doses of a certain preparation produce refractoriness as efficiently as do large doses, whereas another preparation—the flavianate—only incompletely immunizes in small doses. Third, the sera of animals chronically treated with the flavianate preparation show no inhibitory properties against it. Fourth, the thyroids of animals which have become refractory to the Na_2SO_4 preparation are stimulated when the flavianate preparation is injected even though the extract is made from anterior hypophyses of the same species of animal—the ox.

The flavianate has some degree of antigenicity, as shown by partial immunization and by its partial interaction with antibodies against the other preparation used. This remaining antigenicity suggests that a species which forms antibodies more readily than the guinea pig, might become immunized to the flavianate extract and hence refractory to its injection. This is indicated by the work of Evans *et al.*[2]

8636 P

Cytology of the Monkey Endometrium Under Influence of Follicular and Corpus Luteum Hormones.*

FREDERICK C. LENDRUM AND FREDERICK L. HISAW.

From the Department of Clinical Medicine, University of Wisconsin, and the Biological Laboratories, Harvard University.

The histologic features of the endometrium of *Macacus rhesus* monkeys under treatment with the ovarian hormones have already been described by one of us (Hisaw[1]). We have had the opportunity to make cytological studies involving the use of various special stains upon specimens from 4 uteri under the influence of the ovarian follicular hormone (oestrin) and upon specimens from 6 uteri under the influence of the corpus luteum hormone (corporin). The monkeys used were castrated immature or young adult females, and the dosage and duration of treatment were sufficient to produce the histologic pictures in the endometrium which have been described (Hisaw[1]) as characteristic of oestrin or of corporin stimulation.

---

[2] Evans, H. M., Pencharz, R. I. and Simpson, M. E., *Endoc.*, 1935, **19**, 509.

* Aided in part by the National Research Council, Committee on Problems of Sex, and in part by the Wisconsin Alumni Research Foundation.

[1] Hisaw, F. L., *Am. J. Ob. and Gyn.*, 1935, **29**, 638.

Glycogen. Special staining methods do not ordinarily reveal the presence of any glycogen in the endometrial epithelial cells during treatment with pure oestrin. However, minute traces of glycogen may be found occasionally in the basal ends of some cells following prolonged treatment with large doses of oestrin. The presence of glycogen is a characteristic feature of the endometrial response to the administration of corporin. One of the earliest manifestations of corporin influence, as revealed by ordinary routine staining methods, is a migration of the epithelial nuclei toward the lumina of the glands, leaving a conspicuous clear zone between the nuclei and the basement membrane (Hisaw[1]). Special stains reveal that this clear zone contains masses of glycogen which form beneath the nuclei and separate them from the basement membrane. With continued corporin administration the nuclei return after a few days to the basement membrane, and the glycogen masses are found at the luminal ends of the cells. During the transitional period glycogen is found at both poles of many cells, and small particles of glycogen may be seen lying along the sides of the nuclei. This appearance suggests that the glycogen migrates from the basal to the luminal end of the cells in particulate form.

The accumulated glycogen masses enlarge the luminal ends of the cells into club-like protrusions. This phenomenon produces the frayed appearance of the luminal ends of the cells which is seen with ordinary staining methods. The glycogen escapes from the cells into the lumina of the glands in masses varying from 1 to 10 micra in diameter. When corporin treatment is much prolonged a condition of secretory exhaustion results, in which most of the glycogen is found in the lumina of the glands, and very little remains in the shrunken epithelial cells.

The Golgi Apparatus. Appropriate stains reveal the Golgi apparatus as a conspicuous skein lying between the nucleus and the lumen in the cells of the endometrial epithelium. Inasmuch as the Golgi apparatus is alleged to have an important function in the process of secretion, one might expect it to present conspicuous modifications in the course of the cyclic changes in the endometrium. In this expectation, however, we have been disappointed. Under the influence of corporin the Golgi skein becomes somewhat larger and coarser than in the oestrin type of endometrium, but no other difference has been observed.

Mucin. We have not found mucin in the endometrium of untreated castrated monkeys, or of monkeys under treatment with oestrin. Mucin appears much later than glycogen following corporin administration. The mucin which appears in the endometrium under corporin influence presents 2 very striking differences from gastrointestinal mucin when stained with the standard Mayer's mucicarmine method. Whereas mucin may be stained in the form of large globules within such cells as the intestinal goblet cells, we have never been able to obtain a staining reaction for mucin in the epithelial cells of the endometrium, but have found it only in the lumina of the glands. Moreover gastrointestinal mucin stains deep red with mucicarmine, while the mucin which is seen in the endometrial glands stains only a faint pink color.

Fat. The Scharlach R stain did not reveal the presence of fat in the uninjured endometrial stroma or epithelium, or in the secretion either in the castrated monkey or in animals under treatment with oestrin or corporin. Following trauma of the endometrium, as a result of biopsy, fat is usually present in the interstitial cells as well as in phagocytes.

Epithelial Proliferations. One of us (Hisaw[1]) has called attention to a very peculiar type of epithelial proliferation which occurs following operative trauma of the endometrium in the presence of corporin stimulation. These nests of epithelial cells present a striking likeness to the epithelial proliferations which Hartman and Streeter[2] have found at the implantation site of an ovum in the monkey. In our material mucin and fat were completely absent from these cells. Most of the cells also contained no glycogen though certain scattered epithelioid cells and nests of cells exhibited a conspicuous layer of glycogen surrounding the nuclei.

---

[2] Hartman, C. G. and Streeter, G. L., personal communication.