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THE EFFECT OF Na⁺ REMOVAL ON CATECHOLAMINE SECRETION
INDUCED BY MUSCARINE FROM PERFUSED ADRENAL GLAND
OF THE GUINEA-PIG

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(Summary of graduation thesis written under direction of Dr. Y. Nakazato)

1. The effects of extracellular Na⁺ deprivation on muscarine-induced catecholamine secretion compared with that evoked by caffeine were examined in perfused adrenal glands of the guinea-pig. The effects of ryanodine, thapsigargin and cyclopiazonic acid on the evoked secretory responses were also studied in the absence of extracellular Ca²⁺ and Na⁺.

2. Muscarine was repeatedly applied for 1 min at 15-min intervals in the presence or absence of extracellular Ca²⁺. The amount of catecholamine released by muscarine gradually declined on repetition. The extent of the decrease was much greater in the absence of Ca²⁺ than in its presence. On the other hand, when both Ca²⁺ and Na⁺ were removed, the secretory response to muscarine was significantly enhanced.

3. Under Na⁺-deficient conditions, the caffeine-induced secretory response, but not the muscarine-induced one, disappeared after the treatment with ryanodine, thapsigargin or cyclopiazonic acid. In the presence of extracellular Na⁺, however, thapsigargin abolished both responses to caffeine and muscarine.

4. These results suggest that the cytosolic Ca²⁺ concentration responsible for catecholamine secretion is partly regulated by the Na⁺-Ca²⁺ exchange mechanism, and that muscarine may mobilize Ca²⁺ from intracellular stores, which are insensitive to ryanodine and Ca²⁺-ATPase blockers under Na⁺-free conditions.