

# Week 10 Lecture 1

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## 1 Administrative drivel

- Last day to pick up exams
- Lecture images through respiration are posted
- The review sheet through respiration has been posted – to be updated up till wednesday
- Those with 100% on the term papers, submit without revision

## 2 Defence and repair – immune system

- **Chemical barriers** – review
  - Oils
  - Salts
  - Saliva – lysozyme
    - \* Dodgs have a lot of lysozyme, so getting licked can be beneficial
- **More chemical barriers**
  - **Acid** – secreted by the stomach
    - \* Hydrochloric acid chemically rips apart pathogens
      - Cells in the walls produce this acid
      - also assists with digestion
      - Allows pepsidogen to be broken into pepsin – beginning of protien digestion, then finished in the small/large intestin
      - the stomach also mechanically breaks the food down
      - The stomach mainly functions for the storage of food (so you don't have to eat constantly exposing you to danger), and
      - the high acid level kills contaminants in food
    - \* pH = 2 (between lemon juice and battery acid)
  - **Helpers** – beneficial bacteria and fungi – “probiotics”
    - \* Large populations in the gut outcompete pathogens
      - makes it harder for outsiders to get a foothold
    - \* Glycogen secreted within the vagina promotes *Lactobacillus* bacteria, which consume glycogen and convert it back to lactic acid
- **Oh no** – the barrier is breached
  - Damage to the skin give pathogens acces to your insides
  - Need to build the walls back up

- Wound repair: – what needs to happen
  - Stop blood loss
    - \* Clotting does this
  - Remove damaged and dead cells
  - Destroy any pathogens that got in
    - \* battle.
  - Reconstruct the barrier
    - \* epidermis grows back in along with some scar tissue
- Stop blood loss:
  - 1. **Vasoconstriction**
    - \* min continuing blood loss
  - 2 **Platelet** activation
    - \* Platelets stick to the injury site
    - \* platelets change shape, becoming sticky
    - \* platelets trigger clotting proteins
    - \* clotting proteins activate **fibrin** to form a net over the wound
  - 3. **Clot formation**
    - \* Red blood cells get caught in the net
    - \* this clot (scab) plugs the wound, blocking further blood loss
- Remove damaged and dead cells
  - Inflammatory response brings in clean-up cells
    - \* mostly white blood cells
    - \* fight infection and remove damaged or dead cells
- Inflammation:
  - 1. Damaged cells release chemical messengers
  - 2. this signals other cells (mast cells) which send a response (histamines)
  - 3. Which leads to vasodilation (the swelling of the capillaries)
    - \* This allows larger gaps in the wall to form, allowing white blood cells and fluid into the surrounding tissue to do battle
    - \* The fluid that gets out of the capillaries causes swelling
  - 4. More signals from the damaged cells trigger Phagocytes
    - \* macrophages, neutrophils – white blood cells
- **Phagocytes:** – type of white blood cell
  - **Macrophages and neutrophils** (phagocytes) can get out of the capillaries near the injury site and into the damaged tissue – they can move on their own!
    - \* each attack and kill in specific ways
    - \* macrophages are the most numerous, and engulf many pathogens into an internal vesicle, bring digestive enzymes in a separate vesicle to them, and digest them
    - \* neutrophils are suicide bombers, engulfing the pathogen and killing themselves, releasing chemicals that kill nearby cells

- 1. Mast cells detect injury to nearby cells and release histamine, initiating inflammatory response
- 2. Histamine increases blood flow to the wound sites, bringing in phagocytes and other immune cells that neutralize pathogens.
- Phagocytes die, turning into pus
- pimple == dead phagocytes after fighting a bacterial infection of an oil gland in a hair follicle
- Bacteria are everywhere in the environment, so generally some enter in a wound, thus, usually some to kill off.
- Reconstruct the barrier
  - Reconnect the vasculature
    - \* remaining capillaries grow toward the wound site, and toward each other
  - Rebuild the physical structure
    - \* epidermal cells reconnect under the scab
    - \* extracellular collagen protein gets deposited into the wound site under the epidermis
    - \* repair collagen is slightly different in structure and arrangement than normal skin collagen – **scar**