Week 9 Lecture 0

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1 Administrative drivel

- New due date for term paper revisions: Due Mon, Nov. 8 11:59pm
- Date for **final exam** Thurs Dec 16th at 4:30pm

2 Anatomy and Physiology

2.1 Respiratory system

- The surface area in the lungs is larger than the average house
- Parts of the alveoli:
  - Alveolar duct, blood vessels, lumen of bronchiole, alveolar sac
- in the lungs in the alveoli, the boundary between the alveoli and the capilaries is 2 cells thick (1 cell thick in the alveoli and 1 cell thick in the capilary)
  - once again, diffusion over short distances is quick, long distances are slow

2.1.1 Breathing

- Clicker q: what is the beneefit of lots of tiny little alveoli for gags exchange instad of just a single big sack of a lung? Lots of alveoli means larger surface area for gas exchange.
- When we breath, we're moving air (a fluid)
- Fluids flow from areas of high pressure to areas of low presure, i.e. fluids flow down a pressure gradient
- Breathing = adjusting lung pressure so that air flows down the pressure gradient into or out of the lungs.
- We adjust the pressure by adjusting the volume of the thorasic cavity
- Pressure:
  - **Atmospheric pressure:** 760 mmHg (sea level)
  - **Inhilation**: making pressure in alveoli lower than 760 mmHG, an air will flow in
  - **Exhalation**: Make pressure in alveoli higher than 760 mmHg, and air will flow out
  - How to adjust pressure in the alveoli:
    - Adjust volume and pressure follows (increase volume, pressure decreases, decrease volume pressure increases)
- Inhilation:

  - To cause air to flow into the lungs, lower the air pressure in the lungs below atmospheric pressure
  - it lower pressures in the lungs, increase the volume of the lungs
  - Muscles (between ribs, external **intercostal** muscles) surrounding lungs pull outwards (and up) and downwards (diaphragm muscle)
  - only mamals have a diaphragm: it coverse the botom of the ribcage
  - a "stitch" in the side is a cramp in the diaphragm!
- Exhalation:
  - done by raising the pressure in the lungs by decreasing the volume
  - Muscles surrounding the lungs relax, elastic nature of lungs shrinks their volume
  - and, forced exhalation also involves **internal intercostal** muscles
  - this control allows us to talk, sing, blow out candles, etc.
  - diaphragm relaxes into the domed position, helping decrease the volume of the lungs
- note: the diaphragm is not esential to breath, but helps with controlled breathing
  - Birds and reptiles breath just fine without them
- CLicker q: in order to exhale the pressure in the lungs has to be greater than 760 mmHg
- **Breathing control**
  - Unconscious control over the diaphragm
  - controlled by the brain stem – majority of nervous control
  - Generally gives aboout a 2 second contractiono, followed by 3 seconds of relaxtion, a bit on the fast side but generally 12-18 breathes/min
  - Can be overridden by higher brain function