

# Week 10 Lecture 0

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## 1 Administrative drivel

- Exams are here!
  - curve: 26.5
  - mean: 48.5

## 2 Defence and repair – immune system

- Note: this is a simplification compared to real world immunology!
  - at least we'll get to see some gross images.
- There's no one organ in the body that's responsible for immunity.
- There are 3 main systems that act mostly independently with some coordination
- The structure of organisms allow to distinguish between “me” and others – i.e. the body knows what cells are its own
- Recognizing the difference between self and not-self is the **basis for immunity**
- there are non-self organisms that the body wants to keep around, cause they're helpful, but for our purposes we'll ignore them.
- You have around 10 or 20 trillion cells, and the immune system can recognize them. Cells that are not yours do not have markers that the immune cells will recognize as belonging to you!
- further, non-self cells have markers on their surface that identify their particular type, allowing the immune system to specialize its response against that specific kind of non-self cells.
  - this can take weeks to develop
- There are more immediate responses the body can mount
- clicker q: what is not a pathogen?
  - roundworms – this is a parasite and a pathogen
  - bacteria that can only live in the soil – this one is not
  - yeast in the cheek
  - influenza
- Who wants in?
  - Foreign invaderse:
    - \* parasites

- \* bacteria
- \* viruses
  - a bit unusual, as they need to invade a cell to copy themselves
  - typically not considered living
- \* fungi
  - e.g. ring worm or yeast infections
- a **Pathogen** is a disease-causing organism, usually microbe
- Note, most bacteria are beneficial or neutral, and some viruses are beneficial or neutral.
  - \* So, it's not a good idea to try to get rid of all of these things
- What is “IN”?
  - pathogens have to enter the body
  - things on the surface don't tend to cause many problems
  - Consider the donut – a short tube of tissue
    - \* we take the top of the hole as the mouth, and the bottom hole to be the anus
    - \* Only the yummy bits past the glaze that is considered *inside* – this is where the pathogens wanna be
- We inject lots of pathogens, but most of them get killed in the gut, or are passed otherwise
- If they make it through the walls of the gut or through the body surface, then you have an infection
  - likewise with the lungs – the pathogens must make it through the walls of the lungs to infect
    - \* e.g. tb eating the walls of the alveoli
- Maintaining the **ME** / **NOT ME** barrier:
  - There are 3 lines of defense
- Innate immunity:
  - Generalized defense against a general enemy
    - \* 1. physical barriers – first line
    - \* 2. recognition of “non-self”, but not specifically who the invader is – second line
- Acquired immunity
  - *Specific*, trained defense against a *specific* enemy
    - \* recognition of a **unique** invader
    - \* not just which species of invader, but also which *strain*
- Physical barriers:
  - Skin! – the epidermis is made up of (largely) dead cells filled with keratin
    - \* New cells migrate to the top of the skin, where they die, completely filled with keratin, and get densely packed
      - these cells also secrete lipids (from the sebaceous glands, specifically sebum) conditioning the skin (keeping it from drying out and cracking) – this oil is also not pleasant for most micro-organisms, as it's hydrophobic (it's hard to survive without water)
      - The tight packing (along with adhesion molecules holding the cells together) makes it hard to get between them into the tissues.
    - \* keratin is not a good diet for micro-organisms (usually), so they tend to not survive
    - \* keratin is hydrophobic, so it's dry

- \* further, the top layer gets shed off constantly, so the would-be invaders get sloughed off
- **Cilia** (tiny hair-like projects in the nose and respiratory tract beat and move particles trapped in mucus (snot) towards exit (nostril, or goes into gut))
  - looks kind of like shag carpet
  - moves in a coordinated fashion, moving the mucus up and out
- Skin has to open in a few places:
  - mouth, nose, anus, urethra, vagina
- **Chemical barriers** defend these openings
  - Openings are lined by mucous membranes that have the following:
  - **Oils** – secreted by oil glands in the skin
    - \* Forms a hydrophobic film over the skin – pathogens slide off and can't penetrate
    - \* keeps the skin from cracking
  - **Salts** – secreted by sweat glands and tear glands
    - \* Salty env is not tolerated by many pathogens (high salt outside bacterial cell causes water to diffuse out of those cells)
  - **Saliva** – secreted by salivary glands
    - \* contains an enzyme called **lysozyme**, which breaks open bacteria
    - \* lysol does the same things as this enzyme
- smell or appearance of food is also a defence – senses:
  - rotten food tends to smell or look funny