

Relationship of Blood Lactate and Sweat Lactate on Exercise Intensity

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ABSTRACT

Typical procedures for measuring blood lactate involve either finger stick blood samples or venous blood draws. The literature is equivocal regarding whether sweat lactate values change with exercise intensity.

Recently, wearable technology devices have been developed to measure sweat lactate. **PURPOSE:** To examine the relationship between sweat lactate and blood lactate values during incremental exercise.

METHODS: This study consisted of 12 (8 male, 4 female) healthy recreationally active individuals (VO_{2peak} 35.5 ± 7.6 ml/kg/min) between the ages of 18 and 25 (22 ± 2 yrs) who volunteered for the study.

Participants performed an exercise test on a cycle ergometer to volitional fatigue to determine blood lactate, lactate threshold, VO_{2peak} , and peak heart rate (HR). Blood lactate was collected via finger stick at each 3-min stage of exercise. Participants performed a subsequent exercise session at 40, 60, and 80% heart rate reserve (HRR). During the 20-min stages of this test, blood and sweat lactate were collected during each intensity level. Sweat lactate was collected in a sweat "pouch" at each state of exercise. Sweat lactate samples were analyzed via the lactate oxidase method on a Chemwell 2910 chemistry analyzer. Blood lactate samples were analyzed using a Lactate Plus analyzer. Whole body sweat rate was calculated from pre- and post-exercise body weight at each intensity, factoring in water consumed and urine voided.

RESULTS: Sweat rate increased with increasing intensity (40%: 9.66 ± 7.58 ; 60%: 18.10 ± 12.51 ; 80%: 24.32 ± 15.44 ml/min). Sweat lactate significantly differed between 60 and 80% intensities (15.66 ± 5.73 , 12.52 ± 4.44 mmol/L, respectively), $P = 0.03$. Blood lactate levels at 40, 60, and 80% intensities were 2.67 ± 1.15 , 3.60 ± 1.90 , and 4.83 ± 1.52 , respectively ($P < 0.001$). **CONCLUSION:** These findings agree with Buono, Lee, & Miller, 2010 who found sweat lactate decreases as sweat rate increases. It is likely that sweat lactate decreases with increasing exercise intensity due to dilution as sweat rate increases. From this data, it appears that sweat lactate does not demonstrate a relationship with blood lactate that warrants replacing blood lactate in exercise testing with sweat lactate. This may be due to the lactate in sweat originating from eccrine glands and thus is not reflective of muscle metabolism.