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Temperature Correction of Arterial Blood-gas Values

To the Editor:—Andritsch *et al.* recently reviewed the methods by which blood-gas values measured at 37° C can be corrected to patients' body temperature, but failed to make a case for why this correction needs to be done other than to say that "the need for accurate diagnosis and appropriate intervention requires (this)."[1] Alteration in body temperature is an unnatural state in homeotherms. Normal blood-gas values in homeotherms refer to body temperature at 37° C. Blood-gas values corrected to patient's body temperature other than 37° C are difficult to interpret because normal values for different temperatures are not known.

Blood-gas values provide information about oxygenation, ventilation, and acid-base (metabolic) status. Temperature correction is essential to assess oxygenation (P_{O_2}), but may be unnecessary to determine adequacy of ventilation (P_{CO_2}) and acid-base status of blood (pH). When blood is collected anaerobically in a syringe and cooled, P_{CO_2} decreases the pH increases while CO_2 content is unchanged. Though it appears alkaline, the relative alkalinity of blood with respect to neutral water is unchanged because pH of neutral water also increases with cooling.[2,3] Howell *et al.* and Rahn *et al.* have shown that *in vivo* changes in P_{CO_2} and pH in poikilotherms, which change body temperature with ambient temperature, are very similar to *in vitro* changes that take place in an anaerobic sample that is cooled.[2,*] Reeves has also shown that factors affected by changes in pH at a constant temperature brought about by titration of acid, are unaffected by changes in pH brought about by temperature changes. Thus, net charge on protein buffer (imidazole) and Donnan distribution of ions across (red) cell membrane are unchanged when pH increases as blood is cooled.[3,4] The implication of these findings is that P_{CO_2} and pH changes brought about by changes in temperature do not alter the acid-base status of blood and has led Rahn to suggest that in order to interpret acid-base status of a patient who is hypothermic, one need only look at the values measured at 37° C. If P_{CO_2} and pH measured at 37° C were 40 mmHg and 7.4, respectively, then the acid-base status of the patient is unperturbed for whatever temperature existed at the time the specimen was drawn.[5] Blayo *et al.* recently confirmed this in patients undergoing cardiac operations during hypothermia.[6]

MURALI SIVARAJAN, M.D.
Associate Professor
Department of Anesthesiology RN-10
University of Washington
Seattle, Washington 98195

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