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The Direct Effects of Lactic Acid and pH in the Glycerinated Muscle Fiber*

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It is well known that muscle fatigue in sprinting is accompanied by an increased concentration of lactic acid (LA) in muscle tissues. We examined the direct effect of LA on the contractile protein system in glycerinated muscle fiber, and observed the following : 1) A decline of tension development in muscle fibers arose with increasing LA concentration (0-30 mM) in the media, involving a pH decrease from 6.8 to 5.5. 2) Keeping the pH at 6.8 in several concentrations of LA, had little affect on tension development. 3) Tension decline was also observed with decreasing pH in the medium, but was slightly milder than the effects of LA and pH together. 4) After soaking in a normal medium, LA-treated fiber recovered tension to a remarkable extent. 5) Tension decline could be prevented with a sucrose solution which preserved the hydrogen bonds in the protein structure.

These facts suggest that LA might denature some parts of the contractile protein apparatus (probably myosin) by decreasing pH, thereby causing muscle fatigue.

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