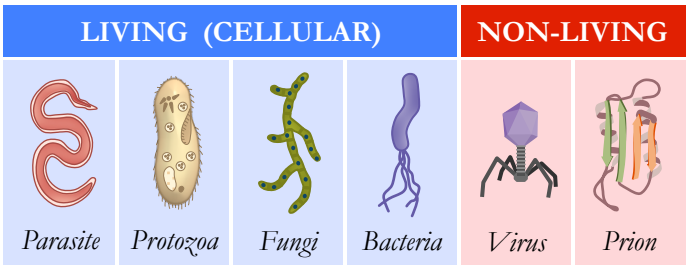
TOPIC 6.3: DEFENCE AGAINST DISEASE

Pathogens

Pathogens are disease-causing agent that disrupt the normal physiology of infected organisms (i.e. homeostatic imbalance)

Pathogens may be species-specific or cross species barriers

- Diseases that can be naturally transmitted between animals and humans are called **zoonotic** diseases



Lines of Defense

Immune system can be divided into three lines of defense:

- 1st line of defense – Surface barriers (skin / mucus)
- 2nd line of defense – Innate immunity (non-specific)
- 3rd line of defense – Adaptive immunity (specific)

Antibiotics

Antibiotics are compounds that target prokaryotic features but don't harm eukaryotic cells (i.e. don't affect host organism)

- May target structures (e.g. cell wall) or metabolic processes

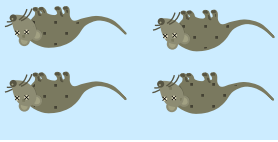
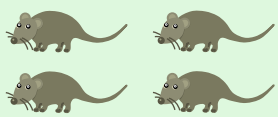
Some strains of bacteria have evolved with genes that confer resistance to antibiotics (some even have multiple resistance)

- Antibiotics can't be used to treat viruses (no metabolism)

The first antibiotic identified was penicillin (Fleming – 1928)

- Its treatment use was demonstrated by Florey and Chain

Experiment: Mice infected with pathogenic bacteria

Control: No treatment	**Treatment:** Penicillin
	
Result: All mice died	**Result:** All survived

Conclusion: Penicillin has antibiotic properties

Surface Barriers

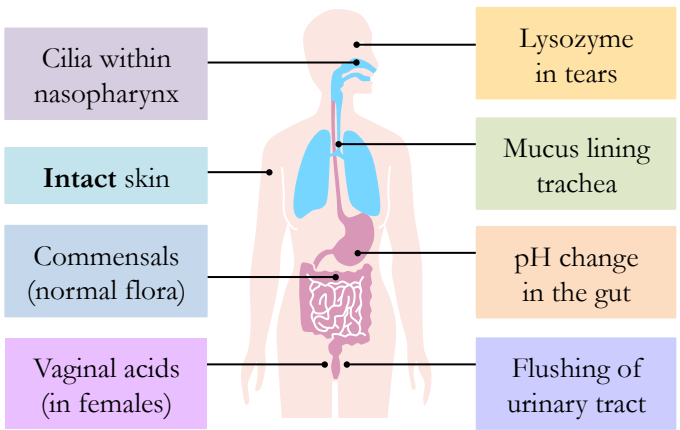
The first line of defense against infectious disease is the surface barriers that function to prevent pathogenic entry

Skin

- Protects external structures (i.e. outside the body)
- Thick, dry and composed predominantly of dead cells
- Glands secrete chemicals to restrict bacterial growth

Mucous Membranes

- Protects internal structures and cavities (inside body)
- Thin region composed of living cells that secrete fluid (mucus) to trap pathogens (which may then be removed)



Clotting

Clotting seals damaged vessels to prevent pathogenic entry

- Injured cells and platelets release clotting factors
- These factors convert prothrombin into thrombin
- Thrombin converts fibrinogen *(soluble)* into fibrin *(insoluble)*
- Fibrin forms a mesh of fibres that block the injured site
- Clotting factors also cause platelets to become sticky and form a solid plug (called a clot), sealing the wound
- This process of events is called a coagulation cascade
- Clot formation in coronary arteries lead to heart attacks