THE DIFFERENCES OF BLOOD LACTATE CONCENTRATION IN THE TOE, EAR AND FINGERTIP IN RESPONSE TO THE HIGH INTENSITY EXERCISE

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Introduction

The potential implications of blood lactate assessment for endurance performance are well known. Nevertheless, a blood lactate (BLA) concentration in the high intensity exercise is still incompletely understood. Recent studies indicate that muscles and other tissues, such as a heart, liver and kidney, are capable of consuming BLA. Because BLA diffused from muscles is oxidized by other tissues, it is difficult to evaluate BLA concentration in the strenuous exercise, especially. Also, BLA concentration might be different depending on the blood sampling sites. Presently, BLA is mainly taken from the fingertip and earlobe in the sport fields in order to evaluate an endurance performance. A few studies which compared BLA concentration in the fingertip, earlobe and toe at the low-middle intensity exercise have been done, but little attention has been paid to BLA concentration in the high intensity exercise. The purpose of this study was to compare BLA concentrations taken from the toe with that from the earlobe and fingertip in the treadmill running to the exhaustion.

Methods

Six physically active people (Male=5 Female=1, 22.3±3.1yr, 169.1±6.3cm, 62.0±5.0kg) volunteered to participate in this study. Each subject ran on a treadmill at the fixed speed (19-24km/h) until the exhaustion. The BLA was taken from three sites of the body, which included the fingertip, earlobe and toe. In addition, BLA was taken pre-exercise and after 1-min, 3-min, 5-min and 10-min exercise bouts with subjects being in a sitting position.

Results

Subjects ran 89.7±21.2sec on the treadmill until the exhaustion. The maximum BLA concentration of the fingertip, earlobe and toe was 15.8±2.1mmol/l, 14.0±2.6mmol/l, 14.3±1.1mmol/l, respectively. In prior to exercise, BLA in the toe (4.3±0.9mmol/l) was significantly higher than that in the earlobe (2.6±1.3mmol/l) and fingertip (3.0±1.6mmol/l). After 1-min and 3-min exercise bouts, BLA in the fingertip was significantly higher than that in the earlobe (10.4±3.5mmol/l, 12.5±2.8mmol/l) and the toe (10.4±2.7mmol/l, 13.2±1.2mmol/l).

Discussion and Conclusion

The differences of BLA concentrations were seen in the three different body sites both before and after exercise. Although it is difficult to explain the definite reasons for the differences of BLA concentration in the fingertip, earlobe and toe in the high intensity exercise, they may reflect the lactate shuttle. Previous studies mentioned that BLA in active muscles were diffused to veins and oxidized. This might be the reason why BLA concentration in the toe was lower than that in the fingertip after the exercise. However, this explanation is not sufficient because the low level of BLA concentration was also seen in the earlobe. Therefore, the change of blood flow allocation and the oxidization of BLA in each part of body must be examined. In conclusion, the sites of blood sampling should be considered when BLA is employed as the criterion to evaluate the anaerobic capacity.

Keywords: Treadmill, Exercise Biochemistry, Lactate