BRIEF NOTE

**Ultrastructure of the Neurohypophysis in Dogs with
Diabetes Insipidus and Normal Dogs**

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Diabetes insipidus is a disease that occurs with defect in the secretion of antidiuretic hormone (ADH) and that is clinically characterized by polyuria and polydipsia. Many cases of hypothalamic diabetes insipidus are caused by the compression of the hypothalamic-neurohypophyseal system. Compression may arise from large pituitary neoplasm and craniopharyngioma [2], or from chronic infections, as well as degenerative necrotic process, in the tuber cinereum or diencephalon. There were only a few electron microscopic reports on diabetes insipidus in animals. One of them was associated with pituitary neoplasm in a dog [1]. Another deals with homozygous diabetes insipidus in mice [3]. In this study, two cases of chronic central diabetes insipidus in dogs were reported, with special emphasis put on the electron microscopic findings of the neurohypophysis.

The neurohypophysis was collected immediately after killing, fixed in 5% glutaraldehyde, and postfixed in 1% osmium tetroxide.

It is not only a storage organ for neurosecretion, but also a secretory organ itself. In it the authors found secretory neurons similar to those in the nucleus paraventricularis and nucleus supraopticus. In a nor-

mal 14-year-old poodle these neurons were $150,000 \times 200,000$ Å in size and contained neurosecretory granules 700 to 3,000 Å in diameter (Figs. 1, 2). These granules closely resembled those previously reported [1, 4] to be 750 to 3,000 Å in diameter within nerve endings.

Two cases of chronic central diabetes insipidus in dogs

Case 1: A 15-year-old poodle manifested an increase in thirst at 4–5 years of age. The total daily intake of water was 8 liters (approximately two-thirds of its body weight). Atrophy of the hypophysis was shown macroscopically. Atrophy of the nucleus paraventricularis was revealed by light microscopy. The nucleus supraopticus still retained chrome hematoxylin-phloxine positive substances. A marked increase was observed in fibroblasts and pituicytes in the neurohypophysis. Electron microscopy showed that unmyelinated nerve fibers contained neurosecretory granules 500 to 2,000 Å in diameter, and that the endoplasmic reticulum was widely dilated in neurons. Nerve endings were separated from capillaries by a basement membrane consisting of large numbers of delicate collagen fibrils, fibroblasts and pituicytes (Fig. 3).

Case 2: A 14-year-old poodle became ill with diabetes insipidus at about 4 years of age. No pathologic changes were observed macroscopically or light microscopically in the neurohypophysis. There was, however, a decrease in the amount and size of neurosecretory granules, and many neurotubules were present in swollen axons in the observation by the electron microscope (Fig. 4).

The above-mentioned electron microscopic findings in both cases are possibly related to endocrine dysfunction due to axonal degeneration with consequent re-

duction of neurosecretory granules. They may also be due to such neurovascular changes as characterized by a marked increase in delicate collagen fibrils in the perivascular spaces.

References

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要 約

健康および尿崩症の犬の下垂体後葉の電顕像 (短報): 佐々木 啓・鈴木直義——臨床的に, 中枢性尿崩症と診断され, 慢性経過をたどった, 14歳齢と15歳齢のプードル犬の下垂体後葉を, 電子顕微鏡により検索した。神経終末における神経分泌顆粒の著明な減少, 小型化 (500~2,000 Å), 神経微細管の著しい増加などが共通の変化として認められた。血管周囲腔内に, 繊細な膠原線維が増生することにより, 腔が拡大し, 神経終末と, 血管腔との間に著しい隔りをもつものが1例認められた。

Explanation of Figures

Fig. 1. Two surveys of perikarya of neurosecretory neurons with neurosecretory granules of various sizes and lipofuscin in normal neurohypophysis. Concentrated neurosecretory granules are seen in dilated Golgi-areas. $\times 7,200$.

Fig. 2. Normal neurohypophysis. Note a venule and irregular widening of the perivascular space with collagen fibrils. There is a difference in density. Large scale granules (700-3,000 Å) with a single membrane in nerve endings. Numerous fenestrates in endothelial cells ($\uparrow$). Nerve endings are in close apposition to the outer basement membrane. $\times 20,000$.

Fig. 3. Neurohypophysis of a dog with diabetes insipidus. Note remarkable extension of perivascular spaces with large amounts of delicate collagen fibrils, fibroblasts (F), and elements of pituicytes (P). Swelling of neurosecretory fiber ($\uparrow$). Strong dilatation of endoplasmatic reticulum in neurosecretory neuron (N). Lumen (L). $\times 4,200$.

Fig. 4. Neurohypophysis of a dog with diabetes insipidus. Neuronal swelling containing a small amount of elementary granules (500-2,000 Å) and many neurotubules. $\times 20,000$.