

## THE ACTION OF GLANDULAR EXTRACTS UPON THE CONTRACTIONS OF THE UTERUS.<sup>1</sup>

By ISAAC OTT, M.D.,

*Professor of Physiology, Medico-Chirurgical College, Philadelphia,*

AND

JOHN C. SCOTT, M.D.,

*Demonstrator of Physiology.*

The uterine tissue consists of unstriated muscle fibre and ganglia of the sympathetic system imbedded in it. The sacral roots and pelvic nerve do not enter into the composition of the uterine plexus.

In the rabbit, irritation of the hypogastric nerve produces vasoconstriction and contraction of the uterus. In cats, stimulation of the hypogastric nerve produces at one time contraction and at other times relaxation of the uterus. Dixon<sup>2</sup> has shown that ergotoxin paralyzes the augmentor fibers and leaves the inhibitory fibers in the sympathetic intact. In the rabbit's uterus the augmentor fibers always predominate; hence an irritation always produces a rise of tonus in the uterus. After paralyzing the augmentor fibers with ergotoxin, adrenalin excites the inhibitory fibers and relaxes the uterus. In the unimpregnated uterus of the cat adrenalin relaxes the uterus, but with a pregnant uterus it causes contraction. However, Fardon<sup>3</sup> found that when nicotin is given first a contraction of the non-pregnant uterus is caused by adrenalin instead of the usual relaxation. Adrenalin is supposed to act on nerve endings; hence nicotin must act on these nerve terminals or on the muscle itself. This reversal of action of adrenalin by previous use of nicotin is not due to a paralysis of the inhibitory nerve endings, for if ergotoxin be added after the reversal has been produced, the action of adrenalin is once more reversed and produces inhibition.

<sup>1</sup> Received for publication November 23, 1908.

<sup>2</sup> Quoted by Fardon, *Bio-Chemical Journal*, 1908, iii, 405.

<sup>3</sup> *Bio-Chemical Journal*, 1908, iii, 405.

Our experiments number fifty-four and were made upon the uteri of cats and rabbits. We excised a small piece of the uterus, and one end was attached to a Porter heart-lever and the other end to the extremity of an L-shaped tube immersed in Ringer's solution. Oxygen was kept bubbling through the solution and the temperature was kept steadily at 37.5° C. by means of a water-bath and a small dental gas burner beneath the water-bath. The animals were first etherized, and then a small part of the uterus was excised. The powdered extracts were added directly to Ringer's solution. The oxygen supply was at a continuous rate of about two hundred bubbles a minute. Two hundred cubic centimeters of Ringer's solution were used.

*Normal Movements.*—In the pregnant uterus the movements are more pronounced than in the unimpregnated one. The non-impregnated uterus of young animals does not give curves of any

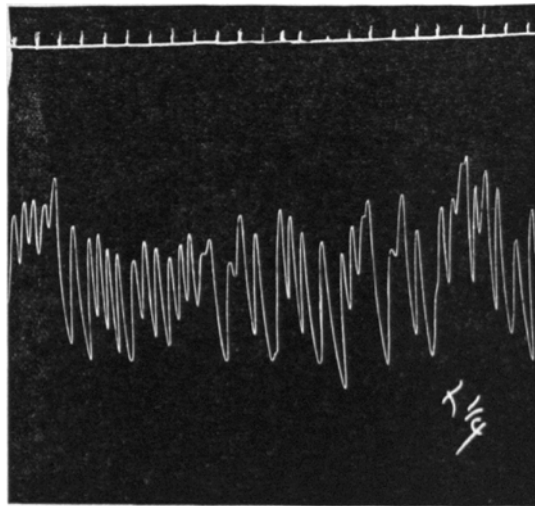


FIG. 1. Normal uterine contractions. Effect of mammary gland extract on uterine contraction.

extent, and adding adrenalin, a sympathetic nerve stimulant, does not seem to better the results. The uterine contractions normally show considerable variation in regard to chemical stimuli. The animal extracts used were those of Armour & Co., except where otherwise stated.

*Mammary Gland.*—Extract of mammary gland in doses of  $\frac{1}{8}$  to 1 grain augmented the uterine contractions and increased the tonus (Figs. 1 and 2). Large doses relaxed the uterus, diminished in extent and slowed contractions.

*Prostate.*—The prostate in doses of  $\frac{1}{4}$  to 1 grain increased the extent of the uterine contractions and increased the tonus of the uterus. In the cat the uterus took on after one grain of the extract

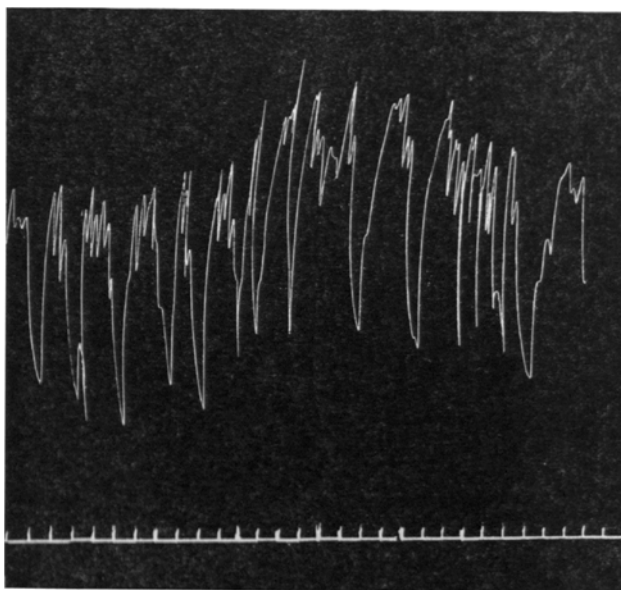


FIG. 2. After effect of  $\frac{1}{4}$  grain of extract of mammary gland (same experiment as Fig. 1). Read from left to right. Time marks every 5 seconds.

a series of short and frequent contractions, followed by contractions much larger than normal (Figs. 3 and 4). Tonus was primarily decreased after a dose of one grain.

*Spleen.*—In doses of  $\frac{1}{4}$  to  $\frac{1}{2}$  grain, splenic extract increased slightly the uterine contractions; there was no effect on tonus.

*Testicle.*—In doses of  $\frac{1}{4}$  to  $\frac{1}{2}$  grain, testicular extract slightly increased the extent of uterine contractions; there was increased tonus.

*Parotid Gland.*—In doses of  $\frac{1}{8}$  to  $\frac{1}{2}$  grain, parotid extract

slightly increased the extent of the uterine contractions; there was increased tonus.

*Pancreas.*—In doses of  $\frac{1}{8}$  to  $\frac{1}{4}$  grain, pancreatic extract increased the extent of the uterine contractions and slightly augmented the tonus.

*Pituitary Body.*—In doses of  $\frac{1}{8}$  to 1 grain, pituitary extract increased the extent of the contractions of the uterus and the tonus. This effect has been noticed by Shäfer.

*Thymus.*—In doses of  $\frac{1}{8}$  to 1 grain, extract of thymus slightly increased the extent of uterine contractions; it increased tonus.

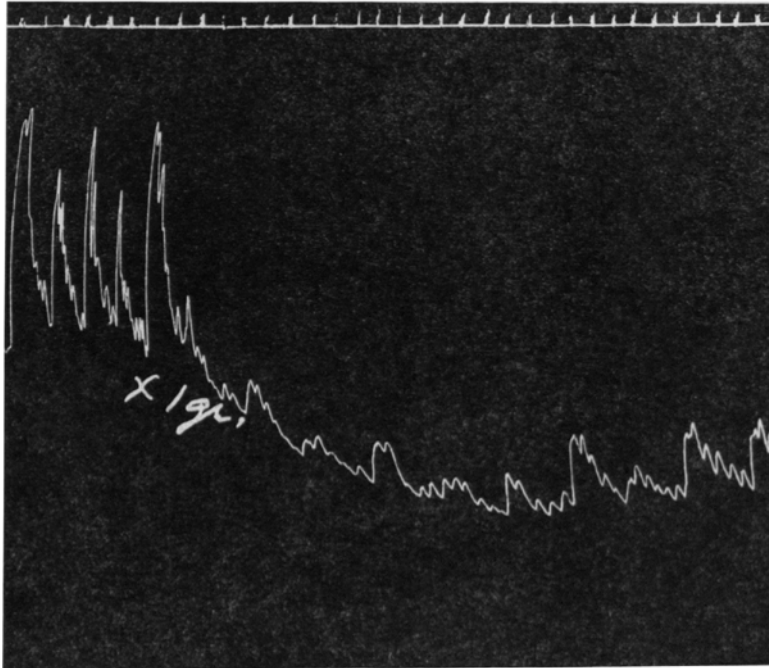


FIG. 3. Primary effect of prostate on uterine contractions.

*Iodothyron.*—This agent in doses of  $\frac{1}{8}$  to  $\frac{1}{2}$  grain increased the extent of uterine contractions and the tonus.

*Spermine (Poehl).*—In one- to five-drop doses, spermina increased the extent of uterine contractions; there was slight increase of tonus.

*Ovary.*—In doses of  $\frac{1}{8}$  to 1 grain, extract of ovary augmented the extent of the uterine contractions; there was increased tonus.

*Dried Brain.*—In doses of  $\frac{1}{8}$  to 1 grain, dried brain gave a marked increase of extent of uterine contraction and increased tonus.

*Adrenal.*—This agent, in one- to two-drop doses, always caused a marked contraction of the uterus; it also increased the tonus in

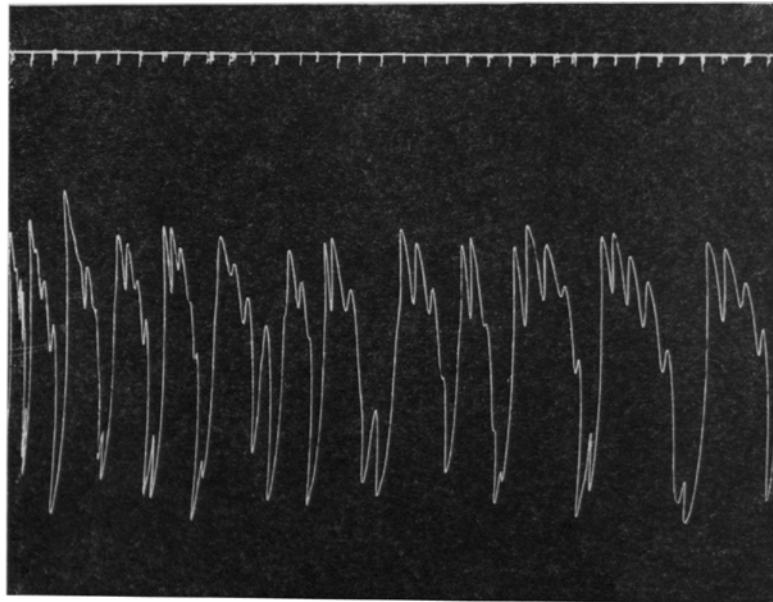


FIG. 4. After effect of prostate on uterine contractions in the same experiment.

the rabbit. In the non-pregnant cat we found, as Fardon did, that it relaxed the uterus and the contractions ceased or nearly ceased.

Of all the extracts those of the mammary gland and the prostate had the most energetic action on the uterus. Starling<sup>4</sup> has shown that the embryo develops a chemical messenger (hormone) to stimulate the cells of the mammary gland. It seems that mammary glands secrete or contain a substance which stimulates the muscle cells of the uterus.

<sup>4</sup>*Ergebnisse der Physiologie*, 1906, v, 686.