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A Study on the Comparative Cytology of Some Endocrine Glands in *Rana plancyi* between Hibernation and Post-hibernation

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Abstract: -This paper studies the ultrastructure of the pituitary gland cell and the adrenal cortex cell in *Rana plancyi* between hibernation and post-hibernation. The results show that the two kinds of cells mentioned above are much less inactive during hibernation than during post-hibernation. The significance of those results is also discussed.

Key words: Amphibia, Anura, *Rana plancyi*, pituitary gland, adrenal cortex, comparative cytology.

Introduction

Hibernation is an adaptive strategy of frogs for keeping out of the cold during the winter. Studying the hibernation biology of frogs is beneficial to protecting the frogs and making use of frog resource. No paper related to the comparative cytology of the endocrine glands in frogs has been reported in China for many years. This paper reports the results of studying the comparative cytology of the pituitary gland cell and the adrenal cortex cell in *Rana plancyi* between hibernation and post-hibernation by using a transmission electron microscope.

Methods

According to the regular pattern of hibernation in the locality, many specimens of *Rana plancyi* were collected from a little river in October 1992, in the suburbs of Xuzhou City, put into a box, and then laid outdoors during the winter. Some specimens, which represent the hibernation group, were fetched from the box and used for the experiment on January 8, 1993. Some specimens representing the post-hibernation group were collected from the same little river mentioned above and were used to do the experiment on May 17, 1993.

Four specimens were collected from the two groups, regardless of their sex. The specimens were killed and dissected so that the pituitary gland and the adrenal gland were obtained. The two glands were fixed with 4% glutraldehyde and embedded in Epon-812. Ultra-thin sections were doubly stained with uranyl acetate and lead citrate by the standard method, and the specimens were examined with a Hitachi 600-A-II electron microscope.

Results

Pituitary gland cell

The pituitary gland cell of the hibernation group has plenty of glycogen particulates (Pl. I:1) but few rough endoplasmic reticulum and mitochondrium (Pl. I:2), while the pituitary gland cell of the post-hibernation group has plenty of rough endoplasmic reticulum and Golgi bodies but no glycogen particulates (Pl. I:3). The pituitary gland cell of the post-hibernation group also has plenty of secretory granules (Pl. I:4), and some secretory granules can sometimes be seen moving to blood capillary (Pl. I:5).

Adrenal cortex cell

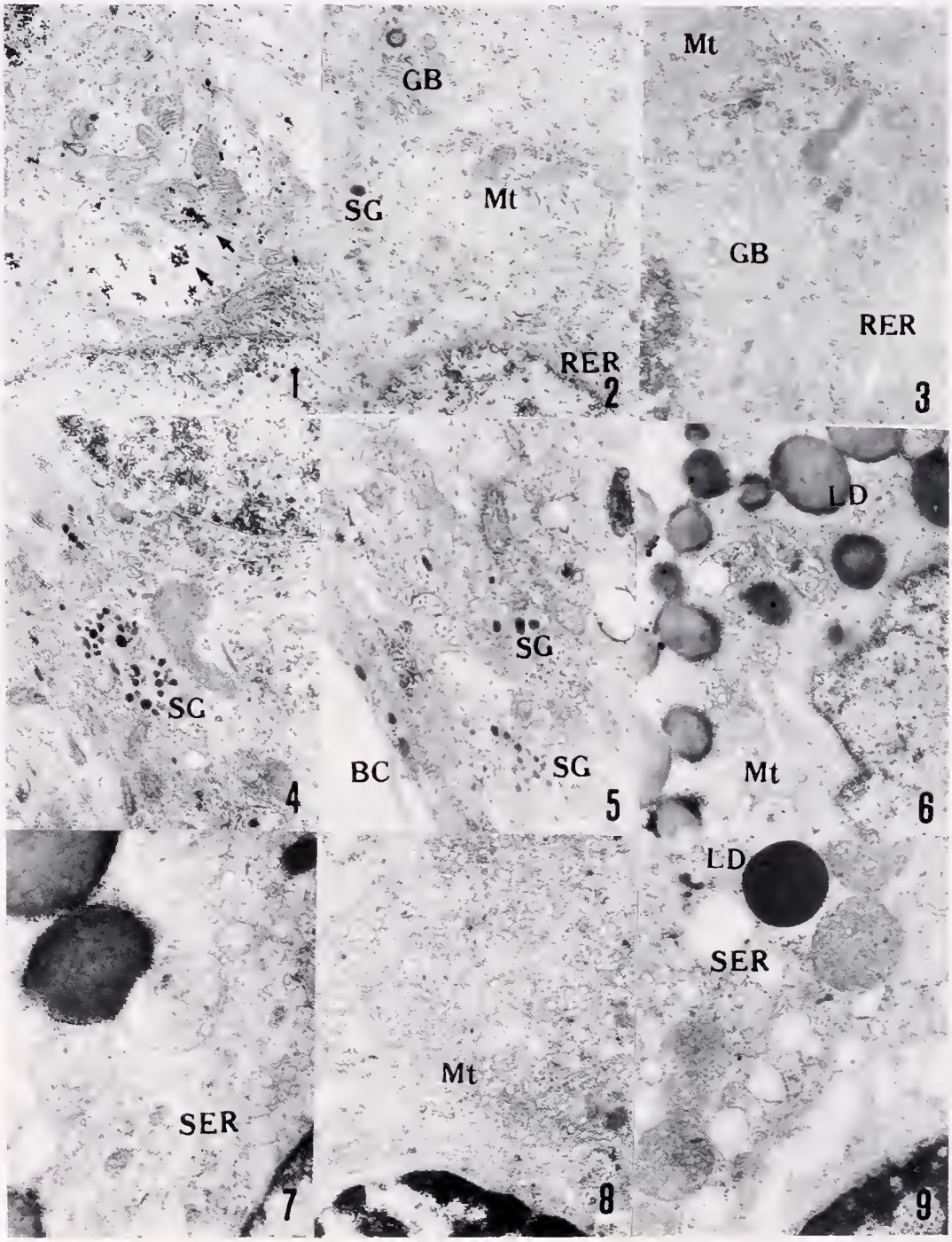
According to the result of the examination of the semi-thin sections, the adrenal cortex in the adrenal gland was defined. The adrenal cortex cell has tubular cristate mitochondrium as its marking. The adrenal cortex cell has plenty of lipid drops, some smooth endoplasmic reticulum and few mitochondrium (Pl. I:6, 7) during hibernation, but has plenty of mitochondrium (Pl. I:8), few lipid drops and plenty of expanded smooth endoplasmic reticulum (Pl. I:9).

Discussion

The pituitary gland is the most important endocrine gland in the frog and plays an

Plate I

1. Pituitary gland cell showing glycogen particulates during hibernation (arrows). X 12 000
2. Pituitary gland cell showing mitochondrium (Mt), rough endoplasmic reticulum (RER), Golgi bodies (GB) and secretory granules (SG) during hibernation. X 15 000
3. Pituitary gland cell showing Mt, RER and GB during post-hibernation. X 20 000
4. Pituitary gland cell showing SG during post-hibernation. X 17 000
5. Pituitary gland cell showing SG near the blood capillary (BC) during post-hibernation. X 20 000
6. Adrenal cortex cell showing lipid drops (LD) and Mt during hibernation. X 20 000
7. Adrenal cortex cell showing smooth endoplasmic reticulum (SER) during hibernation. X 20 000
8. Adrenal cortex cell showing Mt during post-hibernation. X 20 000
9. Adrenal cortex cell showing expanded SER and LD during post-hibernation. X 20 000



important role in its hibernation. It can secrete, releasing hormone which can regulate the activity of the other endocrine glands. The studies on frog cytology have not concerned the pituitary gland for many years. Previous work (Daguy, 1963; Saint Girons, 1975) has showed that the pituitary gland in some reptiles increase in activity several weeks before the end of hibernation. This investigation shows that the pituitary gland cell is inactive during hibernation, but active during post-hibernation. It also suggested that the behavior of the pituitary gland in frogs is similar to the same gland in reptiles during hibernation and post-hibernation.

The adrenal cortex can secrete glucocorticoid and mineralocorticoid. The two kinds of hormones can regulate glucometabolism and mineralometabolism. These two kinds of hormones are both synthesized in the smooth endoplasmic reticulum, so that the number of smooth endoplasmic reticulum can indicate the secreting level of the two kinds of hormones. Previous work (Robertson et al., 1959; Chan et al., 1971) have shown that the adrenal cortex is inactive during the winter and active in the summer. This investigation also shows that the adrenal cortex cell is active during post-hibernation and inactive during hibernation. According to this investigation, it is considered that the activity of the adrenal may begin from the end of hibernation.

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