



Turkish Journal of Medical Sciences

Turkish Journal
of
Medical Sciences

Discrimination Between the Acidic and Molecular Effects of Lactate on Muscle Tension Development

Şeref ERDOĞAN
Sanlı Sadi KURDAK
Nilay ERGEN
Ayşe DOĞAN

Department of Physiology, Faculty of Medicine, Çukurova University, 01330 Balcalı, Adana, Turkey

 [Keywords](#)
 [Authors](#)



medsci@tubitak.gov.tr

[Scientific Journals Home Page](#)

Abstract: Fatigue can be defined as the decrease in the genesis of maximal muscle tension, and it may develop when metabolic end-products cannot be readily washed out. During anaerobic exercises, lactate accumulates in the muscle and blood, resulting in acidic pH in these tissues. Fatigue during lactate accumulation is generally attributed to its acidifying property; however, the inverse effect of lactate on muscle tension also at isopH values may be due to the molecular as well as the acidifying effects of this metabolite. In this study, we aimed to distinguish the molecular and acidifying effects of high lactate, both of which lead to decreased muscle tension development. Muscle tension developing in response to low frequency (0.5 Hz) supramaximal stimuli was recorded in the rat hemidiaphragm preparation. Rat Ringer solution (pH=7.33) was used as the control. Effects of high lactate concentration (high [La]) and acidic pH were evaluated by adding 20 mM of L-(+)-Lactate and 5 mM of acetic acid into the Ringer solution, respectively; pH values of the corresponding solutions were adjusted either by buffering with NaOH or sodium acetate. Records were obtained at pH values of 7.30, 7.00 and 6.50. One way Anova was used for statistical analysis. Muscle tension decreased by nearly 17% at a lactate concentration of 20 mM at iso pH (pH=7.33), and lower pH values resulted in greater decreases in the genesis of muscle tension. However, at the same pH values, recorded muscle tension differed by approximately 14% between the high [La] and acetate treatments, and the effect of high [La] was more evident. High [La] resulted in greater decreases in the developing muscle tension if acidity was increased, but its molecular effects did not change significantly. The inverse effects of 20 mM of lactate on the genesis of muscle tension at nearly iso pH values (pH=7.30-7.00) develop mainly via its molecular influences; on the other hand, its acidifying property predominates when acidity is increased (pH=6.50) but its molecular effects remain almost unchanged. Our findings may lead to the conclusion that acidic and molecular effects of high [La] at these pH values show an additive property and they influence the genesis of muscle tension in a negative manner.

Key Words: Lactate, acetate, pH, muscle tension development

Turk J Med Sci 2002; **32**(2): 121-126.

Full text: [pdf](#)

Other articles published in the same issue: [Turk J Med Sci, vol.32,iss.2.](#)