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Further Aspects of the Exploratory Behaviour in Aggressive Mice

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Abstract. Aggressive mice can be divided in two sub-groups according to their exploratory activity. The "active" and the "blocked" aggressive mice show a different sensitivity to drugs, although they have a similar decrease of brain serotonin turnover rate.

Key-Words: Aggressiveness — Brain Serotonin — Exploratory Activity — LSD 25 — Fenfluramine — Yohimbine — Strychnine — Medazepam — Oxazepam — Propericiazine.

Previous results have shown that aggressive mice exhibit less exploratory activity and a different sensitivity to psychoactive drugs compared with normal mice (Valzelli, 1969a). Further experiments demonstrated, however, that aggressive mice could be divided into two groups: the "active" animals, showing a reduced exploratory activity and the "blocked" animals, completely unable to perform any exploratory activity (Table 1). Each group represents about 50% of the aggressive animals.

Table 1. *Exploratory activity of normal (N), "active" aggressive (AA) and "blocked" aggressive (BA) mice*

Time after saline administration	Number of holes explored ± S.E.		
	N	AA	BA
0	45 ± 4	12 ± 2	0
90 min	37 ± 4	8 ± 3	0
8 h	38 ± 3	9 ± 4	0
24 h	40 ± 6	10 ± 3	0
48 h	39 ± 3	9 ± 4	0

Each figure represents the mean of 20 animals.

Aggressiveness was developed in Swiss Albino male mice after 4 weeks of isolation, according to the experimental conditions described by Yen *et al.* (1959) and Valzelli (1967, 1969b).

The exploratory behavior was quantified by means of the "hole board" apparatus (Boissier *et al.*, 1964), used in an automated form (supplied by LP Italiana, Piazza San Carlo 9, Cinisello Balsamo, Milano, Italy).

Table 2. *Effect of various drugs on the exploratory behaviour of normal (N) and aggressive (A) mice*

Treatment mg/kg i.p.	Time after administration	Number of explored holes ± S.E.		
		N	A	
			"Active"	"Blocked"
LSD 2	0 min	45 ± 4	8 ± 2	0
	90 min	24 ± 4*	12 ± 3	2 ± 1
	8 h	25 ± 9	2 ± 1*	5 ± 2
	24 h	25 ± 5*	9 ± 1	15 ± 5*
	48 h	18 ± 4*	8 ± 2	6 ± 2
Fenfluramine 10	0 min	36 ± 4	9 ± 2	0
	90 min	14 ± 5*	7 ± 1	3 ± 2
	8 h	21 ± 4*	11 ± 2	4 ± 2
	24 h	16 ± 2*	7 ± 2	1 ± 0.5
	48 h	21 ± 3*	15 ± 3	2 ± 1
Yohimbine 2	0 min	38 ± 4	8 ± 2	0
	90 min	12 ± 2*	6 ± 2	2 ± 1
	8 h	28 ± 2	20 ± 6	6 ± 3
	24 h	21 ± 4*	26 ± 6*	7 ± 1*
	48 h	29 ± 3*	40 ± 5*	14 ± 2*
Strychnine 0.2	0 min	38 ± 2	14 ± 1	0
	90 min	13 ± 4*	6 ± 3*	2 ± 1
	8 h	13 ± 3*	8 ± 2	2 ± 1
	24 h	12 ± 4*	8 ± 3	2 ± 0.5
	48 h	21 ± 3*	9 ± 2	2 ± 1
Medazepam 5	0 min	30 ± 4	8 ± 2	0
	90 min	16 ± 7	6 ± 2	0
	8 h	17 ± 6	6 ± 2	0
	24 h	18 ± 2*	10 ± 4	3 ± 1
	48 h	18 ± 4*	7 ± 3	6 ± 1
Oxazepam 5	0 min	30 ± 2	10 ± 2	0
	90 min	22 ± 4	5 ± 3	3 ± 1
	8 h	16 ± 4*	6 ± 3	2 ± 1
	24 h	25 ± 5	7 ± 3	7 ± 2*
	48 h	27 ± 2	8 ± 4	6 ± 2*
Propericiazine 0.1	0 min	34 ± 2	8 ± 2	0
	90 min	10 ± 1*	9 ± 3	2 ± 1
	8 h	13 ± 2*	8 ± 4	4 ± 2
	24 h	22 ± 2*	13 ± 3	3 ± 1
	48 h	18 ± 2*	12 ± 2	4 ± 2

* $p < 0.01$.
Each figure represents the average of 5 determinations.

The times of observation reported in Table 1 were selected in such a way as to avoid the negative effect of the satiation of the environment upon the exploratory activity (Berlyne, 1955; Montgomery, 1953).

In the experiments reported in Table 2, several drugs were used in order to observe whether there was a different effect in relation to the behavioral situation. Lysergic diethylamide (LSD 25) depressed the exploratory behavior of normal and "active" aggressive mice but it increased the exploration of "blocked" aggressive mice. Yohimbine also depressed the behavior of normal mice while it increased the exploration of both "active" and "blocked" aggressive animals. Other drugs, such as fenfluramine, strychnine, medazepam and propericiazine were effective in normal animals but they did not show any effect in aggressive animals. Oxazepam stimulated the behavior of "blocked" aggressive mice but depressed normal animals.

Since previous studies (Garattini *et al.*, 1969) indicated that aggressive animals show a decreased turnover rate of 5-hydroxytryptamine (5 HT) compared with normal mice, it was of interest to determine this biochemical parameter in the "active" and "blocked" aggressive animals.

Table 3 shows that in both groups of animals there was a decrease of brain 5-hydroxyindolacetic acid (5 HIAA) and a considerable decrease in the turnover rate of brain 5 HT.

Table 3. *Brain 5-hydroxytryptamine (5 HT) turnover in normal (N), "active" aggressive (AA) and "blocked" aggressive (BA) mice*

Behavioral type	Brain levels μg/g ± S.E.		Brain 5 HT turnover		
	5 HT	5 HIAA	K (h−1) ± S.E.	Rate μg/g/h	Time min
N	0.63 ± 0.01	0.46 ± 0.02	1.03855 ± 0.03	0.50	69
AA	0.64 ± 0.01	0.35 ± 0.02*	0.69569 ± 0.05*	0.29	150
BA	0.61 ± 0.02	0.35 ± 0.02*	0.62907 ± 0.03*	0.25	160

* $p < 0.01$ in respect to the normal mice.

The 5 HT turnover was calculated according to Tozer *et al.* (1966) as reported elsewhere (Garattini *et al.*, 1967, 1969).

Brain 5 HT and 5 HIAA were determined according to Giacalone and Valzelli (1969).

Each figure represents the mean of 8 determinations.

In conclusion, the analysis of the exploratory behavior allows two sub-groups of aggressive animals to be differentiated which respond in a dissimilar way to drugs. Both sub-groups, however, show a similar decrease in turnover rate of brain 5 HT.

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