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Experimental Observations on the Anesthetic Properties of Divinyl Ether.*

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Studies have been reported on the anesthetic properties of certain unsaturated ethers,¹ from which it seems that divinyl ether is a compound deserving thorough investigation as a potentially useful general anesthetic agent. This earlier survey was made on an apparently impure sample (B.P. 36-39°C.). Thanks to Ruigh and Major² an adequate supply of pure divinyl ether (B.P. 28.2-28.5°C., corrected; Sp. Gr. 0.77 at 20°C.) is now available, and it is a pleasure to acknowledge their kindness in furnishing the substance for our present use.

The range of minimal anesthetic concentration of divinyl ether was found to be between 1.35 and 1.75 millimols per liter of air. This was estimated by inhalation for 10 minutes in a series of 104 mice by a method essentially the same as that described by Johnston.³ The time period required to anesthetize 60 different mice at the minimal certain anesthetic concentration (1.75 millimols per liter of air) varied between 30 and 70 seconds. This is more rapid on the average than the time range required to anesthetize this same group of mice with the minimal certain anesthetic concentration of chloroform (0.3 millimols per liter of air). During anesthetization with divinyl ether, mice show a short excitement period, rapidly become ataxic, and may exhibit running movements during the initial period of anesthesia. Upon removal from the anesthetizing chamber, the mice recover at the concentration noted, within 40 seconds. The range of minimal lethal concentration of divinyl ether for mice is apparently above 6 millimols per liter of air on 10 minutes inhalation.

In semi-quantitative experiments in dogs, divinyl ether in oxygen anesthetizes much more rapidly than di-ethyl ether in oxygen, and without as much excitement or struggling during induction. There

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¹ Leake, C. D., and Chen, M. Y., *Proc. Soc. Exp. Biol. and Med.*, 1930, **28**, 151.

² Ruigh, W. L., and Major, R. T., *J. Am. Chem. Soc.*, 1931, **53**, 2662.

³ Johnston, J. F. A., *J. Pharmacol. Exp. Therap.*, 1931, **48**, 85.

is not as much evidence of local irritation with divinyl ether as with either chloroform or di-ethyl ether. It stimulates respiration during induction and rapidly depresses it as deep anesthesia is reached. Cardiac action is not greatly altered even in relatively deep anesthesia. Although the blood pressure falls as anesthesia deepens it is maintained at more than half the normal level even after the anesthetic concentration has been high enough to stop respiration for ten minutes. Upon withdrawing the divinyl ether and oxygen anesthesia under these conditions respiration spontaneously recovers. Divinyl ether does not seem to cause the marked disturbance of the acid-base equilibrium characteristic of di-ethyl ether or chloroform. Recovery of dogs from prolonged anesthetization with divinyl ether and oxygen is more rapid than with either ether or chloroform.

Divinyl ether is as inflammable as di-ethyl ether, and probably as explosive. It is roughly thrice as efficient an anesthetic as di-ethyl ether in regard to concentration in oxygen required to anesthetize, in rapidity of anesthetization, and in promptness of recovery. It is less active than chloroform from the standpoint of concentration in oxygen required to anesthetize, but it is about as prompt in causing anesthesia, and it produces a comparable relaxation. Divinyl ether appears to be preferable either to chloroform or ether from the standpoint of its physiological and pathological effects.