Physical training is generally considered to increase serum high density lipoprotein cholesterol (HDL-C) levels. However, how exhaustive training influences serum HDL-C levels remains unknown. Intense exercise increases oxygen consumption and free radical formation, and induces oxidation of low density lipoprotein (LDL). LDL plays an important protective role in LDL oxidation. An imbalance between free radical production and antioxidants is considered to lead to oxidation of LDL and subsequent alterations in serum HDL metabolism. This study investigates changes in serum urate, which is the most important intrinsic antioxidant, and serum lipids in male athletes after three weeks of exhaustive training.

We measured fasting serum lipids and urate in 11 male athletes (mean (SD) age 21.2 (2.2) years; height 168.3 (4.2) cm; body weight 65.4 (3.7) kg) before and after three weeks of exhaustive training. All the subjects performed the same intensity exercise, which consisted of a 20 (3) km run and isometric training for two hours every day for three weeks. The daily diet provided 9802 (209) kJ and consisted of about 12–15% protein, 55–65% carbohydrate, and 25–30% fat over the study period. None were taking drugs known to affect lipid and lipoprotein metabolism. Special care was taken to exclude athletes using anabolic drugs, vitamins, or other antioxidants or who were smokers. Serum lipids were measured by automated enzymatic means using Determiner TC (Kyowa Medex Co, Tokyo, Japan) for total cholesterol, AutoSera S TG-N (Daichi Pure Chemicals, Tokyo, Japan) for triglycerides, Determiner HDL-C (Kyowa Medex) for HDL-C, and Cholestest LDL (Daichi Pure Chemicals) for LDL-C. Serum urate was measured using the uricase calorimetric method (Fuji Co, Tokyo, Japan).

After three weeks of training, serum HDL-C levels increased in six subjects, and decreased in five (fig 1A). As expected, the changes in serum LDL-C levels were inversely associated with the change in serum HDL-C levels (data not shown). However, serum triglyceride levels were not significantly different after training in all participants (data not shown). Unexpectedly, serum urate levels decreased in all subjects with increased HDL-C levels, but increased in all with decreased HDL-C levels (fig 1B). The change in serum urate levels correlated significantly and inversely with the change in serum HDL-C levels (fig 2).

Physical activity is a widely accepted means representing a metabolic adaptation that contributes to a reduced risk of coronary heart disease. However, the influence of exhaustive training on serum HDL-C levels remains obscure. Our data show that the effect of the same conditioned exhaustive training on serum HDL-C levels varies greatly among individuals.

Furthermore, we identified a significant inverse correlation between the changes in serum urate, which is the most important intrinsic antioxidant, and HDL-C levels, indicating the close association between urate and HDL metabolism during exhaustive training. However, we should mention that the number of participants was limited and the detailed mechanisms underlying this phenomenon remain to be elucidated.

**Figure 2** Correlation between percentage change in serum urate and high density lipoprotein cholesterol (HDL-C) levels. Statistical analysis was performed by Fisher’s Z transformation.

**References**


Are Reliable Change (RC) calculations appropriate for determining the extent of cognitive change in concussed athletes?

Reliable Change (RC) indices are a group of statistical techniques used in many areas of