microscope as light spots without the iodine treatment, and an enormous number of the cells are scattered over the yolk sac. The cells of the small-mouthed black bass are large and contain much glycogen which dissolves very readily in water after iodine staining. I have noted in pike-perch which have been kept under observation for a considerable time that their glycogen cells become greatly diminished in number. I have not been successful in finding the glycogen cells in all species of fish. I have never been able to discover them in *Fundulus*, and have sought for them in vain in recently hatched smelt. They evidently act as temporary reservoirs of glycogen, but why they are present in some species of recently hatched fish, and not in others, is not apparent.

If it should be discovered that these peculiar cells can be isolated and satisfactorily cultivated in artificial media, they will offer most promising material for studying experimentally the formation of glycogen.

Frederick W. Ellis

Monson, Mass.,
August 23, 1920

THE OVARIAN CYCLE OF SWINE

Most of our information regarding the changes in the mammalian ovary during the various events of the reproductive cycle has been gained from study of the laboratory rodents and small carnivores. The domestic ungulates, on account of their large size and commercial value, have been neglected in this respect, although they promise certain advantages because of the simplicity of their ovarian structure and the regular, outspoken appearance of œstrus.

The only attempt to follow the history of the ripening follicles and the corpora lutea of an ungulate, with material of known history, is that recently published by Max Küpfer of Zurich,[1] who made use of the municipal abattoir of that city to procure a large series of ovaries of the cow. He was able to obtain records of the last appearance of œstrus in a certain number of animals (apparently 33) and has given a set of handsome plates illustrating the rise and retrogression of the corpus luteum. From the gross appearances and from measurements (no microscopic studies were made) Küpfer states that the interœstral period of 21 days may be divided into two parts. During the first 10–11 days after ovulation the corpus luteum is slowly reaching its full size, and thereafter it is in a state of retrogression which continues throughout the next interval, until by the time of the second following ovulation (42 days) the corpus luteum is macroscopically insignificant. The ovaries of animals undergoing uninterrupted œstrus cycles will therefore contain the follicles and corpora lutea of two or three periods, at successive stages of growth and retrogression.

The present writer has been endeavoring to piece out a similar account of the pig, in order to provide an anatomical basis for the physiological relations of ovary, ovum, and uterus in this species, and has published[2] a description of the mature follicles and developing corpora lutea up to the tenth or eleventh day, but has been unable, until the present, on account of conditions of the meat-packing trade, to follow the animals longer than this time. The lacking material has now been supplied, through the cooperation of Mr. W. N. Cooper, manager of the American Feeding Company of Baltimore, at whose large piggery farm a series of 22 sows has been obtained covering practically every day of the 21-day cycle.

The story as read from these specimens is a simple one, as will be seen from the accompanying diagram. It appears that mature ovaries of non-pregnant animals contain a reserve stock of follicles of 5 mm. diameter or

[1] Küpfer, Max, "Beiträge zur Morphologie der weiblichen Geschlechtsorgane bei den Säugetieren," *Denksschr. d. Schweiz. Naturf. Gesellsch.*, 1920, Bd. LVI.

[2] Corner, G. W., "On the origin of the corpus luteum of the sow from both granulosa and theca interna," *Amer. Jour. Anat.*, 1920, Vol. 26, pp. 117–183.

less. One or two days before the onset of œstrus some of the follicles rapidly enlarge to the full diameter of 7 to 10 mm., and the enclosed ova pass through the preliminary stages of maturation. Ovulation occurs on the second of the three days of œstrus; the ova are three days en route through the Fallopian tube and pass into the uterus on the fourth day. If not fertilized they degenerate in utero about the seventh or eighth day after ovulation. The corpora lutea, as already described, reach full histological complexity about the seventh day, by which time they have attained a diameter of 9 mm. The new specimens show that they remain in a state of full development, without obvious further change, until the fourteenth or fifteenth day after discharge of the follicles, and then begin a retrogression which is initiated by a sudden disintegration of the granulosa lutein cells, which have formed the chief bulk of the organ. In a few days more the corpora consist only of connective tissue containing in its meshes a few lipoid-laden cells; and by the time of the next ovulation they have diminished in size to a diameter of 6 mm. During the second intercestral interval after their formation they shrink still further, until at the age of 40 days they are but 2 or 2.5 mm. in diameter. After this they are not readily distinguishable from other ovarian tissues in the gross, and microscopically are so far degenerated that one does not feel able to separate them from atretic follicles.

When the pig's ova are fertilized, the embryos gain attachment to the uterine wall between the tenth and fifteenth day after ovulation. It is a most important fact, therefore, that the corpus luteum persists until the fourteenth or fifteenth day, for this finding harmonizes with the current hypothesis that the corpus luteum exercises an effect upon the uterus, preparing it for implantation. The duration of the corpus luteum is quite variable in different species, but in none has it been found less than the time required for attachment of the embryos. Another supposition with regard to the function of the corpus luteum, that it serves, while present, to restrain the growth of follicles, is also borne out by our observations, as far as they go, for it will be noticed that a new group of follicles passes beyond the resting dimension only after the degeneration of the last corpora is under way.

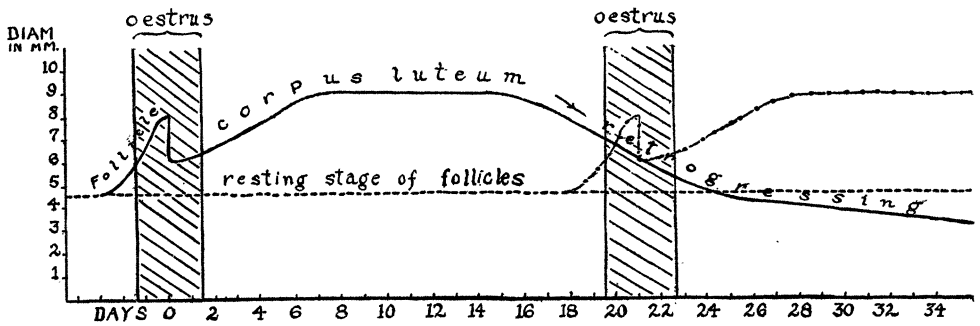

FIG. 1.
Diagram representing the ovarian cycle of the nonpregnant sow.

A full account of these studies will form part of a monograph on cyclic changes in the ovaries and uterus of the pig, now in preparation.

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THE NATIONAL ACADEMY OF SCIENCES

THE annual meeting of the National Academy of Sciences was held at the Natural History Building, U. S. National Museum, in Washington on April 25, 26 and 27, 1921.