Biophysical Note

A Mass Spectrographic Investigation of the Hydrate of H₂S and Halothane


The mixed hydrate of H₂S and halothane, reported by van der Heem, was investigated using a mass spectrograph. Results were consistent with the conclusion that the hydrate possesses a clathrate structure. (Key words: Mass spectrograph; Mixed hydrate; Halothane.)

As a preliminary to an experimental study of the Pauling theory of general anesthesia, a mixed hydrate of H₂S and halothane (Fluo-

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Fig. 1. System used to prepare H₂S and halothane for spectrography (see text).

Fig. 2. Results of spectrography.

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thane) was formed, isolated and dissociated. The resulting gases were analyzed by a mass spectograph to determine the molecular masses in the vapor, and thus to determine the nature of the hydrate crystals.

Methods

The crystals were prepared by the technique of Van der Heem.\(^2\) They were stored at 5 C until all ice had melted. Next, the crystals were filtered out of solution and stored in the sample tube at 5 C (Fig. 1). The system was evacuated by opening valves D and A, and C was slowly opened to establish a vacuum in the sample tube. As the pressure in the sample tube decreased, bubbling, possibly due to free halothane boiling from the surface, was observed on the surface of the crystals. When this activity ceased the crystals became very white and began to dissociate. Before the crystals had completely dissociated, B was closed and A opened. This partial dissociation was allowed so that the gas lines would be completely flushed of air. To ensure that all trapped halothane and H\(_2\)S were given off, the variable-temperature bath was now warmed to 60 C. When the crystals had returned to the liquid phase, C was opened to a pressure of 2 psi of He, to pressurize the system for transfer of the sample to the mass spectograph. When the pressure had equilibrated, A was closed and the collection tube replaced. Halothane and H\(_2\)S were collected by a similar procedure, to check that impurities were not present in either gas. Mass spectra were drawn for all three samples.

Results (Fig. 2)

The triplet due to unfragmented halothane molecules was present in both the halothane sample spectrum and the clathrate sample spectrum. Also present in both spectra was the doublet due to the fragments CF\(_3\)CH\(^{12}\)Cl and CF\(_3\)CH\(^{13}\)Cl. The complementary fragments \(^75\)Br and \(^81\)Br, being negative ions, were not observed. At 7.5 eV ionizing energy no fragmentation of the H\(_2\)S molecule occurred.

Conclusion

The crystals do not appear to involve chemical reactions between the three constituents, H\(_2\)S, H\(_2\)O and halothane, which is consistent with the clathrate structure previously suggested.\(^2\)

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References

2. van der Heem P: Preparation of a solid hydrate of halothane. Anesthesiology 27:85, 1966

Pediatrics

RENAL TOXICITY Histologic examination of the kidneys of 34 infants who died following cardiac catheterization revealed medullary necrosis in three and proximal tubular epithelial vacuolization in another four. In eight piglets, intra-aortic administration of either sodium iothalamate or meglumine diatrizoate caused a prompt and sustained decrease in renal blood flow. Histologic examination of the kidneys revealed changes in tubular epithelium similar to those in the infants. In a prospective study of 100 infants and children undergoing cardiac catheterization, eight developed hematuria after administration of contrast material, either meglumine diatrizoate or sodium iothalamate in doses of 3 to 5 ml/kg body weight. Hematuria did not occur when the dose did not exceed 3 ml/kg. These studies indicate that contrast material utilized in cardiac catheterization can affect renal function and may produce irreversible renal damage. (Gruskin, A. B., and others: Effects of Angiography on Renal Function and Histology in Infants and Piglets, J. Pediat. 76: 41 (Jan.) 1970.)