

Lactic acid and fatigue in working sheep

DG Martin, E Teleni

Nutritional Physiology and Metabolism Unit, Department of Biomedical and Tropical Veterinary Sciences, James Cook University, Townsville, QLD 4811

In a previous study (1) it was suggested from data on the concentration of circulating plasma lactic acid that fatigue in the working buffalo was probably caused by the accumulation of lactic acid in the muscles of the limbs of the animal. The suggestion was largely speculative as no examination of the flux of lactic acid into and out of, or its accumulation in the limb muscles was undertaken. This study, using sheep as the ruminant model, was therefore conducted to examine the flux of lactic acid across the working hind-limb muscles.

Twelve Merino wethers, aged 2.5 years with a mean live weight of 34 kg, were each installed with indwelling catheters in a femoral artery and lateral saphenous vein to facilitate the sampling of blood perfusing the hind-limb muscles. The animals were subjected to a schedule of work in which each at any one time, was required to pull a draught load equivalent to 11% of its live weight while walking on a treadmill at a speed of either 0.69 m/sec (slow) or 1.00 m/sec (medium) or 1.40 m/sec (fast) for three hours.

Since the fast group was not able to sustain its work load for at least an hour, comparisons between groups were confined to a work period of 30 minutes.

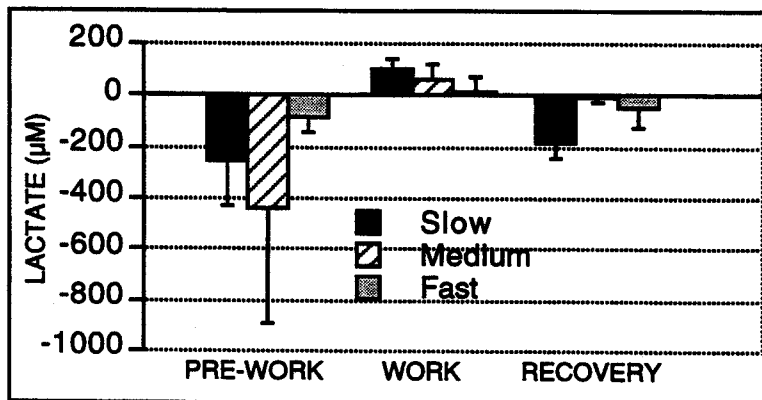


Figure. Mean arterio-venous concentration difference of lactate in plasma of sheep during the pre-work, work and recovery periods and at slow, medium and fast walking speeds. Vertical bars represent standard errors.

The concentration of arterial plasma lactic acid increased during the work period in all groups; being 1.21 mM, 1.85 mM and 3.12 mM in the slow, medium and fast groups, respectively. Before the work period, all animals released lactic acid from their hind-limb muscles. The reverse was the case during the work period when the same tissue took up the metabolite. It would appear that lactic acid might be an important energy-yielding substrate for the working hind-limb muscles. Thus contrary to previous speculation (1), the production of lactic acid by the muscles of the limbs is probably not a significant factor in the onset of fatigue in the working sheep or buffalo.

1. Martin DG, Teleni E. Fatigue in buffaloes on different work loads. DAP Project Bulletin 1989;8:2-6.