**Hormonal control of the rat myometrium**

SIR,—The influence of the female sex hormones on the myometrium has been most clearly demonstrated in the rabbit (for references see Schofield, 1963). In this species the progesterone-dominated uterus, when compared with the oestrogen-dominated uterus, is insensitive to oxytocin, gives a different staircase effect in response to electrical stimulation and binds calcium more effectively. The present work reports the results of similar studies on the rat myometrium.

A total of 45 Wistar rats, 13–15 weeks old, were ovariectomized under ether anaesthesia and 10 days later two treatments were adopted. (1) The oestrogen-dominated group received 10 $\mu$g of oestradiol monobenzoate intramuscularly daily for 10 days. (2) The progesterone-dominated group were treated similarly with oestrogen and, in addition, received 5 mg of progesterone intramuscularly daily for the last 3 days of treatment. A control group were given no hormones.

The animals were stunned, decapitated, and the uteri rapidly dissected into a dish of modified Krebs solution (Knifton, 1966) at 4°. A 25 mm length of uterine horn was cut, transferred to a 10 ml tissue bath and assembled for electrical stimulation and isometric recording as previously described (Knifton, 1966).

After adjusting the tissue to resting length, five procedures were adopted. The threshold voltage and staircase effect were determined and the tissue rested for 10 min before measuring the minimum dose of oxytocin (Syntocinon, Sandoz) causing a uterine contraction (oxytocin threshold). Finally, the tissue was stimulated electrically at 1 min intervals. When the contractions attained a steady state tension, the tissue was washed repeatedly in calcium-free Krebs solution and the time when the tension was reduced to 50% of the steady state tension (T50) was measured. The procedures involving electrical stimulation have been previously described (Knifton, 1966).

The results are summarized in Table 1. In the rat it was not posssible to demonstrate different types of staircase consistent with varying hormone domination of the myometrium as has been shown in the rabbit (Csapo & Corner, 1952), sheep (Bengtsson & Schofield, 1960) and pig (Knifton, 1966). This confirms the work of Schofield (1960).

TABLE 1. THE EFFECT OF FEMALE SEX HORMONES ON THE RESPONSE OF THE MYOMETRIUM TO ELECTRICAL STIMULATION AND OXYTOCIN

| | Controls | Oestrogen-dominated | Progesterone-dominated |
|---|---|---|---|
| | Mean values ± s.e. | | |
| Threshold voltage (V/cm resting length) .. | 0·63 ± 0·09 | 0·47 ± 0·07 | 0·49 ± 0·06 |
| Oxytocin threshold (m.U.) .. .. .. | 0·99 ± 0·19 | 0·03 ± 0·007 | 0·23 ± 0·04 |
| Steady state tension (g) .. .. .. .. | 1·6 ± 0·4 | 4·7 ± 0·39 | 4·7 ± 0·6 |
| T50 (min) .. .. .. .. .. | | 4·2 ± 0·84 | 5·6 ± 1·09 |

There was no significant difference in the values for threshold voltage between the 3 groups of uteri, but there were differences in sensitivity to oxytocin. The control uteri were less sensitive ($P < 0.01$) than the hormone treated ones, and the progesterone-dominated uteri were less sensitive ($P < 0.01$) to oxytocin than the oestrogen-dominated. These results are in accord with the concept of "progesterone block" discussed by Schofield (1963).

The steady state tension of the control group was significantly less ($P < 0.01$) than that of the hormone treated uteri, which is to be expected since oestrogens control the synthesis of contractile protein in the myometrium (Csapo, 1950).

A comparison of the hormone treated groups however, shows that progesterone does not reduce the tension in response to electrical stimulation. Similarly, there is no significant difference between the oestrogen- and the progesterone-dominated uteri in the degree of calcium binding. These results contrast with similar studies in the rabbit (Schofield, 1955; Csapo, 1956) and pig (Knifton, 1966).

The only effect of progesterone on the rat myometrium that this study reveals therefore, is a decrease in the sensitivity to oxytocin.

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### Nature of adrenergic receptors on the skin melanophores of *Rana tigrina*

SIR,—This report describes the experiments conducted to determine the nature of adrenergic receptors on frog melanophores.

Adult *Rana tigrina* (80–350 g) were anaesthetized by injection of pentobarbitone sodium (50 mg/kg) into the abdominal cavity. Drugs, dissolved in 0·6% saline or amphibian Ringer solution, were injected through the cannulated left branch of thoracic aorta (Bhide & Gupta, 1967) or through one of the liver lobes. Skin colour was observed with the naked eye, and melanophores of the web skin were graded by the method of Hogben & Slome (1931). In experiments in conscious frogs, drugs dissolved in distilled water were injected into the abdominal cavity. From 3 to 6 frogs were used for each dose of each drug and the average change in melanophore index recorded (Tables 1 and 2).

Noradrenaline, which acts predominently on α-type adrenergic receptors was more potent in concentrating melanin in melanophores than adrenaline which

TABLE 1. EFFECT OF ADRENERGIC DRUGS ON THE MELANOPHORE INDEX IN *Rana tigrina*

| Drug | Anaesthetized frogs | | Conscious frogs | |
|---|---|---|---|---|
| | Dose mg/kg (No. of frogs) | Average change in the melanophore index Decrease (−) Increase (+) | Dose mg/kg (No. of (frogs) | Average change in the melanophore index Decrease (−) Increase (+) |
| Noradrenaline hydrochloride .. | 0·1 (7) | −1·2 | 1·0 (4) | −2·0 |
| | 0·5 (7) | −1·8 | 4·0 (9) | −3·5 |
| | 1·0 (5) | −2·6 | | |
| Adrenaline hydrochloride .. .. | 0·5 (3) | −0·75 | 0·3 (5) | −0·7 |
| | 1·0 (7) | −1·25 | 1·0 (3) | −1·33 |
| | 2·0 (5) | −1·8 | 3·0 (3) | −2·33 |
| Isoprenaline sulphate .. .. | 0·3 (5) | +0·67 | 0·3 (3) | +0·66 |
| | 1·0 (3) | +1·0 | 1·0 (4) | +1·0 |
| | 3·0 (4) | +0·88 | 3·0 (6) | +1·5 |