Plasma volume expansion does not influence oxygen uptake kinetics in trained cyclists

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TO THE EDITOR: I have read the recent article by Berger and colleagues (1) on the effects of plasma volume expansion on oxygen uptake kinetics, peak oxygen uptake, and performance during high-intensity cycling exercise. These researchers have shown that after 7 ml/kg infusion of a plasma volume expander (~580 ml), and a reduction in hemoglobin concentration by 8%, there was no difference in oxygen uptake kinetics. Nonetheless, maximal oxygen uptake and time to exhaustion increased by 6 and 16%, respectively (1).

The lack of a change in oxygen uptake kinetics is not new. The authors have failed to discuss the results of two similar companion papers published recently in which minute ventilation and oxygen uptake kinetics were unchanged from plasma volume expansion compared with control (2, 3). Specifically, a reduction in oxygen delivery during intense exercise by 377 ml/min from plasma volume expansion (3) did not influence oxygen uptake kinetics (2). The similarities between the work of Berger et al. (1) and ours are numerous. First, we both used colloids to expand plasma volume by approximately the same amount. Second, the decrease in hemoglobin concentration caused by plasma volume expansion was approximately the same. Third, we both used high-intensity cycling exercise protocols. Although the aims of our papers were different, our data are worth mentioning because they are highly related to the work of Berger et al. What is different in our results was that contrary to Berger et al., we did not see any change in the peak oxygen uptake after 6.5 min of very strenuous cycling exercise after plasma volume expansion (500 ml Pentaspan), but we did see a significant change in arterial blood acidity (2). However, unlike Berger et al., our subjects were highly trained, and perhaps the level of fitness precluded any increase in oxygen uptake from plasma volume expansion despite lowering arterial pH (2). As well, unlike the study of Berger et al., we also measured cardiac output and stroke volume in our subjects and found no changes in these parameters from expansion. This implies that right ventricular filling was not limited in our very fit subjects. In the case of Berger et al., right ventricular filling may have been limited in these “lower fit” subjects as evidenced by the increase in peak oxygen pulse (1). Therefore, the issue of whether performance and/or maximal oxygen uptake and/or cardiac output is improved with plasma volume expansion still needs to be studied further in various populations (i.e., highly fit vs. recreationally active vs. sedentary subjects), but the issue of whether it affects oxygen uptake kinetics, in my opinion, is answered.

REFERENCES

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