SUMMARY

Rat ileum

1. Nicotine, dimethylphenylpiperazinium (DMPP) and acetylcholine (ACh) in the presence of hyoscine caused a dose-related relaxation of the isolated rat ileum. The relaxation was Ca^{++} -dependent. Pronethalol or phentolamine only partially blocked relaxation. Given together they produced complete block.

2. The relaxation was absent in reserpinized preparations and prior exposure to noradrenaline (NA) produced restoration. The restored responses were blocked by xylocholine, bretylium and guanethidine; this block was reversed in some experiments by dexamphetamine.

3. Hexamethonium, pempidine and mecamylamine and local anaesthetics which are known to possess ganglion blocking action and hypothermia to which ganglionic synapses are more senstive than are the postganglionic neurones, all blocked

responses to nicotine and DMPP, but either did not affect responses to ACh and NA or potentiated them.

4. Tetrodotoxin markedly inhibited responses to nicotine and DMPP, did not affect those to ACh and potentiated those to NA.

5. Hemicholinium (HC-3) and triethylcholine blocked responses to nicotine and DMPP and potentiated those to ACh and NA. HC-3 also significantly reduced the release of ACh by nicotine.

6. It is concluded that nicotine and DMPP stimulate parasympathetic ganglia in the rat ileum to release ACh and that this endogenously released ACh and exogenously applied ACh in turn releases NA and that the mechanism is generally consistent with the concept of cholinergic link between sympathetic nerve impulse and the release of NA.

Rabbit ileum

1. Isolated ileum preparations from rabbits 1 - 15 day old were used for this study.

2. Stimulation of periarterial nerves to ileum preparations from 1 - 3 day old rabbits elicited motor responses at all frequencies (1, 2, 5, 10 and 20 Hz). The responses were potentiated by physostigmine (0.2 µg/ml) and blocked by hyoscine (0.1 µg/ml) indicating that ACh release mediated the motor responses.

3. NA (200 - 500 ng/ml) failed to relax intestine of 1 day old rabbit, but preparations from 2 - 12 day old rabbits were relaxed. Presumably, adrenoceptors of the rabbit ileum develop on the 2nd day of life.

4. In preparations from 4 - 10 day old rabbits responses to lower frequencies (1, 2 and 5 Hz) were motor but those to higher frequencies (10 and 20 Hz) were inhibitory. In preparations from rabbits 11 and 12 day old, responses to all the frequencies were inhibitory. Exposure to NA (1 µg/ml) of preparations in which lower

frequencies elicited motor responses, converted the motor responses to inhibitory responses. The observations suggest that : (i) endogenous NA stores in the periarterial nerves of younger rabbits increase with advancing age and (ii) exogenously administered NA is taken into the nerves and then released by nerve stimulation.

5. The endogenous NA content of intestine of 1 - 6 day old rabbits was considerably higher than that of adult rabbits but declined sharply on the 7th day. A further gradual decline occured by the 12th day.

6. In view of the inconsistent inhibitory responses to nerve stimulation of preparations from 1 - 6 day old rabbits (Table 2) at a time period when the endogenous NA content of the intestine was high it is concluded that the two observations are causally unrelated. The high NA content may possibily be derived from maternal source during

the intrauterine life of the young rabbit, a suggestion consistent with the observation of Ignarro and Shideman (1968 a).

7. Ileum preparations from 1 - 6 day old rabbits accumulated small amounts of NA. That this accumulation may have been through active neuronal uptake is suggested by the cocaine-sensitivity of the accumulation. Thus, the neuronal uptake mechanism though not fully functional at birth seems to be present.

8. The high T/M ratios of NA observed in experiments wherein ileum pieces from rabbits older than 7 days were incubated in medium containing NA, suggests that the uptake mechanism is fully functional from this day onwards. The complete cocaine-sensitivity of the uptake mechanism suggests that the uptake is neuronal.

9. Day and Rand (1961) showed that the nerves to rabbit intestine which on stimulation liberate

ACh at younger ages also release it at older ages. The present study indicates that large stores of NA are built up in these nerves at older ages. It is, therefore, suggested that at older ages, nerve stimulation releases ACh which in turn releases NA to evoke inhibitory response.