

## SHORT COMMUNICATIONS

### Anesthesia—LXIX

#### Anesthesia with deuterio ether\*

(Received 11 August 1966; accepted 1 September 1966)

IN OUR former studies<sup>1</sup> we showed that deuterated ethylene elicited anesthesia in dogs similar to that of ethylene. We were interested in determining if the same similarity of response prevailed between ether and deuterio ether. It was shown by Kaplan *et al.*<sup>2</sup> that deuterated ethanol was more narcotic than ethanol. In addition, we were concerned with the possibility of atomic transfer during anesthesia. The problem becomes especially pertinent since Van Dyke *et al.*<sup>3</sup> have shown that many volatile anesthetics are partially metabolized.

#### MATERIALS AND METHODS

The ethyl ether was Fisher's spectrograde ether. The deuterated ether was the Volk product with an isotopic purity of 99 atom per cent.

Anesthesia was conducted on Swiss Webster albino mice ICR strain. The mice in four groups of five were placed in a 4-liter jar of oxygen provided with a gauze bag of soda lime. The anesthetic agent was introduced through the stopcock and the anesthesia allowed to continue for 30 min. The gaseous contents of the jar were then drawn off by mild suction through a trap chilled with CO<sub>2</sub>, ice and ethyleneglycol monomethylether acetate. This was continued for 30 min. The frozen vapors were thawed and subjected to isotopic analysis with a CEC model 21103C mass spectrometer.

#### RESULTS

The anesthetic syndrome appeared to be identical for deuterated ether and its hydrogen analog. A concentration of 6 vol per cent vapor of the anesthetic provided a smooth anesthetic syndrome without threatened respiratory failure with each agent.

The mass spectrometric analysis showed that the deuterated ether contained in the jar after anesthesia had not undergone atomic transfer with hydrogen from body tissues and was completely deuterated.

#### DISCUSSION

The absence of deuterium exchange from deuterio ether suggests that the anesthetic action of ether is not dependent upon atomic exchange of ether with other molecules in the biological system. It suggests that the syndrome is evoked by the intact molecule. This observation is compatible with the theories of anesthesia proposed by Pauling<sup>4</sup> and Miller.<sup>5</sup> Each of these involves relatively weak van der Waals attraction between the molecules of the anesthetic and molecules of compounds in the biological system, and not atomic exchange.

Department of Chemistry,  
Johns Hopkins University and  
the Huntingdon Research Center,  
Towson, Md., U.S.A.

JOHN C. KRANTZ, JR.  
WALTER S. KOSKI  
CLAIRE K. LOECHER

#### REFERENCES

1. C. J. CARR, R. M. BURGISON, F. K. BELL and J. C. KRANTZ, JR., *Anesthesiology* **12**, 230 (1951)
2. H. L. KAPLAN, R. B. FORNEY, A. B. RICHARDS and F. W. HUGHES, *Pharmacologist* **8**, 217 (1966).
3. R. A. VAN DYKE, M. B. CHENOWETH and A. VAN POZNAK, *Biochem. Pharmac.* **13**, 1239 (1964).
4. L. PAULING, *Science, N.Y.* **134**, 15 (1961).
5. S. L. MILLER, *Proc. natn. Acad. Sci.* **47**, 1515 (1961).

\* Supported by a grant from the Life Sciences Division, Army Research Office.