To the Editor:—In response to Doctor Kopman’s letter regarding our report, “A program for calculation of intrapulmonary shunts, blood–gas and acid–base values with a programmable calculator,” equation 2 is a modification of Adamsons’\(^1\) equation as proposed by Severinghaus.\(^2\) However, a sign inadvertently was dropped from the equation. The equation should be corrected to:

\[
pH_{\text{temp. corr.}} = (\Delta T) [-0.0065 (7.4 - pH_i) + 0.0146] + pH_i
\]

Doctor Kopman’s comment on the effect of base excess or base deficit on temperature coefficient of pH is valid. We did not use base excess when calculating temperature changes in pH because:

1) Severinghaus\(^2\) suggests disregarding the base excess correction.

2) The effect of base excess or deficit is very small. For example, in a case of severe acidosis where the measured pH is 7.100, the body temperature is 30°C, and the base deficit is 20, pH calculated without a base deficit correction is 7.189. When pH is calculated using a correction for a base deficit of 20, it is 7.193—a difference of 4 thousandths (0.004) of a pH unit.

3) With Adamsons’ equation one must calculate base excess before the temperature can be corrected for pH. But, if you need the temperature-corrected pH to determine base excess, how can you know the base excess? This problem can be overcome by making an initial assumption that the base excess = 0. Find the temperature-corrected pH, and then calculate base excess. This new base excess is used to recalculate the temperature-corrected pH, and the base excess is then recalculated. These calculations must be repeated until little or no change appears in the temperature-corrected pH and base excess. The execution of this loop takes time and program memory. We felt that the small difference in pH does not justify the cost.

We also found a printer’s error in equation 6 which did not appear in the galleys. As printed, one of the terms read: \([0.02 (P_{O_2} - 230)]^2 – 1.  This should read \([0.02 (P_{O_2} - 230)]^2 + 1.\)

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REFERENCES


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The Fallacy of Failsafer

To the Editor:—The recent communication by Scurlock (“More failsafe failsafes,” Anesthesiology 42:226–228, 1975) raises some basic and interesting issues about fundamental approaches to safety in anesthetic methods and techniques.

A fundamental law is that “if a piece of mechanical apparatus can fail, then it will eventually fail,” commonly and facetiously known as “Murphy’s law.” The roots of the law (\(^2\)) are solidly planted in statistical theory and the law of great numbers.

Assuming the validity of Murphy’s law, the basic issue then shifts to the development and construction of a system where a given type of failure is not possible because of the properties of the system. Considering the issue at hand, one such fail-proof system would include the following: a) avoidance of nitrous oxide as an anesthetic; b) avoidance of all vaporizers that are not “on line” and that are not driven and operated by the oxygen line pressure, i.e., avoidance of the Copper Kettle, Vermitrol, etc. In such sys-
tems, if the oxygen delivery system fails, then everything else also fails. The rebreathing bag empties and one soon realizes that nothing is being delivered to the patient.

I have personally employed nothing but various modifications of such a fail-proof system for the last 12 years, and I can assure all that, once one gets over the iconoclastic shock, anesthesia is not only possible but indeed safer.

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Oxytocin-induced Delay of Induction of Obstetric Anesthesia

To the Editor:—Unexpected delay during the induction of anesthesia for an obstetric emergency can represent hazards to both mother and child.

Late decelerations of fetal heart rate developed during labor in a healthy 25-year-old primigravida during intravenous infusion of oxytocin. The infusion was stopped, but the cannula was not disconnected, and the patient taken to the operating room for emergency cesarean section.

An infusion of physiologic saline solution was substituted for the oxytocin drip, using the same intravenous cannula. Fluid had to be forced through the cannula before the saline infusion would run at a moderate but steady rate. The patient had been premedicated with 0.7 mg atropine intramuscularly. After 5 minutes of preoxygenation 250 mg thiopental were injected intravenously through the injection port on the intravenous cannula. The patient failed to fall asleep, and another 50 mg thiopental were injected. A total of 300 mg of thiopental was considered the maximal safe dose, and 50 mg of succinylcholine were then administered shortly after the last dose of thiopental to facilitate intubation. Barely visible fasciculations of the brow and eyelids were observed. The patient remained completely awake, however, alert and with no sign of muscular relaxation.

Drugs comprising a total fluid volume of 11 ml had been injected with no sign of extravasation or retrograde flow into the infusion set.

An intravenous cannula was quickly inserted in a vein on the contralateral arm, and anesthesia was induced uneventfully with 150 mg thiopental, with intubation smoothly performed after 50 mg succinylcholine. Anesthesia was maintained with oxygen, 4 l/min, and nitrous oxide, 5 l/min, in a nonrebreathing system, relaxation being maintained with an intravenous succinylcholine infusion. A healthy male infant, Apgar score 10 at 1 minute, was delivered by cesarean section.

The first intravenous cannula had been inserted in a vein on the dorsal aspect of the arm 5 cm proximal to the wrist. On re-examination, the veins were found to be completely collapsed proximal to the cannula, but engorged distal to the cannula. Injection of 10 ml physiologic saline solution through the cannula distended the vein only 1 cm proximally, but rapidly distended the veins peripheral to the cannula.

Induction of anesthesia failed in this patient because intense venous spasm induced by the oxytocin infusion led to peripheral pooling of the anesthetic agents. This case represents an extreme example of locally induced venous spasm. Oxytocin infusions are frequently used during labor, and less dramatic, but appreciable, delays in the response to urgently needed intravenous therapy may be expected in some cases.

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