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Relation of Alcohol Concentration to Intoxication.

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Mellanby[1] made the statement that dogs, after ingestion of a dose of alcohol, manifested a greater degree of drunkenness at a given blood alcohol concentration when this was ascending than they did when the same concentration was again reached on the descent. This observation has been confirmed recently in two publications. Mirsky, *et al.*,[2] found that in both hepatectomized rabbits and normal men, when the blood alcohol concentration was maintained constant over a period the symptoms of drunkenness originally present disappeared, in spite of lack of any change in alcohol concentration. Eggleton[3] demonstrated the same thing in man, and showed, furthermore, that if the alcohol concentration was raised very slowly no symptoms of intoxication appeared even at quite high levels. It was her feeling that the determining factor in the development of intoxication is the rate of increment of alcohol concentration, rather than the actual height achieved. This is probably not fundamentally different from the concept advanced by Mirsky, *et al.*,[2] that the nervous system is able in time to adapt itself to the presence of alcohol in its environment.

Because of the contention by some that alcohol concentration is a reliable index of drunkenness, confirmation of these findings, which if true would completely invalidate such a contention, is of the utmost importance, both from the scientific and the medicolegal aspects, and it was for this reason that the present investigation was instituted.

Two human subjects, both males, were employed. Both could be characterized as occasional drinkers, but from previous investigation it was obvious that one was more susceptible to alcohol than the other. Commercial 95% grain alcohol was diluted to about 20% with tap water and ingested in a period of 5 minutes or less, on an empty stomach unless otherwise stated. All alcohol doses are re-

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1 Mellanby, E., Med. Res. Council (Gr. Br.) Special Report Series No. 31, 1919.

2 Mirsky, I. A., Piker, P., Rosenbaum, M., and Lederer, H., *Quart. J. Stud. Alcohol*, 1941, **2**, 35.

3 Eggleton, M. G., *Brit. J. Psychol.*, 1941, **32**, 52.

corded as grams of 100% ethyl alcohol. Subsequent small doses required to maintain the blood concentration constant were diluted with milk to slow absorption. Samples of blood, urine, or saliva were collected at appropriate intervals, and alcohol determined by the method of Newman.[4] The degree of drunkenness was tested by means of a commercially available device whereby accuracy in aiming a gun at a moving target was automatically recorded, the test occupying about 8 minutes. Practice over a period of a week was sufficient to eliminate any increment in performance due to learning. A perfect score was 150; this was occasionally achieved by these subjects. Control runs varied less than 5 points.

Fig. 1 shows the results following ingestion of 0.8 g of alcohol per kg 2 hours after lunch by the more susceptible subject. The maximum of both alcohol concentration and decline in performance came at 1 hour. Subsequently, although the alcohol concentration did not change appreciably, by 2½ hours performance had returned to normal.

Fig. 2 represents the results when the less susceptible subject ingested a dose of 1.0 g per kg, and subsequently maintained his alcohol concentration constant over a period of 6 hours by means of

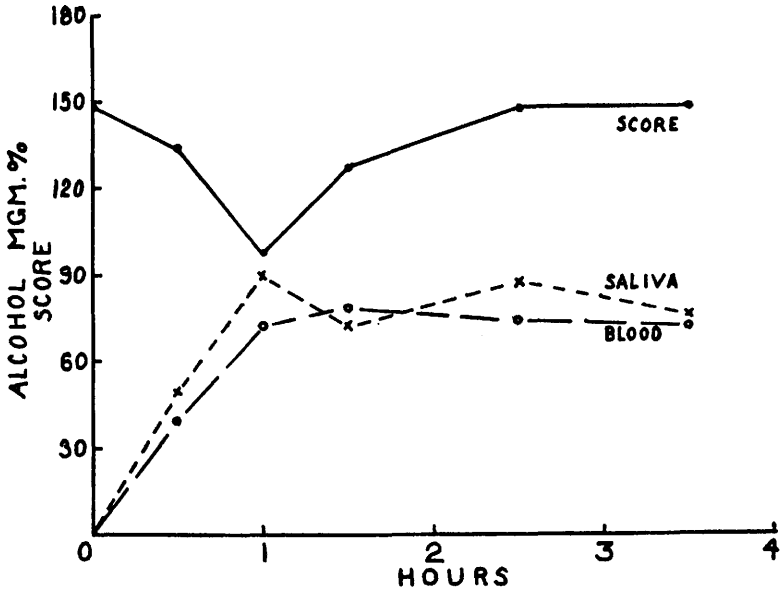

FIG. 1.
Alcohol concentration and test performance after ingestion of a single dose of 0.8 g of alcohol per kg body weight in a relatively susceptible subject.

[4] Newman, H. W., *J. Pharm. and Exp. Therap.*, 1936, **56**, 278.

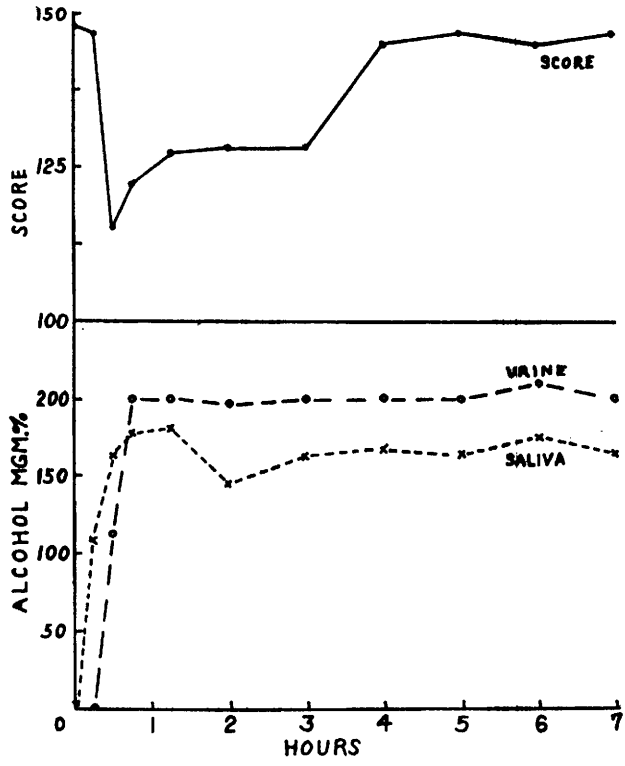

FIG. 2.

Alcohol concentration and test performance after ingestion of a dose of 1.0 g of alcohol per kg, followed by hourly doses of 8.0 g of alcohol diluted with milk in a relatively resistant subject.

hourly doses of 8.0 g of alcohol in milk. Maximal alcohol concentration and decline in performance came at 30 to 45 minutes. However, by the end of 4 hours, performance had returned to normal, in spite of the continued presence of a rather high alcohol concentration.

In Fig. 3 we see the results when the same subject raised his alcohol concentration slowly by ingesting 16.0 g of alcohol in milk hourly for 6 hours. It is striking that in no respect was performance affected by this slow increment of alcohol concentration.

Fig. 4 bears directly on the question of whether the important factor is the actual rate of increment, or the period of time elapsing during which "adaptation" to alcohol can take place. A small dose, 0.5 g per kg, was ingested by the less susceptible subject, resulting in the prompt attainment of a concentration insufficient to lower performance. This concentration was maintained for 4 hours by hourly ingestion of 8.0 g of alcohol. Then another dose equal to the

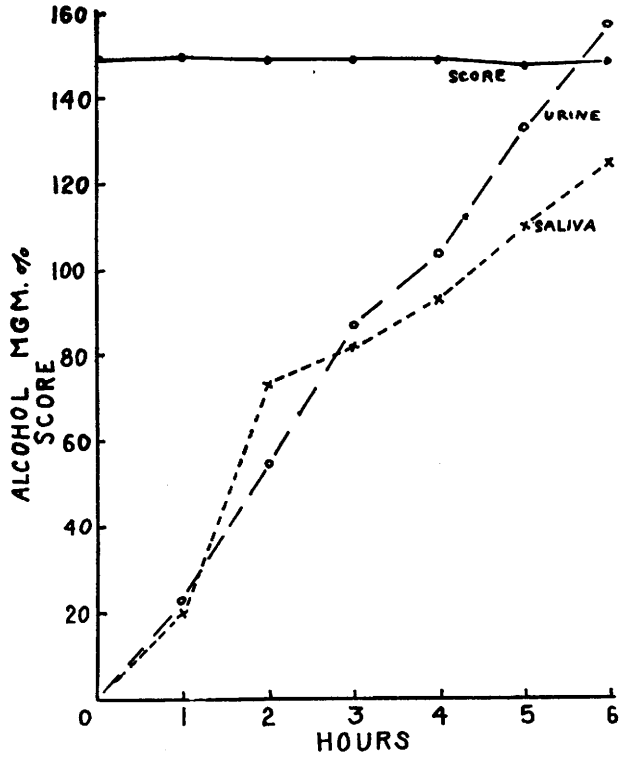

FIG. 3.

Alcohol concentration and test performance with ingestion of 16.0 g of alcohol in milk hourly in the resistant subject.

initial one was given, resulting in a rapid rise to a concentration which, when attained initially by the same subject in a previous experiment, shown in Fig. 2, had resulted in a considerable decrease in performance. Here, although the rate of increment was quite comparable to that in the previous experiment, apparently the 4-hour period at a lower alcohol concentration had been effective in "adapting" the nervous system, and no decrease in performance resulted.

Summary. The presence of alcohol in the body over a period of several hours effects a change in the response of the nervous system to alcohol, with the result that concentrations which initially produced drunkenness no longer are capable of showing this effect. Thus the effect of a given concentration of alcohol depends not only on its absolute value but also on how long a time it has been present in the body.

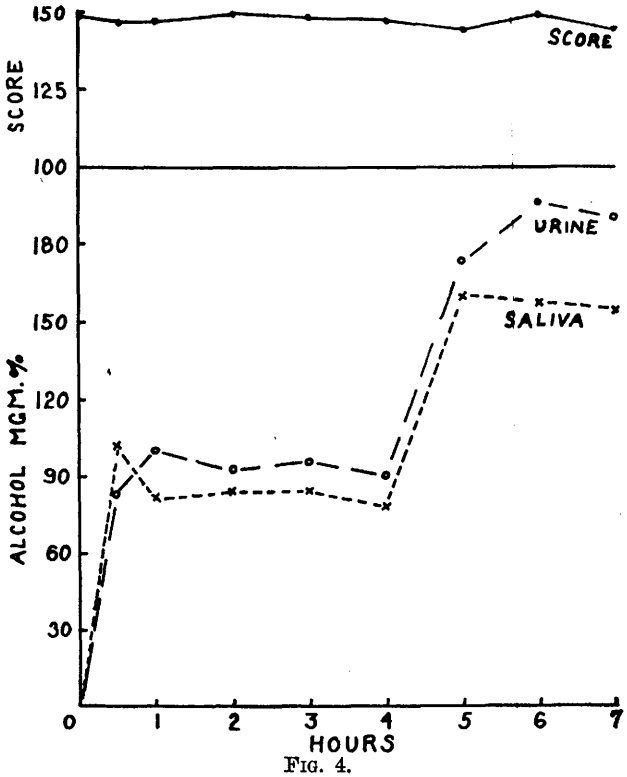

FIG. 4.

Alcohol concentration and test performance after 2 doses of 0.5 g of alcohol per kg separated by 4 hours. The alcohol concentration was maintained constant in the interval and after the second dose by hourly doses of 8.0 g of alcohol in milk.

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Possible Rôle of the Kidney in Regulation of Normal Blood Pressure in the Dog.

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The well-known rôle of the Goldblatt kidney in the production and maintenance of one form of experimental hypertension[1] raises the question of a possible specific rôle for the kidney in the regulation of normal blood pressure. Wakerlin and Chobot[2] found no evi-

1 Goldblatt, H., *Am. J. Clin. Path.*, 1940, **10**, 40.

2 Wakerlin, G. E., and Chobot, G. R., PROC. SOC. EXP. BIOL. AND MED., 1939, **40**, 331.