stereotaxic techniques. Animals were first used 14 days after surgery when they were manually restrained as 1 μl drug or solvent was delivered bilaterally to the centre of the nucleus accumbens (Ant. 9.4, Vert. 0.0, Lat. ±1.6; De Groot, 1959). Hyperactivity was assessed by placing animals in individual screened cages, measuring 25 × 15 cm and 15 cm high, and used in banks of 30 in a sound-proofed room maintained at 21 ± 2°C. Each cage was fitted with one photocell unit and the number of interruptions of the individual light beams was recorded electromechanically and noted for each 5 min period. Experiments were carried out between 08.00 and 18.00 hours.

Intra-accumbens (+)-amphetamine (1.25–25 μg) caused dose related hyperactivity which was prevented by pretreatment with α-methyl-paratyrosine (250 mg/kg i.p., see also Jackson, Andén & Dahlström, 1975). The amphetamine hyperactivity was also prevented, dose-dependently, by intra-accumbens apomorphine (1.56–6.25 μg given immediately after the amphetamine), although similar injections of apomorphine above (into the caudate-putamen) or below (into the tuberculum olfactorium) the nucleus accumbens were without effect. The abolition of the amphetamine hyperactivity (10 μg) caused by apomorphine (6.25 μg) was prevented by pretreatment with pimozide (0.0625 mg/kg i.p.) or haloperidol (0.00625 mg/kg i.p.), although these doses of neuroleptic did not modify the amphetamine response *per se*. Doses of pimozide (0.125–0.5 mg/kg i.p.) and haloperidol (0.0125–0.05 mg/kg i.p.) were required to reduce/abolish the amphetamine response. Pretreatments with aceperone (2.5 mg/kg i.p.), propranolol (5 mg/kg i.p.), atropine (5 mg/kg i.p.) and cyproheptadine (2.5 mg/kg i.p.) failed to modify the effects of amphetamine or apomorphine.

In a further series of experiments 6-hydroxydopamine (8 μg/4 μl) was injected bilaterally into the nucleus accumbens of rats pretreated for 4 h with tranylcypromine (5 mg/kg i.p.) and for 1 h with desmethylimipramine (25 mg/kg i.p.). After 14 days animals were either used in behavioural studies or sacrificed for biochemical assessment of the lesion. The 6-hydroxydopamine lesion depleted accumbens dopamine by approximately 80%. In these selectively denervated animals the response to intra-accumbens amphetamine was only slightly attenuated but the inhibitory effects of apomorphine were abolished. It is therefore suggested that dopamine receptors (sensitive to apomorphine and neuroleptic agents) located on dopamine nerve terminals the nucleus accumbens are able to prevent the locomotor hyperactivity caused by amphetamine injected into the same nucleus.

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Adenosine may mediate neuronal depressant effects of morphine

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Recent evidence suggests that theophylline, widely regarded as a relatively specific antagonist of adenosine, will block the inhibition of transmitter release produced not only by adenosine but also by morphine (Jhamandas, Sawynok & Sutak, 1978). It is therefore possible that morphine is acting indirectly by releasing adenosine. One of the properties of morphine receiving much attention is its ability to depress the firing of central neurones, and as adenosine shares this property we have investigated the possibility that a relationship may exist between these compounds.

Male rats were anaesthetised with urethane and the skull removed to allow access to the corpus striatum. All compounds were administered by microiontophoresis from 6- or 7-barrelled micropipettes, recording unit activity through one of the barrels or through a separate electrode glued alongside. Morphine sulphate was ejected from a 50 mM solution, adenosine hemisulphate 100 mM; naloxone HCl 50 mM; and aminophylline (theophylline ethylenediamine) was ejected from a 50 mM solution in distilled water, pH 9 (not adjusted). Aminophylline was ejected as an anion.

Morphine produced a rapid depression of firing of 19 of 21 striatal neurones tested, using ejecting currents of 60–160 nA. Adenosine and GABA also

depressed most of the cells tested. The ejection of aminophylline produced a rapid and reversible reduction of responses to both adenosine and morphine on all 15 neurones tested. Nine of these cells showed an increase in firing rate during the application of aminophylline, the doses of which ranged from 14 to 90 nA. Responses to GABA were never affected by aminophylline.

Naloxone proved able to reduce the depressant effects of morphine but not adenosine, when applied with low currents of 10–25 nA to reduce direct depression by naloxone. The morphine depressions thus appear to be a specific effect.

These results support the idea that the first consequence of the interaction of morphine with its receptor is the local release of adenosine.

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Behavioural scoring—how good is the agreement between scorers?

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Behavioural models are used increasingly to determine neurotransmitter receptor sensitivity. However, there are problems in quantifying such models as characteristics can only be assessed subjectively. Examples of such models are the behavioural syndromes seen in rats after administration of either p-chloroamphetamine (PCA) (Trulson & Jacobs, 1976) which releases brain 5-HT (Conti, Strope, Adams & Marsden, 1978), or tryptamine plus a monoamine oxidase inhibitor (Marsden & Curzon, 1978). Both syndromes are characterised by lateral head weaving, forepaw treading, hind limb abduction and straub tail. One method of assessment is to score the presence of each behavioural component on an integral 0–3 scale (0 = absent, 1 = occassional, 2 = frequent, 3 = continual) during 1 min observation periods (Marsden & Curzon, 1978). This report outlines a study to determine the scoring agreement between 5 trained observers rating such behaviour and the use of the method to compare the effects of (±)-propranolol on the behavioural syndromes produced by PCA and by tranylcypromine (TCP) + tryptamine.

Unlabelled video cassette films made of the behaviour of 18 male Wistar rats for 60 min after treatment with either PCA (7.5 mg/kg) or tryptamine (5 mg/kg) 30 min after TCP (10 mg/kg) were viewed in random order by five trained observers who simultaneously and independently rated the filmed behaviour. Using the non-parametric Friedman test (Marascuilo & McSweeney, 1977), casting the results matrix with the scores for each film forming the 18 rows, each syndrome characteristic and the totals were analysed, demonstrating that the observers did not differ significantly from each other in their scoring technique.

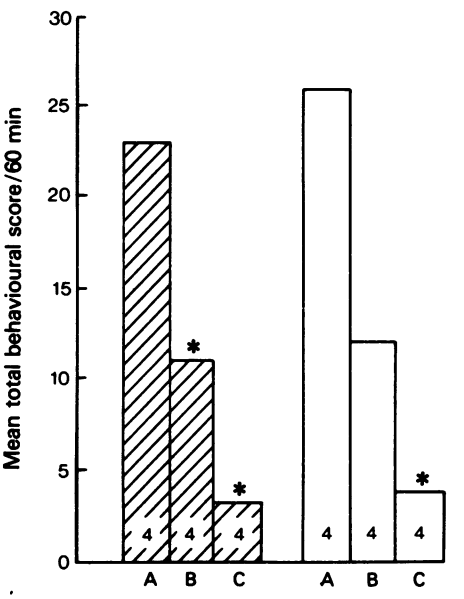

Figure 1. Effect of (±)-propranolol (20 and 40 mg/kg) on the behavioral score induced by either tranylcypromine (10 mg/kg) plus tryptamine (5 mg/kg) 30 mins later (□) or *p*-chloroamphetamine (7.5 mg/kg ■). (±)-Propranolol was given 30 min before either tranylcypromine or *p*-chloroamphetamine. A = saline, B = (±)-propranolol 20 mg/kg, C = (±)-propranolol, 40 mg/kg. *Significant decrease from saline pretreated group ($P < 0.05$—Mann Whitney U test).