CORRESPONDENCE

Anesthesiology
83:1368, 1995

Unitary *Versus* Multiple Mechanisms of Anesthesia

To the Editor:—The discussions in the report by Ichinose *et al.*[1] and in the accompanying editorial by Johns[2] may be misinterpreted. Both argue that the data support the idea that "multiple pathways are responsible for anesthesia"[2] or "for maintaining pain perception and consciousness."[1] We have no quarrel with either this generalization or the elegant study by Ichinose *et al.* that supports it. However, the notion of multiple pathways might be interpreted to mean that several mechanisms in concert (perhaps involving several molecular sites of inhaled anesthetic action) are responsible for the phenomenon of anesthesia (or pain perception and consciousness). An alternative view (one we prefer) is that there is one mechanism for each of these phenomena and one molecular site of action for such phenomena but that other factors (*e.g.*, temperature,[3] hyperbaric conditions,[4] altered transmitter release[5]) also can influence each site. A particularly pertinent example is the decrease in minimum alveolar concentration resulting from ablation of brainstem nuclei[6]: Although the brainstem nuclei can influence minimum alveolar concentration, the capacity of inhaled anesthetics to abolish movement in response to noxious stimuli is mediated by an effect on the spinal cord rather than the brainstem.[7–9]

The difference between one *versus* multiple mechanisms for a given anesthetic endpoint is more than semantic or trivial. The multiple mechanisms notion is complex and may not be testable. The notion of a single mechanism is parsimonious and testable.

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Supported in part by National Institutes of Health grant 1P01GM47818-01A1.

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(Accepted for publication August 29, 1995.)

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In Reply:—The concept that there are distinct single mechanisms for pain and for consciousness and that each could be influenced by multiple factors certainly is possible. However, it is difficult to understand that, because this hypothesis is simpler and more "parsimonious and testable," it is likely to be more valid than any multiple mechanisms concept. Biologic systems are complex. Like critical components of anesthesia machines, critical components for life often are backed up by "fail-safe" mechanisms.

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(Accepted for publication August 29, 1995.)