Morton, 1965). In taenia coli from the rabbit or guinea-pig, isometrically contracted by carbachol, isoprenaline in low concentrations ($<7\times10^{-7}$ g/ml.) selectively relaxed the muscle by stimulating β-receptors. The effect was selectively blocked by MJ 1999 ($5–12\times10^{-6}$ g/ml.). In higher concentrations ($>1\times10^{-6}$ g/ml.) isoprenaline also stimulated α-receptors and the effect was blocked by a combination of MJ 1999 and dibenamine ($0.5–1\times10^{-6}$ g/ml.). Phenylephrine in low concentrations ($0.25–1.25\times10^{-6}$ g/ml.) selectively relaxed the muscle by stimulating α-receptors; in higher concentrations ($>1\times10^{-6}$ g/ml.) phenylephrine also stimulated β-receptors. In taenia coli from the rabbit, adrenaline in the lowest active concentration ($2\times10^{-8}$ g/ml.) relaxed the muscle by stimulating β-receptors. In taenia coli from the guinea-pig adrenaline stimulated α-receptors in the lowest active concentration ($1.6\times10^{-8}$ g/ml.). The relaxation mediated by α-receptors was more rapid and complete than that mediated by β-receptors.

In taenia coli from the rabbit the relaxing effect mediated by β-receptors was potentiated by theophylline ($7.5\times10^{-5}$ g/ml.) and selectively blocked in glucose-free solution. It was still present in $K^+$-depolarized muscle. The relaxing effect was in time preceded by a fall of the content of adenosine triphosphate (ATP) and creatininephosphate (CrP) of the muscle, an increase of the phosphorylase-*a* activity, and an increase of the hexosephosphates (G-1-P, G-6-P, F-6-P) and lactate levels of the muscle. All these metabolic actions and the relaxing effect were blocked by β-receptor blocking agent. The relaxing and metabolic effects of isoprenaline was mimicked by treating the muscle with dinitrophenol ($4\times10^{-5}$M). (ACTH (0.15 i.u./ml.) relaxed the taenia coli of the rabbit via β-receptor like mechanism.

The relaxing action mediated by α-receptors was not potentiated by theophylline of associated with any changes of the ATP or CrP level of the muscle or influence on the carbohydrate metabolism. It was selectively blocked by procedures tending to eliminate the concentration gradient of $K^+$-ions over the cell membrane or decrease the $K^+$ permeability of the membrane. The relaxing action was thus blocked in $K^+$-depolarized or cold treated muscle. The effect was also inhibited after treating the muscle by digitalis glycosides ($1\times10^{-4}$M) or desoxycorticosterone ($1\times10^{-5}$M) for 60–120 min.

It is suggested that the relaxing action mediated by β-receptors is dependent on a metabolic action probably mediated by cyclic AMP. The relaxing action mediated by α-receptors is probably dependent on a selective increase of the $K^+$-permeability of the cell membrane as suggested by Jenkinson & Morton (1965).

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## A hyoscine-resistant contraction of the chicken isolated oesophagus to stimulation of the vagus and descending oesophageal nerves

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Isolated oesophageal preparations with vagus and descending oesophageal nerves attached were made from young and adult chickens (Bartlet & Hassan, 1968a), and the contractions of the longitudinal muscle recorded isotonically. The preparations were suspended

in Krebs solution containing half the normal concentration of $Ca^{++}$, equilibrated with 5% carbon dioxide in oxygen and maintained at 35° C. *In vivo* experiments were carried out on cockerels anaesthetized with halothane and decerebrated; after an interval of 60–90 min contractions of the oesophagus to stimulation of the vagus and descending oesophageal nerves were recorded by a balloon-tambour system (Hassan, 1967). In both *in vitro* and *in vivo* experiments the nerves were stimulated with square wave pulses (width 10 msec, frequency 20 c/s and intensity 5V) the duration of stimulation being 5–15 sec applied every 2–15 min.

Exposure of the isolated oesophagus to hyoscine (1–100 μg/ml.) for 30 min abolished the contraction produced by stimulation of either nerve if the duration of stimulation was less than 5 sec; however, prolonged stimulation produced a delayed contraction which was not antagonized by hyoscine (100 μg/ml.) although cocaine (50 μg/ml.) abolished it (Bartlet & Hassan, 1968b). The hyoscine-resistant contraction was abolished by cutting the nerves, but mepyramine, methysergide or bretylium had no effect on it. Physostigmine (5 μg/ml.) did not have a significant effect on the hyoscine-resistant contraction and physostigmine (50 μg/ml.) antagonized it ($P<0.05$). In six experiments tubocurarine (50 μg/ml.) reduced the height of the hyoscine-resistant contraction by a mean (±S.E. of mean) of 21% (±8, $P<0.05$) and hexamethonium (100 μg/ml.) reduced it by a mean of 59% (±14, $n=3$, $P<0.05$).

In previous experiments with pentobarbitone-anaesthetized chickens, the contraction of the oesophagus *in vivo* produced by stimulation of the vagus and descending oesophageal nerves was abolished by intravenous hyoscine (Hassan, 1967). Decerebrate preparations have now been used to find out whether the pentobarbitone had blocked a hyoscine-resistant response of the oesophagus to nerve stimulation. Hyoscine (100 μg/kg intravenously) abolished the contractions of the oesophagus produced by prolonged stimulation of the vagus and descending oesophageal nerves.

The *in vivo* experiments suggest that the vagus and descending oesophageal nerves are cholinergic, but the *in vitro* experiments suggest that these nerves release acetylcholine which acts on receptors inaccessible to hyoscine added to the organ bath.

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## Study of the effects of progesterone therapy on the oestrogen-induced sensitivity of rat uterus

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Khan & Qureshi (1967) observed that reserpine therapy prevented the marked increase in the sensitivity of rat isolated uteri to oxytocic drugs by stilboestrol. They considered this to be due to excessive release of progesterone from the corpora lutea. This effect of reserpine disappeared in ovariectomized (Ansary, 1965) and hypophysectomized rats (Khan & Shariff, 1967).

The effect of progesterone on the isolated uterine sensitivity both in ovariectomized and intact animals was determined in eighty-eight rats. Progesterone was administered