INTRODUCTION

Blood lactate responses to swimming are commonly employed for evaluation and prescription of training programmes. In particular the relationship between blood lactate and swimming velocity is employed in training contexts. This is despite a potential for large errors, especially when diet is not standardised. The aim of this study was to examine the effects on the blood lactate-swimming velocity relationship of a combined dietary and training regimen designed to reduce glycogen stores prior to testing.

METHODS

Eight well-trained swimmers (4 males, 4 females, mean age 14.2 years) participated in the study after obtaining parental approval or signing voluntary informed consent forms. The subjects were monitored under a normal mixed diet (53.6 ± 7.8% CHO) and under a decreased carbohydrate (36 ± 10.7% CHO) condition over 3 days. The separation of the two conditions was verified by a 3-day weighed food intake and the conditions were presented in a random order. Personal best competitive times over 400 yards (364 m) were taken to indicate maximum swim velocity. Testing at the end of each condition consisted of 2x200 yard (182 m) swims at 85% and 100% of maximum swim velocity. Blood sampling from an earlobe was performed 3 min following the end of each swim; active recovery at 65% maximum swim velocity separated the tests. Three time-trials over 100, 200 and 400 yards (91, 182, 364 m) were subsequently undertaken, the subjects being allowed to recover fully between trials.

RESULTS

Mean (± S.D) swim performance deteriorated over 100 yards (from 66.1±3.8 to 67.0±4.1 s) and 400 yards (from 300.8±15.1 to 308.8±16.4 s) with the carbohydrate reduction regimen (P < 0.05). The decline in swimming performance over the intermediate distance was not significant (P > 0.05). Mean blood lactates were decreased after the carbohydrate depletion protocol at 85% (from 3.7±1.1 to 2.9±1.5 mM) and 100% (from 6.3±1.1 to 4.7±1.6 mM) of maximum velocities (P < 0.05). As a result, the mean swim velocities associated with 4 mM blood lactate concentration (V-4 mM) were significantly altered by the experimental manipulation from 0.67±0.04 m/s on a mixed diet to 0.70±0.05 m/s under the increased carbohydrate condition.

DISCUSSION

The observations confirm that a combined dietary and training manipulation designed to reduce available glycogen stores adversely affects swimming performance. This applied to both 100 and 400 yard times. In addition mean swimming velocity
corresponding to a reference blood lactate level was altered by the combined regimen. The experimental manipulation was moderate compared to the glycogen reduction regimens employed in previous laboratory based studies (Hughes et al., 1982). The alterations in blood lactate responses were opposite to those induced by a high carbohydrate diet which promotes increased glycogen utilisation and leads to an elevation in blood lactate (Reilly and Bryant, 1986). This result of increased carbohydrate intake has been demonstrated also in swimmers (Reilly and Woodbridge, 1996). The results lead to question still further the role of lactate response curves for prescribing training intensities and indicate that control of diet is needed in monitoring training regimens.

REFERENCES