

ELECTROPHYSIOLOGICAL CHARACTERISTICS OF EFFECTS OF EXOGENOUS ESTROGENS ON UTERUS AND FETUS

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Intramuscular injection of estrone into healthy rabbits at the end of pregnancy causes changes in the state of the myometrium within 3-3.5 h (as reflected in its integral electrical activity); changes occur at the same time in the blood flow in the uterus (judging from changes in the fetal heart rate.)

Chronic experiments were carried out on healthy unanesthetized animals in order to determine the latent period of action of estrogens on the frequency and amplitude of fast potentials generated by the myometrium and on the fetal heart rate; to judge from data in the literature [2, 3, 5], changes in the fetal heart rate can reflect overall changes taking place in the uterus, and especially changes in its blood flow; fast potentials recorded from the uterus are associated with myometrial activity [1].

EXPERIMENTAL METHOD

To record the electrohysterogram (EHG), two small ring-shaped electrodes were sutured to the anti-mesometrial aspect of the uterine cornu, 3 cm apart. The wire leads were brought out from under the skin in the occipital region [6]. Electrodes for recording the EKG of 2-5 fetuses were implanted at the same time by Konstantinova's method [4].

The potentials from the uterus were fed into an ac amplifier (transmission band 10-1000 Hz) and recorded on a loop oscillograph or encephalograph (transmission band 30-500 Hz), and the integral value of the uterine potentials in microvolts every 5 sec was determined by means of an integrator. The fetal heart rate was expressed as the number of cardiac cycles every 5 sec. Fetal movements were estimated from

TABLE 1. Frequency of Changes in Fetal Heart Rate at Various Times after Injection of Estrone into the Mother

Change in fetal heart rate	Time elapsing after injection of estrone (in h)					
	0,75-1,5	2-2,5	3-3,5	4-4,5	5-6	22-48
Increase	2	4	9	10	13	14
Decrease	4	1	5	2	3	13
No change	15	7	3	0	2	1
Percent with change . .	28,6	41,7	82,3	100	88,9	96,5
χ^2	1,56	1,32	13,60	18,73	16,90	28,31

Note. When χ^2 exceeds 3.84 the association is unlikely to be accidental.

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displacement of the isoelectric line of the ECG. On the 29th-30th day of pregnancy, the female rabbit was given estrone (a single dose of between 50 and 500 μ g, intramuscularly, estradiol dipropionate (50 μ g, intramuscularly), or sigetin (dipotassium salt of meso-4,4-diphenylhexane) (20 mg, intravenously).

EXPERIMENTAL RESULTS

Data obtained on 20 pregnant rabbits and 51 fetuses were analyzed (only the fetal ECG was recorded in the case of 13 pregnant rabbits, and the EHG in 7 animals, in 4 of them the EHG and ECG being recorded simultaneously).

To detect changes in the fetal heart rate due to the action of estrogens, the data were analyzed in the following order: using the difference method the heart rate of each fetus was compared before and at various times after administration of the compounds to the mother, and the number of cases showing the presence or absence of changes was then calculated; the results were summarized in a 2×2 table and the value of χ^2 determined. The results obtained on 33 fetuses from 14 rabbits are given in Table 1.

Before injection of estrone, significant changes in the fetal heart rate occurred in 30% of cases, compared with 82.3% of cases 3-3.5 h after estrone. Estrone produced changes (mainly an increase) in the fetal heart rate 3-3.5 h after its injection into the mother. This latent period was independent of the dose of the compound; it also was found in the case of administration of estradiol dipropionate. However, the subsequent viability of the fetuses depended on the dose of estrone given; the higher the dose of estrone, the larger the number of fetuses which died. Movements of half of the fetuses were reduced 5-6 h after injection of 100-500 mg estrone, and in all fetuses 20 h after injection. The electrical activity of the myometrium was reduced 2-3 h after injection of estrone; the integral myometrial activity 20-25 h after injection was 50-100% greater than before injection of estrone.

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