SEASONAL VARIATION OF FAT OXIDATION KINETICS IN PROFESSIONAL CYCLISTS

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Introduction. Increased fat oxidation is one of the major metabolic adaptations of endurance exercise training (Saltin). Exercise intensity at which fat oxidation remains elevated is also dependent of training adaptation. Professional cyclists are reported to train and race for several hours about everyday for over 10 months in a year, which may represent one of the most extreme forms of endurance training regimen. Therefore we studied the seasonal variation in the kinetics of fat oxidation in a group of professional cyclists.

Methods. 24 professional cyclists -mean (SD) 25.30 (3.70) years, 74.80 (4.95) kg, 67.38 (5.60) mlkg⁻¹min⁻¹, 417.96 (42.05) W- performed a quasi steady-state incremental test (50 W/3 min) until exhaustion on a bike ergometer (Lode Excalibur), both in December (OFF) and in May (ON). Physiologic parameters were measured continuously (Jeager Oxycon V) and recorded every 30s until test termination. The values of the last minute of each completed step were averaged and used for analysis. Individual rates of fat oxidation (FATox) were calculated using stoichiometric equations (Peronnet), and then individually normalized relative to VO2max. Ventilatory Threshold (VT) was determined by studying the kinetics of the VE/VO2 relation (Hollmann).

Results. Comparing ON vs OFF values, body weight was lower (-1.50 kg, p<0.001), VO2max was higher (+6.30 mlkg⁻¹min⁻¹, p<0.0001), Wmax and VT(W) were higher (+40.83 W and +67.21 W, respectively, both p < 0.0001), VT(%VO2max) was higher (+10.5, p<0.0001). From 35% to 95% VO2max, all RER ON-values were significantly lower. (OFF vs ON): 45% VO2max: 0.89 vs 0.85 (p = 0.004); 65% VO2max: 0.92 vs. 0.87 (p < 0.0001); 85% VO2max: 1.01 vs. 0.94 (p < 0.0001). From 35 to 95% VO2max, all FATox values were significantly higher: 45% VO2max: 0.417 vs. 0.622 gmin⁻¹ (p = 0.0004), 65% VO2max: 0.421 vs. 0.755 gmin⁻¹ (p < 0.0001), 85% VO2max: 0.091 vs. 0.379 gmin⁻¹ (p < 0.0001). The maximum rate of FATox (FAToxmax) during OFF was 0.505 (0.16) gmin⁻¹ and occurred at 54.1% (11.72) VO2max. In comparison, ON-FAToxmax was 0.790 (0.24) gmin⁻¹ and occurred at 64.8% (6.13) VO2max (all, p < 0.001).

Conclusion. In a group of professional cyclists already considered fit by most standards, the kinetics of fat oxidation can be significantly modified by 5 months of training and competition. Not only the rate of fat oxidation is much larger after training (+79% at 65% VO2max and +315% at 85% VO2max) but the exercise intensity at which this elevated rate is maintained is also significantly higher, indicating a major shift in the kinetics of lipid metabolism in these athletes.