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Saline Infusion, Acidosis, and the Stewart Approach

To the Editor:—The report by Scheingraber *et al.*[1] highlights the phenomenon of acidemia after infusion of 0.9% saline in the perioperative period. The accompanying editorial[2] discusses several relevant points; however, we are disappointed that neither the article nor the editorial addresses the central issue of the relative merits of the Stewart approach[3] in describing acid-base physiology and pathophysiology.

Compared with the Henderson-Hasselbalch approach, the Stewart approach has a number of appealing features. (1) The control of acid-base and water homeostasis can be explained in terms of both sodium and chloride regulation. (2) Acid-base status is partly controlled by a number of plasma electrolytes, notably sodium and chloride. These electrolytes can be manipulated in the clinical setting to optimize acid-base status. (3) The factors controlling acid-base status are independent. Criticisms of the Henderson-Haselbalch approach include a lack of independence between carbon dioxide and bicarbonate.[4] (4) The Henderson-Hasselbalch approach does not allow assessment of nonvolatile buffers, whereas the Stewart approach explicitly includes assessment of weak acids.[4]

Comparison of the Stewart and Henderson-Hasselbalch approaches is complicated by the fact that both approaches adequately describe the acid-base end point, as Scheingraber *et al.* demonstrate.[1] Further study is required to determine which approach better describes the mechanisms of acid-base physiology.

Previous animal studies[5] have suggested that the alkalinizing effect of lactate-containing solutions in acute resuscitation is time dependent, which underscores the concept of lactate as a strong ion. The removal of lactate from the circulation will increase the strong ion difference and reduce acidosis.[3] This effect may be supplemented by further increases in the strong ion difference associated with lactate metabolism[6]; in contrast, added chloride ions appear to persist longer in the circulation. Subsequently, a smaller strong ion difference is maintained along with greater acidosis, as seen in the report by Scheingraber *et al.*[1]

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Article Supports Findings of Previous Comparison

To the Editor:—The article by Scheingraber *et al.*[1] supports the findings of a previous comparison of saline with a balanced salt solution carried out by McFarlane and Lee in 1994.[2] The accompanying editorial by Prough and Bidani described this study as a clinical report of the administration of "unusually large volumes of saline."[3] The study was, in fact, a randomized-controlled comparison of saline with a balanced salt solution, both of which were administered at 15 $ml \cdot kg^{-1} \cdot h^{-1}$. This rate of administration was half the rate used by Scheingraber *et*