Role of ACTH on the cytomorphology of testes of the immature rat[1]

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Summary. The male gametogenic development of the immature rat shows inhibitory effect by the exogenous infusion of ACTH (0.25 IU and 0.50 IU; i.p.). Seminiferous tubular degeneration, Leydig cell atrophy and Sertoli cell regression are very conspicuous in the dosage of 0.50 IU ACTH (i.p.). Cytometrical and histological evidence confirms that ACTH could be inhibited by FSH during male gametogenic development which leads to cellular degeneration of testes in the immature rat.

The functions of the adrenal cortex and its control by ACTH are very well known facts. Recent studies showed the controlling effect of adrenal on testes of the immature rat[3]. Many workers observed that ACTH could inhibit the production of gonadotropin in mature boar[4]. It had also been observed in congenital adrenal hyperplasia that high level of ACTH stimulated adrenal testosterone production, and as a result gonadotropin secretion was inhibited by negative feed back mechanism[5]. No report was available in relation to ACTH and immature testicular function; therefore the present investigation was undertaken to find the effect of ACTH on the testes of immature rat.

Materials and methods. 15 immature rats were maintained on normal food and water with an average bwt, 44±5 g divided into 3 groups, A, B and C, with 5 animals in each group. The group A served as control; the rats of group B and C were given ACTH (Feederlksberg. Chemical Labs Ltd, Copenhagen) by i.p. route at the dosages of 0.25 IU and 0.50 IU (solution were made in 0.2 ml sterile 0.9% normal saline) respectively, and the treatment was continued for 10 consecutive days. The equivalent amount of 0.9% normal saline (i.p.) was given to the control animals for the same period.

The animals were sacrificed by cervical dislocation on the 11th day. The testes were dissected out and weighed. The testes were fixed in Bouin's fluid and 5 µm thick Paraffin sections were stained with weighert's iron hematoxyline and methyl green. Seminiferous tubular diameter and Leydig cell nuclear diameter were measured with an occular µm at 160-fold and 640-fold magnification respectively. Leydig cell nuclear poopulation were continued at 640-fold magnification. Gametogenic cell counts for immature rats were performed according to method of Clermont and Perey[6]. Results are recorded in table.

Results and discussion. The table shows that the i.p. injection of ACTH at a dosage of 0.50 IU/0.2 ml causes a significant decrease of the testicular weight. Significant decrease of diameter of the seminiferous tubules, Leydig cell count and Leydig cell nuclear diameter was seen with the same dose of ACTH. In contrast, the administration of ACTH at a dose of 0.25 IU produces a significant increase of Leydig cell nuclear diameter, gametogenic cells, namely spermatogonia (Spg A), resting spermatocytes (R-Sp-Cyt) and pachytene spermatocyte (Pachyt) were counted. The gametogenic cells are expressed per 6.4 Sertoli cells. From the table it is clear that gametogenic cells are significantly lower in both the dosages of ACTH (0.25 and 0.50 IU/0.2 ml 0.9% saline) along with progressive decrease of Sertoli cells.

Histological examination reveals that cellular deformations of the seminiferous tubules are more pronounced in group C where tubular lumens are filled up with cellular garbage and phagocytic cells. Moreover, the basement membrane of the seminiferous tubules is irregular. Degeneration of the gametogenic cellular associations in the testes of the immature rat in group C is very conspicuous as compared to that of group B. Vacuolation of spermatogonial cells and pyknotic degeneration in the resting and pachytene spermato-

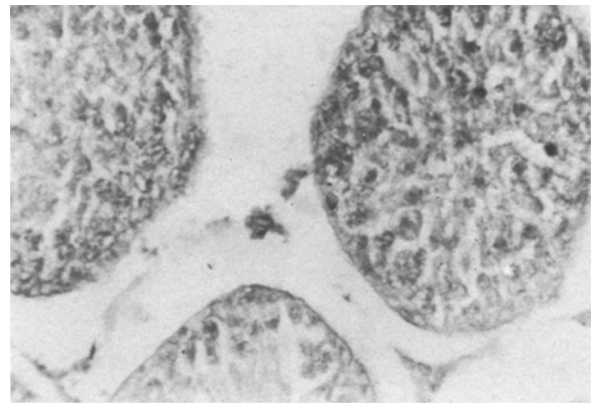

Fig. 2. Immature seminiferous tubular cellular alteration after 0.25 IU ACTH treatment (i.p.) for 10 days. × 640.

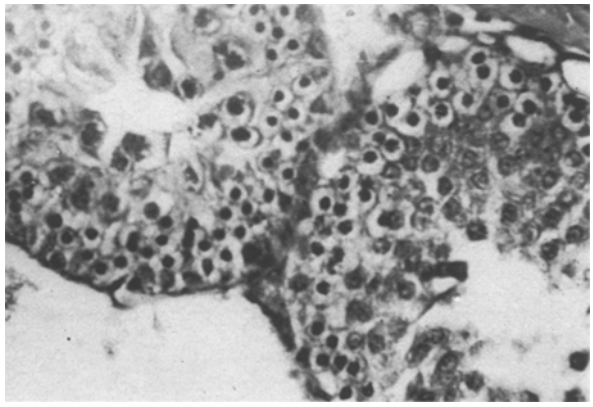

Fig. 1. Histological structure of testes of immature rat showing seminiferous tubular cellular association. × 640.

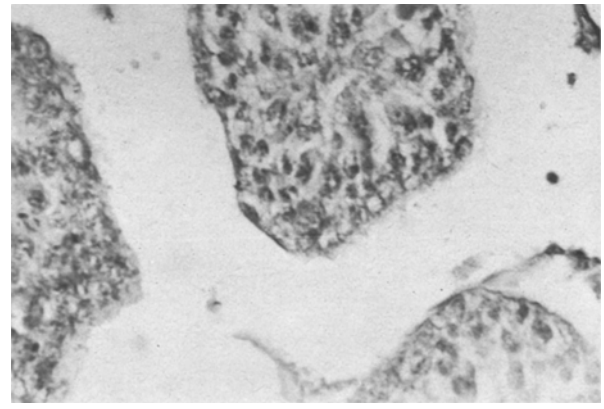

Fig. 3. Showing immature testicular degeneration after 0.50 IU ACTH treatment (i.p.) for 10 days. × 640.

Effect of ACTH (0.25 and 0.50 IU/0.2 ml 0.9% saline; i.p.) on testes of the immature rat. In each case 5 animals were used, mean ± SE

	Weight of testes (mg)	Seminiferous tubular diameter (nm) (10)	Leydig cell count (20)	Leydig cell nuclear diameter (nm) (10)	Gametogenic count/6.405 Sertoli cells Spg	R-Sp-Cyt	Pachytene	Sertoli cells
Control (A)	227.25 ± 0.35	184.20 ± 4.82	7.23 ± 1.02	4.09 ± 0.22	10.84 ± 0.42	25.75 ± 3.37	29.62 ± 0.55	6.40 ± 0.78
ACTH (0.25 IU) (B)	220.05 ± 0.24 NS	182.40 ± 3.63 NS	7.05 ± 1.02 NS	6.77 ± 0.24*	10.29 ± 1.33 NS	9.99 ± 0.16*	13.79 ± 1.70*	4.50 ± 0.31*
ACTH (0.50 IU) (C)	137.60 ± 2.09*	110.40 ± 2.99*	3.35 ± 0.80*	1.95 ± 0.22*	3.66 ± 0.71*	7.84 ± 0.17*	11.97 ± 0.23*	3.00 ± 1.25*

Histological observation are in parenthesis; NS, not significant: * $p < 0.001$.

cytes can be noted (figure 3). Leydig cells are atrophic and granulated. In group B (figure 2) the diameter of the seminiferous tubules is not changed and cellular degeneration is less conspicuous than group C.

The present study indicates an effect of ACTH on the cytomorphology of testes of immature rat. It is well documented that adrenal and testes have a very close relation, due to the same embryological origin[7]. During immature stage, the presence of FSH stimulates the early stages of development of the germ cell (spermatogonia and spermatocytes) and Sertoli cell differentiation[8]. Rudimentary Leydig cells in the immature rats are not capable of synthesizing androgen, as the testosterone concentration in the blood and the testes is not adequate[9]. Our results clearly indicate that cellular regression of testes completely depends on dosages of ACTH, because higher doses of ACTH (0.50 IU) cause significant decrease in testicular weight, seminiferous tubular diameter, Leydig cell nuclear count and Leydig cell nuclear diameter. Moreover gametogenic cellular inhibitions are very significant in the gametogenic count. Inhibition of testicular steroidogenesis by ACTH administration has also been reported. It is well known that crowding and aggressive interactions between males can delay puberty and suppress gonadal activity under both natural and experimental conditions, and these phenomena are thought to be mediated through the activation of pituitary gonadal axis[11].

In view of our findings, it could be stated that supplimentation of ACTH (0.25 and 0.50 IU causes increased production of cortical steroid including testosterone, which may lead to a suppression of pituitary FSH, and as a result atrophy of the testes and degeneration of the seminiferous tubules become very prominent. It is further observed from the present results that significant regression of the Sertoli cell count may be due to FSH inhibition by ACTH supplementation. Therefore, it seems possible that ACTH has a role in inhibiting gametogenic growth through the pituitary during immature stages.

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Etude des variations nycthémérales de la filtration glomérulaire chez le rat

Diurnal variations evidence of glomerular filtration in the rat

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Summary. Parallel variations in plasma and urine variations of endogenous urea and creatinine level in the rat during 4 consecutive 6-h-long periods permit to evidence urea and creatinine clearance diurnal variations with very significant increase in the 2 nightly periods. The signification of this very large nightly glomerular filtration increase is discussed.

Nous avons récemment montré l'existence de variations nycthémérales de l'excrétion urinaire des protéines totales chez le rat, en particulier une nette augmentation nocturne de cette excrétion[2]. De prudentes hypothèses de tendance explicative ont été avancées faisant intervenir l'influence éventuelle de certains facteurs à prépondérance nocturne, tels que le comportement alimentaire rythmé, la vasodilatation postprandiale, les variations circadiennes des fonctions rénales, récemment revues chez l'homme[3], ou encore le taux de certaines hormones. Plus récemment, nous avons décelé, pour la première fois à notre connaissance chez le rat, des variations circadiennes du taux sérique et urinaire de l'urée, de la créatinine et des protéines totales[4].

Sur de telles bases, nous avons analysé le rôle éventuellement exercé par le rein, précisément par le glomérule, sur les variations nycthémérales de la protéinurie physiologi-