Infectious D.
→ Non-infectious D.
caused by pathogens.

Can say vaccines are ~~specific~~ specialized to treat one type of pathogen but antibiotics are general.

- Pathogens → disease-causing organism
- Disease → a condition that causes the body to function less effectively

- Vaccine → contain an agent that resembles a pathogen and prevent infectious diseases by stimulating WBCs to quickly produce antibodies when the pathogen invades.

- Antibiotics → drugs ~~that~~ made by microorganisms that are used to kill or inhibit growth of bacteria.

CH 11 Infectious Diseases

Disease → a condition that causes the body to function less effectively.
- illness → need to cure
- suffers from
- Produce specific signs & symptoms → 3rd party observed; felt by patient

LO(a) State that infectious diseases can be spread from person to person whereas non-infectious diseases cannot + Identify e.g.s of each

Infect. D.	Non-infect. D
Can be spread from person to person ∵ caused by pathogens (b., v.)	Cannot be spread from person to person ∵ not caused by pathogens
E.g. Influenza, Pneumonia, Covid-19, HIV/AIDS, Malaria, Cholera	E.g. Asthma, Diabetes, Osteoporosis, Dust allergy, Coronary ♡ dis., Amphesema, Bronchitis, Kidney dis. etc. (from previous ch.)
	Can get it by: – inheriting it – exposed to environ. factors (e.g. pollution) – unhealthy lifestyle (smoking, excess intake of sat. fats and cholestrol)

figure out how to reduce spread of disease

LO(b): Explain that infect. dis. are caused by pathogens (bacteria, virus) and can be spread from person to person thru → body fluids (air, contact) → food, water

pathogens ↳ disease-causing organisms.

• **Body Fluids**

Droplets in air

How? Cough/Sneeze → numerous tiny respiratory droplets are expelled ↓ contains resp. tract secretions that may contain pathogens ↓ person in close range (~1m) may breathe in the droplets (that contain pathogen) and become infected #

Prevent? – mask up → certain grade → droplets ✗ pass thru to air
– social distance → won't breathe in by uninfected person ✗ infected

Direct Contact

Body fluids exchanged from infected to uninfected person → disease from ✗✗ transmitted; produced by body; E.g. sexual int., breastfeeding.

How? exchange of body fluids (mucus, blood, semen, breast milk, urine, sweat (?), digestive juices (?))
↳ blood of ✗✗ comes into contact w mucous membrane of another person (common entry pts for pathogens) ↳ moist lining of nose, mouth, throat, genitals
↳ blood of ✗✗ comes into contact w bloodstream of an uninfected person thru a break in the skin
↳ exchange of body fluids during sexual intercourse [e.g. HIV] Human Immuno deficiency Virus
↳ mother to baby during breastfeeding [e.g. Hepatitis B → liver dis.] ; delivery ↳ HIV
↳ vector-borne diseases (carries disease)
E.g. mosquito → malaria (blood of ✗✗ contact w bloodstream)
Prevent? Insecticide, No stagnant water (breeding)

Prevent? be social responsible. – wash hands – sanitise / disinfect common surfaces – ✗ share needles

• **Food & Water**

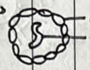
How? food & water (ingest) contaminated w pathogens when food & water not properly stored / handled [e.g. bacteria cause cholera]
Prevent? – purchase from reliable vendors
– wash hands + tools when preparing food

Structure of (typical) Pathogens

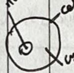
VIRUS

LO(c). State that a typical v. has
→ a protein coat enclosing its gen. mat. (DNA or RNA)
→ reproduces (only in living host cells) ∵ host cell contains necessary mat. for reproduct.

• Living characteristics

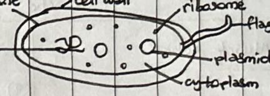


• Non-living characteristics
↳ no cellular structures (not considered cell)
(e.g. cell m., cytoplasm, organelles) (protoplasm (found in animal cell), nucleus)
↳ does not grow, move, feed, respire, excrete (✗ metabolic activities)



BACTERIA CELL

LO(d) State that a typical bact. cell has
→ a cell wall
→ DNA w/o a nucleus
• → Some are pathogenic, some non-pathogenic (disease-causing; non-disease-causing)



• Single-celled organism that does not have a membrane-bound nucleus (✗ nucleus)
• has a cell wall, ribosomes, plasmids, one or more flagella
↳ small circular DNA molecules

COMPARE!

VIRUS	BACTERIAL CELL
☆ Both lack a nucleus.	
☆ Both contain genetic material.	
Has protein coat.	Has a cell wall (and cell membrane)
Genetic mat. may not be DNA. (DNA/RNA)	Genetic material is typically DNA.
Does not have a cell membrane	Has a cell membrane
Does not have a cytoplasm	Has a cytoplasm.
Does not have ribosomes.	Has ribosomes. + plasmids.
Requires a host cell to reproduce	Can reproduce by itself.

∴ ☆ Outer covering; ☆ Genetic mat.; ✳ comparison.

identify using the structure
A. Outer covering (protein coat / cell w & cell m.)
B. Got cell m? → no / yes; got ribo?
C. Gen. mat. (usually RNA) → DNA / Not DNA?

Bacterial cell vs Animal cell.
→ does not have a membrane-bound nucleus
→ contains small circular DNA molecules called plasmids
→ has a cell wall
→ genetic mat. not enclosed in a membrane

INFLUENZA & PNEUMOCOCCAL
(caused by virus) (caused by bacteria)

LO(e) State signs & symptoms

Influenza	Pneumococcal Disease
Chills (w shivering)	
Cough	
Fever (↑in temp, feel warm)	
Headache	
Muscle ache	Vomiting
Sore throat	Shortness of breath (rapid breathing)
Fatigue (more obvious than pneumococcal d.)	Photophobia
Runny nose	Chest pain

[3m] LO(f)a. Describe the transmission

Influenza (① attacks resp. sys.)	Pneumococcal D.
② caused by Influenza virus (spike protein, gen. mat, membran envelope, protein coat)	caused by string round shape Streptococcus pneumonia resp. system (pneumococcus bacteria) (& more) exists as strings one bacterial cell "○"
③ mode of transmission: mainly • thru droplets in the air (cough, sneeze) • thru direct contact with surface (object contaminated w virus then touching own mouth, nose, eyes (mucous membrane)) Saliva, mucus spread onto surface	mode of t.: • mainly through droplets in the air

LO(f) b. Describe (in sentences) the methods to reduce transmission

Both:
- Get the respective vaccinations (influenza vaccination Can annual vacc. is recommended / pneumococcal vaccination)
- Avoid close contact with ppl who have the flu
- If you are sick, cover your mouth and nose w a tissue when you cough/sneeze and dispose of the used tissue properly
- Wash your hands w soap and water / Rub w disinfectant
- Avoid touching your eyes, nose, mouth
- Wear a surgical mask if you are not feeling well.
- practise • good personal hygiene.

Treat:

Influenza:
Take prescribed antiviral drugs
↓
help body fight off disease-causing viruses
(minimize symptoms, shorten length of illness
inhibit development (hijacking host cell to reproduce))

Pneumococcal Disease:
Take prescribed antibiotics to treat the disease

Date: / /

To unpack tomorrow:

Today's mood: Craving coffee | Main character energy | BRB overthinking | 11/10 | Logging off

VACCINES

substance that is introduced into body to protect it against a disease.

LO(g) State that vaccines contain an agent that resembles a pathogen (weakened form of pathogen) and prevent infectious diseases by stimulating WBCs to quickly produce antibodies when the pathogen invades.

How they work:

Vaccines can be taken orally or administered through an injection.

1. White blood cell (B-cell (Lymph.) / T-cell (Lymph.)) binds to antigens on agent that resembles pathogen/weakened pathogen (from vaccine) (see Ch6) (inactivated vac. / live vac.)
2. WBC is stimulated to divide
3. Many copies of the WBC produce many antibodies
4. Antibodies help to destroy the agent in vaccine
5. Some WBCs remain in the bloodstream for a long time as memory cells.

In the future, when the same pathogen enters the body, the memory cells can recognise and produce the antibodies to destroy it quickly before it can invade body cells

→ increased immunity to the pathogen.

Weaker immune system → reduced ability to kill pathogens in the body on its own.

↓ requires vaccines & antibiotics to ↑ immunity to the pathogen.

Vaccines	Antibiotics
Given before infection to prevent the disease	Given once infected to treat the disease
Stimulate WBCs to produce antibodies	Prevent synthesis of cellular structures in pathogen.
Can prevent subsequent infections (same)	Would not be able to prevent (same) subsequent infections

ANTIBIOTICS

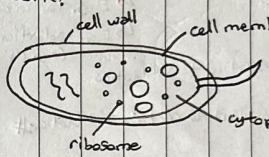
usually chemically modified to make them more effective in treating diseases

Antibiotics → drugs made by microorganisms that are used to kill or inhibit growth of bacteria. — by interfering w the growth & metabolic activities of the pathogen

LO(h) a. Explain that antibiotics (drugs to treat bacterial infections) target bacterial by preventing synthesis of cellular structures (but are b. ineffective against viruses due to structural and reproductive differences)

(see Ch1 How cells work)

How they work?



prevents cell from bursting	Cell Wall	• Prevent synthesis of bacterial cell wall. ↳ cell wall weakened → water enters cell via osmosis (↳ cell expands, bursts - dies #)
Controls movement of substances in & out of cell	Cell Membrane	• Inhibits cell membrane function (② ↳ breaks up cell m.) ↳ ✗ cell m → any substance can move into/out of cell (① → no protection from environment #)
involved in protein synthesis	Ribosomes	• Prevent ribosomes from taking part in (③ protein synthesis) (① bind to bacterial ribosomes) ↳ inhibits bacterial cell's growth #
main site of cell activities	Cytoplasm	• Antibiotics inhibit enzyme (action) needed for synthesis of folic acid (→ Bacteria no folic acid (Vitamin required for growth) in cytoplasm) ↳ growth inhibited #

virus got no cell wall

virus no cell m.

e.g. infected by virus → die #

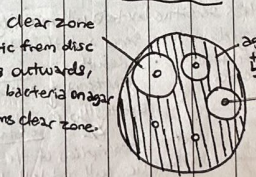
bacteria stays

virus no ribosome, do not grow

↳ So pregnant mothers need to be careful not to take antibiotics that may affect fetus development (Eg. Trimethoprim)

"antibiotics inhibit cell membrane function but virus lacks a cell m. so it is ineffective."

Petri Dish thingz



- most effective → largest diameter of clear zone ↳ killed most bact.
- ineffective → no clear zone around disc ↳ didn't kill bact.

Today's mood: Craving coffee / Sin character energy / 11/10 / BRB overthinking / Logging off

To unpack tomorrow:

Date: / /

TYPO

ANTIBIOTIC RESISTANCE

LO(i) Discuss how the misuse & overuse of antibiotics may accelerate the emergence of antibiotic-resistant bacteria

"superbugs"

- How pathogens become resistant to antibiotics?

→ exposed to certain chemicals or mutagenic agents, (see genes ↑ rate of mutation)
- E.g. tar in cigarette smoke
- E.g. radiation (e.g. UV light/X-rays)

their genes may change

↓↓

become less/more sensitive to antibiotics

↓

bacteria becomes resistant to certain antibiotics

May still prescribe when you have viral infection

viral infection → immunity ↓ → more vulnerable to bacterial invasion → (more severe illness) ✗✗

← prescribe antibiotics to prevent secondary infections from bacteria

How to reduce antibiotic resistance?

→ not misusing or overusing antibiotics to treat a viral infection instead of a bacterial infection.

→ using antibiotics only when necessary, not on minor infections

→ Completing course of antibiotics prescribed by doctor

↳ increase chances of killing less sensitive bacteria + less chances of resistant bacteria.

Prescribed Course of Antibiotics

During initial doses of antibiotic,

- Bacteria that are more sensitive to antibiotic → killed
- Bacteria that are less sensitive to antibiotic → not killed easily ↳ survive

If prescribed course of antibiotic is completed / not completed

Higher chance that all bacterial cells are killed

The less sensitive bacteria will reproduce, passing down their genes and thus, their resistance to the antibiotic increases → Resulting in more resistant bacteria to antibiotic → need a stronger dose

Eventually, population becomes resistant

Further prescription of the same antibiotic will not kill the bacteria.

↓

need a diff antibiotic

(limited antibiotics available in the long run)

To unpack tomorrow:

Today's mood: Craving coffee

Logging off 11/10