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Effect of underfeeding on ovulation and the œstrous rhythm in guinea-pigs.

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Under well-regulated food conditions the œstrous cycle in the guinea-pig is almost uniformly 16 to 17 days in duration.

Underfeeding with a diet of 20 grams of carrots per day produces a prolongation of the diœstrum and, at the same time, a congestion in the ovary and uterus and a degeneration of developing graafian follicles.

The extent of prolongation of the diœstrum depends upon the stage at which an animal is underfed.

Underfeeding during the first 5 to 7 days of the diœstrum has only a slight effect, postponing the next œstrus for one or two days, while underfeeding during the later part of the diœstrum gives much more marked results.

When an animal is underfed for 5 days, from the 12th to the 17th day after an ovulation and œstrus, the next ovulation and œstrus is delayed for about 7 days, being expressed at the 23d to 25th day instead of at the 17th.

Should an animal be underfed for 7 days, from the 10th day to the 17th day after œstrus, the next ovulation and œstrus is postponed for 10 to 11 days, arriving at the 27th to 28th day, instead of the 17th day.

This variation in the effect of the underfeeding when applied at different periods of the diœstrum is associated with the fact that the conditions of the ovary differ at the different times.

Shortly after an ovulation the ovary contains almost entirely small primary follicles. These follicles are not so unfavorably affected by food conditions as are the large graafian follicles, which begin their growth and development during later stages of the diœstrum.

A large follicle at the height of its development seems to require much better nutrition than a small primary follicle, and the lack of proper food arrests its progress very readily. Thus a late underfeeding has a more injurious effect than an early one, and the postponement of the next œstrus is correlated with a postponement of the development of new ripe follicles in the ovary. The entire œstrus activity depends chiefly upon the conditions prevailing in the ovary.

The fact that following a late and long underfeeding the next ovulation is delayed about 11 days after the underfeeding has been stopped is in accord with the results of operation experiments which Papanicolaou has performed on the corpora lutea in guinea-pigs.

These experiments show that after removal of all young corpora lutea following an ovulation, the next ovulation arrives in about 11 days instead of 16 to 17 days as would be expected. This acceleration of 5 to 6 days is due to the absence of the corpora lutea, which if present evidently inhibit the maturation, or prolong the time necessary for the development, of ripe follicles in the ovary.

These experiments all demonstrate the sensitiveness of the follicles within the ovary to environmental conditions and when considered in more detail than is here possible, they throw light on many peculiar reproductive phenomena observed in nature. The extreme variations in the œstrous cycles recently recorded for the rat by Long and Evans (Proc. Am. Ass'n of Anatomists, Anatomical Record, April 1920) may be in part, at least, due to the variations in the diet taken by the individuals. When rats are fed a mixed diet no doubt certain individuals receive a ration quite different from that eaten by certain other members of the colony.