STIMULATION OF FALLOPIAN TUBES BY PROSTAGLANDIN $F_{2\alpha}$, BIOGENIC AMINES AND PEPTIDES*

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The musculature of the Fallopian tube is hyperactive during the time of ovulation, but the mechanism which activates the tube is obscure. A humoral regulation of tubal motility is more probable than a nervous one, although it is not known to what extent biogenic compounds (tissue hormones) can stimulate the tubes.

We have investigated this question on a quantitative pharmacological basis using eighty-four human tubes on the day of removal. Strips were cut from the infundibular end and suspended in 10 ml Krebs-Henseleit solution at 32° C and aerated with carbogen. The contractions of the preparations were recorded isototonically on smoked paper. The experiments were designed to yield dose-response curves from which the EC_{50} -values and other parameters mentioned in Table 1 were determined. Text-fig. 1 gives two typical examples of dose-dependent responses and shows not only that tubal strips *in vitro* produce powerful contractions, but also that there are great quantitative differences between the endecapeptide eledoisin, and acetylcholine. Nor-adrenaline and the peptides oxytocin, bradykinin, kallidin, and angiotensin were practically inactive. The active substances are summarized in Table 1. In contrast with the well-known biogenic amines acetylcholine, histamine, and 5-hydroxytryptamine, the 'tachykinin peptides' (Erspamer & Anastasi, 1966) eledoisin, physalaemin, and Substance P (Lembeck & Zetler, 1962) were of very great potency. These peptides were even more active than prostaglandin $F_{2\alpha}$ which is the compound of the prostaglandin series with highest stimulating activity on the Fallopian tube (Horton 1965; Horton & Main, 1965; Ingelman-Sundberg, Sandberg & Rydén, 1967; Sandberg, Ingelman-Sundberg & Rydén, 1967). The number of our results is too small to reveal an influence of the phases of menstrual cycle. There was, however, no difference in sensitivity for eledoisin or acetylcholine between tubes of eight women with a mean age of 23.5 years and those of fourteen women with a mean age of 48.4 years.

Corresponding experiments on isolated tubes of guinea-pig, rat, rabbit, cat, pig and sheep revealed great species differences. No tube reacted to 5-hydroxytryptamine. A qualitative and quantitative similarity with human Fallopian tube was found only for the rabbit tube which alone was sensitive to eledoisin.

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The sensitivity of the human and rabbit Fallopian tube to tachykinin peptides and prostaglandin $F_{2\alpha}$ is so high that such compounds could play a physiological role for humoral activation of the tube during ovulation.

TABLE 1

POTENCY OF BIOGENIC COMPOUNDS WHICH STIMULATE HUMAN FALLOPIAN TUBE IN VITRO

Substance	Molecular weight	n	EC ₅₀ (μ moles/litre)*		Relative potency†	Intrinsic activity‡
			$\bar{x}$	$s_{\bar{x}}$		
Eledoisin	1233	24	0.022 $\pm$	0.004	100	1
Physalaemin	1264	4	0.087 $\pm$	0.031	25	0.93
Substance P§	1650	5	0.057 $\pm$	0.014	39	0.9
5-Hydroxytryptamine¶	405	10	9.8 $\pm$	2.8	0.23	0.6
Acetylcholine hydrochloride	182	23	710 $\pm$	280	0.003	0.8
Histamine dihydrochloride	184	8	840 $\pm$	270	0.0027	0.8
Prostaglandin $F_{2\alpha}$	355	5	0.11 $\pm$	0.037	20	0.5

* EC₅₀ concentration which causes 50% of the maximal eledoisin effect.

† Potency of eledoisin taken as 100.

‡ Means of greatest obtainable responses, maximal response taken as unity.

§ Made from cattle brains (Zetler & Baldauf, 1967) and having a biological activity of 11 to 52 Euler-units/mg.

¶ Creatinine phosphate.

TEXT-FIG. 1. Isolated strip of Fallopian tube of a 30-year-old woman, 24 days after the last menstruation. Contractions caused by single doses of acetylcholine hydrochloride and the peptide eledoisin. The figures are μ moles/litre, the highest concentrations corresponding to 5.2 μ g/ml for eledoisin and to 1 mg/ml for acetylcholine. The abscissa indicates percentages of maximal response.

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