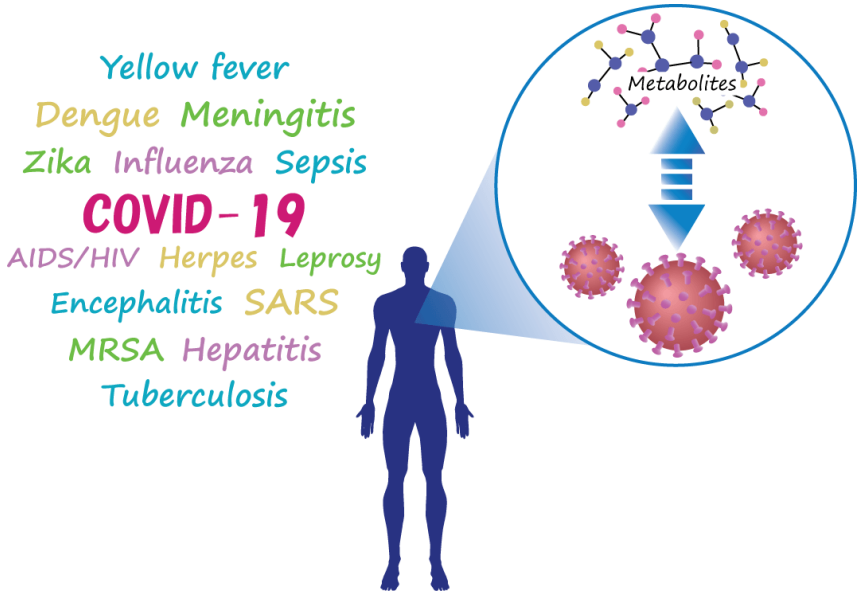
Bacterial Diseases in Humans



Dr. Roongtawan Muangmoon

Infectious diseases

- **1. Bacteria**
- **2. Viruses**
- **3. Mycetes**
- **4. Parasites**

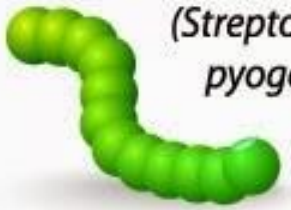
BACTERIA SHAPES

SPHERES (COCCI)

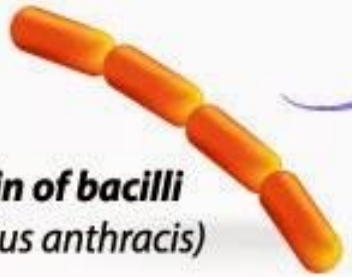
RODS (BACILLI)

SPIRALS

Diplococci
(Streptococcus pneumoniae)



Streptococci
(Streptococcus pyogenes)



Chain of bacilli
(Bacillus anthracis)

Vibrios
(Vibrio cholerae)

Tetrad

Staphylococci
(Staphylococcus aureus)

Sarcina
(Sarcina ventriculi)

Flagellate rods
(Salmonella typhi)

Spore-former
(Clostridium botulinum)

Spirilla
(Helicobacter pylori)

Spirochaetes
(Treponema pallidum)

Bacterial infections

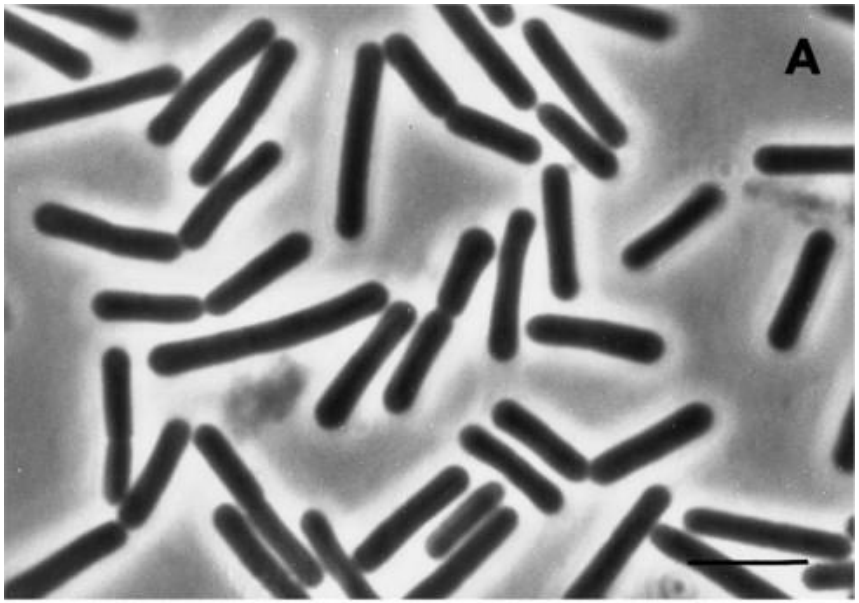
- **Toxemia = toxins in blood circulation**
- **Alimentary tract**
  - **Botulotoxin (*Clostridium botulinum*)**

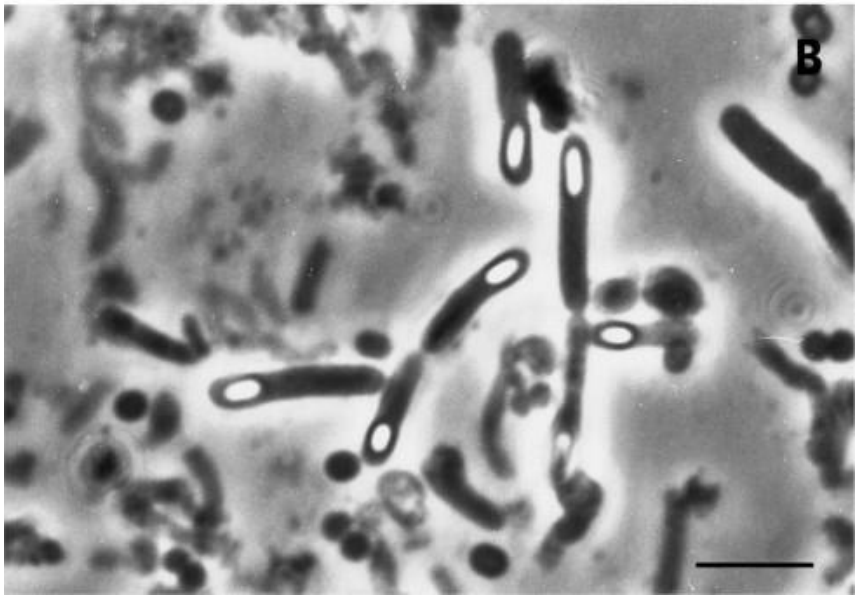
Clostridium botulinum

วารสารราชบัณฑิตยสถาน
ปีที่ ๓๑ ฉบับที่ ๓ ก.ค.-ก.ย. ๒๕๔๙

โบทูลิซึม : โรคอาหารเป็นพิษที่จังหวัดน่าน*

ประเสริฐ ทองเจริญ**
ราชบัณฑิต สำนักวิทยาศาสตร์
ราชบัณฑิตยสถาน

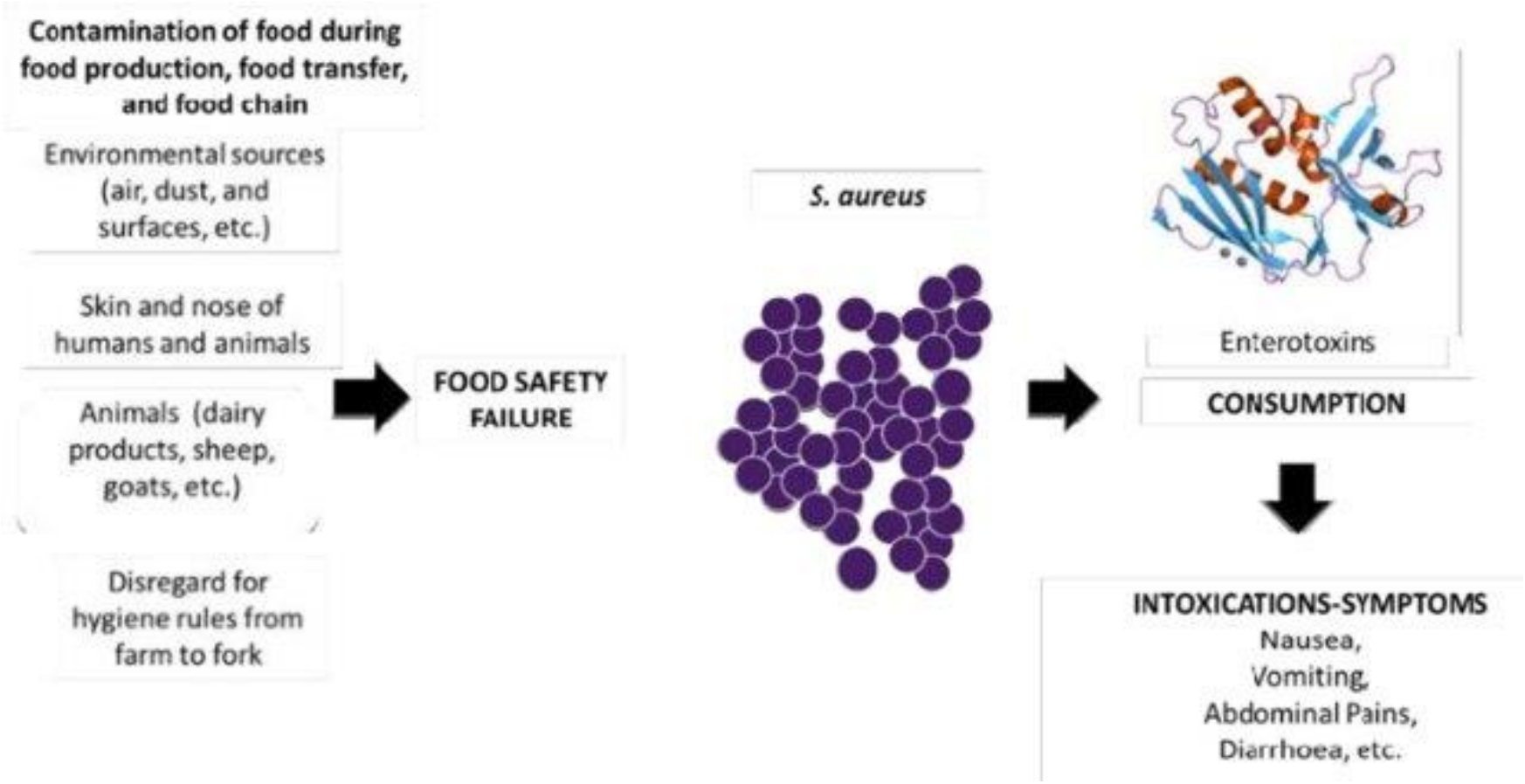




เมื่อเดือนเมษายน พ.ศ. ๒๕๔๑ มีผู้ป่วยทั้งสิ้น ๑๓ ราย มีผู้เสียชีวิต ๒ ราย มีอัตราป่วย-ตาย ร้อยละ ๑๕ ผู้ป่วย ๑๒ ราย อาศัยอยู่ในหมู่บ้านหนองบัว อีก ๑ ราย อาศัยอยู่ในหมู่บ้านดอนแก้ว อำเภอท่าวังผา ผู้ป่วย ๙ ราย เป็นหญิง อัตราส่วนชายต่อหญิง เท่ากับ ๑ : ๒.๓ อายุเฉลี่ย ๔๔ ปี (อยู่ในช่วง ๓๘-๖๘ ปี) ผู้ป่วย ๒ ราย เสียชีวิต ๓ วัน และ ๕ วันหลังจากมีอาการ

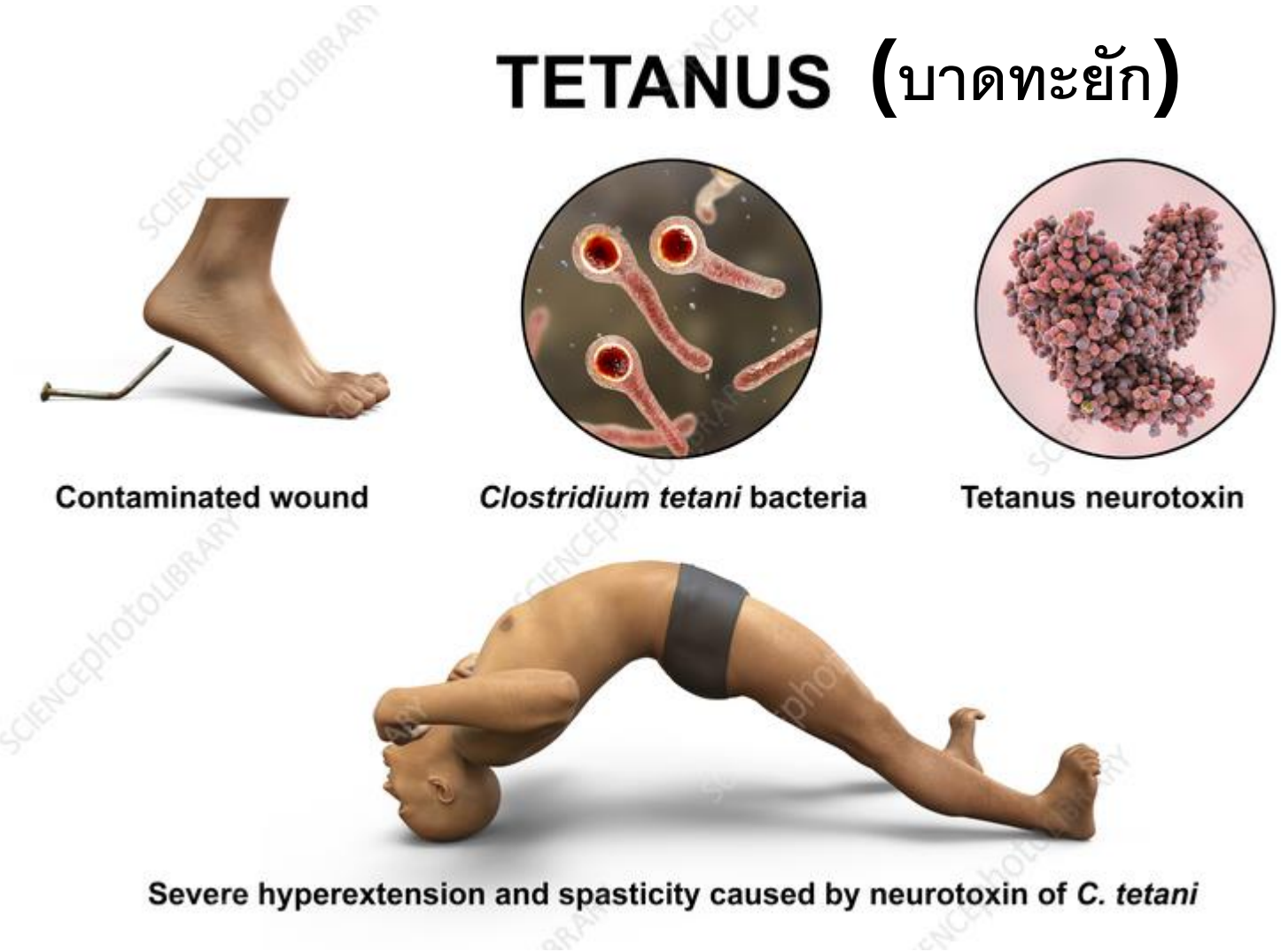
https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/clostridium-botulinum

Enterotoxin (*Staphylococci*)



https://www.researchgate.net/publication/362891897_A_review_on_antimicrobial_activities_of_some_culinary_herbs_and_spices_against_Staphylococcus_aureus/figures?lo=1

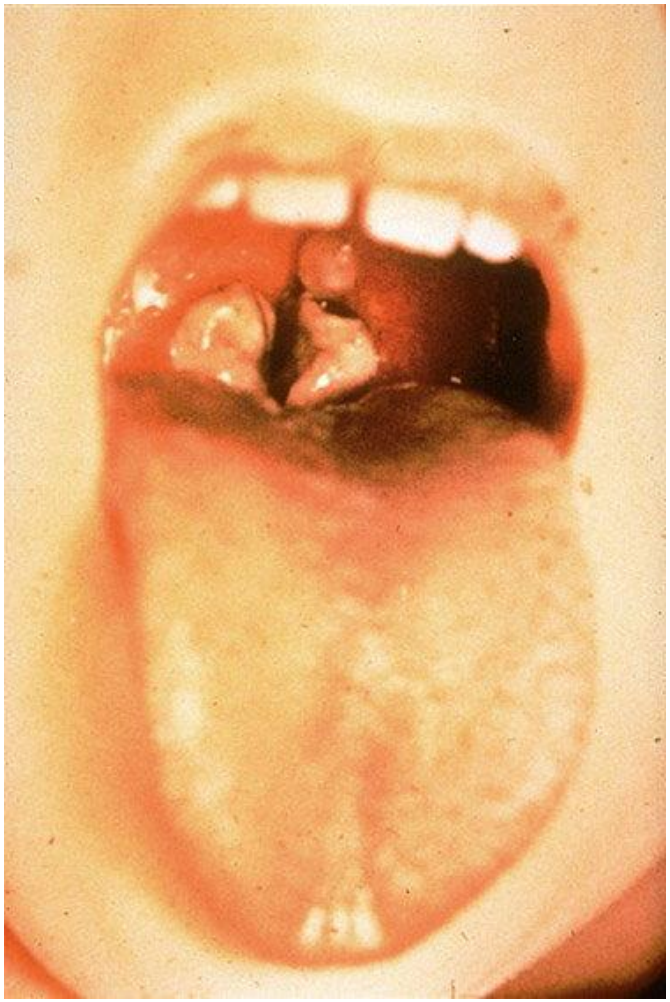
Wound (แผล)
Tetanotoxin (*Clostridium tetani*)



Clostridium

- ***Cl. tetani*** – **tetanus**
- wound → toxins (blood, nerves) → spinal cord → spasms of striated muscles (necroses)
- risus sardonicus + opisthotonus
- 10-50% mortality
- ***Cl. botulinum*** **- botulism**
- meal from tins (toxin)
- visual disturbances, muscle paralysis → respiratory insufficiency + arrhythmias → **death**

Diphtheratoxin (*Clostridium diphtheriae*)



https://www.sciencephoto.com/media/1237727/view/corynebacterium-diphtheriae-illustration

Bacterial infections

- **sepsis** = bacteria > immune system
- fever + splenomegaly + lymphadenopathy
- s*treptococci, staphylococci*

- **metastasizing sepsis** (septicemia)
- nasopharynx → menings (*Neisseria meningitidis*)
- pulmonary abscess → brain abscess
- furuncle → bones + kidney (*Staphylococci*)

Bacterial infections

- **pyemia** (septicopyemia) = thrombi + bacteria in blood circulation
- sequela: septic infarction → metastatic abscess
- 1. central – infective endocarditis
  → brain, kidney, skin, …
- 2. peripheral – purulent thrombophlebitis (p.t.)
  → lungs
- 3. portal – of portal vein branch
  → liver
- 4 . umbilical – of umbilical vein (newborn)

Staphylococci

- Gram+, common
- normally on skin + mucosa
- skin abscesses x sepsis
- nosocomial infections
- secondary infections (influenza)

- ***Staph. aureus + Staph. epidermidis***

https://www.medicalnewstoday.com/articles/staph-infection#gallery-open

Staphylococci

- 1. skin lesions (wounds)
  - furuncle → carbuncle
  - impetigo
  - panaritium
- 2. mastitis (breast feeding woman)
- 3. osteomyelitis + arthritis
- 4. enterocolitis + alimentary enterotoxicosis
- 5. acute infective endocarditis
- 6. toxic shock syndrome

Streptococci

- Gram+, common
- β-hemolytic (A-D, G)
  - ***Str. pyogenes (A)***
  - ***Str. agalactiae (B)*** – mother´s vagina → newborn´s meningitis
- α-viridans (H)
  - subacute infective endocarditis
  - ***Str. mutans*** – caries, pulpitis
- *anaerobic (**Peptostreptococci**)* – oral cavity

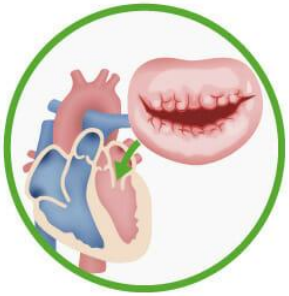
Streptococci

- ***Str. pyogenes (A)***
- 1. local inf. – phlegmone, impetigo, wound inf.
- 2. angina (tonsilitis) → otitis, sinusitis
- 3. scarlet fever (erythrogenic toxin)
  - angina + oral enanthema (raspberry tongue) + skin exanthema (face, trunk)
- 4. erysipelas
  - skin erythema (lower limbs, face) + toxemia
  - lymphatic + blood vein thrombosis → lymphostasis → edema → elephantiasis

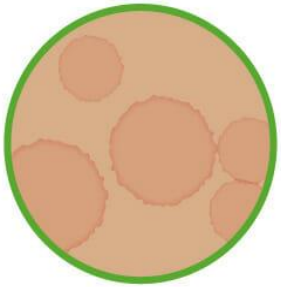
https://www.nhs.uk/conditions/scarlet-fever/

Streptococci

- sequelae (*Streptococcus A*)
  - cross reaction (immune)
  - **acute glomerulonephritis**
  - **rheumatic fever**



Narrowed mitral valve causing heart murmur



Erythema marginatum (non-itchy rash)

Painful joints

Fever of 38.2–38.8°C (100.8–102.0°F)

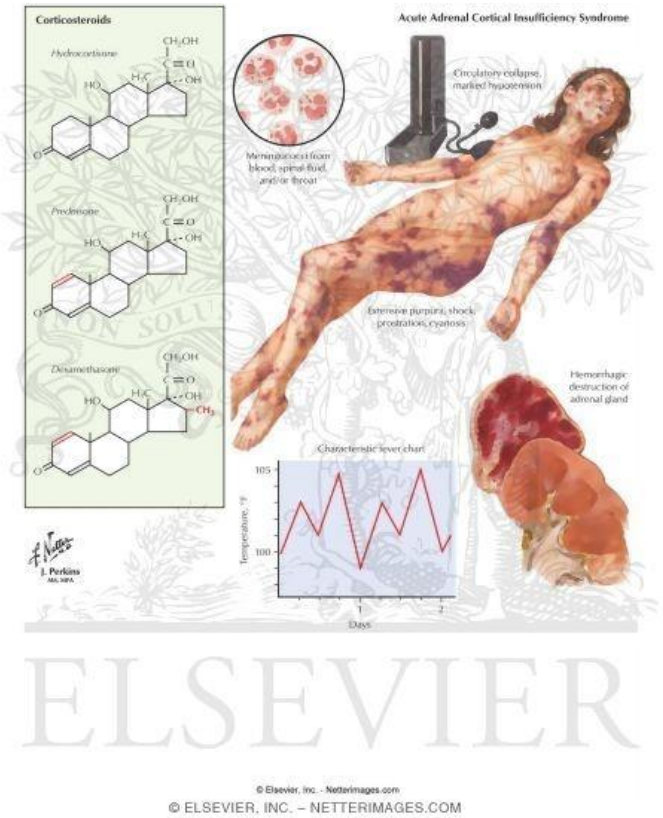
https://www.lecturio.com/concepts/rheumatic-fever-clinical/

Pneumococci

- ***Streptococcus pneumoniae***
- Gram+ diplococci
- children
  - rhinitis, nasopharyngitis, sinusitis, otitis
- adults
  - lobar pneumonia → meningitis

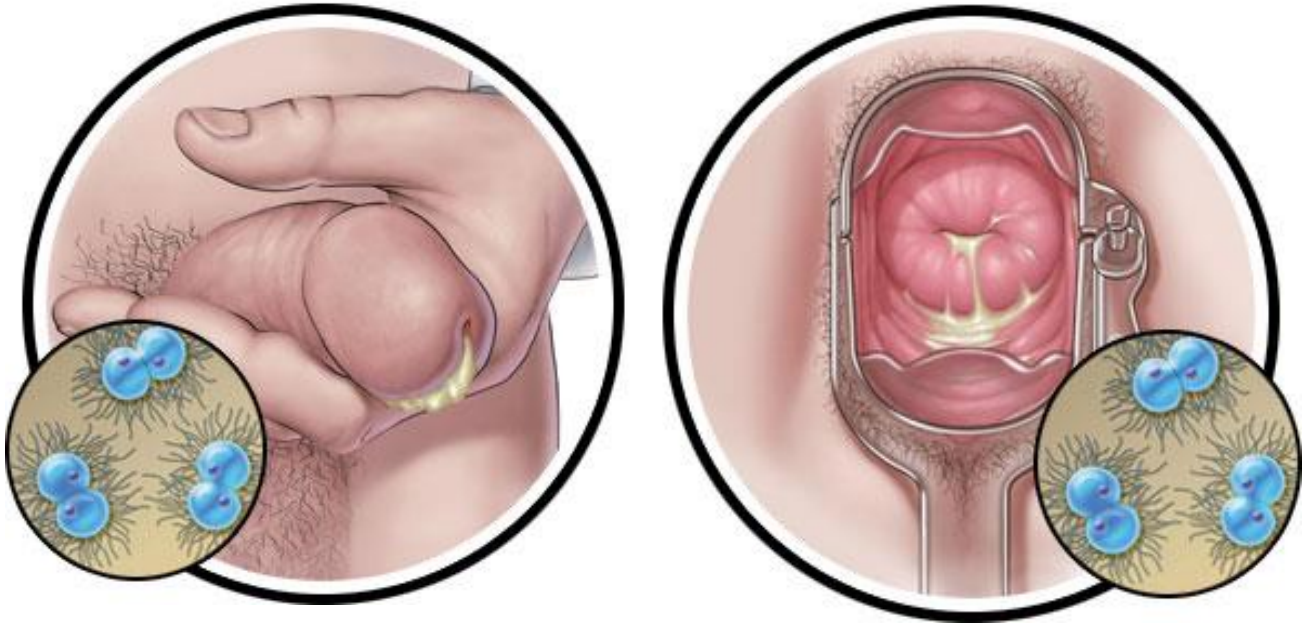
https://www.boystownhospital.org/knowledge-center/pediatric-sinusitis

Neisseria



- Gram- diplococci
- ***N. meningitidis***
- sporadic x endemic
- children, young adults, soldiers
- nasopharynx → menings
- **!!! rapid course → death (hours) !!!**
- meningeal syndrom + skin purpura + DIC
- **Waterhouse-Fridrichsen syndrome**
  - meningococcal sepsis + DIC + bleeding in adrenals (insufficiency)

Neisseria



- ***N. gonorrhoeae*** **(หนองใน)**
- gonorrhoea
- purulent inflammation + discharge
- M: urethritis → prostate, vesicles
- F: kolpitis, cervicitis → endometritis → salpingo-oophoritis → sterility
- distant complication: arthritis (knee)

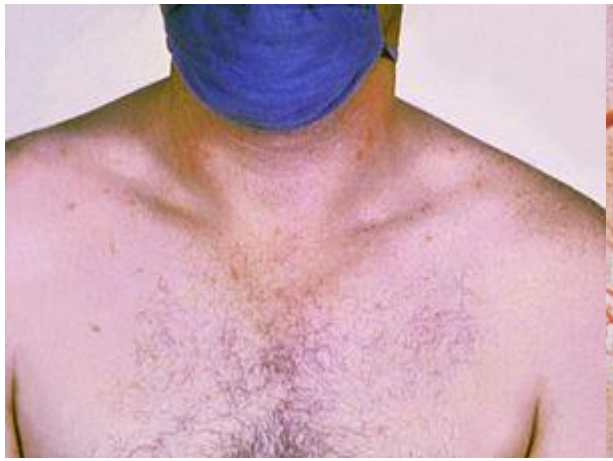
https://www.sexandu.ca/stis/gonorrhea/

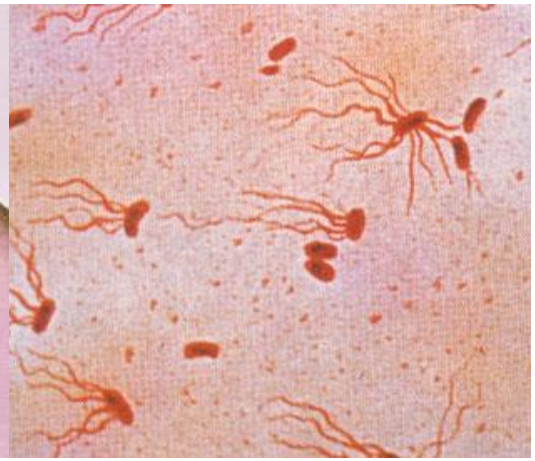
Escherichia coli

- Gram- rod
- normal in colon x other location - pathogenic
- *enteropatogenic* – diarrhoea (newborn)
- *enteroinvasive* – diarrhoea (adults)
- *enterotoxigenic* – travellers´ diarrhoea
- *enterohemorrhagic* - verotoxin
  - hemorrhagic colitis
  - hemolytic-uremic syndrome (children)

https://my.clevelandclinic.org/health/diseases/16638-e-coli-infection

Salmonella



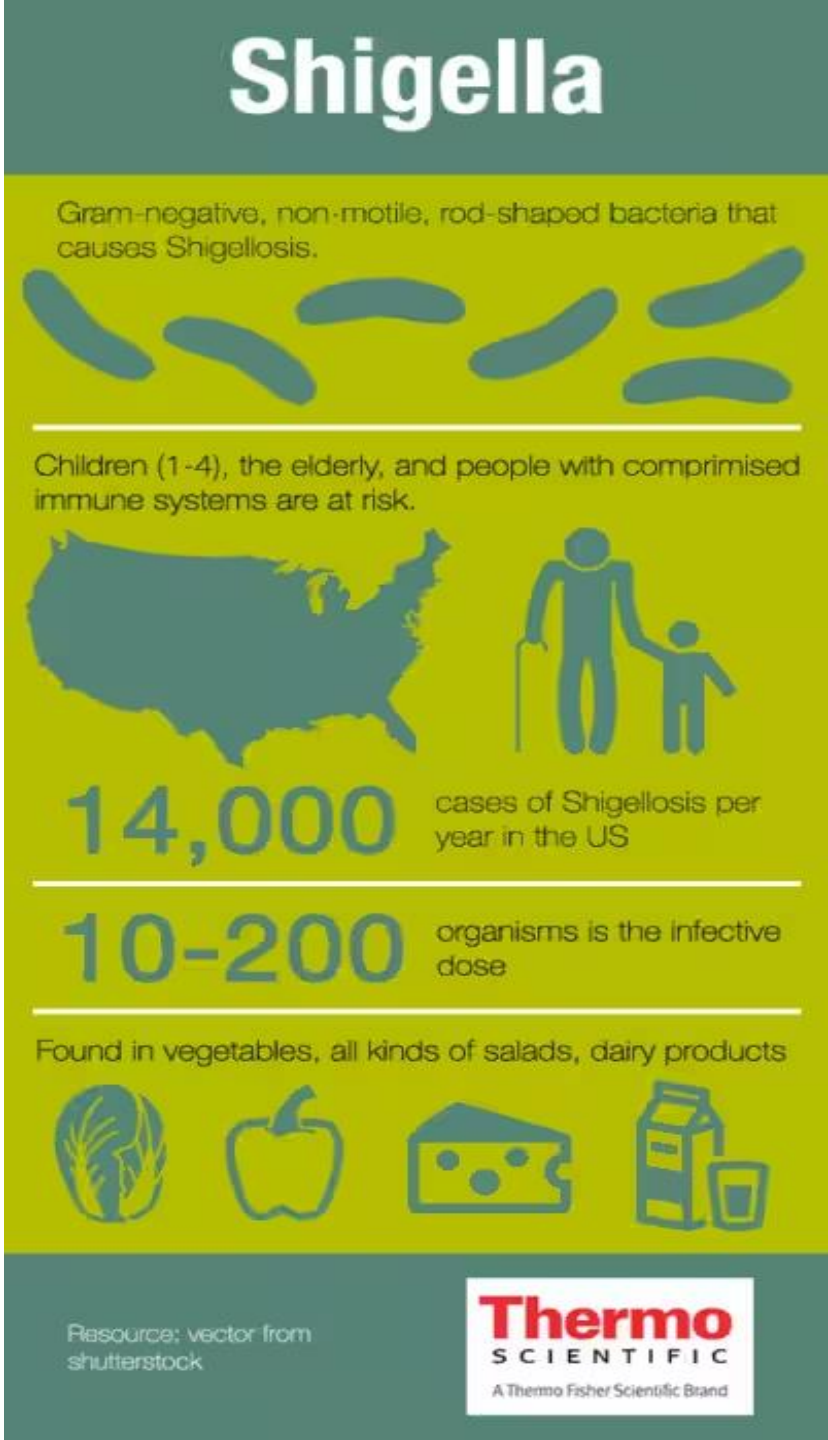


- ***S. typhi* – typhoid fever**
- food → bowel → liver → gallbladder → bowel
- ileum
- 1. hyperplasia of RES in ileum – typhoid cells
- 2. mucosal necroses upon Peyer patches
- 3. ulcerations
- 4. reparation → scar
- complications
  - bowel perforation/hemorrhage
  - chronic carriage (gallbladder)

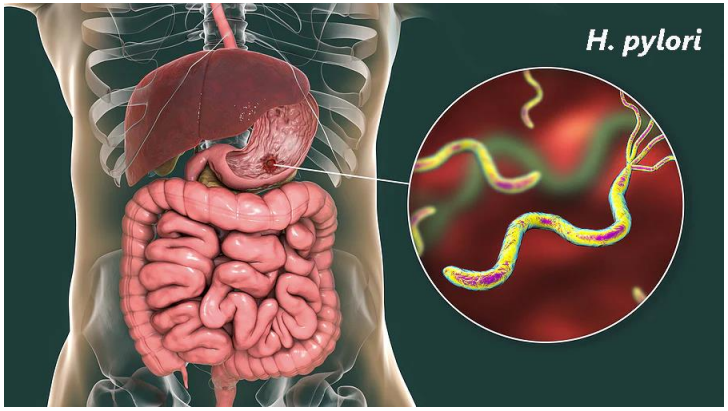
https://step2.medbullets.com/infectious-dis/120050/typhoid-fever

Shigella

- ***S. dysenteriae, S. sonnei., S. flexneri***
- **bacillar dysentery**
- „dirty hands“ + alimentary
- hemorrhagic colitis + ulcers +
- pseudomembranes



Campylobacter + Helicobacter



- ***Campylobacter jejuni***
- infants
- diarrhoea
- ***Helicobacter pylori***
- asymptomatic
- etiology of:
  - chronic gastritis
  - peptic ulcer of stomach and duodenum
  - gastric carcinoma
  - gastric MALT-lymphoma

https://badgut.org/information-centre/health-nutrition/campylobacter/

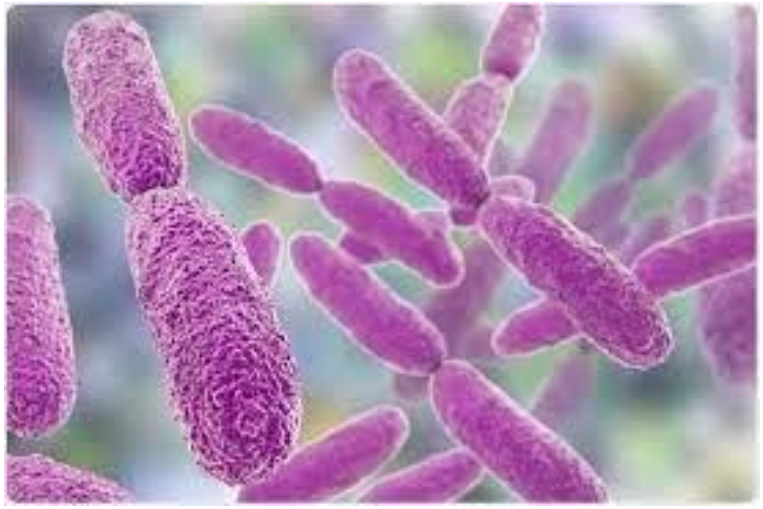
https://www.avivahealth.com/blogs/articles/helicobacter-pylori

Vibrio

- ***V. cholerae*** – **cholera**
- water, food, ill man
- massive watery diarrhoea
- **NO** inflammation x enterotoxin
- dehydration → collapse

- **cholera nostras** - enterotoxins

Klebsiella

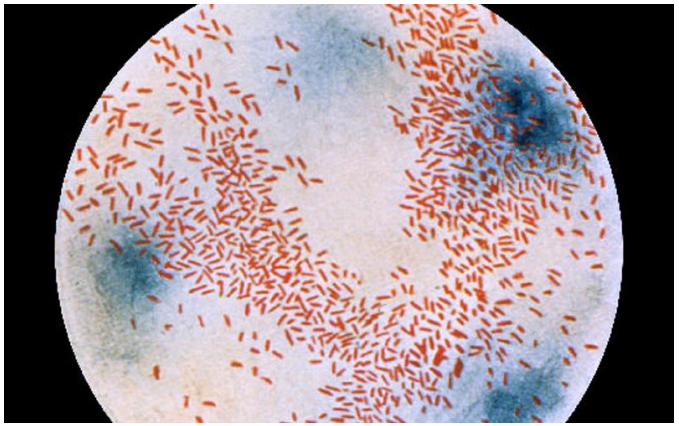


- ***K. pneumoniae***
- pneumonia
- lung + liver abscesses

- ***K. rhinoscleromatis***
- ulcerations of upper airways

https://advancedfunctionalmedicine.com.au/treatment-of-klebsiella-bacteria-and-its-symptoms/

Haemophilus



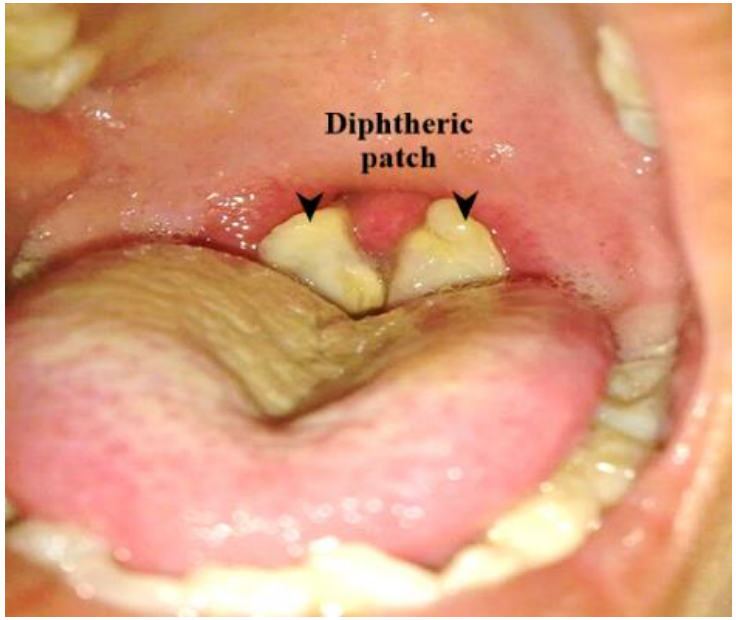
- ***H. influenzae***
- superinfection of viral infections
- children – **epiglottitis**, meningitis, pneumonia
- adults - otitis, sinusitis, bronchitis

- ***H. ducreyi***
- **ulcus molle (chancroid, soft chancre)** - STD

https://www.cdc.gov/hi-disease/about/photos.html

Corynebacterium

- ***C. diphtheriae*** – **diphtheria**
- children
- pseudomembranous tonsilitis + laryngitis
- airway obstruction
- diphtheratoxin - myocarditis



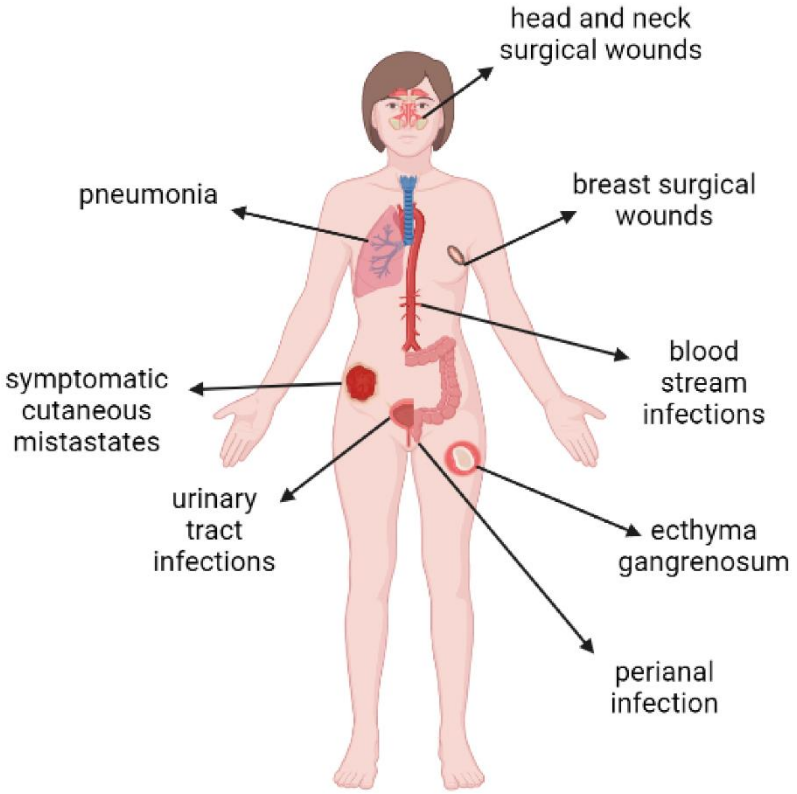
https://specialist-ent.com/o-c-p-faucial-diphtheria/

Bordetella

- ***B. pertussis*** – **whooping cough**
- children
- acute inflammation of upper airways
- cough + vomiting + face edema

CDC - http://phil.cdc.gov/phil/home.asp

Pseudomonas

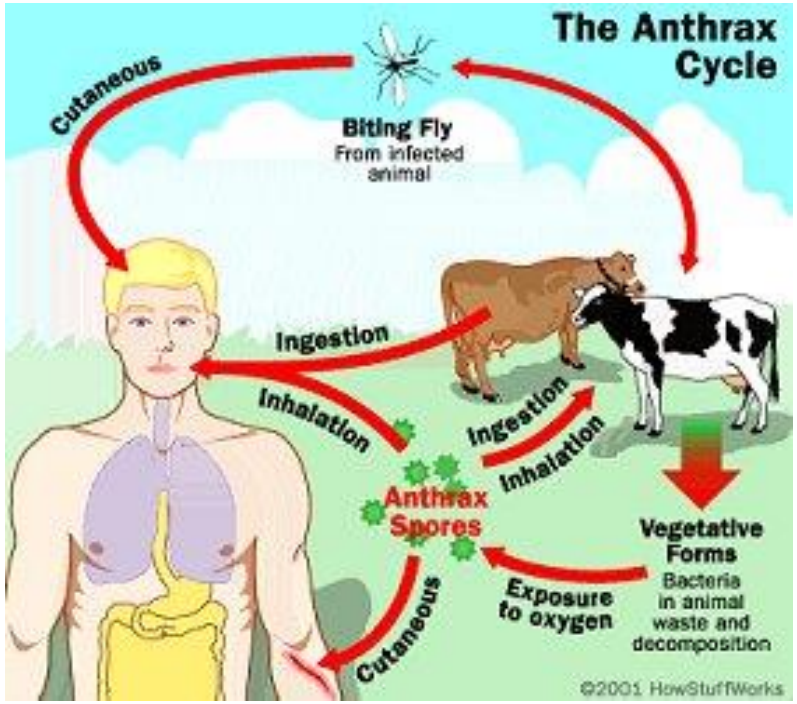


- ***P. aeruginosa***
- colonization of respiratory and urinary tract
- immunocompromised patients
- plastic, catheters
- serious nosocomial infection
- pneumonia, enterocolitis, meningitis, sepsis

https://www.cdc.gov/hai/organisms/pseudomonas.html

Bacillus

- ***B. anthracis*** – **anthrax**
- animal products + dust
- hemorrhagic necrotising lesions
- skin – *pustula maligna*
- lungs, GIT, …



https://www.cdc.gov/anthrax/symptoms/index.html

Yersinia

- ***Y. pestis*** - **plague**
- rodents → rats → flea *(Xenopsylla cheopis)*→ man
- *bubonic plague*
  - skin bite → LN (groin) → hemorrhagic necrosis (black color) + fistulas
- *pneumonic plague*
  - lung abscesses
- ↑ mortality
- WHO report

Bubonic plague

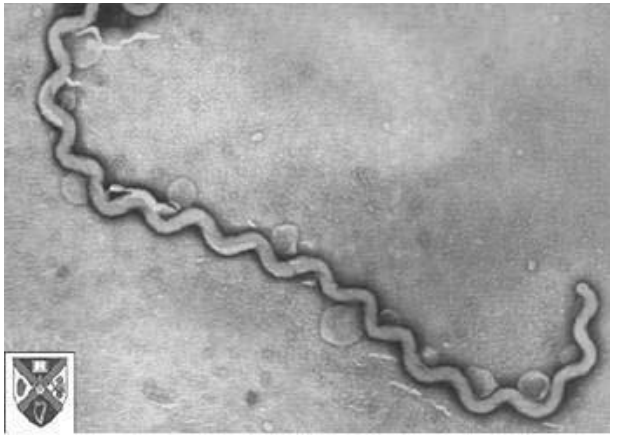
Septicemic plague

Pneumonic plague

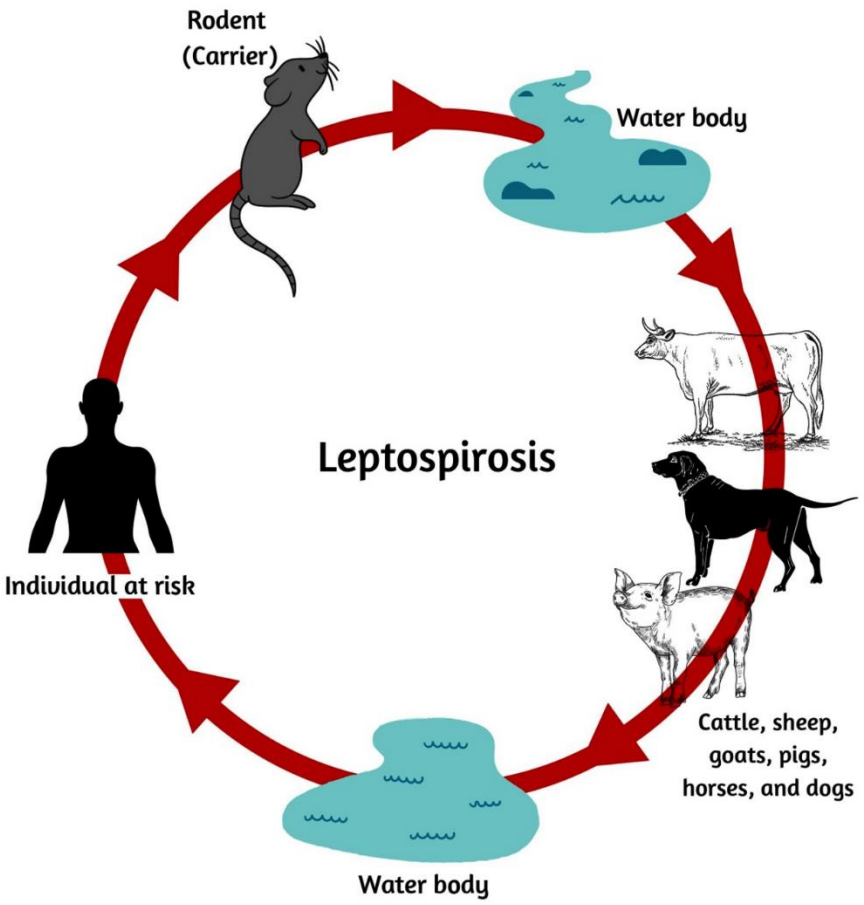
https://www.cdc.gov/plague/symptoms/index.html

Leptospira

- ***L. interrogans*** – **(โรคฉี่หนู)**
- rodents´ urine + skin wound
- fever + jaundice + anuria
- liver - necroses + nephritis
- muscle necroses + myocarditis



web.mst.ed



https://microbiologyjournal.org/molecular-diagnostic-methods-for-the-detection-of-leptospirosis/

Spirochetes

- ***Treponema pallidum* – syphilis**

https://www.rcpjournals.org/content/clinmedicine/16/2/184
https://www.drugtargetreview.com/news/32711/success-culturing-treponema-pallidum/

Borrelia

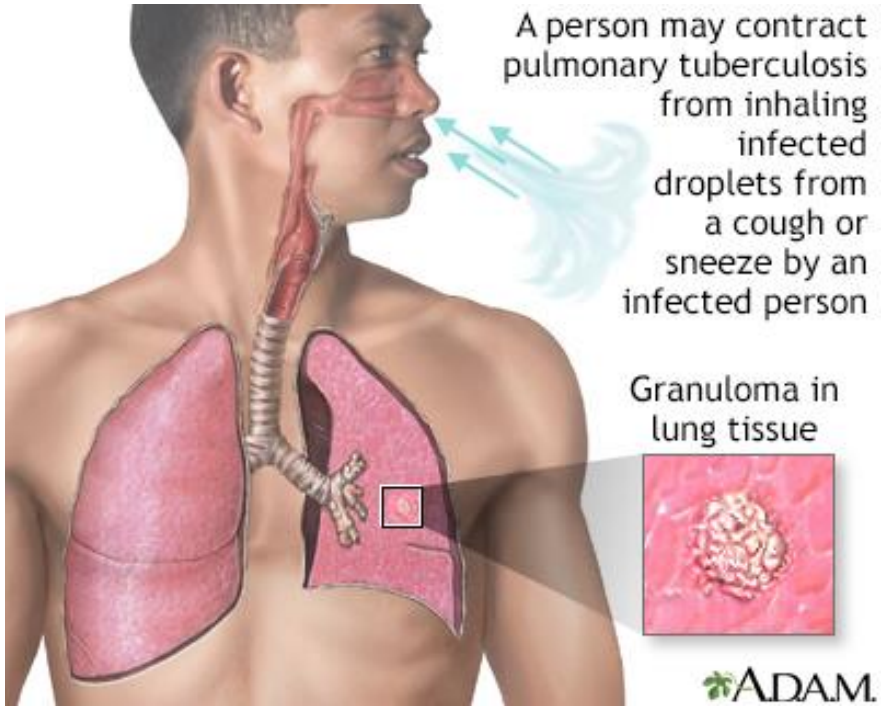
- ***B. recurrentis*** – **febris recurrens**
- ill man → louse → infection
- mucosal hemorrhages + microabscesses
- liver + spleen necroses

- ***B. burgdorferi*** – **Lyme disease**
- rodents → tick *(Ixodes)* → man
- 1. erythema migrans (skin)
- 2. multiple EM + CNS + heart + joints
- 3. acrodermatitis chronica atrophicans + CNS

https://www.medicalnewstoday.com/

Mycobacterium

- ***M. tuberculosis*** – **TBC (วัณโรค)**
- ***M. leprae*** – **leprosy (โรคเรื้อน)**



https://emedicine.medscape.com/art

https://www.mountsinai.org/health-library/diseases-conditions/pulmonary-tuberculosis

Mycoplasma

- NO cellular wall
- children + young adults

- ***M. pneumoniae***
  - pneumonia, otitis, sinusitis
- ***M. hominis***
  - non-gonococcal urethritis
- ***Ureaplasma urealyticum***
  - non-gonococcal urethritis

Rickettsia

- intracellular
- ***R. prowazeki*** – **spotted fever** (typhus exanthematicus)
- ill man → louse *(Pediculus h. corporis)* → skin wound
- endothelium (+ vasculitis) → blood circulation
- skin exanthema + petechiae
- encephalitis + myocarditis
- ↑ mortality (20-70%)
- recurrence (20 years) – **Brill-Zinser disease** (LN)

https://www.healthline.com/health/rocky-mountain-spotted-fever

Sexually transmitted diseases (STD)

•1. Bacteria

- *Neisseria gonorrhoeae* - gonorrhoea
- *Treponema pallidum* - syphilis
- *Haemophilus ducreyi* – chancroid
- *Chlamydia trachomatis* – lymphogranuloma venereum
- *Calymnatobacterium granulomatis* – granuloma inguinale

•2. Viruses

- *HSV* - herpes
- *HBV* – hepatitis B
- *HPV* – condyloma acuminatum + cervical cancer
- *HIV* - AIDS

•3. Parasites

- *Trichomonas vaginalis* – kolpitis (vaginitis)
- *Sarcoptes scabiei* - scabies