes of proctocolitis	Causes of enteritis
Neisseria gonorrhoeae	*Shigella* spp.	*Giardia lamblia*, *Cryptosporidium* spp.
Chlamydia trachomatis:	*Campylobacter* spp.	Microsporidia§
Genotypes D-K	*Salmonella* spp.	Hepatitis A virus
Genotypes L_{1-3} (LGV)	*Escherichia coli*	
Treponema pallidum	*Entamoeba histolytica*	
Herpes simplex virus	*Cryptosporidium* spp.	
Mycoplasma genitalium ‡	Cytomegalovirus§	
Traumatic (sex toys, douching)	Intestinal spirochetosis¶	

Diagnostics

- But who?
  - Certainly when classic symptoms
  - History of receptive anal sex
  - General STD screening

Diagnostics

- Endoscopy: class
  - CAVE: Histolog
    - Lymphoplasmacytic infiltrates
    - Lymphohistiocytic colitis
    - Cryptitis with focal crypt distortion
    - Crypt abscesses



Diagnostics

- Rectal swab for NAAT
  - Visual at endoscopy or blindly if endoscopy declined/not possible

- Serology for treponema pallidum

Treatment

- Chlamydia -> Doxycycline
- Gonorrhea -> Ceftriaxon
- Syphillis -> Penicillin G

Prevention of GI-infections

Prevention of transmission

- Hygiene (handwashing, disinfectant)
  - After using toilet, before preparing or eating food, after sex
  - Caring for a symptomatic patient/family member
  - Petting animals or touching their feces/environments

- Cook it, peel it or leave it

- Ensure food is stored, cooked, prepared and served in a hygienic manner
  - Eggs/poultry on separate

Prevention

- Avoid swimming and sexual activities while symptomatic
- Practice safer sex

Vaccination

- Typhoid fever
  - Middle to high risk areas
  - Intimate contact to carrier
  - Microbiologists/lab workers

- Cholera
  - Travel to cholera-affected areas

Take home messages

Prevention

- Take a careful history, incl. sexual history
- Look for signs of serious illness and complications
- No routine stool assays for acute diarrhea
- Restrict antibiotics to patients who need them
- Instruct patients to reduce transmission
- HYGIENE!