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The ether tension of surgical anesthesia.

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Recent work by Haggard[1] and by Shaffer and Ronzoni[2] has confirmed the idea, first advanced by Snow in 1848 but since often overlooked, that the absorption of ether in the lungs is a simple diffusion, and that the concentration of ether in the blood is therefore a function of the tension of ether in the lung air. The distribution ratio of ether between blood and air at 38° C. is about 15, according to which the tensions in air in equilibrium with the blood concentration required to produce anesthesia in dogs (110 to 130 mg. per cent) (Nicloux) are 19 to 23 mm. (2.5 to 3.0 vols. per cent) values which are much below the tensions commonly used with the Connell machine for the anesthesia of human patients. The concentration used by Boothby[3] for example, 51 mm. tension, if inhaled without dilution until the blood attains equilibrium would correspond to 293 mg. per cent in the blood, an amount which considerably exceeds the amount which causes respiratory failure (Nicloux, Ronzoni). The apparent discrepancy is due to the fact that the air inhaled by the subject is a mixture of that from the machine and of atmospheric air; the actual anesthetic tension in the air breathed is much below that delivered by the machine. White[4] has reported data on human patients which agree well with the data on dogs.

The present communication reports further data on the direct determination of ether in the blood of patients during surgical ether anesthesia. The results confirm the figures of the earlier workers on dogs, and indicate very similar range of anesthetic concentrations in human subjects.

For deep anesthesia a range of 110 to 170 mg. per 100 cc.

[1] Haggard, H. W., *J. Biol. Chem.*, 1923, lv, 131.

[2] Shaffer, P. A., and Ronzoni, E., *J. Biol. Chem.*, 1923, lvii, 741; Ronzoni, E., *J. Biol. Chem.*, 1923, lvii, 761.

[3] Boothby, W. M., *J. Pharmacol. and Exp. Therap.*, 1913-14, v, 379.

[4] White, J. C., *Archives of Surgery*, 1923, vii, 347.

was found; for light anesthesia 41 to 110 mg. per 100 cc. of blood. These patients had all had morphia 1/6 gr. and atropine 1/150 gr. preliminary to operation. Another group of patients who had received hyoscine as well as morphine before operation were sufficiently relaxed by concentrations of 39 to 100 mg. of ether per 100 cc. so that abdominal operations were satisfactory.

A few direct determinations of the ether in the alveolar air of patients gave results below 25 mm. tension.

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Quantitative experimental evidence on the acuity for hearing by bone transmission.

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The type of apparatus employed in this series of observations has been previously described in this journal. We submit some very general conclusions based on the observations made on individuals with known sensitivity for air-transmitted sound. A continuous tone scale was employed and the threshold approached from below as in the air tests.

Sensitivity for tone-transmission of sound varies a great deal more than that for air-transmitted sound, and is not definitely related to it. The sensitivity at any given frequency is not a criterion of the sensitivities at other pitches. We found about 500 v. p. s. the least variable. Areas of marked decrease in air acuity are similarly registered through the bone.

In normal ears the hearing is most acute at normal pressure for both air and bone transmitted sound. The development of plus and minus pressures in the air of the external auditory canal decreases acuity for both series of tests, and leads to the conclusion that the cranio-tympanic conception of sound transmission is probably the correct one.

In comparing the acuity for bone-transmitted sound, with external canals open, as opposed to external canals occluded, some rather disconcerting findings were made. The individual with