EFFECT OF EXERCISE ON PORTAL AND HEPATIC BLOOD FLOW IN LAMBS

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Quantitative assessment of the absorption and uptake of nutrients by the gut and liver requires absolute measures of portal (PVf) and hepatic arterial (HAf) blood flows. In many metabolic studies these flows have been determined by the indicator dilution technique, which requires steady state conditions and cannot measure hepatic arterial blood flow directly. The present study was conducted to examine the effects of exercise on HAf and PVf measured directly in real time.

Five ewe lambs weighing 28-33 kg were housed in metabolism cages and fed to maintenance. Ultrasonic blood flow probes (Transonics Inc. Ithaca, NY) were fitted around the portal vein and hepatic artery. The sheep were exercised on a moving belt treadmill at a speed of 0.7 m/s and inclination of 9° for 1 h. HAf and PVf were measured prior, during and post exercise at 1 second intervals and averaged over five minutes. Measurements were recorded on a datalogger and are presented as a percentage of resting values .

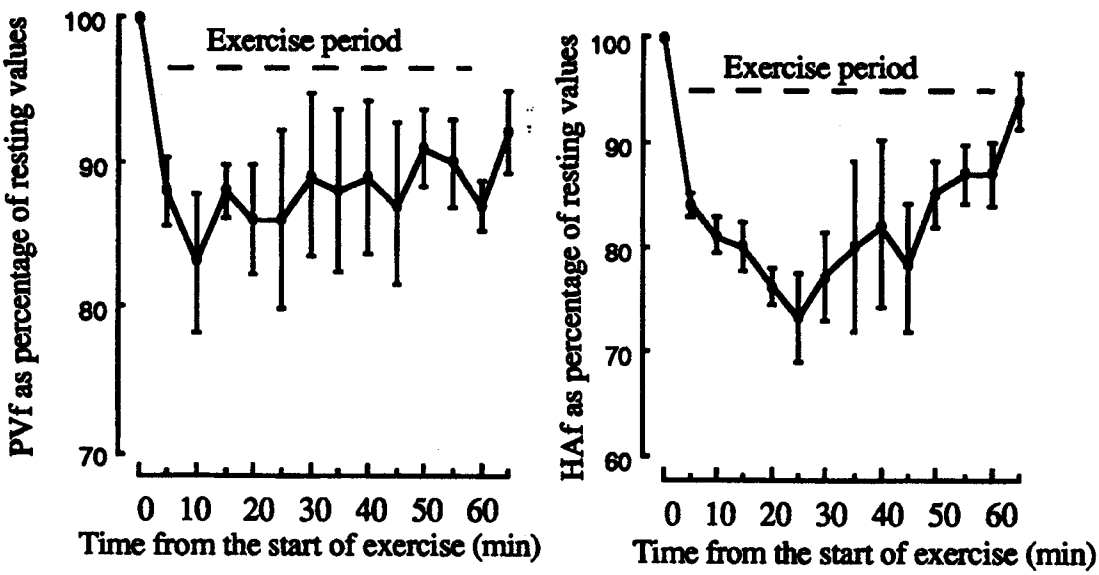

Figure 1. Percentage changes in PVf and HAf during exercise and 5 min post exercise

Mean (± s.e.m.) values for HAf and PVf during rest were 61±2.6 and 1255±120.6 mls/min respectively. These values decreased by a mean of 20% and 13% respectively during exercise and tended to stabilise to pre exercise levels five min post exercise (Figure 1). The decrease in HAf contrasts with the results of Brockman (1987) who measured a three-fold increase in HAf in response to exercise when using the indicator dilution technique. The decrease in PVf and HAf measured in response to exercise in this study would be mediated by changes in the vascular resistances in the mesenteric, splenic and hepatic vasculature. The acute decline in flows at the onset of exercise could be associated with sympathetic stimulation of α-adrenergic receptors in these vessels, while the rebound of HAf towards control values with time may be due to metabolic factors.

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