

## muscle physiology lecture 32

Interacting enzymes AMPK: metabolic dictator

mTOR: enzyme (kinase) many enzymes influence athletic performance through mTOR. enzymes that enhance endurance metabolism - mitochondrial enzymes, glycolytic enzymes, the enzymes involved in fatty acid metabolism. enzymatic adaptations for strength and hypertrophy - attenuating the activity or reducing the supply of those endurance enhancing and simultaneously catabolic enzymes.

AMPK is an example; it helps regulate the energy status of your muscles during distance running/endurance sports. however, it also phosphorylates (inhibits) rapTOR, which prevents mTORC1 from phosphorylating its downstream targets (p70S6K and 4E-BP1) it also prevents rhb from activating mTOR because it phosphorylates tuberin. there is limited data to support this,

but it also seems to phosphorylate mTOR directly, which seems to impair mTOR signaling. AMPK is considered an important enzyme in cases where there is a deficit of cellular energy because it is able to inhibit metabolic pathways that take up energy and increase mechanisms that produce energy.

<sup>ATP hydrolysis</sup>  
Energy.  $ATP^{4-} + H_2O \xrightarrow{ATPase} ADP^{3-} + HPO_4^{2-} + H^+$ . AMP binding to AMPK

promotes it. ATP binding to AMPK inhibits it. your AMP can be deaminated (by AMP deaminase) to form inosine monophosphate (IMP) and ammonia ( $NH_3$ )

AMPK has two regulatory subunits:  $\alpha$  &  $\gamma$ .  $\gamma$  is where AMP binds and two molecules do that binding. 1st - enhances binding of the

second one. thus makes small changes in AMP concentration elicit a

larger effect on AMPK activation. high levels of AMP activate AMPK

by these three ways - direct allosteric activation of its kinase activity,

increasing activation loop phosphorylation by upstream kinase, and

protection of the phosphorylated activation loop against dephosphorylation.

AMPK can sense carbohydrate levels within the cell as a component of

total stored and available cellular energy because part of its role is to take up carbohydrates. (GLUT4 translocation)