The opposite of dilution acidosis occurs during physical exercise

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TO THE EDITOR: Dilution acidosis as described by Wolf and DeLand (6) is an interesting but often overlooked phenomenon. We ourselves have needed a long time before understanding that the opposite, i.e., withdrawal of water, causes alkalosis (e.g., 1). During exercise a water shift from blood and interstitial fluid to the working muscles concentrates extracellular buffers (proteins and bicarbonate) and increases base excess, which counteracts lactic acidosis. Therefore the decrease of actual as well as of standard base excess caused by a given lactic acid concentration change is smaller during than immediately after exercise when water rapidly returns to the extracellular space. This effect has to be considered also in comparisons of H⁺ and lactate⁻ transport from muscle to blood.

Also during heat stress and in clinical cases with large water and/or blood losses, the fluid-withdrawal effect on acid-base status plays a role, and application of the model would be of practical interest.

Two statements of Wolf and DeLand (6) on unexplainable observations should be commented since the causes are long known:

1) The slight decrease of standard base excess during short-term hypocapnia [see Figure 9 in Wolf and Deland (6)] clearly results from lactic acid produced by glycolytic stimulation because of the pH increase; this has been described various times between 1955 and 1974 (references compiled in 2). The ventilatory work is not the cause; it is at least as high during acute hypercapnia where no lactic acid changes have been found.

2) The causes for discrepancies in the Donnan ratio r for bicarbonate in Figure 4 of Wolf and Deland (6) are also long known (e.g., Ref. 5, p. 81). Early studies by Henderson (4) and Dill et al. (3) did not take into account the binding of CO₂ to hemoglobin as carbamate; therefore they calculated too high bicarbonate concentrations from PCO₂ and total CO₂ in the red blood cells.

DISCLOSURES
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REFERENCES