Topic 6: Human Health and Physiology

Digestion of large molecules
- Compounds broken down => digested
- Have to be small enough for:
  - Diffusion
  - Facilitated diffusion
  - Active transport

Amylase
- Salivary glands
- Starch → maltose
- pH 7

Villi
- Many - huge surface area
- Food quickly absorbed
- Microvilli in villi → SA
- Diffusion distance small
- Lacteal: takes away fat

Capillary bed

Lacteal

Enzymes
- Biological catalysts which lower the activation energy without affecting body temperature

Heartbeat
- SA node → AV node
- Nerves and hormones
- Adrenaline

Capillaries
- 1 cell wall thick
- Exchanges
- No valves
- Low pressure

Artery
- Thick valves
- No exchanges
- No internal valves
- High internal pressure

Penicillin
- Alexander Fleming
- 1928
- Fungi grew in petrie
- WW2: purify it → resistant bacteria

Pathogen
Virus or organism causing disease

Virus
- Eukaryotes
- Proto zoa, fungi, worms

Bacteria
- Prokaryotes

HIV
- Human immuno deficiency virus
- → AIDS
- Attacks helper T
  - Communicator
  - Tells which cells should reproduce, i.e. antibodies
  - HIV → can't communicate

AIDS
- Causes
  - Lack of education
  - Lack of medical facilities
- Transmission
  - Blood
  - Sexual fluids
  - Body fluids
- Social implication
  - May be discriminated

Ventilation
- Breathing
- Maintaining CO_2, O_2 levels in lungs

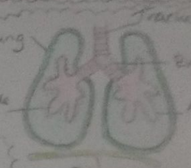
Why do we need ventilation?
- Our bodies are thick, air can't diffuse in
- To maintain correct levels of oxygen in blood and lungs

Cell respiration
- Biochemical pathway
- Breaking down glucose → ATP

Inspiration
- Diaphragm contracts ↓
- External intercostal muscles contract
- Pressure inside decreases → volume increases
- EXPIRATION: opposite

Gas exchange
- To supply body tissue with O_2
- To remove CO_2 from body tissues

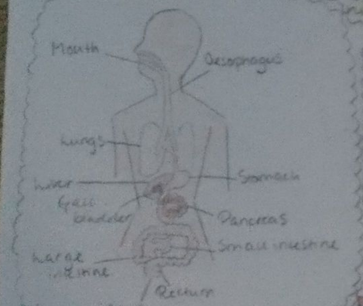
Alveoli
- Single cell layer
- Dense network of capillaries
- Many alveoli
- Fluids to avoid sticking together

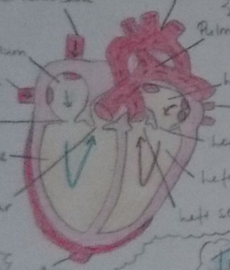


Absorption
- Food → body → cells, body tissue
- Villi, small intestine

Assimilation
Food molecules → part of body

Alimentary canal
Mouth → oesophagus → stomach → small intestine → large intestine → rectum





Coronary artery
supply heart with blood with oxygen and nutrients

Heart movement
- Atria collects blood
- Atria contract → atrioventricular valves open
- Blood → ventricles
- Ventricles contract → semilunar valves open
- Blood → arteries
- Semilunar valves close

Antibiotics
- Effective against bacteria
- Viruses inhibit eukaryotes → not affected by antibiotics

Skin
- Dead cells → virus cannot inhibit

Mucous membrane
- Produce sticky membranes → pathogens are trapped
- Cilia helps move the pathogens out again

Antibody production
- B cells / B lymphocytes
- White blood cells are produced by bone marrow
- Antigen identified → specific antibody identified
- B cell clone by mitosis
- Antibodies circulate → find and eliminate pathogen
- Memory cells created for future encounters

Antigens
- Molecules recognized as 'non-self'
- Antigens are proteins on top of invaders
- Most pathogens
  - Several antigens

Antibodies
- Protein molecules
- Produced in response to specific antigen

Transported by blood
- Nutrients
- Oxygen
- Carbon dioxide
- Hormones
- Anti-bodies
- Urea
- Heat

Vein
- Thin walls
- No exchanges
- Internal valves
- Low internal pressure

Stomach
- Acidic - kill bacteria + food poisoning
- Acidic → optimum pH for enzyme pepsin

Blood
- Plasma
- Erythrocytes (red blood cells)
- Leucocytes (white blood cells)
- Platelets

Unidentified reaction
- Leucocytes (white blood cells) fight pathogens
- Macrophage:
  - Ingest invaders through phagocytosis
  - Lysosomes chemically digest
- Macrophages are flexible and can move around
  - Can meet invader in body tissue

Small intestine
- Enzymes from pancreas
- Absorption of food particles from digestion
- Villi

Large intestine
- Undigested - carry along
- Absorption of water
- Faeces created
- E. coli live here
- Produces pepsin → digests polypeptides and amino acids

Neurons
Dendrites, Axon, Nucleus, Cell body, Nodes of Ranvier, Myelin sheath, Synaptic terminals

CNS - brain and spinal cord

Sensory information - veins
→ motor neurones with response
→ muscles

Nervous system
- Central nervous system
- Peripheral nerves

Neurones carrying electrical impulses

Action potential
when a neurone is conducting an impulse

Resting potential
when a neurone is not conducting an impulse

Synaptic transmission
1. Action potential arrives
2. Vesicle fuses with plasma membrane
3. Neurotransmitter is released into synaptic cleft
4. Neurotransmitter binds to receptor

Diabetes
- I
  - Childhood
  - β cells destroyed by immune system → almost no insulin produced
  - Solved by injection
- II
  - Later in life
  - Receptors don't respond to insulin
  - Well-balanced diet

Glands releasing hormones

Homeostasis
- Stays within certain limits
  - Temperature
  - Blood glucose concentration

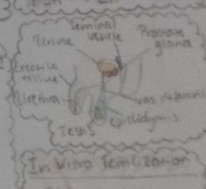
Adrenalin in blood
Adrenal gland

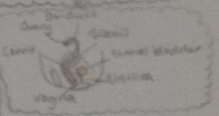
Feedback system
Helps monitoring levels of variables and correct changes.

Follicle stimulating hormone = FSH
Luteinizing hormone = LH
FSH → LH → Oestrogen → Progesterone

Hypothalamus
- Biological thermometer in the brain
- Too warm
  - Increased activity in sweat glands
  - Dilation of blood vessels
- Too cold
  - No sweat
  - Tightened arrectoles
  - Shivering → friction

Blood glucose concentration
- Above set point
  - β cells → insulin
  - Insulin → body cells opened to diffusion of glucose
- Much glucose entering liver
  - Converted into glycogen → lowered glucose
- Below set point
  - α cells in pancreas produce glucagon hormone → more glucose out





In vitro fertilization
- FSH
- Egg collection
- Fertilization
- Embryo implanted
- Issues
  - Infertility - children passing it on?
  - Embryos killed?
  - Designer characteristics

Journey
Sperm produced in testis →
→ maturing in epididymis
→ carried along vas deferens
→ prostate gland: fluid to neutralise (vagina acidic) →
→ ejaculation

Effects of testosterone
- Pre-natal development of genitals
- Sexual change during puberty
- Maintains sex drive