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## Self-stimulation of the brain after administration of an amphetamine-barbiturate mixture

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In 1961 Steinberg, Rushton & Tinson discovered that certain small doses of amphetamine sulphate and amylobarbitone sodium administered as a mixture produced striking increases in the locomotor activity of rats in an unfamiliar Y-maze. Other doses (in a mixture of amphetamine–amylobarbitone of constant ratio 1 : 20) were much less effective (Rushton & Steinberg, 1963). Each of the constituents produced small increases in locomotor activity, but the effect of the mixture could not be explained on an additive model. Dose-response curves, very similar to those of Rushton & Steinberg (1963), have been obtained with mice, in a different kind of exploratory situation (Bradley, Joyce, Murphy, Nash, Porsolt, Summerfield & Twyman, 1968).

The effect of the mixture on learning to press a bar to obtain water has been investigated in water-restricted rats (Joyce & Summerfield, 1966). It is known (Epstein, 1959; Schmidt & Dry, 1963) that the constituent drugs of the mixture can affect spontaneous drinking behaviour and that these effects of the two drugs are in opposite directions. The possibility that amylobarbitone and amphetamine affect motivational factors involved in learning or performing the task thus complicates the interpretation of results obtained with the mixture. Olds & Milner (1954) have demonstrated that satiated rats will learn to press a bar to deliver a brief train of electrical stimulation to a subcortical region of the brain. This " rewarding " effect of electrical stimulation applied directly to the brain maintains bar-pressing. The effect of an amphetamine–barbiturate mixture on this behaviour was analysed for individual animals.

Male rats learned to press a bar to deliver an electrical stimulus to the brain (60 Hz sine wave, 0·5 sec duration, 40–125 $\mu$A) in the region of the lateral hypothalamus. The effects of giving intraperitoneally a mixture of amphetamine sulphate (0·75 mg/kg) and amylobarbitone sodium (15 mg/kg) were then compared with those of giving the separate constituents or saline. At the three current intensities tested the mixture, like amphetamine, increased response rate in each animal; amylobarbitone usually slightly decreased response rate but occasionally increased it. There was no evidence that amylobarbitone and amphetamine given together acted antagonistically. At the highest current intensity (40 $\mu$A above threshold for each rat) all animals tested after administration of the mixture pressed the bar at a higher rate than after amphetamine ($P < 0{\cdot}01$) regardless of whether after amylobarbitone their response rate increased or decreased.

These results provide further evidence that the " special " enhancement effect of the mixture (Rushton & Steinberg, 1963) cannot be explained on an additive model

because, in these experimental conditions, the separate constituents sometimes had opposite effects on response output in the same individual.

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## The effect of *p*-chlorophenylalanine on social interactions of male rats

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Koe & Weissman (1966) found that parachlorophenylalanine lowered 5-hydroxytryptamine in the brain of rats and did not appreciably lower noradrenaline or dopamine. The effect takes 3 days to develop fully after parachlorophenylalanine (316 mg/kg), or three daily doses of 100 mg/kg, given intraperitoneally.

It was noticed that young male rats of 3 weeks, living in a group of ten animals to a cage, and treated over 2 weeks with parachlorophenylalanine, showed loss of hair round the chin and shoulders. Also their vibrissae were absent or appeared to have been cut off. The rats were often seen grooming each other and pulling each other about, but this was also seen in control groups which showed no hair loss. To determine whether the young rats were losing hair as a result of increased social interaction, three groups of 3 week old male rats were put ten rats to a cage. One group was treated with the drug vehicle (1% Tween 80) as a control, one group was treated with *p*-chlorophenylalanine and in the third group five rats received 1% Tween 80 and five received the drug. In addition four rats treated with 1% Tween 80 were kept in separate cages, and so were four rats treated with the drug.

Hair loss was seen in all the young rats kept in groups of ten animals, some or all of which had been given *p*-chlorophenylalanine. In the mixed group, control rats also lost hair. No hair loss was seen in the control group of ten rats or in any of the rats kept individually. These results indicated that the hair loss was associated with some social interaction.