breathing 40% oxygen enriched inspires fully compensates for a 1% rise in \( P_{\text{CO}_2} \) at the top of Mount Everest. At sea level, 1% oxygen enrichment compensates for a 5 torr increase in \( P_{\text{CO}_2} \). The minor acidosis is initially only 0.03 pH units with no ventilatory responsiveness. The beneficial effects of \( CO_2 \) on cerebral and coronary blood flow, on ventilation perfusion matching in the lung, on oxygen unloading in tissue (to cite the most important effects only), should, in light of present knowledge, allay apprehension that the milieu intérieur is compromised by a bit of inspired \( CO_2 \).

I think our patients would not be safer if we used nonrebreathing techniques. They would be poorer, since in the end they pay for their consumed supplies.

Can We Do without \( O_2 \) Analyzers?

To the Editor.—Dr. Zorab's letter suggests that the use of \( N_2O \) premixed with \( O_2 \) would prevent the occurrence of hypoxic accidents during anesthesia without the need for an oxygen analyzer. In another letter, Dr. Feingold raises the question of whether instruments such as the currently available \( O_2 \) analyzers will produce incremental improvements in anesthesia safety. We would like to present a case that may help define the need for \( O_2 \) analyzers.

REPORT OF A CASE

Patient 1, a 63-year-old man, was admitted for a superficial temporal to middle cerebral artery bypass. After induction, anesthesia was maintained with 50% oxygen/nitrous oxide and isoflurane delivered by an Ohio isoflurane vaporizer mounted in the fresh gas supply line to the circle. One hour into the procedure, the surgeon noted dark blood. All connections to the patient were confirmed as being secure, good breath sounds were heard, and the patient's chest was seen to rise with each breath. The flow meter settings were verified at 50% oxygen, and the disconnect alarm did not indicate a pressure loss. The blood remained dark, however, and so the patient was given 100% oxygen and his ventilatory status again checked. At this point, a precipitous drop in blood pressure occurred. The ventilator then was disconnected and manual ventilation attempted. Despite the use of the oxygen flush, the bag would not fill and a disconnect of the machine fresh gas flow then was noted. The problem was corrected, the surgery canceled, and the patient recovered without sequelae.

Many of our anesthesia machines were put into service before to the advent of isoflurane and thus now have an "add-on" vaporizer interposed in the machine-to-circle fresh gas line (fig. 1). There is a one-way valve in this vaporizer, which will prevent pressure loss in the advent of a disconnect between machine and vaporizer. If a descending bellows ventilator is utilized (i.e., Drager), the patient will continue to be ventilated indefinitely—albeit with expired gas plus whatever room air is entrained. In this situation, the inhaled mixture becomes hypoxic. Only a monitor of circle gas concentrations reliably will alert one to this type of disconnect before signs of hypoxic changes. This is true even in the presence of disconnect alarms or anesthesia machines “incapable” of delivering hypoxic mixtures.

There have been other reports, of accidents having these similar features: failure of fresh gas inflow due to a disconnection or leak; maintenance of circle pressure due to a check valve or high outflow resistance; a falling weighted bellows type of ventilator. In these cases,
either a mass spectrometer or O₂ analyzer called attention to the problem.

In the case we present, the problem was not diagnosed until the patient became seriously hypoxic. An O₂ analyzer or mass spectrometer would have alerted us to the situation before this occurred. In answer to Dr. Zorab and Dr. Feingold, it seems to us that the proper use of currently available analyzers can provide an incremental improvement in safety for our patients and that this cannot be provided only by providing a minimum of 20% O₂ from the machine.

JAMES DITCHIK, M.D.
Resident in Anesthesia

GEORGE P. HERR, M.D.
Associate Professor of Anesthesia

Anesthesiology
61:630, 1984

Infrared Heat Lamps Interfere with Pulse Oximeters

To the Editor:—We recently encountered a problem in using infrared heating devices and pulse oximeters simultaneously. ¹

The Nellcor Pulse Oximeter Model 100° (Nellcor Inc.) and BTI Biox III Oximeter° (Bioximetry Technology Inc.) are in use at our institution. Both monitors operate by producing light at two wavelengths (660 nm and 940 nm, respectively) from light-emitting diodes. The light is transmitted through tissue (e.g., of the finger or ear), sensed by a photodetector, amplified, and processed. The character of the two plethysmograph wave forms is determined by the pulsating vascular bed, the wavelengths of light used, and the oxygen saturation of arterial hemoglobin (Sao₂). Sao₂ can be calculated and displayed by using Beer’s law and the amplitude of pulsation at two wavelengths.

Because the photodetectors can measure weak signals, both oximeters are designed to reject ambient light. When the intensity of ambient light is high (as from heat lamps or sunlight), the photodetector cannot sense light transmitted through tissue or calculate Sao₂. The Nellcor Model 100° digital display remains blank, the pulse search light flashes, and the unit may show a falsely low pulse rate or Sao₂. The BTI Biox III° display indicates that the light from the diode is not being sensed by the photodetector. Protecting the light-emitting diode and photodetector from bright light obviates the problem.

TIMOTHY D. BROOKS, M.D.
Resident in Anesthesiology

DAVID A. PAULUS, M.S., M.D.
Assistant Professor of Anesthesiology and Mechanical Engineering

WILLIAM E. WINKLE, B.M.E.T.
Biomedical Engineering Technician

Department of Anesthesiology
University of Florida College of Medicine
Gainesville, Florida 32610

REFERENCES

Anesthesiology
61:630-631, 1984

The “Puff Technic” for Intravenous Diazepam

To the Editor:—Anesthesiologists find many uses for diazepam iv as an anxiolytic, sedative, amnesic, and/or anticonvulsant. The iv route is preferred for prompt action, since absorption from an im site is unpredictably

Department of Anesthesiology
UCLA Medical Center
Los Angeles, California 90024

REFERENCES
2. Feingold A: Oxygen analysers as viewed by the public, attorneys, and an anesthesiologist. Anesthesiology 57:553-554, 1982

(Accepted for publication June 6, 1984)