Acetylcholine release from cortical brain slices of rats injected with lithium

Waziri (1968) found that the addition of Li^+ (10–20 m-equiv/litre) to the fluid bathing Aplysia ganglion cells resulted in pre-synaptic electrical changes consistent with decreased acetylcholine release. Katz, Chase & Kopin (1968) reported decreased release of [^{3}H] 5-hydroxytryptamine or [^{3}H]noradrenaline after stimulation of brain slices from rats previously injected with lithium chloride (2·5 or 7·5 m-equiv/kg 48 and 24 h before) and also from non-injected rats when lithium chloride (1·2 or 2·4 m-equiv/litre) was added to the incubation medium. To ascertain directly the effect of lithium upon acetylcholine release from mammalian brain, we injected rats with lithium and measured the release of endogenous acetylcholine from electrically-stimulated cortical brain slices prepared from these animals and from controls injected with sodium chloride.

Male white Sprague-Dawley rats (150–200 mg) were injected with lithium chloride or sodium chloride (2·5 m-equiv/kg intraperitoneally) twice a day for four days. Three h after the last dose of lithium the rats were decapitated and the brains were removed. Cortical slices were rapidly prepared and mounted for electrical stimulation between quick-transfer electrodes in a water bath (Bowers, 1967). All slice experiments were made in Tyrode solution containing Li^+ 5·0 m-equiv/litre. We had previously determined that the addition of this quantity of lithium to Tyrode solution did not alter the electrically stimulated release of acetylcholine from cortical brain slices of rats which had not been previously injected with lithium. In most stimulation experiments slices from lithium-injected animals and sodium-injected animals were stimulated simultaneously. In some experiments incubated but unstimulated control slices were also added to this group. Acetylcholine was measured by bioassay using the Venus heart (Bowers, 1967). We found that the addition of lithium chloride to the bioassay bath (up to 10^{-4} g/ml) had no obvious effect upon the spontaneous beat of the LSD-stimulated clam heart nor did it affect the shape of the dose-response curves to standard acetylcholine solutions.

Under these conditions, there was no significant difference in the electrically-stimulated release of endogenous acetylcholine from slices prepared from sodium-injected [$0{\cdot}86 \pm 0{\cdot}07(17)$] as compared to lithium-injected [$0{\cdot}92 \pm 0{\cdot}08$ (20)] rats (doses as μg/g of brain, wet weight). Mean values for both these groups were significantly greater than values from control unstimulated slices [$0{\cdot}56 \pm 0{\cdot}05$ (12)] ($P < 0{\cdot}01$). These results do not support the hypothesis that lithium decreases acetylcholine release in mammalian brain. On the other hand, they do not exclude the possibility that certain more physiological forms of acetylcholine release in brain might be influenced by lithium.

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