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

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REFERENCES

BRADLEY, D. W. M., JOYCE, D., MURPHY, E. H., NASH, B. M., PORSOLT, R. D., SUMMERFIELD, A. & TWYMAN, W. A. (1968). Amphetamine-barbiturate mixture: effects on the behaviour of mice. *Nature, Lond.*, **220**, 187–188.

EPSTEIN, A. N. (1959). Suppression of eating and drinking by amphetamine and other drugs in normal and hyperphagic rats. *J. comp. physiol. Psychol.*, **52**, 37–45.

JOYCE, D. & SUMMERFIELD, A. (1966). Amphetamine-barbiturate mixtures and the early conditioning of behaviour. *Proc. 3rd int Pharmac. Congress*, 54.

OLDS, J. & MILNER, P. (1954). Positive reinforcement produced by electrical stimulation of septal area and other regions of rat brain. *J. comp. physiol. Psychol.*, **47**, 419–427.

RUSHTON, R. & STEINBERG, H. (1963). Mutual potentiation of amphetamine and amylobarbitone measured by activity in rats. *Br. J. Pharmac. Chemother.*, **21**, 295–305.

SCHMIDT, H. & DRY, L. (1963). Dose and time as variables in barbiturate action upon water ingestion. *Am. J. Physiol.*, **204**, 817–820.

STEINBERG, H., RUSHTON, R. & TINSON, C. (1961). Modification of the effects of an amphetamine-barbiturate mixture by the past experience of rats. *Nature, Lond.*, **192**, 533–535.

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.

Observations of rats living under reversed daylight conditions showed that in young rats of 3 and 4 weeks there was much social interaction which took the form of chasing and rolling over and lying on top of one another whilst grooming each other. The rats were very active and the number of times control rats lay on top of one another totalled about sixty in 1 hr. The treated rats interacted in this way more frequently, often more than 100 times per hour.

Adult male rats of 10 weeks behave in a different way, showing much less interaction, but in rats treated with *p*-chlorophenylalanine sexual behaviour became quite prominent. This increase in mounting was evident 24 hr after the injection of drug as well as 3 days after.

It is known that atropine blocks sexual behaviour in rats (Singer, 1968). When atropine (2·5 mg/kg) was given to rats in these conditions, whether treated with *p*-chlorophenylalanine or not, all social behaviour stopped. The rats moved around eating and drinking normally, but behaved as if no other rat was present. The effect wore off after 4–5 hr.

Experiments with female rats have failed to show any consistent increase in social behaviour after treatment with *p*-chlorophenylalanine.

REFERENCES

KOE, B. K. & WEISSMAN, A. (1966). *p*-Chlorophenylalanine. A specific depletor of brain serotonin. *J. Pharmac. exp. Ther.*, **154**, 499–516.

SINGER, J. (1968). The effects of atropine upon the female and male sexual behaviour of female rats. *Physiol. Behav.*, **3**, 377–378.

Effects of some catecholamines infused into the hypothalamus of young chickens

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Catecholamines injected intravenously to 1–28 day chickens evoked behavioural and electrocortical sleep (Key & Marley, 1962; Dewhurst & Marley, 1965) and lowered body temperature and oxygen consumption (Allen & Marley, 1967). Similar but longer lasting effects occurred after microinfusions of α-methylnoradrenaline into the hypothalamus of 14–21 day old chicks and were prevented by phenoxybenzamine (Marley & Stephenson, 1968). The effects of noradrenaline, isoprenaline and dopamine infused during 4 min into the hypothalamus in a volume of 0·5–2·0 μl. are now reported together with their interactions with mebanazine (a monoamine oxidase inhibitor), phenoxybenzamine and propranolol.

Noradrenaline (0·05 to 0·075 μ-mole) produced behavioural sleep and hypotonia; temperature was lowered by 2·5° to 6° C and oxygen consumption reduced by up to 24% with recovery after 3–4 hr. The effects of noradrenaline were potentiated by pretreating chickens with mebanazine (10 μ-mole/100 g intravenously 18 hr and 1·5 hr previously). The electrocortical effects were less marked with the catecholamines tested than after intravenous injection. Temperature is lowered by noradrenaline injected into the feline hypothalamus (Feldberg & Myers, 1965).

Isoprenaline had similar but less intense effects than those of noradrenaline and of longer duration. Thus 0·05 to 0·1 μ-mole produced sleep and lowered temperature 1·75° to 5° C with recovery after 5 to 6 hr. Dopamine (0·15 to 0·3 μ-mole) was without effect on behaviour or electrocortical activity although temperature rose 1° C after 1 hr. In contrast, after pretreatment with mebanazine (10 μ-mole/100 g