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The effect of varying the dosage of sodium pentobarbital on the barpress rate of rats

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The dose-response curve for sodium pentobarbital was determined for rats performing a simple barpress response for water reinforcement 20 min after having been injected with dosages of sodium pentobarbitol ranging from 1.3 mg/kg to 5.2 mg/kg of bodyweight. Sodium pentobarbitol, in the relatively low dosages used in the present study, consistently depressed barpress responding. The barpress rate varied directly with the dosage of the drug. The low dosages of the drug used in the present study apparently have a depressant effect on the central nervous system.

The dose-response curve for sodium pentobarbital adminisered to pigeons trained on a pecking task indicates that the response rate varies in a complex manner with the dosage of the drug (Waller & Morse, 1963). At lower dosages, 4 mg/kg to 8 mg/kg, the drug shows a stimulating effect, i.e., it produces an increment above the normal response rate. At higher dosages, 12 mg/kg, the drug has a depressant effect on the response rate.

The purpose of the present experiment was to extend these findings to lower drug dosages than those used by Waller and Morse (1963). The dose-response curve was determined for rats performing a simple barpress response for water reinforcement 20 min after having been injected with dosages of sodium pentobarbital ranging from 1.3 mg/kg to 5.2 mg/kg of body weight.

METHOD

Subjects

The Ss were three male albino rats obtained from the Holtzman Company, Madison, Wisconsin. There were 120 days old at the start of the experiments. Ss were maintained on a 23-1/2-h water deprivation schedule throughout the course of the experiment. They were maintained, ad lib, on Purina Rat Chow. The animals weighed 385-440 g.

Apparatus

The apparatus was a hand-operated Skinner box manufactured by Scientific Prototype Corporation.

Procedure

The rats were trained to barpress in the Skinner box for water reinforcement on a 1:1 reinforcemnt schedule. Barpress training was given for two 1-h sessions per week over a period of one month. At the end of this time, the barpress rate had become stabilized at a high level. After the base responding rate had been established, injections of sodium pentobarbital (Nembutal), of various dosages, were given in order to study the effect on barpress rate. The dosages used were 1.3, 2.6, 3.9, and 5.2 mg/kg of body weight. The drug was injected intraperitoneally.

The order of injection of the dosages of the drug varied directly with the magnitude of the dosage, i.e., 1.3 mg/kg was given first, then 2.6 mg/kg, then 3.9 mg/kg, and, finally, 5.2 mg/kg. The effect of the 2.6 mg/kg dose was tested 5 days after administration of the 1.3 mg/kg dose; the effect of the 3.9 mg/kg dose was tested 8 days after the administration of the 2.6 mg/kg dose; and the effect of the 5.2 mg/kg dose was tested 2 days after the administration of the 3.9 mg/kg dose. There did not seem to be any cumulative effect of the successive administration of these dosages. The drug was prepared in a concentration of 5 mg/cc of water. The control rat, rat "C," was conditioned without being injected with the drug at any time.

RESULTS

The data were analyzed in terms of the mean barpress rate/min for each observation period. Each observation period lasted for about 30 min. Figure 1 shows the dose-response curve for sodium pentobarbital. The response rate varied directly with the dosage of the drug.

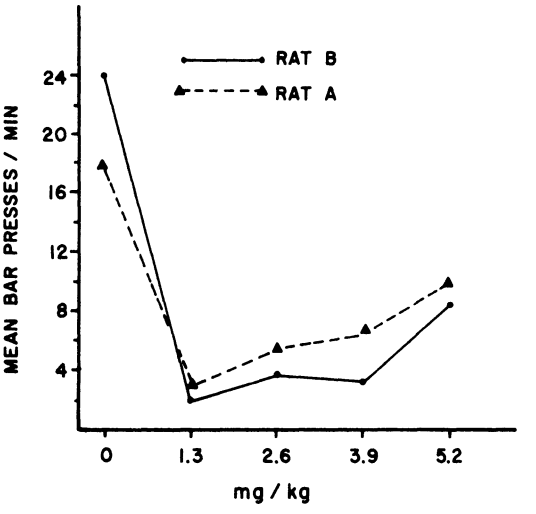

Fig. 1. Dose-response curve for sodium pentobarbital.

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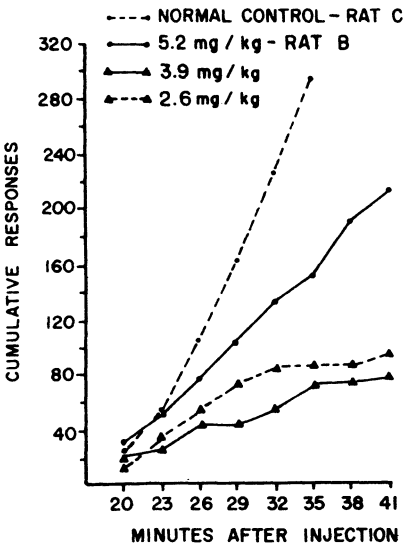

Fig. 2. Cumulative response curves for normal Rat C and drugged Rat B.

Administration of sodium pentobarbital depressed the response rate below the normal control rate. The cumulative response curves for three of the dosages for Rat B, and for Control Rat C, are shown in Fig. 2.

Sodium pentobarbital, in the relatively low dosages used in the present study, consistently depressed barpress responding. The barpress rate varied directly with the dosage of the drug. The low dosages of the drug used in the present study apparently have a depressant effect on the central nervous system. The explanation for the high rate of responding observed with the 5.2 mg/kg dose is not immediately apparent.

The effect of sodium pentobarbital on the barpress response rate of rats reported in the present study supplements the results for pigeons at higher dosages of the drug reported by Waller and Morse (1963). Although Waller and Morse (1963) reported a stimulating effect of 4 mg/kg on response rate, a comparable dosage of 5.2 mg/kg used in the present experiment, depressed barpress performance below the normal rate. The results of the present experiment also supplement the findings of Stretch, Blackman, and Bradley (1967), who reported a depressant effect of 8 mg/kg sodium pentobarbital on the response rate of rats performing in a Skinner box. Miller (1964) has also reported that 10-30 mg/kg of amylobarbitone sodium, another barbiturate, has a depressant effect on the speed of approach to food, but that 0-10 mg/kg had no effect on the response measure.

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