E41010 Proton Nuclear Magnetic Resonance Spectroscopy of Urine for Rapid Multicomponent Analysis of Exercise Stress

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Purpose: This study was done to assess potential use of proton NMR for rapid multicomponent analysis of urinary metabolites on exercise stress.
Methods: 6 healthy male university students performed exercise with the intensities of 80,60% $\dot{V}O_2$max and exhaustive exercise on a mechanically braked leg cycle ergometer. Urinary samples were taken before and after exercise. Proton NMR measurements were made on a JNM EX-270 spectrometer operating at 270.05MHz in the homogated decoupling mode at 298K.
Results: Within a several minutes and without pretreatment, proton NMR sepectra provided signals of many urinary metabolites, including lactate, pyruvic acid, ketone bodies, amino acids and glucose. The proton NMR spectra of urine after 30minutes of the completed exercise showed large increases in urinary excretion of lactate, pyruvic acid and alanine with exercise intensity risen. The amount of urinary lactate abruptly increased above about 4mmol/l (Onset of Blood Lactate Accumulation) of the serum lactate concentration measured, being agreed well with the results reported so far. On the other hand, the amount of urinary ketone bodies related to aerobic exercise increased with the exercise intensity lowered.
Conclusion: The rapid multicomponent analysis of urine by proton NMR spectroscopy can be a useful tool for monitoring the exercise stress.

Key Words Exercise stress, NMR, Urine, Ergometer

E41011 Validity of Three Line Method Using Race Records -Reconsideration of LT and OBLA and indicator of training-

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【Objective】 The aim of this study was to examine the relation between Lactate Training Point (LTP), which was obtained by analyzing lactate condition by three line method on a computer, and actual races and to see validity of LT, OBLA, and LTP as training materials.
【Methods】 We selected subjects of 107 male athletes who had race experiences for 5 to 10 years and their best records between 13'40" to 17'34" for 5000m. Immediately after the subjects raced for 800m, blood sample was collected from their fingertips, and lactate concentrations were analyzed by using the Lactate Pro(KDK Cor.). High-LTP and Low-LTP were analyzed by three line method using a LT analyzed software, MEQNET LT Manager(KDK Cor.), which was jointly developed.
【Results and Discussion】 There were no correlation observed between race records of 5000m and 10000m and $\dot{V}O_2$max, therefore, it's impossible to presume athletes' race records and ability from the $\dot{V}O_2$max. The correlation between the race records and LT/OBLA were as good as the precedent study. The correlation between the race records and LLTP/HLTP were also good. However, both 5000 m and 10000 m showed higher correlation on HLTP. From this study, obtaining HLTP rather than LT or OBLA is more convenient to presume athletes' ability. Similarly, for training, using HLTP is better for gaining exerise intensity which is closer to the actual race speed. By using LTP, KANAGAWA Univ. made good records in HAKONE-Ekiden for the past three consecutive years.
key words; Three Line Method, lactate, training point, HLTP, LLTP