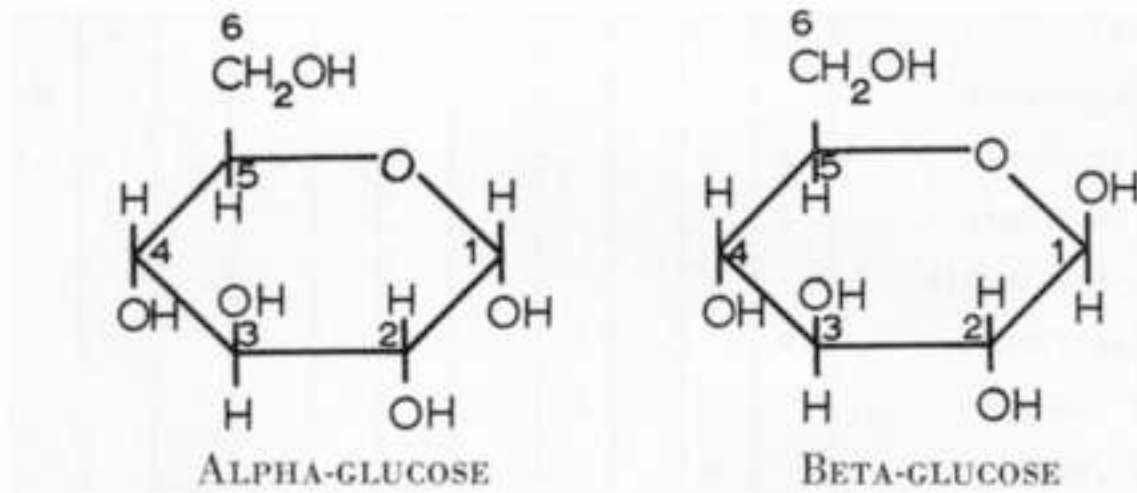


## Risk perception

- We get scared by things we don't understand
- And can't control
  
- Monosaccharides:
  - Glucose: hexose sugar, below



- Galactose- mainly in milk.
- Sucrose- found naturally in fruit, honey and veg

## Disaccharides:

- Maltose: 2 x glucose molecules. Found in germinating seeds.
- Lactose: Glucose + Galactose
- Sucrose: Glucose + fructose

## Polysaccharides

- Form glycosidic links in condensation reactions
- Starch in plants
  - Amylose (straight) + Amylopectin (forked)
- Glycogen in humans
  - Lots of branches, like amylopectin
  - Stored in the liver
    - Both insoluble storage units
    - Both high energy

- Cellulose
  - Insoluble, dietary fibre
  - Straight chain. multiple glucose molecules

## Lipids

- 3 x fatty acids, one glycerol
- Saturated without double bond, unsaturated with
- Insoluble
- High energy
- Good insulator
- Combine with phosphate group to produce phospholipids

## HDL

- High density lipoproteins
- Made from unsaturated fats
- Takes cholesterol to the liver for break down
- Good

## LDL

- Low density lipoproteins
- Transport cholesterol to cells, binding to LDL receptors
- Too many LDLs overload receptors, causing cholesterol to be deposited in vascular tissue, forming atheromas.
- Bad

## BMI

- $\text{Weight in kg} / (\text{Height in m})^2$

## Proteins

- Multiple amino acids
- Joined by condensation reactions to form peptide bonds
- Structure
  - Primary: Order of amino acids
  - Secondary: alpha helices or beta pleated sheets, held by H-Bonds
  - Tertiary: Folding due to disulphide bridges, h-bonds and ionic bonds.
  - Quaternary: Multiple proteins in one, e.g. haemoglobin
- Haem is a prosthetic group (non protein)

Blood pressure = hydrostatic pressure (pressure exerted by a liquid)

- Systolic/ Diastolic (Contracted/ Relaxed)
- Greater peripheral resistance = Greater blood pressure
- High blood pressure = hypertension
- More likely to damage vessels
- Can cause OEDEMA
  - Tissue fluid forced out of the blood by high pressure and cannot get back in at venous end
  - Often associated with left sided heart failure

Risk factors:

- Hereditary
- Age related
- Gender related
- Stop smoking (hypertension, reduced O<sub>2</sub> in blood, damage to epithelium walls from CO)
- Do exercise: raises HDL levels, reduces likelihood of diabetes and lowers body mass
- Antioxidants prevent free radical damage (causes senescence and cancer)
- Lower salt intake; salt increases fluid in the blood, raising pressure & CHD risk
- Stress
- Alcohol consumption raises blood pressure, increases fibrillation and obesity. LDLs may also be created from ethanal.

Diet

- Low salt
- Low sat fat
- High unsat fat
- Soluble fibre
- Low cholesterol
- Fruity & veg for antioxidants & soluble fibre
- Oily fish ( for unsat fats)
- Sterols and stanols lower blood pressure

Drugs

- Anticoagulants such as aspirin or clopidogrel
- Statins in margarine

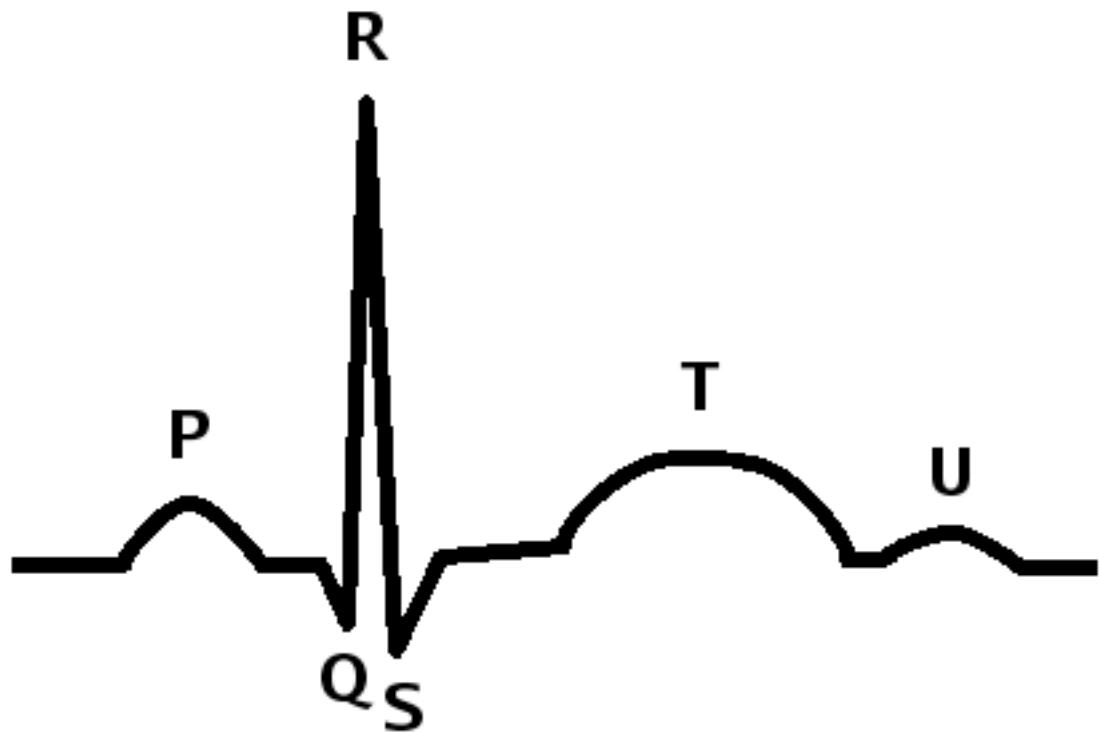
### Surgery

- Coronary angioplasty
  - Small balloon on catheter forces vessels open
- Cardiac bypass
  - Blood vessel, usually from leg or chest, is grafted onto blocked artery, bypassing the blockage

### ECGs

- Can identify tachy- and brady- cardia (high and low heart rates)
- Bradycardia can indicate
  - Hypothermia
  - Ischaemic heart disease
  - Medicine/drug use
- Tachycardia
  - Coronary heart disease
  - Heart failure
  - Anaemia or fluid loss
- Can identify arrhythmias
- And fibrillation
- Areas of damage and irregular blood flow
- QRS complex

- P wave is depolarisation of atrium, leading to atrial contraction



- QRS complex shows ventricular systole
- T is repolarisation of the ventricles

#### The heart's electrical activity

- SAN node (pacemaker)
  - Is controlled by the medulla oblongata via the vagus and sympathetic nerves
  - Generates a signal which spreads across the atrium, causing rapid depolarisation
- AVN node
  - Situated on the non-conducting wall
  - Transmits signal along bundles of his/ purkyne fibres to the apex of the ventricle
  - Depolarisation then spreads upwards

#### Symptoms of CHD

- Angina

- Sharp chest pains and shooting pains down left side
- Caused by build up of lactic acid through anaerobic respiration
- Breathlessness
- Burning chest
- Eventually, risk of **myocardial infarction**, or heart attack, if coronary artery is properly blocked.

#### The threats

- Embolism
  - When a blood clot breaks off and flows in the blood until a smaller arteriole, which is then blocks
- Thrombosis
  - A clot
- Aneurysm
  - Where a plaque leads to a ballooning and often breaking of a blood vessel especially if it is under high pressure.

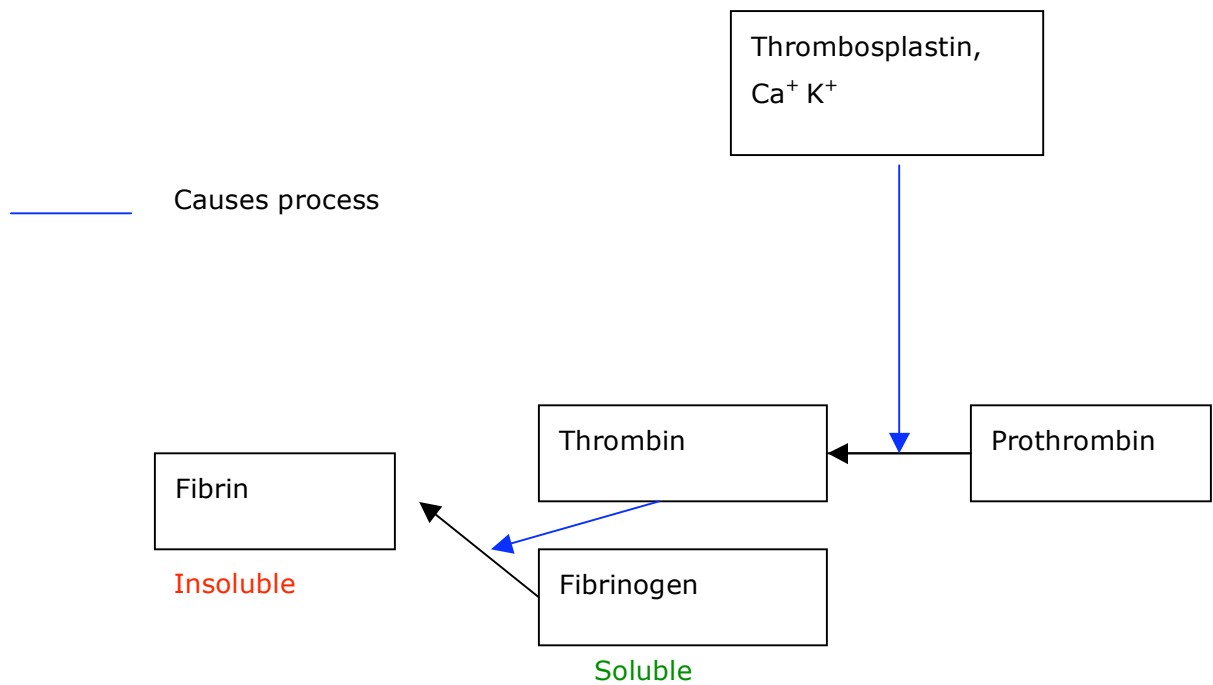
#### Stroke

- Caused when the brain becomes oxygen starved
- Symptoms
  - Numbness
  - Dizziness
  - Confusion
  - Slurred speech
  - Blurred or loss of vision, often in only one eye
  - Paralysis in opposite side of body
- If blood flow is only slightly interrupted, a mini stroke, or transient ischaemic attack may occur

#### Clotting

1. The lining of the lumen becomes damaged
2. The damaged endothelium releases clotting agents (**thromboplastin & Ca<sup>+</sup> K<sup>+</sup>**)
3. A cascade of chemical changes occurs, with soluble fibrinogen being convert to insoluble fibrin
4. A platelet plug forms, causing a clot, or **thrombosis**.

**thromboplastin & Ca<sup>+</sup> K<sup>+</sup>**



### Atherosclerosis

1. The endothelium becomes damaged
2. There is an inflammatory response, caused by the cessation of NO production, which causes monocytes to leave the blood to become foam macrophages in the endothelium. These accumulate LDL, or 'bad cholesterol'.
3. An atheroma is therefore formed
4. The atheroma hardens into a plaque as calcium salts and fibrous tissue build up.
5. This narrows the artery, raising blood pressure and creating positive feedback.

### The heart

- One complete sequence of filling and pumping out of blood is called a cardiac cycle
- Three stages:
  - 1.1. Atrial Systole
    - The atria contract, forcing blood through the atrioventricular valves into the ventricles
  - 1.2 Ventricular Systole
    - ventricles contract from the base of the heart upwards
    - AV valves are forced closed
  - 2.1 Diastole
    - Both atria and ventricles then relax
    - Elastic recoil lowers pressure in both chambers
    - Semilunar valves are forced shut to prevent backflow
    - Low pressure in the atria helps draw blood in from the veins

It is the sound of the closing of the AV and semilunar valves that create the heartbeat.

## Vessels

<b>Arteries</b>	<b>Veins</b>
Narrow lumen	Wide lumen
Thick walls	Thin walls
More collagen, elastic fibres and muscle	Less collagen, elastic fibres and muscle
No valves	Valves
High pressure	Low pressure

Both have:

- Endothelium
  - Made from epithelial cells
  - Inner layer of cells in the lumen
  - Sensitive to damage
  - Prevent blood from touching the muscle and elastic tissue
- A tough outer coat made from connective fibres and collagen

Capillaries are only a single epithelial cell thick, allowing easy diffusion in and out of them.

Blood flow

- Arteries
  - Stretch during systole
  - Contraction in sections during diastole forces blood along
- Veins
  - Blood flow aided by the contraction of skeletal muscle through movement
  - Valves prevent backflow
  - Lower pressure

Why have a heart? (Circulatory System= Mass flow system)

- If you are too big for diffusion to provide you with oxygen and water
- Closed circulatory system
  - Allows high pressure by using narrow tubes
  - Valves ensure unidirectional flow of blood
    - Single circulatory system



- E.G in fish
  - Heart → Gills → Body → Heart
- Double circulatory system
  - E.G in mammals
    - Heart → Lungs → Heart → body → heart
    - This means that during a cardiac cycle, blood passes through the heart twice
    - Allowing higher pressure and larger bodies/ high BMR