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Lactate Kinetics during Multiple Set Resistance Exercise

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ABSTRACT

Intensive exercise like strength training increases blood lactate concentration [La]. [La] is commonly used to define the metabolic stress of an exercise and depends on the lactate production, transportation, metabolism, and elimination. This investigation compared multiple set training of different volumes to show the influence of exercise volume on [La]. Ten male subjects performed 3 sets of resistance exercises within 4 separate sessions: Arm Curl with 1 or 2 arms (AC1 or AC2), and Leg Extension with 1 or 2 legs (LE1 or LE2). Each set was performed at a standard velocity and at a previously determined 10RM load. Blood lactate samples were taken immediately before and after each set (pre1, post1, pre2, post2, pre3, post3). Maximum [La] was significantly higher after LE2 (6.8 ± 1.6mmol·L^{-1}) and significantly lower after AC1 (2.8 ± 0.7mmol·L^{-1}) in comparison with the other exercise protocols. There was no difference between AC2 (4.3 ± 1.1mmol·L^{-1}) and LE1 (4.4 ± 1.1mmol·L^{-1}). Surprisingly, [La] decreased during the 3rd set (for AC exercise), and during both the 2nd and 3rd sets (for LE exercise) and increased only during the recovery phases. In contrast to our expectations, blood [La] decreased during the 2nd and 3rd exercise sets and further increased only during recovery phases. However, from the increases observed following the first set, we know that lactate was produced and transported to the blood during our exercise protocol. We speculate that lactate is taken up and metabolized by distal muscle fibres or organs. In addition, as the decreases occurred within a short period of time, blood volume shifts and/or the muscle-to-blood gradient may account for the rapid decreases in [La].

Key words: Muscle-to-blood lactate gradient, metabolism, strength training

Key Points

- Blood lactate concentration [La] decreases during the 2 and 3 set of a resistance exercise program of the leg extensor muscles.
- [La] decreases during the 3 set of a resistance exercise program of the arm flexor