Radioactive Emanating Power and Ultrasonic Treatment

It seems in certain cases reasonable to suggest an influence of ultrasonic treatment on radioactive emanating power[1]. Ultrasound may bring about changes in a solid substance which involve changes of the emanating power, either by affecting the specific surface or the diffusion coefficient of the emanation in the solid phase. A change of the former property should be permanent or show remanence, whereas a change of the latter should be restored after ceasing ultrasonic treatment. It should thus be possible to conclude which of the two changes has occurred.

We have started a study of the effect of ultrasound on the emanating power of gels of metal oxide hydrates. A dilute solution of aluminium chloride was precipitated in the cold with ammonia in the presence of radium–thorium. The carefully washed precipitate was centrifuged, and dried for seven days above concentrated sulphuric acid. It was then placed in the open air.

Measurements were made by the streaming method for radium–thorium often described[2], which affords an almost instant reading of the relative changes in the emanating power. In order to measure the activity of the emanation, we used a modification of the ionization electrometer according to Zimens[3]. A Crystalab ultrasonorator, model SL 520, Fisher Scientific Co., with a maximum effect of 500 watts was used as ultrasonic source. The frequency was 1,500 kc. The sample was exposed to the ultrasonic waves through the thin wall of a glass tube, which was placed in the oil fountain.

The experiments so far made have shown an immediate increase in emanating power caused by the ultrasonic waves. Thus in a typical experiment we got an increase amounting to 26 per cent. The high value remained constant for an hour, after which a slow decrease might perhaps be observed. The increase depends on the sound effect. In another experiment we got an increase of 24 per cent, at a generator output of 100 watts, and this value increased gradually to 33 per cent, as the generator output was increased to 500 watts. It must be remembered that the efficiency in this simple but typical experimental arrangement can scarcely be ascertained. It is, however, quite low.

These preliminary experiments seem to indicate that treatment with ultrasound brings about a disintegration of the agglomerates of the aluminium oxide hydrogel. From experiments of an entirely different character, Sata and Naruse have come to a similar conclusion[4]. In our case, however, another interpretation is possible, namely, that the ultrasound may have an influence on the amount of water absorbed by the gel, thus causing a change in the emanating power[5].

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[1] See, for example, Zimens, *Z. phys. Chem.*, A, **191**, 1 (1942–43).
[2] Zimens, *Z. phys. Chem.*, B, **37**, 236 (1937).
[3] *Z. phys. Chem.*, B, **45**, 216 (1940).
[4] *Kolloid Z.*, **86**, 102 (1939); **89**, 341 (1939).
[5] Hahn and Biltz, *Z. phys. Chem.*, **126**, 323 (1927).

Some Pharmacological Properties of Sodium Ethyl, 3 : 3 Dimethylallylbarbiturate

Preliminary observations have shown that when sodium ethyl, 3 : 3 dimethylallylbarbiturate was administered to dogs and cats, it produced a marked stimulation of gastric and salivary secretion. The stimulation appeared to be of central rather than peripheral origin[1-3].

Further studies with this compound, No. 16-*A* (Eli Lilly and Co.), have disclosed that it possesses other powerful pharmacological properties not usually ascribed to barbituric acid derivatives. It appears that the actions of this substance are the exact opposite of the ordinary hypnotic barbiturates. The effects studied so far show that it causes a distinct rise in blood pressure even when given intravenously; it causes an immediate marked stimulation of depth and frequency of respiration, and the body temperature is sharply raised. In unanæsthetized animals, overdosage is associated with restlessness, muscular contractions and violent convulsions. The animal's temperament appears to change, so that it appears frightened and becomes bold and vicious. Sympathetic over-activity may be noted. Death occurs following convulsive episodes and may be due to spasm of respiratory muscles, since anæsthetic doses of ordinary barbiturates may increase the tolerance to five to six times the M.L.D. for unanæsthetized animals.

The M.L.D. for cats and rabbits is approximately six to seven mgm./kgm. when administered intraperitoneally or intravenously. Symptoms occur when doses of 3–4 mgm./kgm. are reached. Cats anæsthetized with pentobarbital will tolerate total doses of 50 mgm./kgm. given over four hours. An intravenous dose of 5 mgm./kgm. in such a preparation caused a rise of 36 mm. mercury in blood pressure, which rapidly returned to normal.

In unanæsthetized animals, respiration is markedly stimulated, and vigorous panting occurs for approximately three hours; the rate may reach 180 per min. The rectal temperature rises to 105–107° F. and may reach 112° F. at death.

The isolated gut suspended in Ringer's solution is first stimulated and then narcotized when total concentrations of 0·01 per cent of 16-*A* are reached. During the latter stage, the gut fails to respond to added acetylcholine or histamine, but the response rapidly returns after washing out the barbiturate solution.

The antagonistic action of this compound to ordinary barbiturates suggests that it may be used to overcome some of their undesirable effects, such as depression of respiration and blood pressure, and might be of value as an antidote to barbiturate poisoning. Preliminary experiments indicate that an anæsthetic mixture of 16-*A* and pentobarbital may be rapidly given intravenously to rabbits without causing respiratory paralysis.

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[1] Noble, R. L., *Canad. Med. Assoc. J.*, **54**, 69 (1945).
[2] Ballem, C. M., Noble, R. L., and Webster, D. R., *Canad. Med. Assoc. J.*, **58**, 447 (1948).
[3] Noble, R. L., *Canad. Med. Assoc. J.* (in the press).