flurane (but not isoflurane). Interpolation to lower, clinically relevant concentrations suggests that enflurane and halothane only minimally affect intracellular free calcium.

E. I. EGER, II, M.D.
Professor and Vice Chairman for Research
Department of Anesthesia
University of California, San Francisco
513 Parnassus Avenue
San Francisco, California 94143

REFERENCES

1. Nakagawara M, Takeshige K, Takamatsu J, Takahashi S, Yoshitake J, Minakami S: Inhibition of superoxide production and Ca^{2+} mobilization in human neutrophils by halothane, enflurane, and isoflurane. ANESTHESIOLOGY 64:4–12, 1986
2. Welch WD: Inhibition of neutrophil cidal activity by volatile anesthetics. ANESTHESIOLOGY 64:1–3, 1986
3. Renzi R, Waud BE: Partition coefficients of volatile anesthetics in Krebs' solution. ANESTHESIOLOGY 47:62–63, 1977

(Accepted for publication March 13, 1986.)

Anesthesiology
65:123, 1986

In reply:—It has been known that oxygen radicals produced by phagocytes play a crucial role in the host–defense mechanism. The inhibitory effects of volatile anesthetics on the oxidative metabolism in human neutrophils were reported by Welch *et al.*[1,2] They have shown that the anesthetics inhibited oxidative metabolism of human neutrophils reversibly at clinically relevant concentrations.

Our intent was to study the mechanism of the inhibitory effects of the anesthetics on the superoxide-releasing activity of human neutrophils.[3] We used the relatively high concentrations of the anesthetics to obtain distinct evidence of the inhibitory effects of the anesthetics on the superoxide release and Ca^{2+} mobilization. The concentrations we used were not lethal to the neutrophils as shown by the trypan blue exclusion test, wherein more than 90% of the cells were viable and that functional recovery of 65–85% was observed after removal of the anesthetics. This may be due to a short anesthetic exposure time of only 10 min. In clinical usage, the volatile anesthetics might not so strongly affect oxidative metabolism and the mobilization of Ca^{2+}, but we believe that the same mechanism may work with a longer exposure time even at lower anesthetic concentrations. Further study by using a more sensitive method for determination of intracellular free Ca^{2+} concentration, such as aequorin,[4] would be necessary.

MIWAKO NAKAGAWARA, M.D.
Instructor of Anesthesiology

JUNNICHI YOSHITAKE, M.D., PH.D.
Professor of Anesthesiology

SHIGEKI MINAKAMI, M.D., PH.D.
Professor of Biochemistry

Kyushu University School of Medicine
3-1-1, Maidashi, Higashi-ku
Fukuoka City, Japan

REFERENCES

1. Welch WD, Zaccari J: Effect of halothane and N_2O on the oxidative activity of human neutrophils. ANESTHESIOLOGY 57:172–176, 1982
2. Welch WD: Effect of enflurane, isoflurane, and nitrous oxide on the microbicidal activity of human neutrophils. ANESTHESIOLOGY 61:188–192, 1984
3. Nakagawara M, Takeshige K, Takamatsu J, Takahashi S, Yoshitake J, Minakami S: Inhibition of superoxide production and Ca^{2+} mobilization in human neutrophils by halothane, enflurane, and isoflurane. ANESTHESIOLOGY 64:4–12, 1986
4. Ware JA, Johnson PC, Smith M, Salzman EW: Aequorin detects increased cytoplasmic calcium in platelets stimulated with phorbol ester or diacylglycerol. Biochem Biophys Res Commun 133:98–104, 1985

(Accepted for publication March 13, 1986.)

Anesthesiology
65:123–124, 1986

In reply:—Dr. Eger suggests that the findings of Nakagawara *et al.* are interesting, but may have limited clinical relevance because of the very high partial pressures of anesthetics required to achieve the reported effects. I have always found "anesthetic concentrations" *in vitro* to be a controversial topic, perhaps due to the ambiguity of what constitutes a clinically relevant anesthetic concentration in an *in vitro* system.

The partition coefficient of Hanks' buffer at 37° C for halothane is ~0.8[2] and for whole blood at 37° C, 2.4. If