Antibiotic treatment in gastroenterology

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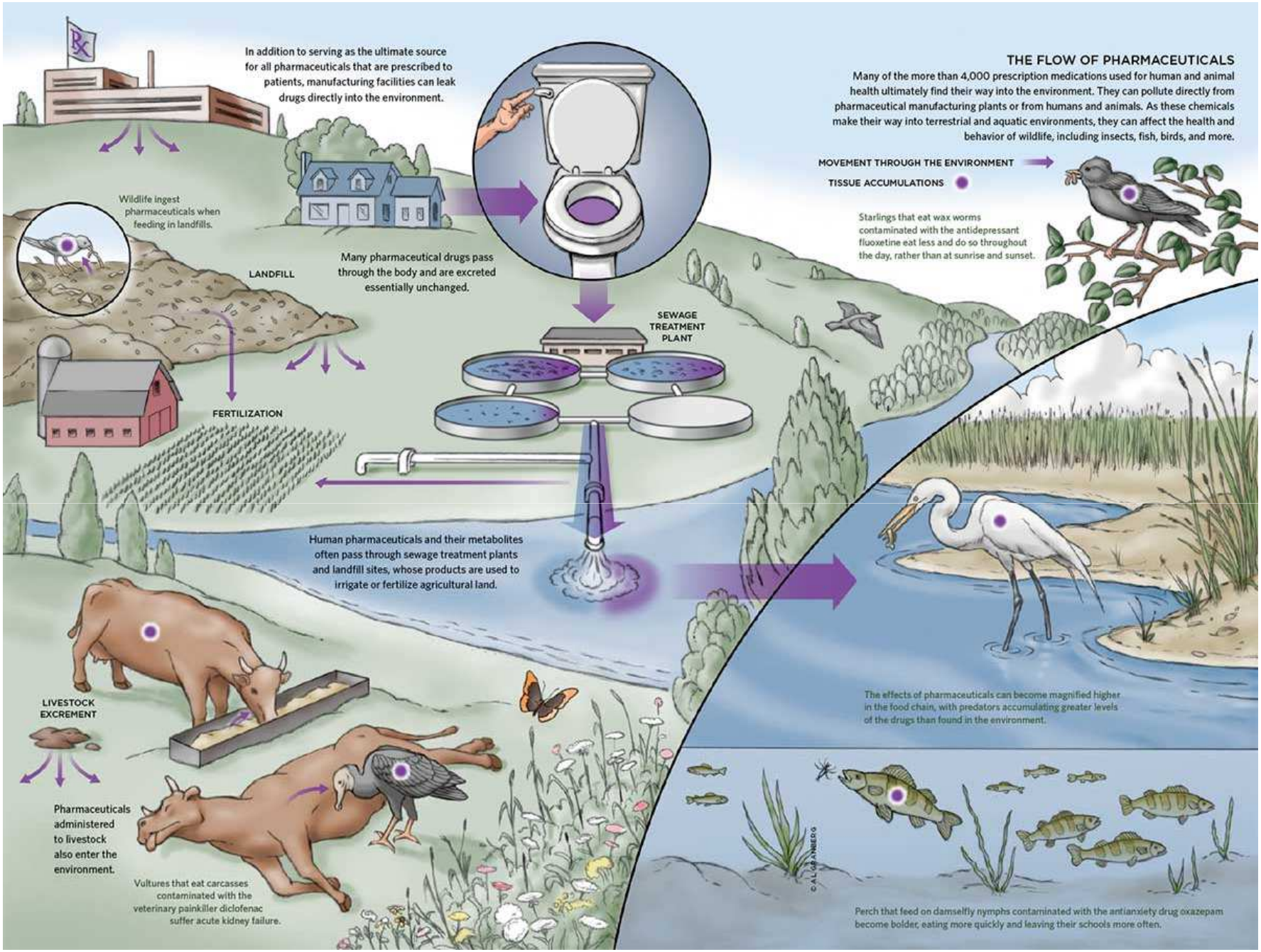
Antibiotics in generally

- the most successful drugs, but!
- narrowing indications and increasing side effects:
- Clostridium difficile colitis, antibiotic-associated diarrhea, growing antibiotic resistance, environmental pollution (agriculture)
- ←→ increasing antibiotic use in general practice
- because of
- fear? (we have to prescribe something to heal immediately the patient)
- lack of knowledge? (visit uptodate.com!)
- other?
- consequence: >90% of skin infections is caused by MRSA in the USA



https://www.the-scientist.com/features/drugging-the-environment-35077

Considering before and during giving antibiotics

- 1.) What types of bacterias are the common cause of the infection?
- Mostly enteric Gram-negative rods and anaerobic organisms is likely to be encountered in gastrointestinal infections → the main antibiotics used in gastroenterology are ciprofloxacin, ceftriaxon, metronidazole and rifaximin.
- 2.) What types of antibiotics penetrate well to the site of infection?
- In case of abscessus, antianaerobic antibiotic must be also used. Aminoglycosides do not penetrate well into abscessus, and they have no effect on anaerob bacteria. Imipenem do not penetrate well to the meninges, only meropenem.
- 3.) How long should the antibiotic treatment last?
- In case of abscessus: till no sign of abscessus on medical imaging, no sign of fever and normal WBC-count is achieved.
- In case of Clostridium difficile 10-14 days of antibiotic treatment is recommended, even if the symptoms disappear after 3 days.

- Do not give antibiotics in case of:
- viral infections (tonsillopharyngitis)
- asymptomatic bacteriuria
- toxin induced gastroenteritis (food-poisoning)
- Exceptions?
- neutropenia, pregnancy, cholera (for controlling the epidemic)

- Some definition:
- diarrhea: passage of loose or watery stools at least 3 times in a 24-hour period
- acute diarrhea: persist < 14 days
- persistent diarrhea: persist 14-30 days
- chronic diarrhea: persist > 30 days
- dysentery = invasive diarrhea: diarrhea with visible blood or mucus

Pathophysiology of gastroenteritis

1.) Non-inflammatory gastroenteritis

- Mostly effect the small intestines
- No anatomical changes
- Increased secretion or decreased absorption
- Watery diarrhea without blood
- Leucocytes are missing in the stool
- Caused by viruses (most commonly), bacterial toxins (e.g. Vibrio cholerae), protozoa (e.g. Giardia lamblia)
- Usually less severe than the inflammatory type (but e.g. Vibrio cholerae infection has a high mortality)

Pathophysiology of gastroenteritis

2.) Inflammatory gastroenteritis

- Mostly effect the large intestines
- Invasive infection
- Destruction of the mucosa layer (anatomical changes)
- Dysentery: blood or mucus in stool
- Leucocytes in the stool (sometimes even pus in stool)
- Fever, tenesmus
- Caused by bacterias (Shigella, Salmonella, Campylobacter, Yersinia, EIEC, EHEC)
- Entamoeba histolytica is the only protozoa that can cause dysentery
- Usually more severe than the non-inflammatory type

Medical history (anamnesis)

- Previously taken food and drinks
- Others are affected? (e.g. in family, in school)
- Travel history (e.g. subtropic-tropic countries)
- Use of swimming pool
- Previous hospitalization (Clostridium difficile)
- Previous antibiotic treatment (Clostridium diff.)
- Current medications
- Acute / persistent / chronic diarrhea

Viral gastroenteritis

- non-inflammatory gastroenteritis type
- the most common cause of gastroenteritis
- high frequency of vomiting
- usually lasts for 3-8 days
- mostly healed without medical treatment

- Therapy:
- Increased salt and water needs
- Oral rehydration therapy (ORT)

Oral rehydration therapy (ORT)

- Oral route is prefered than intravenous in mild and moderate dehydration
- Oral Rehydration Solutions (ORS): contain water, salt and sugar
- Even in small intestine enteritis, the intestinal glucose absorption by sodium-glucose cotransport remains intact mostly
- → if salt and glucose are both present, they assist to absorb water from the lumen

ORS

- Isotonic ORS with equimolar concentrations of glucose and sodium is as effective as intravenous hydration in case of mild and moderate hypovolaemia
- High rate of glucose → unabsorbed glucose increase the osmolality in lumen and decrease water absorption
- High rate of sodium → may cause hypernatraemia, and unabsorbed sodium increase the osmolality in lumen
- Home-made ORS: 1 teaspoon salt + 8 teaspoon sugar + 1 liter water + 1 cup of orange juice

Toxin induced gastroenteritis

- Staphylococcus, Bacillus cereus, Clostridium perfringens, Clostridium botulinum
- Caused by preformed toxins, not real infections
- No fever! Early onset (<12 hours after meal), except botulism (> 12 hours – till few days)
- Antibiotic treatment is harmful (they don’t affect on preformed toxins). Antitoxin in case of botulism.
- Th: Oral Rehydration Therapy

Bacterial gastroenteritis

1. Salmonella typhi and Salmonella paratyphi

- Typhus abdominalis / thyphoid fever
- Salmonella paratyphi / parathyphoid fever is less severe
- Systemic infection with bacteriaemia
- Diarrhea and vomiting is missing!
- High fever, abdominal pain, constipation
- Complications: intestinal hemorrhage, perforation
- Blood culture and stool sample
- Antibiotic treatment: fluoroquinolones, iv. ceftriaxone or azithromycin

2. Salmonellosis

- Most common cause is Salmonella enterica
- Dysentery (and not systemic infection!)
- Fever, abdominal pain, vomiting
- Typically lasts for 4-7 days
- Antibiotic treatment is not indicated, because it prolongs the defecation of Salmonella
- Antibiotic treatment is needed in case of severe disease or prothesis implantation (joint, heart valve)
- Fluoroquinolones or iv. ceftriaxone

3. Campylobacterosis, Shigellosis, Yersiniosis, E.coli (EHEC, ETEC, EPEC, EIEC), travelers' diarrhea, Entamoeba histolytica

- Dysentery
- Antibiotics prolong the restoration of normal microbiom, and also increase the risk of HUS (EHEC)
- → Generally antibiotic treatment is not advised, just in case of severe or long lasting disease.
- But Entamoeba infection should be treated (metronidazol)
- Antibiotics: fluroquinolons, azithromycin, ceftriaxone, trimetophrim-sulfamethoxazole (TMP-SMX), or rifaximin
- Camplyobacter: resistant to TMP-SMX and ß-lactams
- Yersinia: usually resistant to ß-lactams and azithromycin

- In case of all dysentery, the isolation of the patient and taking stool culture is necessary, and taking blood culture in severe cases!

4. Clostridium difficile

- Gram-positive, anaerob, spore-forming bacteria
- Leading cause of dysentery in hospital
- Mostly occur after antibiotic treatment
- Colonizes the human colon, high chance of relapse
- Treatment: p.o. metronidazol or p.o. vancomycin for 10-14 days (iv. vancomycin has no effect on Clostridium difficile colitis)
- p.o. vancomycin is superior to metronidazol, because vancomycin is not absorbed → high concentration can be achieved in the colon
- In case of 1st relapse: p.o. vancomycin or fidaxomycin
- After the 2nd relapse: fecal microbiota transplant (FMT) is recommended

Cholecystitis, cholangitis

- E. coli, Klebsiella pneumoniae, Enterococcus faecalis
- usually mechanical obstruction or gallstone is present
- antibiotics - ?
- ceftriaxon + metronidazol
- ceftazidim + metronidazol
- ciprofloxacin + metronidazol
- levofloxacin + metronidazol
- moxifloxacin
- piperacillin-tazobactam
- imipenem / meropenem
- ampicillin + gentamicin (Enterococcus faecalis)

- in case of grade I cholecystitis, antibiotic treatment should last for 1 day after cholecystectomy
- in the other cases, antibiotic treatment should last for +4-7 days after successful cholecystectomy or ERCP

Inflammatory bowel disease (IBD)
Crohn's Disease (CD) and Ulcerative Colitis (UC)

- Clear evidence in case of abscess or wound infection
- Antibiotics given usually to alter gut microbiom, and to prevent bacterial translocation during relapse of CD or UC

- Relapse of active CD: until excluding bacterial infection, usually metronidazol, metronidazol + ciprofloxacin, rifaximin is given
- fistulizing CD: metronidazol + ciprofloxacin
- UC-relapse: metronidazol, metronidazol + ciprofloxacin, rifaximin

1. case

- 26-year-old woman, symptoms started 6 hours ago:
- fever, nausea, vomiting 6 times, watery diarrhea
- mild-modest diffuse abdominal pain and tenderness, punctum maximum in the epigastrium
- ?
- dg: viral gastroenteritis – antibiotic treatment is harmful!
- 4 hours later: fatigue, increasing abdominal pain
- status: abdominal tenderness moved to the right lower quadrant
- ?
- dg: appendicitis! Early symptoms can mimic viral gastroenteritis

2. case

- 42-year-old woman, st.post tonsillectomy
- symptoms started 6 hours ago:
- subfever, diffuse spastic abdominal pain, 5x diarrhea, some blood in the last stool
- status: mild diffuse abdominal tenderness, modest tenderness in the right lower quadrant. Digital rectal exam negative. Good general condition.
- ?
- US: negative, appendix is normal
- WBC: 16 G/l, CRP 120 mg/dl, others normal
- ?
- observation

2. case

- Next day: spastic abdominal pain slightly increased, 4 times watery diarrhea, 2 times few blood in the stool
- th: stool culture taken, observation
- 3.day: persistent abdominal pain and diarrhea
- status: mild-modest tenderness
- WBC: 24 G/l, CRP: 281 mg/dl, others normal
- th: preparing for colonoscopy (IBD)
- 4.day: persistent mild abdominal pain, but good general condition
- colonoscopy was negative, ileum is normal
- 1 day later getting better
- discharge from hospital
- viral infection ? dysentery?
- Never treat the CRP-level alone!

3. case

- 69-year-old man, T2DM, hypertension
- admitted to hospital because of right-sided pneumonia, antidiabetic treatment switched to insulin
- iv. ceftriaxon treatment, no fever from the 2.day, improving general condition
- on the 6.day fever reoccur and mild abdominal pain appeared. WBC 28 G/l, CRP 50
- ?
- next day: greenis mucous diarrhea appeared → C. difficile colitis → p.o. vancomycin 4x125mg