Week 6 Lecture 1

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1 Administrative drivel

- Exam next friday. Covering from stuff just after exam 1 till what we get to on Wednesday.

2 Anatomy and Physiology

2.0.1 Bones

- Repair:
- Left off talking about what happens when you break a bone.
  - It's been found that bones can be lengthened by breaking and allowing it to begin to regrow, then pull the end further apart and repeat.
- Biomechanics:
  - Bones have neat properties, cause they're strong
  - Bones are moderately good at tension, great at compression, and TERRIBLE at torsion
  - Tensile forces pull the bone from both ends, but usually modest amounts of force (body weight of individual)
  - Compressive forces tend to be much greater than tensile forces.
  - A femur can take 17k lbs of compressivev force!
  - Bone is made up of calcium phosphate used to make hydroxylapatite, collagen
  - calcium minerals are very strong under compesive forces, and crumbles under torsion and tension
  - Collagen is strong under tension and torsion, and bends under compression
  - bone is a composite material, making it very strong
- Bone health – exercise and nutritionn
  - Since bone is a living tissue, it responds to activity
  - so, if it undergoes stronger forces, it will become stronger (from bone repair)
  - Daily activity (mechanical stress) keeps bones at the level required for the acctivity
  - Sedentary lifestyle leads too less bone density
    - more porous (more spongy bone)
    - more brittle
  - Active live leads to more bone deensity
  - Calcium and vitamin D intake is essential for bone health
  - Calcium tipically comes from meat and leafy green vegetables

  - Bone loss start to occur after around age 50, ,more exaggerated in females once menopause has occured, wmen are more vunerable to osteoporosis, = moroe fragile bones, increased resk of fracture / damaga in old age
  - Bones density continues to increase till 20s, then steady out till 50s, then steadily declines
  - excess calcium is excreted in the urine
- cartilege and collagen are not the same thing, but they are similar
- clicker q: what to osteoclasts do? Dissolve bone minerals
- end of bones

2.0.2 Muscles

- Muscles are contractile tissues – the change their length
- kinds: smooth, cardiac, and skeletal (striated)
- here we'll look at skeletal muscle tissue
- Antagonism pair
  - Opposite sets of muscles result in opposite motion – called extensor/flexor pairs, e.g. tricps/bisseps
  - each pulls other back to full length
  - **Tendons** connect muscles to bone (accross a joint)
  - **Ligaments** are bone-bone connections
  - tendons and ligaments are similar, be tendons have extra things like nerves that communicate to the nervous system how much force is going on
  - mmuscles can only contract, so they can only pull, not push
- structure of muscle
  - Most of the action of contraction happens at a microscopic level
  - tendon on one end
  - Theere's a sheath around a bundle of fibres, which makes up the muscle which is made up of fibers, each of which is a muscle cell
  - muscle cells are multicelluar, they start as many, then fuse into the long strand
  - in between the fibers are mitocondria
  - there's a sarcoplasmic reticulum corresponding too each strand, and is similar to the smooth ER; critical in muscle contraction
  - Each muscle cell is made up of long tubes called myobibril, which is made up of many repeating segments.
  - each segment is called a sarcomere, which is the part of the muscle that actually contracts!
  - two protiens that do the contraction:
    - Thin filament (actin) – looks like beads on a string (the string is the actin), 2 twisted together, attached to the ends of the sarcomere
    - Thick filament (myosin) – looks like a golf club, all stacked side by side
  - the more sacromeres stacked side by side, the stronger, the longer the stack end by end, the faster the contraction
- Clicker q: what is a sarcomere? A unit of contraction
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