

Lecture 30

Sunday, July 18, 2021

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mTOR part 3

- Immune/chemicals
 1. Go exercise and you'll release a bunch of arachidonic acid (via phospholipase A2)
 2. Arachidonic acid is a substrate for COX, so you synthesize a bunch of prostaglandins
 3. Prostaglandins signal the MEK-ERK pathway
 4. MEK-ERK and mTOR "cross-talk"
 5. You grow
- mTOR can be activated by immune/chemicals
 - o Inflammatory/immune activation of cell surface receptors: prostaglandins, interleukins 2 and 15, interferon γ , reactive oxygen species, Wnt proteins, TNF α , myostatin (negative regulator); works through MAPK and PI3K
- mTOR can be activated by mechanical tension
 - o Your mechanoreceptors are sensing the weight of the load, the duration of tension, speed of contraction, positions, angles, and everything else quantifiable
 - o That information (characteristics of the load) gets converted into chemical and electrical signals that trigger the cascades that result in protein synthesis
- Structural proteins called "mechanoreceptors" that do the detecting
- They collect information about whatever activity you're doing
- Intercellular load --> cadherins --> cytoskeletal architecture
- Intracellular load --> titin --> cytoskeletal architecture
- Extracellular load --> **integrins** --> cytoskeletal architecture
- Cytoskeletal architecture --> functional response
 - o Signaling
 - o Excitability
 - o Impulse propagation
 - o Contractility
 - o Gene expression

- Functions of titin:
 - Longitudinal axis stabilizers of myosin
 - Template organizer for myosin assembly
 - Provides elasticity of sarcomere
 - Mechanotransduction
- Integrins and cadherins = transmembrane proteins
 - If you have a multicellular structure, you have cell adhesion molecules
 - Integrins are responsible for cell-to-ECM communication
 - Cadherins are responsible for cell-to-cell communication
 - [Cell signaling cascades]
- 4 pathways
 - PI3K pathway
 - MAPK pathway
 - DGK pathway
 - SACs