# Week 1 - Tissue Histology

- There are 4 different types of tissue:
  1. muscle
  2. epithelial
  3. connective
  4. nervous (neural)

## Muscle Tissue

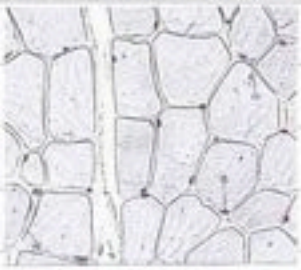
- this is skeletal muscle, it's usually parallel in shape and are multinucleated (developed from multiple cells that are fuse

- those striations are called sarcomere → basic unit of muscle

- skeletal muscle cannot join together; they join to bones via tendons

- In the sarcomere, it's the actin & myosin that interact which results in a contraction
- the organelles of a muscle cell/fibre are located at the periphery, so it doesn't interfere with the contraction of the cell

- In the cross section, you can see that the nuclei are at the periphery of the cells
- the capillaries & connective tissue can also be seen in the cross section view (between the cells



(cross section)

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(longitudinal)

- This is smooth muscle, it's present for a majority of our organs
- It has no sarcomeres & no striations (∴ smooth)
- they have a spindle shaped cells (fusiform)

∴ can see them better in a cross section.

- some nuclei of smooth muscle may appear smaller or thicker, however that's due to the way it's been cut

(mostly longitudinal)

- can see in this view that some appear long and some appear round → this is because the muscle cells aren't all lined up parallel → resulting in some being cut longitudinally and some being cut as cross section

- smooth muscle have a single nucleus
- In the longitudinal cut, the cell membrane is not visible, as a specific stain would have to be applied

- If some cells appear to be lacking a nucleus, again it's because of the way it's cut

(cross section)

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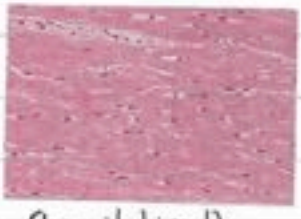
(longitudinal)

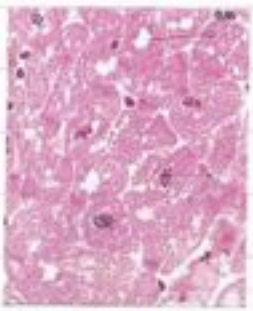
- this is cardiac muscle, only found in the heart
- these also have striations

- the "D" is indicating the intercalated disks → split between different cells (as shown in the longitudinal cut) → allowing one cell to communicate with a bunch of others

- the electrical signal carries through the same as in skeletal muscle but does so via the intercalated disks



(longitudinal)



(cross section)

has holes in which charge can pass through without the need for a vesicle with a neurotransmitter to diffuse through

- this results in faster communication between cells → which is needed in order for the entire chamber to contract in unison
- In the cross section, the centrally located nucleus is visible

# Epithelial Tissue

- this is the tissue that lines & covers everything e.g. skin, oral cavity, nasal cavity, respiratory airways (trachea), gastrointestinal tract (oesophagus).

- not all epithelial tissue looks similar
- they have various function & roles:

① protection → eg. skin
② absorption → in digestion of food
③ filtration → eg. kidneys
④ excretion → in the gut
⑤ secretion → mucus glands in the GI tract

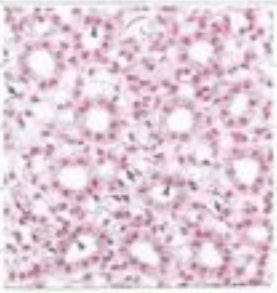
- there are also various different types:


- simple → 1 cell layer thick
- squamous → cells are flattened (including the nuclei

- this means that cross section they would appear thin, but in a longitudinal cut they would appear large and spread out

- cuboidal → cells look like cubes
- columnar → cells look like columns (including the nucleus)

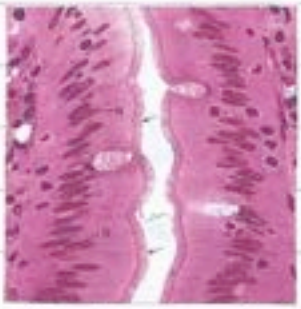
- all epithelia sits on a based membrane (collagen or proteins), which are themselves extracellular material (ECM)
- It helps epithelium to attach to the extracellular matrix (acting as glue)
- the base membrane has different levels of permeability (how much material can pass through). It can also be impermeable
- It can also serve to connect epithelial tissue together eg the epithelia of alveoli & capillaries for $O_2$ exchange (there's no connective tissue inbetween)



(simple epithelia)

- the arrow heads ▲ are showing simple columnar cells
- the arrows ↑ are showing much flatter cells → simple squamous and simple cuboidal cells

- the diagram on the right shows elongated cells → simple columnar epithelium

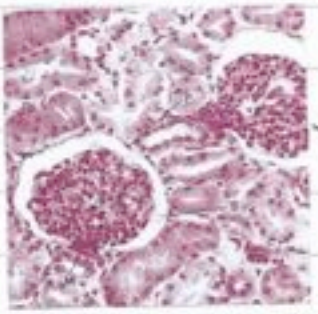


(simple columnar)

(simple epithelia)

(simple squamous)

(simple squamous)



(simple squamous)

- the black spots are macrophages → carbon particles taking up the waste.

this is the glomerulus, where filtration occurs, it's where the afferent and efferent arterioles met, the whole structure is located inside the Bownan's capsule

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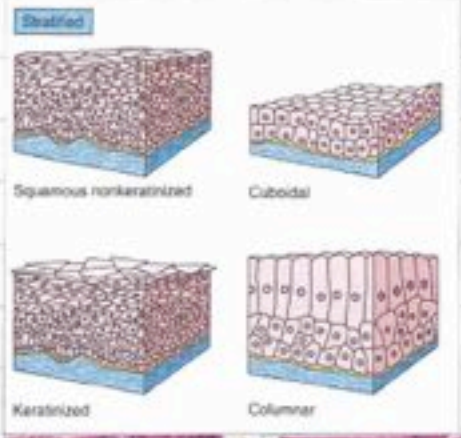
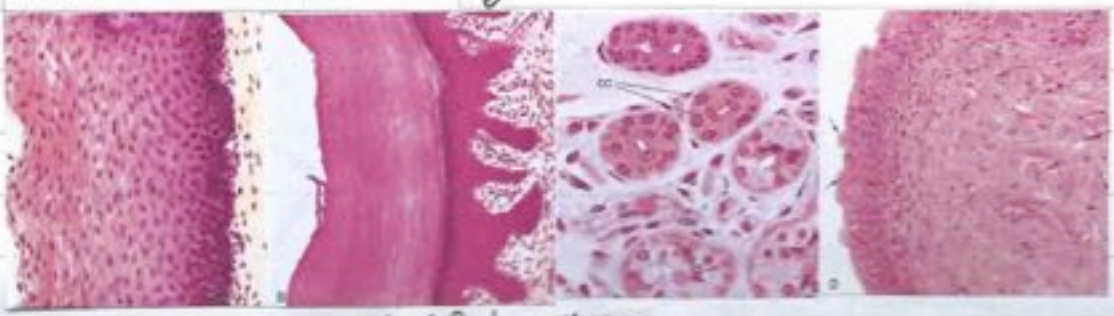



- Stratified → more than 1 cell layer
- the arrows on the pictures are pointing to the edge of the surface (where it's more obvious
e.g. in the oesophagus there needs to be multiple layers for mechanical protection from food



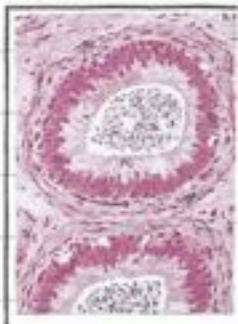
- the skin is considered an organ as it contains 2 or more tissue types
- there is a layer of dead skin which is packed with keratin
  ∴ It's keratinised stratified epithelia

- stratified cuboidal and stratified columnar is usually more than 1 layer thick, unlike stratified squamous

- epithelial cells have tight junctions, however in order for them to have a stretching ability e.g. bladder when empty vs. full, there would have to be small gaps between the junctions, giving them a domed shape for epithelial surfaces:

- and also there would be a lot more layers when it's not stretched → the cells can essentially slide on each other

(resting) (stretched)




- pseudostratified → are like simple epithelum, looks like stratified epithelium, however each of the cells are close together and overlapping

- this type of epithelial tissue would appear in goblet cells → produce mucus

(pseudostratified epithelia)

- In this picture we can see that not all cells reach the surface, however all have to be attached to the basement surface
- these cells are overlapping each other → some of the ones that have reached the surface, have the rest of the cell burried under the others till it's attached to the base