When the duration of stimulus was diminished by using condensers of lesser capacities and at the same time the duration of the interval increased, the frequency remaining constant, it was necessary to increase the voltage at which condensers were charged to produce falling or past pointing. (Figure 1.)

Because relationships of current, duration of stimuli and interval between stimuli, similar to those described in electrokinetic phenomena are also found in the production of falling or past pointing when a galvanic current is passed through the head, it is suggested that an electrokinetic change in the endolymph is responsible for the stimulation of sensory end organs, when a galvanic current is passed through the head.

10752 P

Normal Development and Regression of the Prostate Gland of the Female Rat.*

DOROTHY PRICE. (Introduced by Carl R. Moore.)

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In an earlier paper,[1] the normal embryological and post-natal development of the prostate gland of the male rat was described, and brief mention was made of the embryology of the female homologue. In young males, castrated at birth, the prostate continues to differentiate in the absence of the testes and maintains this differentiation for a limited period of time. The normal post-natal development of the female homologue has now been studied for comparison with the male and a portion of these data will be presented here.

Marx[2, 3] first described prostatic lobes in female rats and Korenchevsky[4, 5, 6] showed that female prostates, hypertrophied by androgens, were histologically identical with the ventral lobes of males. Estrogens produced no stimulation. Androgenic stimulation and

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1 Price, D., *Am. J. Anat.*, 1936, **60**, 79.

2 Marx, L., *Arch. Entw.-mechan.*, 1931, **124**, 584.

3 Marx, L., *Z. Zellforsch mikroskop. Anat.*, 1932, **16**, 48.

4 Korenchevsky, V., *Nature*, 1935, **136**, 185.

5 Korenchevsky, V., and Dennison, M., *J. Path. Bact.*, 1936, **42**, 91.

6 Korenchevsky, V., *J. Physiol.*, 1937, **90**, 371.

lack of estrogenic effects have been reported by other workers.[7, 8] Witschi and collaborators,[9, 10] likewise noted that female prostates reacted in the same way to injected sex hormones as the male ventral lobe, and by selective breeding have greatly increased the incidence of prostates in females. Female prostates have been induced in embryos of rats and mice by injection of pregnant females with androgenic hormones.[11, 12, 13]

The female prostate has been described as atrophic or rudimentary and the occasional macroscopically visible lobes have been considered similar histologically to the atrophied castrate male prostate. The light areas which are so typical of the normal secreting ventral prostate of the male have never been described in the female except in rats treated with androgenic substances.

The cases presented are limited to macroscopically visible lobes and the number is small due to the low incidence (under 2%) of such prostates in our rat colony, but the age range is wide and an adequate comparison of the female gland with that of the male can be made. Table I lists 19 prostates in rats ranging in age from 5 days to adult. At 5 days the acini are small solid cords of cells which develop lumina by 15 days and epithelial light areas, diagnostic of secretory activity, at 21 days. Light areas develop in ventral prostate lobes of normal males at 12 days and in males castrated

TABLE I.
Occurrence of Light Areas in Prostate Glands of Untreated Female Rats.

Age in days	Position of lobes	Light areas	Age in days	Position of lobes	Light areas
5	Right	0	32	Right	+
15	Left	0	37	"	+
17	Right	0	40	"	+
21	"	+	40	"	+
21	Bilateral	+	45	"	0
28	Right	0	61	"	0
28	Bilateral	R +	80	"	0
		L 0	*ca.* 100	"	0
32	Right	+	*ca.* 100	"	0
32	"	0			
32	Left	+			

[7] Hamilton, J. B., and Wolfe, J. M., PROC. SOC. EXP. BIOL. AND MED., 1937, **36**, 465.

[8] Deanesly, R., and Parkes, A. S., *Lancet*, 1938, Sept. 10, 606.

[9] Witschi, E., Mahoney, J. J., and Riley, G. M., *Biol. Zent.*, 1938, **58**, 30.

[10] Witschi, E., Riley, G. M., and Gardner, M., *Genetics*, 1939, **24**, 90.

[11] Greene, R. R., and Ivy, A. C., *Science*, 1937, **86**, 200.

[12] Greene, R. R., Burrill, M. W., and Ivy, A. C., PROC. SOC. EXP. BIOL. AND MED., 1938, **38**, 1.

[13] Raynaud, A., *Bull. Biol. France et Belg.*, 1938, **72**, 297.

at birth at about 17 days. Light areas appeared in 9 out of 11 female prostates between the ages of 21 and 40 days. The degree of development of the gland varied greatly as it does in prostates of young male castrates. After 40 days of age the female prostate begins to regress as does that of the young male castrate, although the histological picture is not so extreme, in many cases, as in the adult male castrated for twenty days. From these data it appears that the prostate gland of a certain proportion of female rats undergoes normal development, differentiation and regression comparable to that of the prostate of the young castrated male.

Howard[14, 15] suggested that the temporary development of the prostate of the young castrate male rat might be attributed to andromimetic activity of the young adrenal cortex. Prostate development and regression coincided, respectively, with a well differentiated juvenile cortex and one which had lost its characteristics and approached the adult condition. Davidson and Moon[16] found gross and histological stimulation of the prostate in young castrated male rats after administration of adrenocorticotropic hormone which caused hypertrophy of the adrenal cortex. Burrill and Greene[17] compared prostates of young male castrates with those of adrenalectomized rats and with those from rats both adrenalectomized and castrated. Their results strongly suggest that the adrenals of young castrates maintain the prostates in a functional state.

The present findings indicate that whatever is responsible for temporary prostate differentiation in young castrated males may be operating for a like period in young normal females. The juvenile adrenal cortex is the probable factor and this is supported by Howard's studies on the rat adrenal which showed that in both males and females the juvenile cortex is differentiated at three weeks of age and has lost its distinctive character by about 40 days.

Grafts of male prostate tissue have been kept in a functional state with light areas for months in normal adult female hosts.[18] This indicates the presence of some androgenic substance in the adult female but this is probably of ovarian origin. The difference in threshold response between male and female prostates (unpublished

[14] Howard, E., *Am. J. Physiol.*, 1937, **119**, 339.

[15] Howard, E., *Am. J. Anat.*, 1938, **62**, 351.

[16] Davidson, C. S., and Moon, H. D., PROC. SOC. EXP. BIOL. AND MED., 1936, **35**, 281.

[17] Burrill, M. W., and Greene, R. R., PROC. SOC. EXP. BIOL. AND MED., 1939, **40**, 327.

[18] Price, D., *Anat. Rec.*, 1937, **70**, suppl. 1, 60.

results) may account for the absence of light areas in adult female prostates.

Conclusions. In some young normal female rats, as in young castrated males, the prostate grows, develops large acini, high epithelium and light areas diagnostic of a secretory state. In both, the prostate differentiation is maintained only until about 40 days when regression begins. The factor causing this temporary differentiation is thought to be the juvenile cortex of the adrenal.

10753 P

Delayed Prothrombin Clotting Time in Avitaminosis A and Pellagra-Like Chicks.

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A study is being made of the virus-neutralizing properties of fowl blood, plasma and serum, and the relation of refractoriness to prothrombin clotting time in avitaminosis.

Dam, Schønheyder, Tage-Hansen,[1] Almquist,[2] and Quick[3] have shown that prothrombin deficiency can be detected in chicks on a depleted vitamin K diet at an early date.

The experiments herein reported were designed to test prothrombin clotting time on chicks depleted of vitamin K,[2] vitamin A,[4] and of chicks kept on the pellagra-like "F" ration of Ringrose, Norris and Heuser.[5] The chicks used in these experiments came from the same parent stock and received rations prepared bi-weekly. Several control series of chicks in the past showed that depletion of vitamin A occurred between the 7th and 14th days with an average weight of 31-32 g at death. The chicks on the pellagra-like "F" ration were in good health and weighed 61.2 g. To produce depletion 60 day-old chicks were placed on each vitamin deficiency level making a total of 180 chicks. Only the K free chicks were kept from their

[1] Dam, H., Schønheyder, F., Tage-Hansen, E., *Biochem. J.*, 1936, **30**, 1075.

[2] Almquist, H. J., *J. Biol. Chem.*, 1936, **114**, 241.

[3] Quick, A. J., *Am. J. Physiol.*, 1937, **118**, 260.

[4] Emmett, A., and Peacock, G., *J. Biol. Chem.*, 1923, **56**, 679.

[5] Ringrose, A., Norris, L., and Heuser, *Poultry Sci.*, 1930-31, **10**, 166.