

Summary. The rates of respiration and aerobic glycolysis of exudate leucocytes reported by Fleischmann and Kubowitz have been confirmed. A method of measuring the respiration of leucocytes in serum is described. The respiratory rate of leucocytes in serum is greater than the rate in Ringer-phosphate solution.†

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Effects of Female Sex Hormones in Young Opossums.

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In a recent communication¹ the writer described the effects of the male hormone, testosterone propionate, on the developing genital tracts in pouch young of the American opossum, *Didelphys virginiana*. This hormone has a dual action, stimulating the development of both male and female structures in animals of either genetic sex. However, male parts are uniformly better developed in male subjects, and conversely, female structures show greater growth in females. These results illustrate clearly the interaction of hormones and genotype in development. The present report deals with a similar experiment, in which the female hormones estradiol dipropionate and estrone were administered from the 4th to the 18th day of pouch life.

The group treated with estradiol dipropionate consisted of a litter of 12 young (8 males, 4 females) which received a total dose averaging 20-25 gamma daily. Externally no effects were observed until the ninth day, when several individuals showed a distention of the abdomen, and a pronounced enlargement of the phallus, of a different morphological character from that induced by male hormones. Later the abdominal condition had become worse, and 2 individuals appearing moribund, were sacrificed on the 12th day. From day to day others were preserved for the same cause, the last on the 18th day.

At first the symptoms were ascribed to toxicity of the solution; however, autopsy showed a greatly distended bladder, enormous sac-

† We are greatly indebted to Dr. E. Shorr of the New York Hospital for much valuable advice concerning the use of serum.

¹ Burns, R. K., Jr., *PROC. SOC. EXP. BIOL. AND MED.*, 1939, **40**, —

like dilatations of both Wolffian ducts and ureters, and a similar condition of the pelvis of the metanephros. Both meso- and metanephros showed great damage, probably of a mechanical origin, primarily. These animals were apparently dying of a urinary retention, and the cause was found in the condition of urethra and urinogenital sinus, in which an extreme cornification had resulted in complete obstruction of the outlets of the urinary system. With this condition in mind, the effects upon the various parts of the urinogenital apparatus will be summarized.

Wolffian ducts are extremely dilated in both sexes, particularly in the posterior region adjacent to the obstructed urinogenital sinus. This dilation is apparently mechanical in nature, occurs in both sexes, and is not attributed to hormone action.

Müllerian ducts are markedly increased in size in both sexes, but show an important defect in the absence of the posterior region. The ducts end blindly in the wall of the dilated posterior sac of the Wolffian duct. Apparently the tremendous expansion of this sac has prevented the posterior tip of the growing Müllerian duct from establishing a connection with the urinogenital sinus, and the defect cannot be attributed specifically to hormone treatment. The age of these specimens naturally precludes a growth of the female ducts comparable to that found in the previous experiment.

The urinogenital sinus, as stated, shows an extreme cornification of the mucosa, extending to the sinus horns (which contribute to the lateral vaginæ) and into the urethral region of the bladder including the ureteral papillæ. The transition to bladder and Wolffian duct epithelium is abrupt. The lumen of the sinus is reduced to very small caliber by excessive delamination of cornified layers, and completely obstructed by debris. Prostatic glands are lacking in both sexes, although they should be present in older males of the group.

Phallus and urinogenital meatus are extremely enlarged and hyperemic. The form of the organ and its posture—flat against the body wall—are in marked contrast to the normal male organ and the erect posture induced by male hormone treatment. The modified organs appear identical in both sexes.

Pouch and scrotum are apparently unaffected, which agrees with their failure to react to the androgen, as reported.

The gonads are not changed so far as histological type is concerned, but are reduced in size. In the case of testes this reduction is extreme. The sex cords are small and shrunken, imbedded in a dense stroma. This amount of estradiol dipropionate appears to be strongly inhibitory to testis growth.

Another litter of 8 young receiving estrone treatment shows the same modifications induced by estradiol dipropionate in lesser degree.

Summary. Estradiol dipropionate and estrone have only a gynogenic action on the genital tracts of young opossums of either sex, contrasting in this respect with the male hormone testosterone propionate which exerts a dual effect. The most striking effects are exerted on the phallus and the epithelium of the urinogenital sinus. Müllerian ducts, although very immature, are definitely enlarged. Prostatic outgrowths are suppressed.

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A Study of the Fever-Producing Principle in the Typhoid Vaccine.*

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For a quarter of a century typhoid vaccine has been used clinically in what has been called non-specific protein-therapy.¹ The symptoms provoked by the intravenous injection of typhoid vaccine are shown in experiment 1 in Table I. They are fever, shivering (chills), leucopenia, and gastro-intestinal disturbances, such as vomiting and diarrhea. These are in the main, the symptoms mentioned by Hektoen² and Cecil³ as following the intravenous injection of foreign proteins. These symptoms are also paralleled by those elicited in the "pyrogenic reaction" following the intravenous infusion of "pyrogenic" fluids and "pyrogenic" inulin as evinced in experiments 2 and 3 in the table.

The "pyrogen" of infusion-fluids was shown by Hort and Penfold⁴ to pass through a Berkefeld candle. This was confirmed by Seibert,⁵

* We wish to thank Dr. Johannes H. Bauer of the Rockefeller Institute for instructions in the preparation and calibration of Elford-Bauer membranes used in this study.

¹ Petersen, *The Newer Knowledge of Bacteriology and Immunology*, Jordan and Falk, The University of Chicago Press, 1928, p. 1086.

² Hektoen, *J. A. M. A.*, 1935, **105**, 1765.

³ Cecil, *Ibid.*, 1935, **105**, 1846.

⁴ Hort and Penfold, *Brit. Med. J.*, 1911, **2**, 1589.

⁵ Seibert, *Am. J. Physiol.*, 1923, **67**, 90.