

A LITHIUM CARBONATE INDUCED INCREASE IN THE MOUSE BRAIN 5-HYDROXYTRYPTAMINE METABOLISM

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Lithium salts have been found to be effective in the prophylactic treatment of manic depressive disorders. It is not precisely known how this action is mediated but a possible mechanism is the effect of lithium on brain monoamine metabolism.

In the present investigation the metabolism of 5-hydroxytryptamine (5-HT) was examined by measuring the amount of labelled 5-HT recovered from mice brains (Simmonds, 1970) up to 120 minutes after intraventricular injection of 5 μ Ci 3 H-5-HT (generally labelled, 13.7 ci/mmol) in 20 μ l of normal saline. Groups of mice had been previously treated for 3 days with lithium carbonate 2 mEq/kg or a similar volume of normal saline, i.p. twice daily. The 3 H-L-tryptophan remaining in mice brain up to 120 minutes after intravenous injection of 25 μ Ci 3 H-L-tryptophan (generally labelled 7.0 Ci/mmol) was also measured (Schubert and others, 1970) in lithium carbonate treated and control mice. The results are summarised in Tables 1 and 2.

Table 1. Labelled 5-HT in mice brain at intervals after injection of 3 H-5-HT

Treatment	pmol 3 H-5-HT present		
	0 min	60 min	120 min
Normal saline	12.18 \pm 0.50	9.33 \pm 0.55	5.75 \pm 0.76
Lithium carbonate	11.59 \pm 0.52	5.97 \pm 0.67	2.15 \pm 0.27
Significance of Difference	N.S.	P < 0.01	P < 0.01

Table 2. Labelled tryptophan in mice brain at intervals after injection of 3 H-L-tryptophan

Treatment	pmol 3 H-L-tryptophan present			
	0 min	30 min	60 min	120 min
Normal saline	6.40 \pm 0.31	1.83 \pm 0.09	0.90 \pm 0.07	0.21 \pm 0.06
Lithium carbonate	6.81 \pm 0.30	0.91 \pm 0.10	0.59 \pm 0.09	0.12 \pm 0.03
Significance of Difference	N.S.	P < 0.001	P < 0.05	N.S.

N.S. not significant. All figures are means \pm s.e.m. of 6 observations.

From the results the 3 H-5-HT present in mice brain after injection of labelled 5-HT is significantly less in lithium treated mice after 60 minutes and 120 minutes. A significant difference exists between concentrations of 3 H-L-tryptophan at 30 and 60 minutes after injection of labelled L-tryptophan. The results suggest an increased metabolism and turnover of brain 5-HT in the presence of lithium carbonate, which supports similar findings in a previous work (Shaw and Ratcliffe, 1976). It may be that the clinical effect of lithium is exerted to some extent by this modification of brain 5-HT metabolism.

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