

Effect of pH on cardiorespiratory and metabolic responses to exercise.

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Five male subjects performed exercise at 33, 66, and 95% of their maximum power output on three occasions in random order. Each study was preceded by a 3-h period in which capsules were taken by mouth, containing either CaCO₃ (control), NH₄Cl (acidosis), or NaHCO₃ (alkalosis) in a dose of 0.3 g/kg body wt; preexercise blood pH was 7.38 ± 0.015, 7.21 ± 0.033, and 7.43 ± 0.029, respectively. Exercise was continuous and maintained for 20 min at the two lower power outputs and for as long as possible at the highest. Compared with control (270 ± 13 s), endurance time at the highest power output was reduced in acidosis (160 ± 22 s) and increased in alkalosis (438 ± 120 s). No differences were observed for central cardiovascular changes in exercise (cardiac output, frequency, or stroke volume). The respiratory changes expected from changes in blood pH were observed, with a higher alveolar ventilation in acidosis. At all power outputs arterialized venous lactate was lowest in acidosis and highest in alkalosis. Plasma glycerol and free fatty acids were lowest in acidosis. Changes in blood [HCO₃⁻] and pH were shown to have major effects on metabolism in exercise which presumably were responsible for impaired endurance