Table 1. RESULTS OF SWEAT TESTS

Investigation	Subjects	Na^+ concentration (mequiv/l.)	K^+ concentration (mequiv/l.)	Urea concentration (mg/100 ml.)
Second foot journey	Bedouin Arabs			
	Mean	45·5	5·5	44·3
	S.D.	±16·3	±0·7	±11·6
	Non-Bedouin Arabs			
	Mean	42·8	6·7	39·4
	S.D.	±12·0	±1·4	±10·6
Camel journey	Bedouin Arabs			
	Mean	44·0	7·5	49·5
	S.D.	±27·0	±1·4	±8·0

and the concentrations in urine of electrolytes and protein metabolites were also fairly constant. No evidence was found from the blood samples to indicate that haemoconcentration had occurred. During the journeys which were made on foot the Bedouin completed the distance faster than the non-Bedouin, the fastest average speed being 8·0 km/h.

The concentration of electrolytes in sweat (Table 1) was lower than values reported for inhabitants of temperate zones (Na^+: 58·4 ± 15·7 mequiv/l.; K^+: 10·0 ± 2·4 mequiv/l. (ref. 4)), whereas the values we found for urea[5] in sweat were not remarkable. The electrolyte levels are, however, higher than some reported from Caucasians who were well acclimatized to heat[6], and our observations give support to the conclusion of Wyndham, Metz and Munro[7] that some permanent desert inhabitants are not as well acclimatized to hot conditions as is possible in Caucasian subjects.

In conclusion, we have found that although Bedouin perform well in their normal environment we have failed so far to find evidence of remarkable adaptation of the extent of their sweating. This may be related to the fact that while they journey by camel in their normal fashion they are not likely to be subjected to severe water deprivation.

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Effect of LSD-25 on the Septal Region of the Rat Brain

STIMULATION studies have suggested that the septal region[1,2] of many mammals affects behavioural reactions. In rats bilateral lesions of the septal nuclei produce an acute typical reaction resembling aggression which lasts from 24 to 48 h[3]. Septal hyper-irritability after electrical stimulation has been reported to last from 7 to 14 days[3]. Amygdaloid lesions appear to inhibit the septal reaction in the rat and it is believed that these two structures may have opposite functions in the control of emotional behaviour, at least in rats[4].

Lysergic acid diethylamide (LSD) has been shown to induce aggressiveness in normal animals but not bromlysergic acid diethylamide (BOL-148) (refs. 5, 6 and 7).

From an anatomo-physiological point of view, the septal region mediates between diencephalic and hypothalamic structures[8]. Studies have also shown that the septal nuclei can depress both emotional reactions and motor activity[9]. In view of this evidence, it was thought worthwhile to investigate the action of LSD and BOL-148 on rat brain catecholamines. A histochemical fluorescence technique developed by Falck *et al.*[10] was used to visualize the catecholamines dopamine (3,4-dihydroxyphenylethylamine) and noradrenaline before and after the drug treatment.

Thirty male Sprague–Dawley rats weighing between 150 and 200 g were placed in five groups of six. Group 1 received 0·5 and 1 mg/kg of LSD, group 2 received the same doses but were pretreated with 250 mg/kg of the monoamine oxidase inhibitor nialamide. Group 3 received 0·5 and 5 mg/kg of BOL-148. BOL-148, in the same doses, was given to the fourth group of rats previously treated with 250 mg/kg of nialamide. Rats in the fifth group received only 250 mg/kg of nialamide and served as controls. All drugs were injected intraperitoneally. Rats pretreated with the monoamine inhibitor were injected with LSD or BOL-148 2 h after being given nialamide and were killed 2 h 45 min later. Nialamide control animals were also killed 2 h 45 min after the initial injection. Rats receiving only LSD or BOL-148 were killed 45 min after being given the drug.

Rats were decapitated and sections of the forebrain were quickly frozen in a mixture of isopentane and propane (50 : 50) previously cooled in liquid nitrogen to −170° C. The tissues in the isopentane mixture were then suspended in liquid nitrogen where a temperature of −190° C was reached. The sections were next transferred to a lyophilizing machine and were kept for 7 days at a temperature well below −45° C for the drying phase. The vacuum was maintained at 10^{-4} torr. After drying, the method of Falck and Owman[11] was essentially followed for processing and sectioning the tissues.

The catecholamine fluorescence pattern was analysed in all regions of the forebrain. In rats that had received nialamide-BOL-148 no changes in the catecholamine fluorescence of the neuronal or diffuse regions were seen when compared with the controls.

Neither dose of BOL-148 by itself caused changes in the pattern of fluorescence in the regions analysed.

Single injections of LSD moderately increased the catecholamine (probably noradrenaline[12]) cell body fluorescence in the septal region. Rats given LSD after nialamide showed very marked increases in the catecholamine-containing cell bodies in the septum. No variation in catecholamine intensity was seen with doses of between 0·5 and 1 mg of LSD alone or LSD in combination with nialamide.

Table 1. CATECHOLAMINE FLUORESCENCE OF RATS' SEPTAL REGION FOLLOWING LSD AND BOL-148 TREATMENT, WITH AND WITHOUT NIALAMIDE

Drug	Dose (mg/kg)	Septal region fluorescence*
LSD	0·5, 1	+
Nialamide LSD	250 0·5, 1	+ +
BOL-148	0·5, 5	−
Nialamide BOL-148	250 0·5, 5	−
Nialamide (control)	250	−

* Moderate increase (+), strong increase (+ +), no change (−) as compared to nialamide control. $P < 0·001$.

The septal region in the rat is divided into a lateral and a medial area. After administration of nialamide, the lateral septum usually shows a scattering of cell bodies containing catecholamines which do not extend to the medial aspect even after large doses of nialamide and L-DOPA, a precursor of noradrenaline[13]. After treatment with nialamide–LSD, the cell bodies in the lateral septum were found to have increased in quantity and to extend

into the medial part of the septal region. It is too early to evaluate critically this finding although there are several possibilities. It is well known that psychotomimetics induce a malfunctioning of perceptual processes; this is evident after a small intake of LSD in the rat, as well as in man, but not after the brominated isomer of LSD has been taken[14]. It is curious, however, that the central effects produced by LSD can last 24 h in spite of the fact that the drug is totally removed from the body by excretion within a few hours of administration[14]. This seems to suggest that there is a residual action which is maintained as a result of changes in the brain enzyme metabolism occurring within an hour of the drug being given. These changes could affect the monoamine metabolism which would persist long after the total elimination of LSD. Reserpine, for example, produces central depression when given to an animal in small doses, and this compound has been reported to deplete nerve endings and cell bodies of their stores of catecholamines for 24–48 h[12], after which motor behaviour and concentrations of catecholamines return to normal. Animal studies have further shown that LSD can affect the concentrations of noradrenaline in total and particulate (bound) brain fractions[15] although its specific action was not determined.

The lack of sympathomimetic activity by BOL-148 may be a result of its inability to penetrate the blood–brain barrier[16] or, if penetration is achieved[17], of its inability to exert comparable changes in the monoamine brain make-up in the same way as LSD.

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Changes in Rat Brain Neuraminidase during Development

SOLUBLE enzyme preparations from various rat organs contain neuraminidase activity[1,2] with brain, liver and lactating mammary glands showing the highest concentrations of enzymatic activity. I report here the changes in neuraminidase activity which were observed in developing rat brains.

Lactating Sprague–Dawley albino rats were killed by decapitation. Cerebra were rapidly excised, homogenized in ice-cold 0·154 M KCl (1 : 4 w/v) and the homogenates were centrifuged at 100,000*g* for 1 h. The enzyme preparations consisted of nine volumes of supernatant fraction

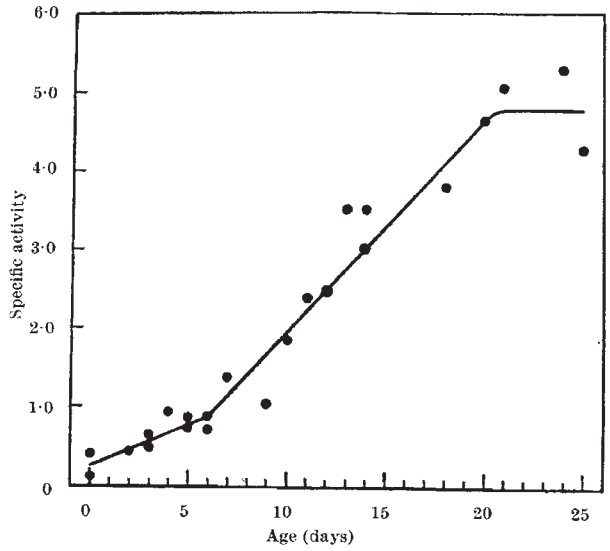

Fig. 1. Changes of brain neuraminidase during development. Specific activities expressed as nmoles of N-acetylneuraminic acid released from neuramin-lactose/mg of protein/3 h.

and one volume of 1 M sodium acetate–acetic acid buffer, *p*H 5·8. Neuramin-lactose (NL) or neuramin-lactose sulphate (NLS)[3] was used as substrate. For the assay[1], 60 nmoles of substrate in 0·1 ml. of distilled water was incubated with 0·3 ml. of enzyme for 3 h at 37°. The reaction was stopped by adding 0·2 ml. of periodate reagent[4] and the free N-acetylneuraminic acid (NANA) was determined by the thiobarbituric acid reaction. Enzyme and substrate controls were run concurrently and their values were subtracted from the experimental values. Protein was determined by the method of Lowry *et al.*[5] with crystalline bovine serum albumin as the standard.

Very low levels of neuraminidase activity can be detected during the first week of life. The specific activity starts to increase at the beginning of the second week and reaches the levels observed in mature animals[2] towards the end of the third week (Fig. 1).

Because the protein content of the supernatant fraction of brain homogenates is fairly uniform throughout development (mean ± *S.D.* = 4·80 ± 0·30 mg/ml.) the plot of activity expressed/g of fresh tissue closely resembles the curve shown in Fig. 1.

Neuraminidase in whole homogenates of brain shows an optimum *p*H between 3·5 and 4·0 (refs. 6 and 7), while soluble preparations[2] have an optimum *p*H of 5·8. Because a change of the optimum *p*H during development could be responsible for the changes observed, several brain preparations (7–14–21–24 days) were also tested at *p*H 4·0; no neuraminidase activity was detected at this *p*H.

High levels of activity of NANA-aldolase in the brain of young rats would also result in an apparent lack of neuraminidase activity. This possibility was investigated by incubating NANA in the conditions of the neuraminidase assay; essentially, quantitative recoveries of NANA were obtained with preparations from 3 and 20 day old rats, respectively. Analogous results were obtained by Tsvetkova who, working with whole homogenates of rat brain, found a rather active neuraminidase[8] but practically no NANA-aldolase activity.

The presence of a neuraminidase inhibitor in the brain of young animals was also considered. Such inhibitors have been detected in tissue extracts of chick embryo[9], and its possible presence in rat tissue homogenates[10] has been implied. This possibility was eliminated after experiments, which were conducted with mixtures of enzyme from 3 and 20 day old animals in various proportions, showed that the values are reasonably additive