EFFECT OF MORPHINE ON THE LIBERATION OF ACETYLCHOLINE FROM THE MOUSE CEREBRAL CORTICAL SLICES IN RELATION TO THE CALCIUM CONCENTRATION IN THE MEDIUM

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The facts that morphine inhibits the release of ACh from isolated guinea-pig intestine and also it suppresses the ChE activity, in vitro or in vivo, led to the hypothesis that the cholinergic mechanism may be involved in the effect of morphine on the central nervous system.

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References
FIG. 1. Effect of morphine on the spontaneous and potassium-stimulated liberation of ACh from mouse cerebral cortical slices.

We have reported that the administration of a single dose of morphine caused a increase of brain ACh content in normal animals and that this increase was not found in animals that had received chronic administration of morphine. From these results, we have suggested that this increase of brain ACh content induced by morphine may be the results of decreased liberation of ACh from its storage site (1).

On the other hand, recently, we have suggested that calcium ion may play an important role in the mechanism of the analgesic effect of morphine (2-5).

In the present paper, we studied the effect of morphine on the liberation of ACh from the cerebral cortical slices in connection with the changes of calcium concentration in the medium.

Cerebral cortical slices were prepared from the separated hemispheres of the male white mice of ddO strain. Liberation of ACh from the slices was performed according to the method of Quastel et al. (6). ACh was estimated by measuring the contraction of the eserinized frog rectus abdominis muscle preparation (7).

In the normal Krebs-phosphate medium, the addition of 1 mM of morphine showed a slight inhibition on the spontaneous liberation of ACh from cerebral cortical slices, but the same amount of morphine inhibited the potassium-stimulated ACh liberation by about 15%.

However, in the calcium-free medium no spontaneous liberation of ACh was observed and the potassium-induced liberation of ACh was also less than that in the normal medium. In this case, morphine failed to exert its inhibitory effect on the liberation of ACh from cerebral cortical slices.

It is revealed from these results that calcium ion is indispensable for the exhibition of the inhibitory effect of morphine on the liberation of ACh from cerebral cortical slices.

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