

IV. — REPRODUCTION

Endocrine control of sexual development in the gilt

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The purpose of the present paper is to review results concerning the physiological bases of the onset of puberty in the gilt.

The first oestrus represents the last phase of a complex maturation of the hypothalamo-pituitary-ovarian axis.

At the end of foetal life, GnRh secreted by the hypothalamus stimulates the pituitary LH and FSH secretions which in turn act on the ovarian development. During the last month of foetal life and the first month after birth, LH and FSH plasma levels are high. Then, LH secretion declines whereas that of FSH remains high and even increases at the end of the second month of age.

Towards the third month, the rhythm of LH pulses is intensified and the ovaries already stimulated by the increase in the FSH levels, develop actively. First antral follicles appear and their number and size increase rapidly. Concurrently, oestrogen production rises which could be the cause of the decline of LH and FSH secretion observed at about 4 months of age.

Just before puberty, changes in pituitary secretions are not well known. However, the lack of variation in oestrogen production and the possibility to induce puberty by stress suggest that the physiological mechanisms required for the onset of puberty are present several weeks before the first oestrus. Induction of the preovulatory follicle growth only depends on a stimulus whose nature has to be elucidated.

**Respective effects of boar introduction and stress
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Boar introduction into the sow pen and stress are often used to induce puberty in the sow, but results are extremely variable. Three experiments were conducted to determine the following points : the physiological stage leading to a maximum response, the respective role of boar introduction and stress due to the transport and herd change and the possible role of adrenal secretions in the induction of oestrus by the stress.

In the 1st experiment, gilts (LW \times LR) belonging to a farm located 15 km away were exposed to the boar immediately after their arrival in the experimental farm. In the second one, only part of the gilts (LW) were subjected to the male effect (group A), while the others (LW \times LR) were subjected to transport stress and the following day to boar introduction (group B). In the latter experiment the adrenal activity was inhibited by a dexamethasone injection in half the females the day before, the very same day and the day after transport and boar introduction. In the first two experiments, ovaries were examined by endoscopy the day of arrival in the experimental farm or the day before boar introduction, then 7 to 14 days later by endoscopy or after slaughter. In females of the second experiment, blood samples were collected on the day of transport and during the first eight hours following boar introduction. The plasma levels of cortisol, prolactin and LH were measured in these samples.

Examination of ovaries and uterus showed two stages of maturity before puberty : « impuberty » characterised by numerous follicles (3 to 5 mm) and a pale and little developed uterus and « prepuberty » characterised by some follicles (4 to 8 mm) and a well irrigated and developed uterus. However, induction of puberty depended more on the nature of the stimulus used than on the maturity stage as ovulation occurred in 76 and 29 p. 100 of the gilts respectively according as the boar introduction followed or not herd changes. But there was no precise relationship with the initial stage of the genital tract. The lower efficiency of the male effect was probably due to an insufficient stimulation of adrenal glands and pituitary as shown by lower plasma levels of cortisol, LH and prolactin. The dexamethasone treatment retarded by about 70 hours the onset of first oestrus without inhibiting it.

Possibilities and limits of using boars in natural mating

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Sperm production of boars subjected to an intensive collection rhythm was compared to that resulting from natural mating. Sow fertility was tested after natural mating at different ejaculation rhythms.

Each boar was collected 1, 2, 3, and 4 times per day for 5 days after a sexual rest of 2 weeks between each series of ejaculations. Some sows were slaughtered immediately after mating for measuring sperm deposited into the uterus. Fertility was tested in sows slaughtered 30-35 days after mating.

The increased collection frequency considerably reduced the sexual activity of boars as well as the number of spermatozoa per ejaculate.

When collection was made once a day, sperm production per ejaculate decreased linearly from the 1st to the 5th day of collection. When collections were made 2, 3 and 4 times a day the production decrease observed on day 1 was followed by a more steady production. From the 3rd day, sperm production did not exceed 10×10^9 for 2 collections and rarely exceeded 5×10^9 for 3 and 4 collections.

The number of ejaculates including less than 3×10^9 spz regularly augmented with an increased ejaculation rhythm.

There was no sperm production difference between collection and mating conditions. During mating, spermatozoa losses due to a reflux from the female genital tract may reach 50 p. 100 of the sperm produced.

In our experimental conditions, fertility decreased from 91.6 to 58.3 p. 100 when mating frequency increased from 1 to 4 per day.