

muscle physiology lecture 36

exertional muscle burning

nervous system - detect and transmit, constantly evaluating environment, detect changes and relay that information to the brain. lookout for noxious stimuli.

external environment (cold, hot, sharp, etc.) internal environment (acidic, inflamed, etc.)

externally sensing it is cold - behavior change to go inside, body makes automatic changes to preserve core temperature. nerve purpose - maintain homeostasis.

pH in blood levels too high or low results in death. nociceptors sense pH. when

too many protons are sensed, the nerve transmits a warning signal and the

brain's reception of that signal feels like exertional burning. pH is not the

only thing that causes muscle pain, but it is the primary thing. the byproduct

of lactic acid, anaerobic metabolism gets blamed (like turkey) common

misconception. glycolysis beginning with glucose, not glycogen because

that would skip the hexokinase step that converts glucose into glucose 6

phosphate. glycolysis beginning from glucose yields no protons while glycolysis

beginning from glycogen consumes one proton. after glycolysis, the

pyruvate can either get converted to lactate (consumes 2 more H^+ ions)

or it can get converted into acetyl CoA. (third carbon released as CO_2)

at the end of the TCA cycle, you will have 2 carbon dioxides (1 from

pyruvate), 3 H^+ ions (1 from pyruvate) (per acetyl CoA) a pyruvate going

through the TCA cycle is responsible for seven H^+ ions. the largest

source of metabolic byproducts that acidifies our tissues - ATP hydrolysis

because it is very active ($ATP^{4-} + H_2O \xrightarrow{ATPase} ADP^{3-} + HPO_4^{2-} + H^+$) hydrogen

ion gets blamed for fatigue more than it deserves. isometric fatigue is

not the same as aerobic fatigue. many things causes fatigue at the

cellular level. Cex: pH, ATP:ADP ratio, phosphate) big picture causes of

fatigue: how much calcium is released from the sarcoplasmic reticulum,

how sensitive the muscle is to that calcium, enabling cross-bridge formation,

how much force the cross bridges can generate, central fatigue.