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Correspondence

Closing Capacity Measurement and Modified Nitrogen Technique

To the Editor:—Hickey, Hajny, and Crossman (Anesthesiology 43:365–367, 1975) introduced a device consisting of a 5-liter syringe to measure closing capacity during controlled ventilation by using the modified nitrogen technique. They found no significant difference between closing capacities during spontaneous breathing and controlled ventilation in awake subjects.

In their study, the test gas was started from functional residual capacity (FRC) instead of residual volume; therefore, expiratory reserve volume (ERV) served as the bolus in their modified-nitrogen technique. As Mansell and co-workers[1] have described, the size of the bolus should approximate the volume of phase IV (closing volume) in order to create the maximum nitrogen gradient in the lung. In the study of Hickey *et al.*, however, the size of the bolus was fixed as ERV since the test gas was started from FRC. Had closing capacity been sufficiently below FRC, Hickey's method would have produced less inflection at the phase III–IV point or would have even failed to measure closing capacity.

They were able to measure closing capacity successfully because most of their subjects had closing capacities that were greater than their functional residual capacities.

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Membrane Effects of Anesthetics

To the Editor:—I wish to comment on two aspects of the article by Diamond, Havdala and Sabelli.[1]

First, these investigators conclude ". . . that the membrane stabilizing actions of general and local anesthetics are not due to the same basic mechanism." There is little question that this view must be correct for ionized local anesthetic species since the inhaled agents do not exist in an ionized form. However, nonionized local anesthetic species also possess anesthetic properties which, for some local anesthetics (*e.g.*, benzocaine or procaine) are more potent than those of the ionized species.[2] Since Diamond *et al.* did not distinguish between the ionized and nonionized species, their results may apply only to the comparison of the inhaled anesthetics and ionized local anesthetics. That is, it is still possible that the membrane stabilizing actions of general and nonionized local anesthetics may be due to the same basic mechanism.

Second, the lowest concentrations of halothane or enflurane used by Diamond *et al.* were far in excess of those required for anesthesia. For example, 9 mM of halothane equals a partial pressure of about 10 per cent of an atmosphere (assuming a Krebs/air partition coefficient of 2.1 at 22–24 C).[3] MAC at this temperature is about 0.67 per cent.[4] That is, the lowest concentration used was 15 times that needed for anesthesia, and I am not sure that effects at such high doses can be used to draw conclusions regarding mechanisms of action.

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To the Editor:—In response to Dr. Eger, it is well known that lower concentrations of general anesthetics depress synaptic transmission (thereby causing general anesthesia), whereas higher concentrations produce axonal block.[1] Therefore, in our studies of the hypothesis of Frank[2] and Seeman,[3] high concentrations of general anesthetics are necessary to demonstrate that conduction blocks by local and general anesthetics are due to the same mechanism. Although the conduction block induced by general anesthetics may be irrelevant to their *in-vivo* action, due to synaptic failure, it seems likely that general anesthetics exert similar membrane effects on synapses and axons.

Whether the ionized or nonionized species of the local anesthetic is active is irrelevant to the aim of this study. If, indeed, the nonionized local anesthetic is the active species, we have then been testing the effects of nonionized procaine; conversely, if the ionized form is the active species, then local anesthetics must interact with negatively charged groups in the nerve membrane[4]; therefore, our conclusion that these sites of action are different from those of neutral anesthetics is necessarily true. Furthermore, the differential influences of D_2O on the actions of anesthetics exist regardless of *p*H.[5] As Dr. Eger points out, our experiments confirm differential effects of general and local anesthetics.

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To the Editor:—Diamond *et al.*[1] conclude that general and local anesthetics interact with excitable membranes in quite distinct ways. This conclusion is based on the observation that altering the calcium concentration or replacing H_2O with D_2O in the bathing Ringer's solution has differential effects on these two classes of anesthetics with regard to their effects on the excitability of frog sciatic nerves. The effects of such manipulations at the molecular level, in this system, are not completely clear. Hence these observations supply only indirect information as to the actual interaction between the anesthetics and the neural membrane. There are, however, data derived from experiments using phospholipid bilayer membranes indicating that general and local anesthetics possess similar properties. This model system is particularly attractive since there is good evidence that the phospholipids of biological membranes are arranged in bilayer form.[2] The cationic local anesthetics interact with