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 editorial² 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 approach³ in describing acid-base physiology and pathophysiology.

Compared with the Henderson-Hasselbalch approach, the Stewart approach has a number of appealing features. (1) 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-Hasselbalch 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 studies⁵ 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 metabolism⁶; 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

David A. Story, M.B.B.S.(Hon), B.M.Sci(Hon), F.A.N.Z.C.A.
Staff Anaesthetist
Department of Anaesthesia
davids@austin.unimelb.edu.au
Frank Liskaser, M.B.B.S., F.A.N.Z.C.A.
Staff Anaesthetist
Department of Anaesthesia
Rinaldo Bellomo, M.B.B.S., M.D., F.R.A.C.P.
Associate Professor
Intensivist and Director of Research
Department of Intensive Care
Austin and Repatriation Medical Centre
Austin Hospital
Heidelberg
Melbourne, Victoria 3084, Australia

References

2. Prough DS, Bidani A: Hyperchloremic metabolic acidosis is a predictable consequence of intraoperative infusion of 0.9% saline (editorial). Anesthesiology 1999; 90:1247-9

(Accepted for publication September 23, 1999.)

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.”² The study was, in fact, a randomized-controlled comparison of saline with a balanced salt solution, both of which were administered at 15 ml · kg⁻¹ · h⁻¹. This rate of administration was half the rate used by Scheingraber et al.²