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THE EFFECT OF ORAL AND INTRAPERITONEAL ADMINISTRATION OF ALCOHOL UPON THE CONCENTRATION OF ALCOHOL IN THE BLOOD OF THE RAT

V. B. FISH AND V. E. NELSON

A number of experiments were made in this laboratory to determine the rate of absorption of alcohol into the blood of rats after the administration of alcohol both orally and by intraperitoneal injection. Both fasted and unfasted rats were used in these experiments.

Young mature rats were selected from the stock colonies maintained in this laboratory. The rats had been fed the stock ration which has been used successfully here for several years. In the experiments using fasted rats each rat was fasted for 24 hours preceding the administration of the alcohol. Substances normally occurring in the blood of fasted rats determined as alcohol amount to above five mg. per 100 ml. of blood. This value was assumed as the initial alcoholic concentration of the blood in these experiments.

In the experiments on the effect of oral administration of alcohol the animals were lightly anesthetized using chloroform and the alcohol administered by means of a stomach tube fashioned from a French style No. 8 catheter. The alcohol solutions used were of such a concentration that one ml. could be given for each 100 grams body weight.

Samples were taken from the external saphenous vein at 15 minute intervals for the first 30 minutes and at 30 minute intervals thereafter. The alcoholic concentration of the blood was determined by the method published in a previous paper (Fish and Nelson, 1941).

The results obtained using fasted rats were in general quite consistent. Some values for individual rats which were fasted for 24 hours and then given 2.5 grams of alcohol per kilo body weight orally are given in table I. The average values for a number of such experiments are also given.

TABLE I.

The alcoholic concentration of the blood of fasted rats after receiving 2.5 grams of ethyl alcohol per kilo body weight orally.

Time (minutes)	Mg. alcohol per 100 ml. blood			
	Rat 1	Rat 2	Rat 3	Average*
0	5	5	5	5
15	98	80	96	94
30	120	92	124	134
60	162	148	157	170
90	192	176	220	198
120	204	192	230	206
150	190	184	230	204
180	184	172	200	198
210	180	160	196	192
240	—	150	190	182
270	—	132	186	174

+ The average values are the averages of these and other similar experiments.

The results obtained using unfasted rats were variable. Data given in table II are for three different rats each of which received 2.5 grams of alcohol per kilo body weight.

TABLE II

The alcoholic concentration of the blood of unfasted rats after receiving 2.5 grams of ethyl alcohol per kilo body weight orally.

Time (minutes)	Mg. alcohol per 100 ml. blood		
	Rat 1	Rat 2	Rat 3
0	5	5	5
15	90	58	90
30	186	118	120
60	218	126	108
90	224	134	90
120	206	147	78
150	188	170	52
190	—	200	—

It would appear from these results that the presence of food material in the stomach at the time the alcohol was given had a marked influence upon the rate at which the alcohol was absorbed into the blood.

The intraperitoneal injection of alcohol presents an entirely different picture. If 2.5 grams of alcohol per kilo are injected the alcoholic concentration of the blood rises more than 280

mg. per cent in 15 minutes. The rats rapidly fall into a state of coma and the blood pressure drops so low that it is difficult to obtain 0.05 ml. samples of blood from the external saphenous vein. In table III data are given obtained at several levels of injected alcohol.

TABLE III

Alcoholic concentration of blood in mg. per cent.

Time (minutes)	Amount of alcohol injected (grams/kilo)				
	1.25	1.41	1.41	1.86	2.50
0	5	5	5	5	5
10	162	140	108	226	284
30	148	140	154	266	286
60	98	124	134	240	276
90	80	114	108	213	270
120	50	100	90	203	256
150	—	80	72	196	216

Both fasted and unfasted rats were used in the injection experiments but fasting had little or no effect upon the absorption of alcohol from the peritoneal cavity. The injection of 2.5 grams of alcohol per kilo is close to the lethal dose when given in this way to the rat.

The alcohol solutions used in the injection experiments were of such concentrations that one ml. of solution was injected per 100 grams body weight.

SUMMARY

In rats fasted for 24 hours and then given 2.5 grams of alcohol per kilo orally the rate of absorption of alcohol into the blood is quite consistent in each case. Average time-concentration values are presented.

Using unfasted rats, orally administered alcohol is absorbed into the blood at differing rates.

The absorption of alcohol into the blood of rats is very rapid if the alcohol is injected intraperitoneally.

The injection of 2.5 grams of alcohol per kilo body weight is nearly a lethal dose for the rat.

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LITERATURE CITED

- Fish, V. B. and Nelson, V. E. 1941. A micro method for the determination of ethyl alcohol in blood. Proc. Iowa Acad. Sci. 48:207.**