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THE INFLUENCE OF MATERNAL ADRENALECTOMY ON THE DEVELOPMENT OF FETAL AND NEONATAL RAT ADRENAL GLANDS

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The fetal and neonatal development of the adrenal gland was examined by means of sterology and electron microscopy in the male offspring of dams bilaterally adrenalectomized on the 16th day of gestation. The pregnant rats and their fetuses were sacrificed by decapitation on the 21st day of gestation. Neonatal animals were sacrificed in the same way at 3 and 14 days of age. In the fetuses and 3-day-old rats zona fasciculata (ZF) and zona reticularis (ZR) were analyzed as one-inner zone (IZ), while in 14-day-old rats they were measured separately.

Investigations of the interrelationship between the maternal pituitary-adrenal system and destruction of the functional integrity of this system in 20-day-old fetuses and 3- and 14-day-old neonatal rats showed: a. In fetuses, maternal adrenalectomy significantly reduced the absolute and relative adrenal weight, as well as the volume of the cortical zones due to a decreased number of parenchymal cells. However, the mean volumes of both zona glomerulosa (ZG) and IZ cells were increased; b. In 3-day-old off-pring of adrenalectomized dams, the absolute adrenal weight was lover, as well as the volume of IZ and the mean volume of ZG cells, but relative adrenal weight was greater than in the controls; c. In 14-day old animals the decrease in absolute adrenal weight still persisted and the volume of cortical zones and number of cells per zone were also reduced. These changes were accompanied by ZF and ZR cell hypertrophy.

These data demonstrate that removal of the maternal adrenal glands on the 16th day of gestation markedly suppressed adrenal growth both in fetal and postnatal offspring. However, it appears that such a hormonal status stimulated cortical cell secretory activity at some stages of development.

Key words: Adrenal gland, fetal period, neonatal period, maternal adrenalectomy, stereology, electron microscopy.

INTRODUCTION

Glucocorticoids play an important role in fetal development of the rat. Adrenocorticotrophin (ACTH) represents the main regulator of glucocorticoid release by fetal adrenal glands in many mammalian species including the rat (Dupouy, 1982). It is also known that corticosteroids from rat fetuses cross the placental barrier and enter the maternal circulation. On the other hand, the fetal pituitary responds to the loss of maternal corticosteroids after adrenalectomy and stimulates the fetal adrenal glands (Milković et al., 1973). At birth, the adrenal glands of off spring of adrenalectomized dams were found to be hypertrophic and the plasma corticosterone level was increased (Thoman et al., 1970; Milković et al., 1976).

Changes at the ultrastructural level reflected the stimulation of adrenocortical cells in neonatal rats (24-48 h after birth) in response to maternal adrenalectomy (Nickerson et al., 1978). As a result of maternal adrenalectomy, hypertrophy of the ACTH-cells was clearly pronounced in the pars anterior of the pituitary in all fetuses and newborn rats of dams adrenalectomised during the last week of pregnancy. However, at the same time, hypertrophy of the ACTH-cells of pregnant rats was not so significantly expressed as in adrenalectomized non pregnant animals (Hristić et al., 1978).

The present study was designed to describe, by means of stereology with a light microscopy and qualitative analyses with electron microscopy the fine structure of adrenocortical cells of male fetal and postantal (3- and 14-day-old) rats and to evaluate the effects of maternal adrenalectomy performed on day 16 of gestation. It is known that this period of gestation is a time of intensive differentiation of the hypothalamo-pituitary-adrenal system of rat fetuses (Daikoku et al., 1976; Dupouy and Magre, 1973; Vranckx et al., 1985; All et al., 1986).

MATERIAL AND METHODS

T r e a t m e n t of animals: Ten female and ten male, three-month-old Wistar rats were mated in the laboratory. The day when the females were sperm-positive was considered the first day of pregnancy. These females were divided into two groups. Group 1 consisted of six rats which were bilaterally adrenalectomized through the dorsal aproach under light ether anaesthesia on day 16 of gestation. Group 2 included four sham-operated animals. Adrenalectomized animals were given physiological saline ad libitum as drinking fluid. Both groups were kept under conditions of controlled heating (22^{0}C) and a 12 h light/dark cycle with light on at 6.00 a. m. Food and water or physiological saline were freely available. The dams and their fetuses were sacrificed by decapitation under light ether narcosis between 9 and 11 a. m. on the 21st day of gestation and the posnatal animals were sacrificed in the same way at 3 and 14 days of age.

L i g h t and electron microscopy: The adrenal glands were removed quickly, freed of adhering fat and weighed. The left adrenals were fixed in

Bouin's solution, embedded in paraffin and serially cut in 5 μm thick sections for morphometric analysis.

Slices (1 mm^3) of the right adrenals were fixed in 3% glutaraldehyde buffered to pH 7.4 with 0.1 M phosphate buffer. While in the fixative, pieces of tissue including all zones of the gland were radially cut to the capsule under the dissecting microscope. Tissue was postfixed in 1% osmium tetroxide in the above phosphate buffer, dehydrated in a graded series of alcohol and embedded in Araldite. One-μm sections were cut from all zones and stained with toluidine blue to verify the zonal location of the tissue. Thin sections were cut with glass knives on an LKB III Ultramicrotome, stained with uranyl acetate and lead citrate and examined on a transmission electron microscope (Philips CM 12).

Morphometry:

Level I: Volume and zonation of the adrenal gland

In order to determine the total volume of the gland and the volumetric densities of the adrenocortical zones, every 5th section of the gland was analyzed using a magnification of 400x and multipurpose-test system M_{42} (Weibel, 1979). In fetal and 3-day old rat adrenals, ZR was poorly defined and could not be clearly seen as a separate zone. For this reason, ZF and ZR were analyzed as one-inner zone (IZ). In 14-day-old rat adrenals, all the three cortical zones were measured.

Level II. Size and number of adrenocortical cells

Fifty test-areas of each zone (ZG, IZ, ZF and ZR) from the sections containing the largest medullary area were counted at a magnification of 1000x with the multipurpose test-system M_{42} (Weibel, 1979). Numerical density of adrenocortical cell nuclei (and thus of cells) was determined according to Weibel and Gomez (Weibel, 1979). The shape coefficient beta (β) was assumed to be 1.382 for cell nuclei of all zones (Malendowicz, 1987). From the numerical density values and number of the cells, mean volumes of the cells and nuclei were calculated.

Statistical analysis: For morphometric investigations, five rats from each group were assayed. Data were expressed as means±S. E. M. Statistical comparison of the data was made by the Wilcoxon test.

RESULTS

Adrenals of 20-day-old fetuses: The results summarized in Table 1. show that the body weight of 20-day-old fetuses of the dams adrenalectomized on day 16 of gestation was decreased (26%) in comparison with fetuses of the dams sham-operated on the same gestational day. The absolute and relative weight, as well as the volume of the adrenal gland were decreased (53%, 37% and 39%, respectively).

The volumes of ZG+C and IZ were also decreased (42% and 28%, respectively).

Table 1. Morphometric parameters of adrenal glands fetal and 3-day-old neonatal off spring of sham-operatrd and adrenalectomized rats.

	Fetuses of sham-operated dams	Fetuses of adrena-lectomized dams	3-day-old rats of sham-operated dams	3-day-old rats of adrenalectomized dams
	Control	Adrenalectomized	Control	Adrenalectomized
Body weight (g)	5.48±0.56	4.05±0.13[d]	8.52±0.51	4.86±0.57[d]
Adrenal weight (mg)	1.74±0.23	0.82±0.25[d]	1.14±0.15	0.86±0.21[a]
(mg/100 g b. w.)	31.70±3.40	19.97±5.59[d]	13.33±1.09	17.52±2.58[b]
Adrenal volume (mm^3)	1.040±0.076	0.639±0.096[d]	0.792±0.105	0.594±0.081[b]
Volume (mm^3)				
ZG + C	0.254±0.020	0.148±0.021[d]	0.191±0.026	0.176±0.026
IZ	0.677±0.049	0.490±0.072[d]	0.601±0.080	0.414±0.048[d]
Volume of cell (μm^3)				
ZG	1775±331	2244±270[a]	1751±286	1268±240[b]
IZ	2558±159	3518±285[d]	2265±218	2278±215
Volume of nucleus (μm^3)				
ZG	219±42	317±47[c]	258±20	162±17[d]
IZ	254±28	286±25	255±60	196±25[a]
Number of cells ($x10^3$)				
ZG	78.3±25.3	37.5±2.4[d]	66.2±13.5	80.8±21.7
IZ	264.9±27.8	130.1±23.7[d]	239.7±30.2	201.1±45.4

Results are given as means for 5 animals ± S.E.M. Statistical significance according to the Wilcoxon test:
a. $P < 0.05$; b. $P < 0.025$: c. $P < 0.010$: d. $P < 0.005$.

The mean volume of the ZG cells, their nuclei and the mean volume of the I Z cells were increased (26%, 45% and 38%, respectively) while the number of cells in both zones was markedly decreased (52% and 51%, respectively).

In the inner zone of fetal adrenals from control and adrenalectomized dams, lymphocytes were observed inflitrated around the cortical cells, as well as a few macrophages and polynuclear giant cells (Figure 1.). The number of giant cells per unit area was significantly reduced in fetuses of adrenalectomized dams (0.5±0.22 giant cells per mm^2) compared to fetuses of sham-operated rats (6.7±2.99 giant cells per mm^2), the difference being statistically significant ($p<0.005$).

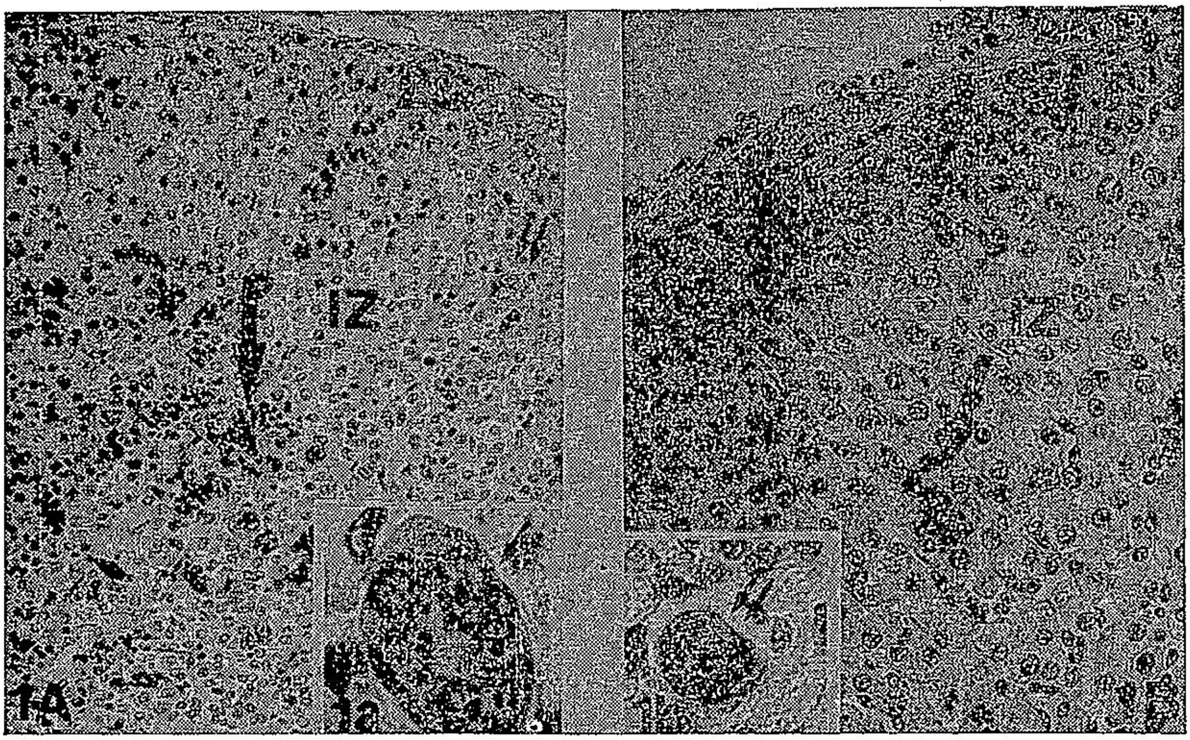

Figure 1. Adrenal of a 20-day-old fetus: A, a - of sham-operated dan (A-350x; a - 1760x) and B, b - of adrenalectomized dam (B - 560x; b - 1100x). Lymphocytes infiltrated around the cortical cells (arrow), polynuclear giant cells (double arrow). ZG - zona glomerulosa, IZ - inner zone.

A d r e n a l s o f 3 - d a y - o l d n e o n a t a l r a t s: The body weight of 3-day-old pups of the dams adrenalectomized on day 16 of gestation was decreased (43%) in comparison with that of the control offspring of the dams which were sham-operated on the same gestational day (Table 1).

The absolute weight and the volume of the adrenal gland were lower (25% and 25%), but the relative weigh was higher (31%) than in control animals.

Total volume of IZ was decreased (31%) in comparison with the controls. The mean volumes of the cortical cells and their nuclei in ZG and of nuclei in IZ cells were lower (26%, 37% and 23%, respectively) than in the control rats.

However, no differences in the number of ZG and IZ cells were observed between the off spring of adrenalectomized dams and control rats at 3 days old which indicates recovery of the glands.

In the inner zone of the glands of control rats, numerous lymphocytes focused as pools of cells in the intercellular space. Also, giant cells and macrophages were present. (Fig. 2A: a). In the experimental neonatal animals

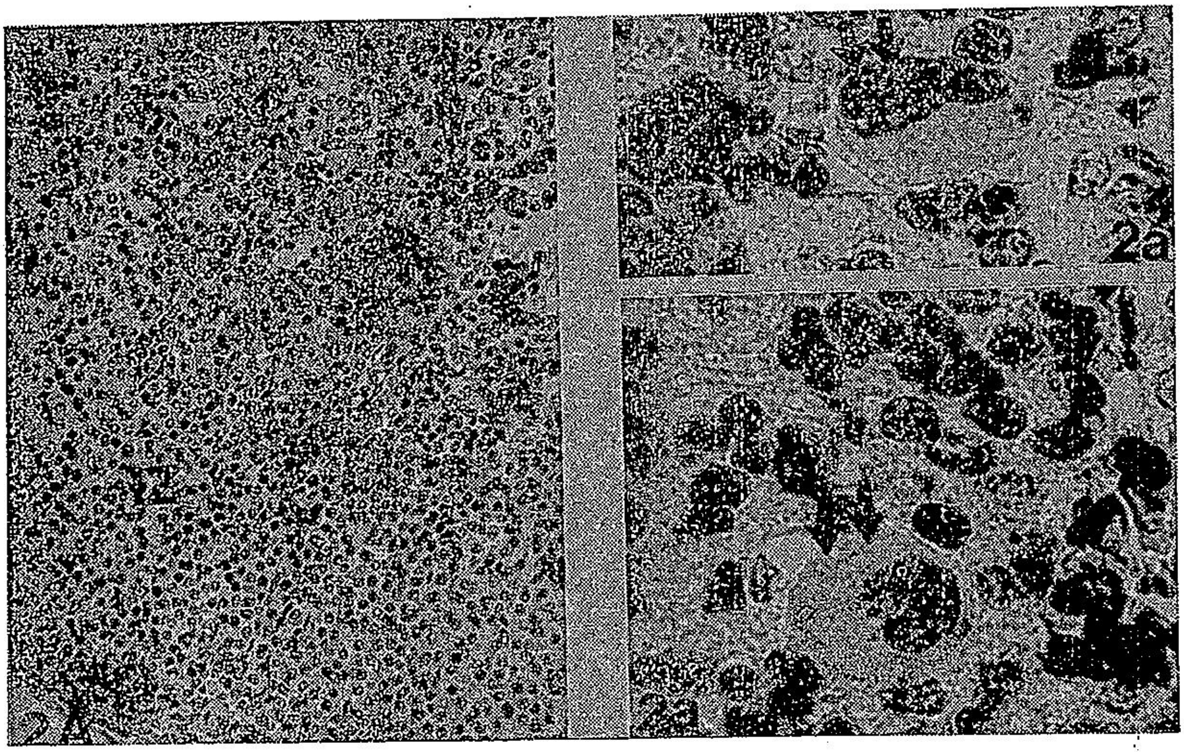

Figure 2. Adrenal of a 3-day-old pup of a sham-operated mother. A - Numerous lymphocytes focus as a pool of cells in the intercellular space (arrow; 350x) and a - different forms of giant cells (double arrow; 1760x). ZG - zona glomerulosa, IZ - inner zone.

necrotic cortical cells were found in the center of the adrenal gland where the cortical cells were intermingled with the medullary elements, but the number of giant cells was decreased (from 4.3±2.07 giant cells per mm^2 in the controls to 1.42±0.83 giant cells per mm^2 in the experimental animals; $p<0.01$; Figure 2 B).

A great number of mitotic figures was observed in the glands of 3-day-old pups of adrenalectomized mothers.

Electron microscopy revealed lipid-like inclusions in the mitochondria, in numerous IZ-cells of the experimental animals while in control animals these

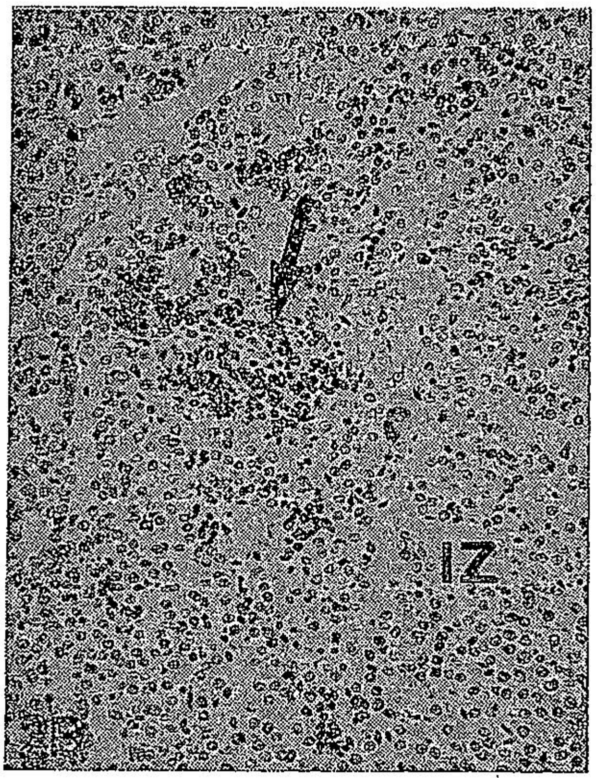

Figure 2B. Adrenal of a 3-day-old pup of an adrenalectomized mother. Lymphocytes and necrotic cortical cells usually occur in the inner cortical zone (arrow; 350x). IZ - inner cone.

structures were seen usually in the cells intermingled with medullary elements with cytoplasm filled with clusters of lipid droplets. During this neonatal period quite a number of multilamellar budies were seen in the intercellular space, in the cytoplasm and lipid droplets in both groups of animals (Figure 3). Phagocytosis of the damaged (necrotic) cells by macrophages was observed both in experimental and control animals. Multilamination of the mitochondria resembled so-called myelin figure or myelin-like structure. Lysosomes were often observed near the lipid droplets.

Adrenals of 14-day-old neonatal rats: The body weight of 14-day-old off spring of adrenalectomized dams was still decreased (41%) as seen in Table 2, compared to neonatal pups of sham-operated mothers. The absolute weight and volume of the adrenal gland, remained decreased (35% and 56%, respectively), while the relative weight of the adrenals achieved the control level. The volume of all three adrenal cortical zones was lower (17%, 62% and 79%, for ZG, ZF and ZR, respectively).

In ZG cells only the volume of the nuclei was decreased (24%). The mean volumes of the ZF and ZR cells were increased (26% and 29%, respectively). The number of cells in all three zones was noticeably decreased (24%, 71% and 83% for ZG, ZF and ZR, respectively).

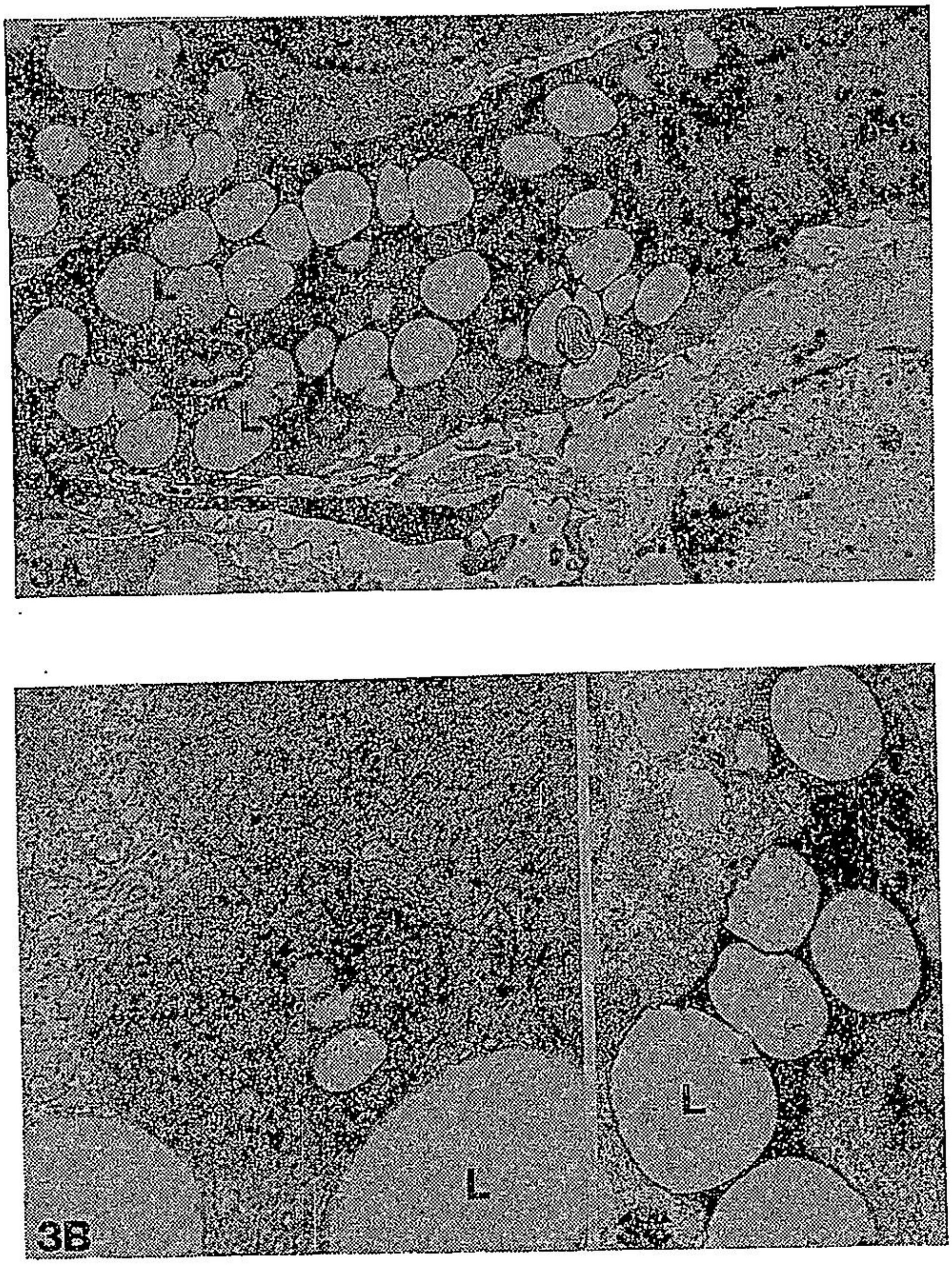

Figure 3. Adrenal of a 3-day-old pup of an adrenalectomized mother. A - Cortical cells of the inner zone with cytoplasm filled with clusters of lipid droplets (L) and numerous myelin-like structures (arrow; 9500x). B - Lipid-Like inclusions (arrow) in mitochondria (m; 19000x). C - Large lipid droplets between degenerated mitochondria (m; 14600x).

The layer structure of the adrenals in 14-day-old rats was similar to that of adult animals. Giant cell and lymphocyte foci were not observed in this group of rats, either of adrenalectomized or sham-operated mothers. Only small pools of lymphocytes were found in the medulla and infrequently in the juxtamedullary zone (Figure 4).

Table 2. Morphometric parameters of the adrenal glands in 14-day-old neonatal offspring of sham-operated and adrenalectomized rats.

	Control	Adrenalectomized
Body weight (g)	31.90±1.26	18.98±0.92[d]
Adrenal weight (mg)	2.14±0.36	1.40±0.22[d]
(mg/100 g b.w.)	7.21±1.06	7.40±1.16
Adrenal volume (mm^3)	1.993±0.129	0.874±0.145[d]
Volume (mm^3)		
ZG + C	0.316±0.027	0.261±0.016[c]
ZF	1.242±0.109	0.470±0.116[d]
ZR	0.191±0.009	0.040±0.006[d]
Volume of cell (μm^3)		
ZG	1596±219	1469±243
ZF	1742±258	2201±364[a]
ZR	1565±232	2022±321[a]
Volume of nucleus (μm^3)		
ZG	318±37	241±35[b]
ZF	298±44	273±41
ZR	262±36	320±46
Number of cells ($x10^3$)		
ZG	149.0±25.4	113.9±27.7[a]
ZF	734.3±155.7	214.8±69.4[d]
ZR	110.0±21.3	18.4±4.7

The results are given as means for 5 animals ± S. E. M. Statistical significance according to the Wilcoxon test: a. P< 0.05; b. P<0.025; c. P <0.010; d. P<0.005.

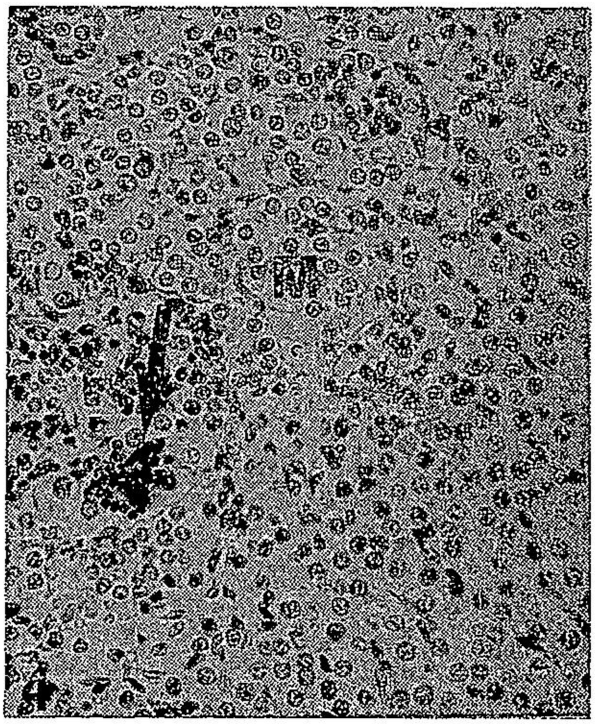

Figure 4. Small pools of lymphocytes (arrow) in the medulla (M) of an adrenal gland in a 14-day-old pup of an adrenalectomized mother (1560x).

The cells of the inner portion of ZG were ultrastructurally analyzed because they represent fully differentiated cells unlike the cells of the outer portion. Cortical cells of ZG in 14-day-old off spring of adrenalectomized dams contained a decreased number of mitochondria with tubulovesicular or vesicular cristae, but the number of lipid droplets was increased (Figure 5). The cells of ZF in

Figure 5. A cortical cell of the inner portion of ZG in a 14-day-old offspring of an adrenalectomized dam with numerous lipid droplets (L). Mitochondria (M) tubular and vesicular cristae are visible (20000x).

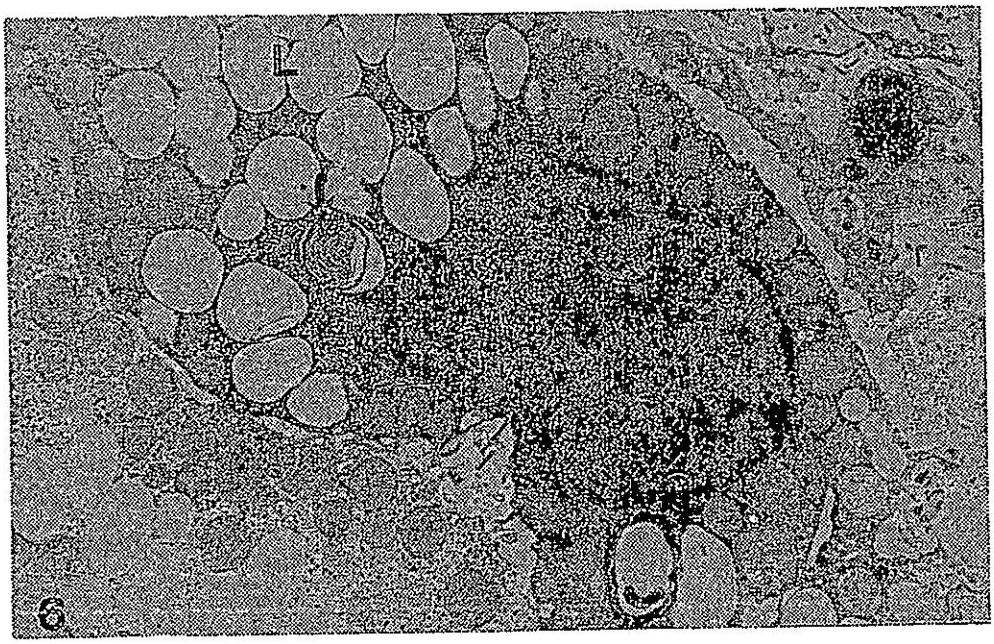

Figure 6. A cortical cell of ZR in a 14-day-old offspring of an adrenalectomized dam with numerous clamped lipid droplets (L), myelin-like structure (arrow) and dark coloured nucleus (N; 9500x).

this group of animals showed no obvious ultrastructural differences in comparison with analogous elements of the control animals, except for a slight accumulation of lipid droplets and dense bodies. In the ZR cortical cells were still intermingled with medullary chromaffin cells. In the offspring of adrenalectomized mothers, a great number of cells was filled with many clampd lipid droplets, which were sometimes so numerous as to almost fill the whole cytoplasm (Figure 6.). The nuclei of these adrenocortical cells showed irregular forms and dark colouring. Necrotic cells in various stages of degeneration were also observed.

DISCUSSION

Adrenalectomy of pregnant female rats performed on day 16 of gestation, during the period of intense differentiation of the hypothalamo-hypophyseal-adrenal system in the fetuses led to significant body weight reduction. In addition, both absolute weight and volume of the adrenal glands decreased, accompanied by structural changes, in 20 day-old fetuses and neonatal 3- and 14-day-old rat pups. There were several reasons for the choice of this period for adrenalectomy of the dams. It is known that on day 15.5 of fetal life the adrenals appear as a thin cell mass embedded in the mesoderm and outer and inner cortical zones can already be distinguished (Daikoku et al., 1976). Steroidogenesis was first noted on day 15 of fetal life (Klepac et al., 1976) and plasma corticosterone could be detected on day 18 of fetal life (Milković and Milković, 1962; Jost, 1966). Cells containing immunoreactive ACTH appeared from the 16th fetal day in the primordial cell outgrowth of of Rathke's pouch (Dupouy and Magre, 1973; Setalo and Nakane, 1976). The activity of the fetal adrenals is controlled by its own ACTH, as early as from day 17. of gestation (Levin et al., 1987). In this period, a conspicuous fall in blood corticosterone level was observed in adrenalectomized animals. This fall provoked a notable rise in plasma ACTH concentration but it did not provoke hypertrophy and stimulation of secretory activity of the numerous pre-existing small accessory adrenocortical nodules present in control rats (Schwabedal and Partenheimer, 1983). The blood concentration of corticosterone and aldosterone showed a 90–98% decrease up to the 20th day after adrenalectomy of non-pregnan rats, but after that, corticosterone levels gradually increased (Belloni et al., 1989).

It is also known that there is transfer of fetal corticosterone to adrenalectomized mothers (Milković et al., 1973; Cohen and Brault, 1974; Arishima et al., 1977; Dupouy et al., 1985). On the other hand, maternal corticosteroids can cross the placental barrier to reach the fetuses during the period before delivery (Zarrow et al., 1970). In late pregnancy, both adrenal and plasma corticosterone levels in fetuses were correlated with the pituitary ACTH content (D'Angelo et al., 1973). Hypothalamic extract from 20-day-old fetuses contains some CRF activity and the fetal pituitary releases ACTH in response to CRF (Dupouy, 1975). Thus, for the maintenance of normal adrenocortical function, the hypothalamus may be indispensable during the prenatal life of rats (Daikoku, et al., 1976).

The maturation of fetal ZF cells was prevented by removal of the fetal pituitary (Robinson et al., 1983). Treatment of hypophysectomized fetal lambs with ACTH reversed most of the effects of pituitary ablation and it appears that the fetal pituitary is critical to fetal adrenal development during the second half of gestation.

The number of ACTH receptors expressed per adrenal increases regularly in fetal and newborn rats and ACTH is able to up-regulate the number of its own receptors (Chatelain et al., 1989).

The results presented in this work demonstrate that adrenalectomy of pregnant dams affects the development of the fetuses. The body weight of 20-day-old fetuses, the absolute and relative weight of the adrenal glands, volume of the adrenal gland and volumes of ZG and IZ were significantly decreased, as well as the number of cells in both zones. At the same time, the mean volume of both the cells and the nuclei in ZG and IZ was increased. The decline of the corticosterone level in maternal blood plasma probably led to hypertrophy of fetal cortical cells, but it sems that normal cell multiplication was prevented thus leading to the reduction of individual cortical zones and of total adrenal gland volume.

Fetal adrenal glands can maintain plasma corticosterone concentration in adrenalectomized mothers so that near term, plasma corticosterone concentrations were found to be equal to those in intact pregnant rats (Milković et al., 1973). Although ACTH concentration in the pituitary and blood plasma of pregnant females was found to be increased after adrenalectomy, it can not stimulate the adrenal cortex of the fetuses, since it does not cross the placental barrier (Milković and Milković, 1966; Negelen-Perchelet and Cohen, 1975). The total adrenal corticosteroid content of fetuses from adrenalectomized mothers was increased and it remained at this elevated level until birth. According to Klepac et al. (1976), the increased funtional activity of the adrenal gland in the fetuses of adrenalectomized mothers results from abolition of the inhibitory effect of maternal corticosteroids.

Josimovich et al. (1954) observed a moderate decrease of rat weight at birth, though the reduction of the true fetal cortical zone recorded in humans was not found. Nussdorfer (1970) showed degenerated cells in the juxtamdullary zone of the intact newborn rat adrenal gland, leading to a fall in the adrenal gland weight. Kamoun (1970) found twice as much corticosterone in the fetal adrenal gland as in the adrenal tissue of newborn animals. Measurement of the adrenal gland of control neonatal rats revealed a reduction between day 1 and 4, to reach again the weight of the adrenal in the 20-day-old fetus between day 5 and 6. After that the adrenals grow very rapidly (to be published). These results agree well with the data of Wyllie et al. (1973) concerning the intensity of degenerative, apoptotic changes in the adrenal gland cortex of newborn rats. The reduction of the adrenal gland weight in the fetuses of adrenalectomized mothers resulted from a significant decrease of the number of cells within both cortical zones. It could be supposed that homeostasis of the cell population had not yet been established, i. e. the equilibrium between mitogenic factors and those influencing cell mortality had not been established.

Our data demonstrating a reduced number of cortical cells in both zones could mean that the mortality of the cells exceeded their mitotic activity. This phenomenon could be also explained in terms of receptor desensitization occuring under the influence of increased ACTH levels in the fetal pituitary. It is known that specific receptors are necessary to achieve a mitogenic ACTH effect and thus, the disturbance of the receptor system would lead to a decrease of mitotic activity of the fetal adrenals. Besides, it is documented that the placenta and several fetal tissues synthesize growth factors which possess the capacity of modulating growth and maturation of the fetal adrenals. However, it should be mentioned also that according o the data of several authors (Simonian and Gill, 1981; Crickard et al., 1981), ACTH is not one of the factors, because it attenuated the mitogenic effects of fibroblast growth factor (FGF) and epidermal growth factor (EGF) on fetal cortical cells in vitro. The recent data of Spencer et al. (1992) indicate the existence of cortical factors present in human fetuses which influence both mitogenic and steroidogenic activity of the cortical cells and which are controlled by ACTH.

Our previous studies showed that maternal adrenalectomy performed on day 14 of gestation produced increased cell necrosis within ZR on the day of birth and 24–48 h after birth. A large portion of adrenocortical cells was present within the macrophages. In otherwise normal adrenocortical cells, lipid droplets were incorporated in some mitochondria (Nickerson et al., 1978). It is possible that the process of apoptosis occurs in which a portion of adrenocortical cells is extruded and phagocytosized by macrophages (Lockshin and Beaulaton, 1975). The appearance of macrophages and numerous giant cells described in the present work confirmed the resorption of a part of the cortex during the neonatal period. In the adrenal gland of fetuses and neonatal rats of adrenalectomized mothers a significantly decreased number of giant cells was seen and there is the possibility that these cells differentiate from macrophages. However, the smaller number of gian cells per area unit of the adrenal gland in fetal and 3-day-old off spring of adrenalectomized dams could be the consequence of stimulated steroid secretion. This is supported by the finding of hypertrophy of cortical cells near term, since it was shown that cortisol acts by inhibiting differentiation of monocytes into macrophages in culture (Baybutt and Holsboer, 1990).

Our data show that the body weight of 14-day-old offspring of rats adrenalectomized on day 16 of gestation, as well as the absolute weight and volum of the adrenal gland and of the three cortical zones were significantly decreased, indicating that the absence of maternal corticosteroids affected not only the development of the fetuses during the last third of pregnancy, but also postnatal development since the changes were maintained till day 14 of postnatal life and the recovery does not appear until sexual maturation (to be published). The mean volumes of the ZF and ZR cells were significantly increased, but the number of cells was decreased as compared to control animals of the corresponding age, resulting in a decrease of the volume of all cortical zones, as well as of the total gland volume. However, the volume fraction of ZG was found to be markedly increased. Necrotic cells in various stages of degeneration were found only in ZR and the mean volume and number of the cells of this zone were conspicuously decreased. No lymphocyte infiltrations were seen in the cortex,and they were seldom observed in the medulla. Giant cells were also absent both in the control and animals of adrenalectomized mothers.

The data presented in this work clearly demonstrate that the removal of maternal adrenal glands on day 16 of gestation significantly suppresses adrenal growth both in fetuses and in neonatal rats. However, it should be underlined that such a hormonal status very probably acts by stimulating secretory activity of the cortical cells at certain stages of development.

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UTICAJ ADRENALEKTOMIJE MAJKE NA RAZVOJ NADBUBREŽNIH ŽLEZDA FETUSA I NEONATALNIH PACOVA

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SADRŽAJ

Razvoj nadbubrežnih žlezda mužjaka pacova u perinatalnom periodu, od majki bilateralno adrenalektomisanih 16. dana graviditeta, praćen je stereološkom metodom i elektronskom mikroskopijom. Majke sa fetusima žrtvovane su dekapitacijom 21. dana graviditeta, a postnatalne životinje su žrtvovane na isti način 4. i 15. dana života. Kod fetusa i neonatalnih pacova od 3 dana, zona fasciculata (ZF) i zona retikularis (ZR) su analizirane kao jedna-unutrašnja zona, dok su kod pacova od 14 dana one analizirane odvojeno.

Ispitivanjem međusobnog odnosa pituitarno-adrenalnog sistema majke i funkcionalnog integriteta ovog sistema fetusa od 20 dana i neonatalnih pacova od 3 i 14 dana zapaženo je sledeće: a. Adrenalektomija majke kod fetusa izaziva smanjenje apsolutne i relativne težine nadbubrežnih žlezda. Volumen kortikalnih zona je redukovan smanjenjem broja parenhimskih ćelija. Međutim, prosečan volumen ćelija zone glomeruloze (ZG) i IZ je povećan. b. Kod eksperimentalnih pacova od 3 dana apsolutna težina nadbubrežnih žlezda je smanjena, kao i volumen IZ i prosečan volumen ćelija ZG, ali je relativna težina nadbubrežne žlezde povećana. c. Kod eksperimentalnih pacova od 14 dana smanjenje apsolutne težine nadbubrežnih žlezda se i dalje održava. Volumen kortikalnih zona i broj ćelija po zonama je takođe smanjen. Ove promene prati hipertrofija ćelija ZF i ZR.

Dobijeni rezultati pokazuju da adrenalektomija majke izvršena 16. dana graviditeta značajno suprimira rast nadbubrežnih žlezda fetusa i postnatalnih pacova od 3 i 14 dana. Međutim izgleda da takav hormonski status stimulira sekretnu aktivnost kortikalnih ćelija u pojedinim periodima razvoja.

Ključne reči: Adrenalna žlezda, perinatalni period, adrenalektomija majke, stereologija, elektronska mikroskopija.