acting on protein synthesis, especially stimulating it, may reduce this resistance. Actinomycin D, which causes "superinduction," i.e., an increase in the concentration and activity of specific proteins after inhibition of RNA synthesis [5], was used for this purpose. Actinomycin D in fact sharply reduced the resistance of the stomach cells to hydroxyurea. Only preliminary injection of actinomycin D, and not its simultaneous injection with hydroxyurea, proved to be effective. This confirms indirectly that "superinduction," and not the direct action of actinomycin D, reduces the resistance of cells, although of course this interpretation is highly hypothetical.

LITERATURE CITED

1. O. S. Frankfurt, Byull. Éksp. Biol. Med., No. 8, 33 (1975).
2. O. S. Frankfurt, Cellular Mechanisms of Tumor Chemoteraphy [in Russian], Moscow (1976).
3. V. H. Bono, Cancer Chemother. Rep., 4, Part 2, 131 (1974).
4. M. W. Lieberman, R. S. Verbin, M. Landay, et al., Cancer Res., 30, 942 (1970).
5. R. D. Palmiter and R. T. Schimke, J. Biol. Chem., 248, 1502 (1973).

ULTRASTRUCTURAL ANALYSIS OF THE ADRENAL CORTEX IN RATS AFTER BILATERAL SUBDIAPHRAGMATIC VAGOTOMY

Yu. K. Eletskii, V. V. Yaglov, and N. Ya. Yakovleva

UDC 616.453-091.8-02:616.833.191.9-089.85-092.9

Electron-microscopic investigation of the zona fasciculata and zona reticularis of the adrenal cortex in rats showed that 7 days after bilateral subdiaphragmatic vagotomy the perinuclear space of the adrenocorticocytes and endothelial cells is widened, the tubules of the smooth cytoplasmic reticulum are dilated, the mitochondria edematous, their cristae reduced, and the number and size of the lipid droplets diminished. After 45 days some mitochondria were starting to undergo myelinization, lipid droplets were aggregating, and electron-translucent vacuoles appeared in them. Vagotomy depresses the function of the adrenocorticocytes of the zona fasciculata and zona reticularis of the rat adrenal cortex.

KEY WORDS: *vagotomy; lipid droplets; mitochondria; adrenocorticocytes.*

The function of the adrenal cortex when its innervation is disturbed has been inadequately studied [1]. One problem, in particular, that is still not settled is the role of the vagus nerve in the innervation and regulation of activity of the adrenal cortex, even though the wide use of vagotomy for the surgical treatment of duodenal ulcer necessitates a study of changes in the structure and function of the secretory cells of the adrenal cortex after disturbance of its vagal innervation.

The object of this investigation was to study the ultrastructure of the adrenal cortex after bilateral subdiaphragmatic vagotomy.

EXPERIMENTAL METHOD

Male Wistar rats (54) weighing 120-140 g were used. Bilateral subdiaphragmatic vagotomy was performed under ether anesthesia. The animals were killed 7 and 45 days after the

Department of Histology and Embryology, Faculty of Internal Medicine, N. I. Pirogov Second Moscow Medical Institute.

(Presented by Academician of the Academy of Medical Sciences of the USSR A. P. Avtsyn.) Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 83, No. 4, pp. 492-494, April, 1977. Original article submitted October 18, 1976.

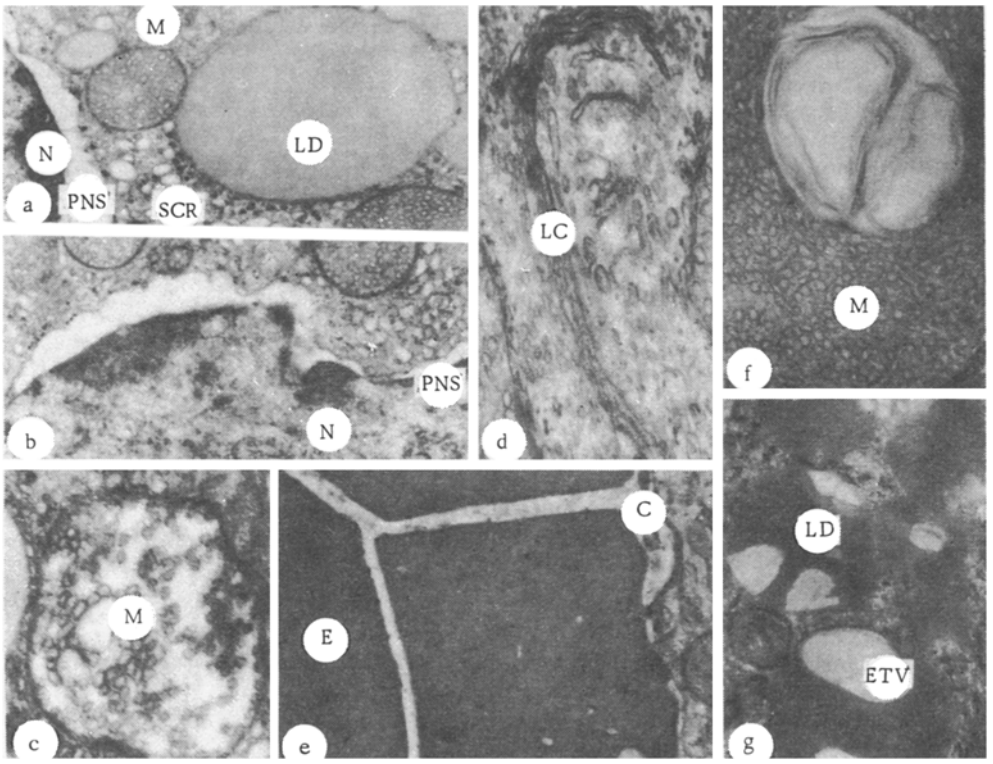

Fig. 1. Adrenal cortex of rats after bilateral subdiaphragmatic vagotomy: a) 7 days after operation: widening of perinuclear space and dilatation of tubules of smooth cytoplasmic reticulum, aggregation of lipid droplets and a tendency for them to merge (13,000×); b) same period: changes in shape of nucleus, widening of perinuclear space (13,000×); c) same period: edema of mitochondria, reduction of vesicles (15,000×); d) same period: compact structure of lamellar complex (15,000×); e) same period: dilatation of capilary lumen, stasis of erythrocytes in it (13,000×); f) 45 days after operation: commencing myelinization of a mitochondrion (15,000×); g) same period: aggregation of lipid droplets with electron-translucent vacuoles (13,000×). LD) Lipid droplets, M) mitochondrion; N) nucleus, PNS) perinuclear space, SCR) smooth cytoplasmic reticulum, LC) lamellar complex, E) erythrocytes, C) capillary, ETC) electron-translucent vacuoles.

operation, 24 h after the last meal, and 1, 2, 3, and 6 h after the introduction of a 20% solution of glucose in a dose of 2 g/kg body weight by gastric tube. Pieces of the zona fasciculata and zona reticularis of the adrenals were taken for electron-microscopic investigation from three experimental and three control animals at each time.

EXPERIMENTAL RESULTS

Many cells with considerable ultrastructural changes were found in the zona fasciculata and zona reticularis 7 days after the operation, alongside cells that still remained intact. Widening of the perinuclear space of the adrenocorticocytes (Fig. 1a, b) and of the endothelial cells was observed. The nuclei of some glandular cells were irregular in shape (Fig. 1b) and the tubules of the smooth cytoplasmic reticulum were dilated (Fig. 1a). Destructive changes were most frequently found in the mitochondria: reduction of the cristae, translucency of the matrix, and an increase in size of the organelles themselves (Fig. 1c). The lamellar complex had a more compact structure than in the gland cells of the control animals and it was located chiefly in the perinuclear region (Fig. 1d). The number and size of the lipid droplets were increased and they had a tendency to merge (Fig. 1a). Dilatation of the capillaries and signs of stasis were observed (Fig. 1e).

Mitochondria with signs of commencing myelinization were frequently seen 45 days after the operation (Fig. 1f). The lipid droplets formed aggregations and contained electron-translucent vacuoles (Fig. 1g). Changes in the blood vessels were less marked than earlier. Administration of glucose had no significant effect on the ultrastructure of the adrenal cortex of the experimental animals at the times studied.

In the modern view the mitochondria of the adrenal cortex play an active part in hormone synthesis [3]. Death of some of the mitochondria, and an increase in the number and vacuolation of the lipid droplets are morphological features reflecting lowered functional activity of the adrenocorticocytes of the zona fasciculata and zone reticularis of the adrenal cortex [2]. This suggests that after bilateral subdiaphragmatic vagotomy the secretory activity of the glandular cells of the zona fasciculata and zona reticularis of the adrenal cortex is inhibited.

The fact that the changes induced by vagotomy are similar in some of their manifestations with those observed by Demin [1] in the adrenal cortex after disturbance of its sympathetic innervation points to a nonspecific response to injury.

LITERATURE CITED

1. Yu. M. Demin, "Postnatal ontogeny of the adrenal glands under physiological and experimental conditions," Candidate's Dissertation, Moscow (1975).
2. J. M. Borowicz, Beitr. Pathol. Anat. Allg. Pathol., 132, 441 (1965).
3. B. J. Merry, J. Anat., 119, 611 (1975).

INJURY TO PANETH'S CELLS IN RATS AFTER ADMINISTRATION OF DITHISONE AND 8-(ARENESULFONYLAMINO)QUINOLINES

V. A. Eshchenko

UDC 612.349.7.014.46:547.831

Injection of dithisone and 8-(arenesulfonylamino)quinolines into rats leads to selective injury to the zinc-rich Paneth's cells of the small intestine. The results confirm the possible role of zinc blocking in the development of cell degeneration.

KEY WORDS: *Paneth's cells; chelating agents; zinc.*

Administration of dithisone and 8-(arenesulfonylamino)quinolines causes selective damage to cells of the islets of Langerhans, which is explained by the high affinity of these chelating agents for zinc atoms contained in the insular tissue of the pancreas [1-4]. An analogous action of these agents on the Paneth's cells of the rat small intestine, which contain considerable amounts of zinc, may also be postulated.

The object of this investigation was to study the general mechanisms of the cytopathogenic action of chelating agents.

EXPERIMENTAL METHOD

Dithisone, 8-(p-toluenesulfonylamino)quinoline (8TSQ), and 8-(benzenesulfonylamino)-quinoline (8BSQ) were injected intraperitoneally and intravenously into 350 rats in doses of 10 to 100 mg/kg. Dithisone was injected as a 1% solution in 0.5% ammonia solution and

Department of Pathological Anatomy and Central Scientific-Research Laboratory, Tomsk Medical Institute.

(Presented by Academician of the Academy of Medical Sciences of the USSR I. V. Toroptsev.) Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 83, No. 4, pp. 494-496, April, 1977. Original article submitted September 29, 1976.