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Morphological Studies on the Thymus of Japanese Serows, *Capricornis crispus*

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SUMMARY

The serow's thymus consisted of the thoracic, intermediate and cervical lobes. The average weight of thymuses was 10.4 g in fawns (6 months old) and 12.5 g in yearlings (1.5 years old). From 2.5 years of age, the thymic weight began to decrease, more rapidly in males than in females. The histology of the thymus was similar to that of domestic ruminants. Age-involution was represented by decrease of lymphocytes and increase of fat cells. Thymic corpuscles (Hassall) also decreased in number with age, and during this process the corpuscles appeared to change from the mass of epithelial cells, keratinization, invasion of granulocytes and lymphocytes, occasional calcification to formation of cysts. It was noted that there was active ectopic, mainly acidophilic granulocytic, myelopoiesis in the thymic medulla of young serows. Rare myoid cells and a case of germinal centers were found in the medulla.

INTRODUCTION

The Japanese serow is the only wild bovine ruminant which is protected as a special natural monument in Japan. Morphological studies on serow skeletons^{1,2)} were initiated by members of our Faculty, as well as infraorbital glands³⁾, reproductive organs^{4,5)}, growth of fetuses^{6,7)} among others^{8,9)} 4 years ago. However, there was no report regarding the morphology of the thymus of the animals. In this study, the macroscopical and histological structures of the serow thymus are described and compared with those of domestic ruminants,

MATERIALS AND METHODS

The thymuses of 81 Japanese serows were used as materials. Determination of serow age was made by noting the eruption of teeth and wear of incisors^{1,6)}. For macroscopical observations the thymuses of fawns were usually used. The total weight of the thoracic lobe and the body of cervical lobes was recorded as thymic weight, because it was hardly possible to remove intact the cranial portion of cervical lobes for thymic involution in aged serows. The thymuses were fixed in 10% formalin, embedded in paraffin, sectioned at 5 μ m in thickness, and stained with hematoxylin-eosin, Masson's trichrome or PAS reaction in the routine way.

RESULTS

In young serows, the thymus consisted of the thoracic, intermediate and cervical lobes. The unpaired thoracic lobe of the thymus was located on the left side ventrally to the cranial vena cava in the mediastinum. At the thoracic inlet it continued to the cervical lobes by way of an isthmus,

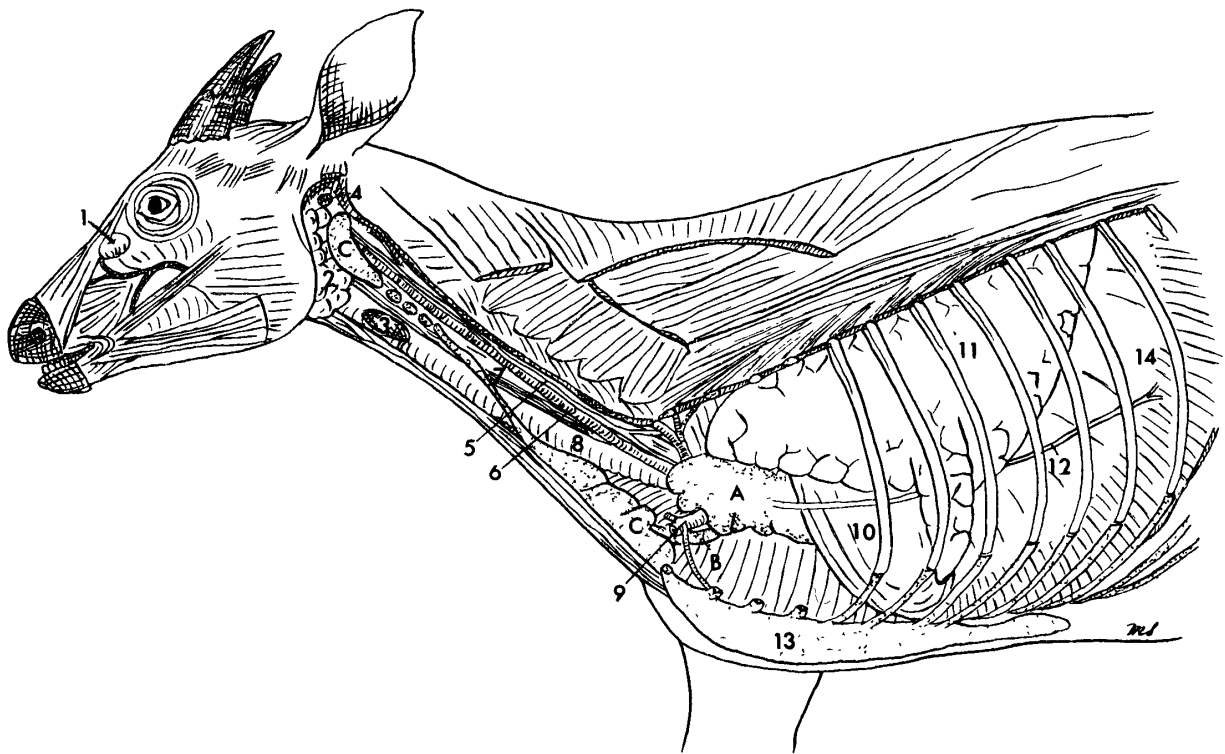


Figure 1. The location of the thymus in 6 month-old serow.

A : Thoracic lobe, B : Intermediate lobe, C : Cervical lobes of the thymus, 1. Infraorbital gland, 2. Mandibular gland, 3. Thyroid gland, 4. Parathyroid gland, 5. Truncus vagosympathicus, 6. A. carotis communis, 7. Esophagus, 8. Trachea, 9. A. subclavicus sinistra, 10. Heart in pericardium, 11. Left lung, 12. N. phrenica, 13. Sternum, 14. Diaphragm.

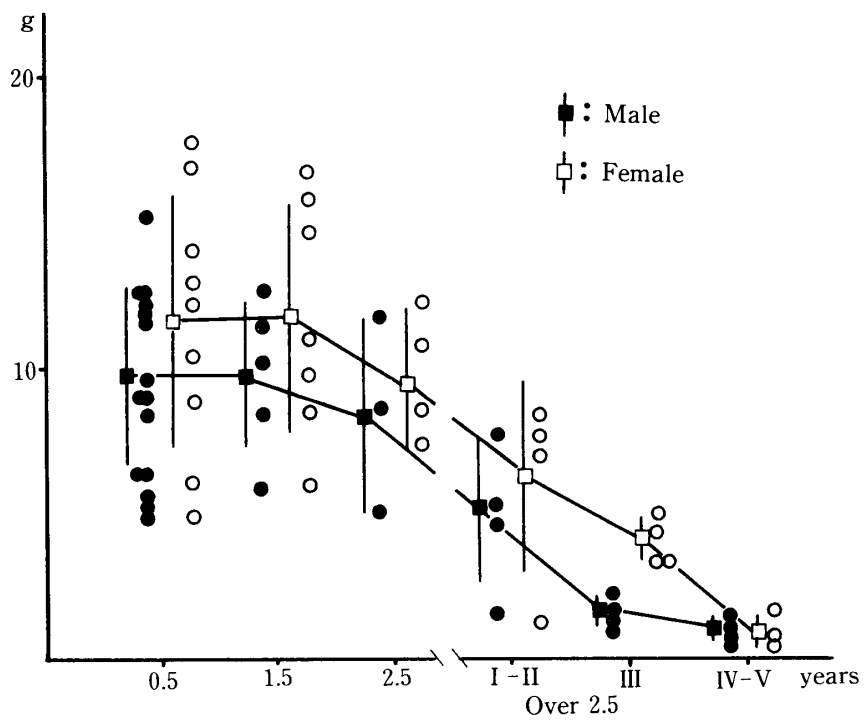


Figure 2. Weight of thymus in Japanese serows.

intermediate lobe, ventral and left of the trachea. The cervical lobes were located on the ventral surface of the trachea in the caudal third of the neck, but became separated into definite right and left portions in the cranial half of the neck and became dorso-lateral to the trachea. Cranially, the right and left cervical lobes formed the bulk of the thymus tissue just caudal to the mandibular gland. In the caudal region of the neck, the bilateral portions of cervical lobes were in apposition to form the body of cervical lobes ventral to the trachea (Fig. 1). The thymus was whitish or yellowish pink in color and composed of large lobules.

The average weight of the thymus was 10.4, 12.5 and 9.5 g in fawns (6 months old), yearlings (1.5 years old) and 2.5 years of age, respectively. The thymic involution appeared to begin from 2.5-year-old serows and was more rapid in males than in females (Fig. 2).

In histology, the thymic lobules consisted of cortex and medulla, and were surrounded with interlobular connective tissue. The cortex consisted of a network of epithelial reticular cells and densely packed, small lymphocytes. The medulla was also composed of a network of epithelial reticular cells meshed with fewer lymphocytes (Fig. 3). In the medulla the thymic corpuscles (Hassall) were observed as an aggregation of flattened and often hyalinized or keratinized reticular cells (Figs. 7, 8). Occasional accessory thyroid glands were found in the cervical lobes (Fig. 6).

Thymic involution with age usually started from 2.5 years of age, and was reflected in fewer lymphocytes, especially rapid decrease in the cortex, and an increase of interlobular or intralobular fat cells (Figs. 4, 5, 11), but the level varied among different serows of the same age. The thymic corpuscles also decreased in number with age. In young serows, the majority of the corpuscles formed a mass of hypertrophic, flattened and/or keratinized epithelial cells. In aged serows, on the other hand, formation of cysts with or without granulocytes, lymphocytes and PAS-positive substance became prominent (Figs. 7 to 11). Polynuclear giant cells and occasional calcification also occurred in cysts (Figs. 9, 10). Rare myoid cells were found in the medulla (Fig. 12). An ectopic, mainly acidophilic myelopoiesis was observed in the medulla and pericapsular cortex (Fig. 13). In one case, there were perivascular germinal centers in the medulla (Fig. 14).

DISCUSSION

The thymus of Japanese serows was basically similar to that of the domestic ruminants in location and relative size of lobes^{10~12}. The absolute weight of the serow's thymus was maximum in yearlings (1.5 years of age), but percent per body weight was about 0.05, 0.04 and 0.03% in fawns, yearlings and 2.5 years of age, respectively. In the serow, therefore, the relative thymic weight may reach its maximum in the late fetal period, as reported in sheep by Luckhaus (1969)¹². The involution of the thymic weight was more rapid in males than in females in the serow. The delayed involution of the thymus like this was also described in the female rat¹³ and the castrated bull¹⁴. The finding suggests that androgenic hormones may affect the acceleration of thymic involution.

The histological structure of the serow thymus was generally similar to that of domestic ruminants^{15,16}, though there were slight differences. In the cow and the goat, numerous myoid cells were found in the thymic medulla^{16,17}. However, myoid cells were rare in the serow. Ectopic myelopoiesis noted in this observation was also found in the bull¹⁴ and other animals¹⁶. No germinal centers are usually found in the thymus of healthy animals¹⁶, while the centers ectopically appear in the thymus of patients suffering from some autoimmune diseases, such as myasthenia gravis and rheumatic heart disease¹⁸. In this observation, germinal centers were detected in a case of serow thymuses. The finding may indicate some autoimmune responses in this serow, but the reasons are unknown at present.

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REFERENCES

- 1) Sugano, M., Tsuchimoto, N., Sugimura, M. & Suzuki, Y. : Morphometrical study on the skeleton of Japanese serows I. Vertebral column and appendicular skeleton (in Japanese with English summary). Res. Bull. Fac. Agr. Gifu Univ. (46) : 205-214, 1982.
- 2) Tsuchimoto, N., Sugano, M., Sugimura, M. & Suzuki, Y. : Morphometrical study on the skeleton of Japanese serows II. Skull (in Japanese with English summary). Ibid., (46) : 215-221, 1982.
- 3) Koderu, S., Suzuki, Y. & Sugimura, M. : Postnatal development and histology of the infraorbital glands in the Japanese serow, *Capricornis crispus*. Jpn. J. Vet. Sci. **44** : 839-843, 1982.
- 4) Ide, Y., Sugimura, M., Suzuki, Y. & Kita, I. : The morphology of female reproductive organs and their changes caused by parturition in Japanese serows (in Japanese with English summary). Res. Bull. Fac. Agr. Gifu Univ. (46) : 193-203, 1982.
- 5) Tiba, T., Sugimura, M. & Suzuki, Y. : Kinetik der Spermatogenese bei der Wollhaargemse (*Capricornis crispus*) I. Geschlechtreife und Jahreszeitliche Schwankung & II. Samenepithelzyklus und Samenepithelwelle. Zool. Anz. **207** : 16-24 & 25-34, 1981.
- 6) Sugimura, M., Suzuki, Y., Kamiya, S. & Fujita, T. : Reproduction and prenatal growth in the wild Japanese serows, *Capricornis crispus*. Jpn. J. Vet. Sci. **43** : 553-555, 1981.
- 7) Sugimura, M., Suzuki, Y., Kita, I., Ide, Y., Koderu, S. & Yoshizawa, M. : Prenatal development of Japanese serows, *Capricornis crispus* and reproduction in females. J. Mammal. **64** : 302-304, 1983.
- 8) Yoshizawa, M., Suzuki, Y. & Sugimura, M. : Morphology of globule leucocytes in the lung of Japanese serows (in Japanese with English summary). Res. Bull. Fac. Agr. Gifu Univ. (46) : 223-230, 1982.
- 9) Suzuki, Y., Sugimura, M., Yagi, K., Ohbayashi, M. & Shoho, C. : Onchocerciasis in wild Japanese serows, *Capricornis crispus*. Jpn. J. Vet. Sci. **44** : 823-825, 1982.
- 10) Deniz, E. : Die Blutgefäßversorgung des Thymus beim Kalb. Zbl. Vet. Med. **11A** : 749-759, 1964.
- 11) Luckhaus, G. : Über die Bindegewebsloge des cervico-thoracischen Thymustyps bei der Ziege. Morph. Jb. **112** : 449-456, 1968.
- 12) Luckhaus, G. : Gravimetrische und entwicklungs-kinetische Untersuchungen am Thymus des fetalen Schafes. Ibid. : **113** : 590-604, 1969.
- 13) Awaya, K. & Oda, M. : Quantitative study on the postnatal growth and involution of the thymolymphatic tissues in the albino rat. Bull. Yamaguchi Med. Sch. **13** : 105-125, 1966.
- 14) Mishra, D. D., Das, L. N. & Biswal, G. : Comparative histological study of the thymus gland of the bull and the bullock. Indian Vet. J. **43** : 12-16, 1966.
- 15) Hammar, J. A. : Zur Histogenese und Involution der Thymusdrüse. Anat. Anz. **27** : 23-30 & 41-89, 1905.
- 16) Bargmann, W. : Der Thymus in "Handbuch der mikroskopischen Anatomie des Menschen" Möllendorff, W. ed. Berlin : Springer Verlag. **6** (4) : 1-172, 1943.
- 17) Sugimura, M. : Myoid cells in the calf's thymus. Jpn. J. Vet. Res. **20** : 1-6, 1972.
- 18) Henry, K. : Mucin secretion and striated muscles in the human thymus. Lancet **1** : 183-185, 1966.

EXPLANATION OF PLATES

Plate I.

- Fig. 3. The thymus consists of distinct cortex and medulla in a fawn. $\times 52$, H-E.
- Fig. 4. Note interlobular fat cells in the thymus of 2.5-year-old serow. $\times 52$, H-E.
- Fig. 5. Note a plenty of fat cells, and decrease of lymphocytes in adult serow, age-class III. $\times 52$, H-E.
- Fig. 6. Accessory thyroid gland in interlobular connective tissue of cervical lobe. 1.5 year-old serow. $\times 52$, PAS.

- Fig. 7. A thymic corpuscle consisted of mass of hypertrophic or hyalinized epithelial cells. 1.5-year-old serow. $\times 260$, H-E.
- Fig. 8. A corpuscle (left side) is composed of densely packed, flattened, keratinized epithelial cells with a few lymphocytes, while other (right side) contains numerous granulocytes and lymphocytes. 2.5-year-old serow. $\times 130$, H-E.
- Plate II.
- Fig. 9. A cystic corpuscle showing calcification of cell debris. Granulocytes are also observed in a cyst. 6-month-old fawn. $\times 260$, H-E.
- Fig. 10. A cystic corpuscle containing two giant cells. 2.5-year-old serow. $\times 260$, H-E.
- Fig. 11. Cysts with or without PAS-positive mucous substance. There are little lymphocytes in parenchyma. Adult serow of age-class IV. $\times 260$, PAS.
- Fig. 12. A myoid cell found in the medulla. 6-month-old fawn. $\times 520$, H-E.
- Fig. 13. Ectopic myelopoiesis in serow's thymus. Several acidphilic myelocytes are found. 1.5-year-old serow. $\times 520$, H-E.
- Fig. 14. Periarterial germinal centers found in the thymic medulla. 1.5-year-old serow. $\times 130$, H-E.

ニホンカモシカ胸腺の形態学的研究

杉村 誠・鈴木義孝・阿閉泰郎

菅野美樹夫・土本信幸

要 約

ニホンカモシカ81例の胸腺を肉眼および組織学的に観察した。カモシカの胸腺は胸葉、中間葉および頸葉からなり、平均重量は6ヶ月齢で10.4g、1.5才で12.5gとなり、2.5才より減少を始めた。この減少は雄で雌より早い傾向がみられた。

組織学的にみた胸腺の一般形態は反芻類家畜のそれと類似していた。年齢に伴う退縮像として、リンパ球および胸腺小体（ハッサル）の減少、小葉間の脂肪細胞の増加が指摘された。胸腺小体は加齢に伴ない、時に石灰化、顆粒球およびリンパ球の侵入、ついで嚢胞化の過程を示した。若齢カモシカの胸腺には好酸性骨髄球を主とする髄外造血がみられた。まれではあるが筋様細胞および胚中心の存在が確認された。

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Plate I

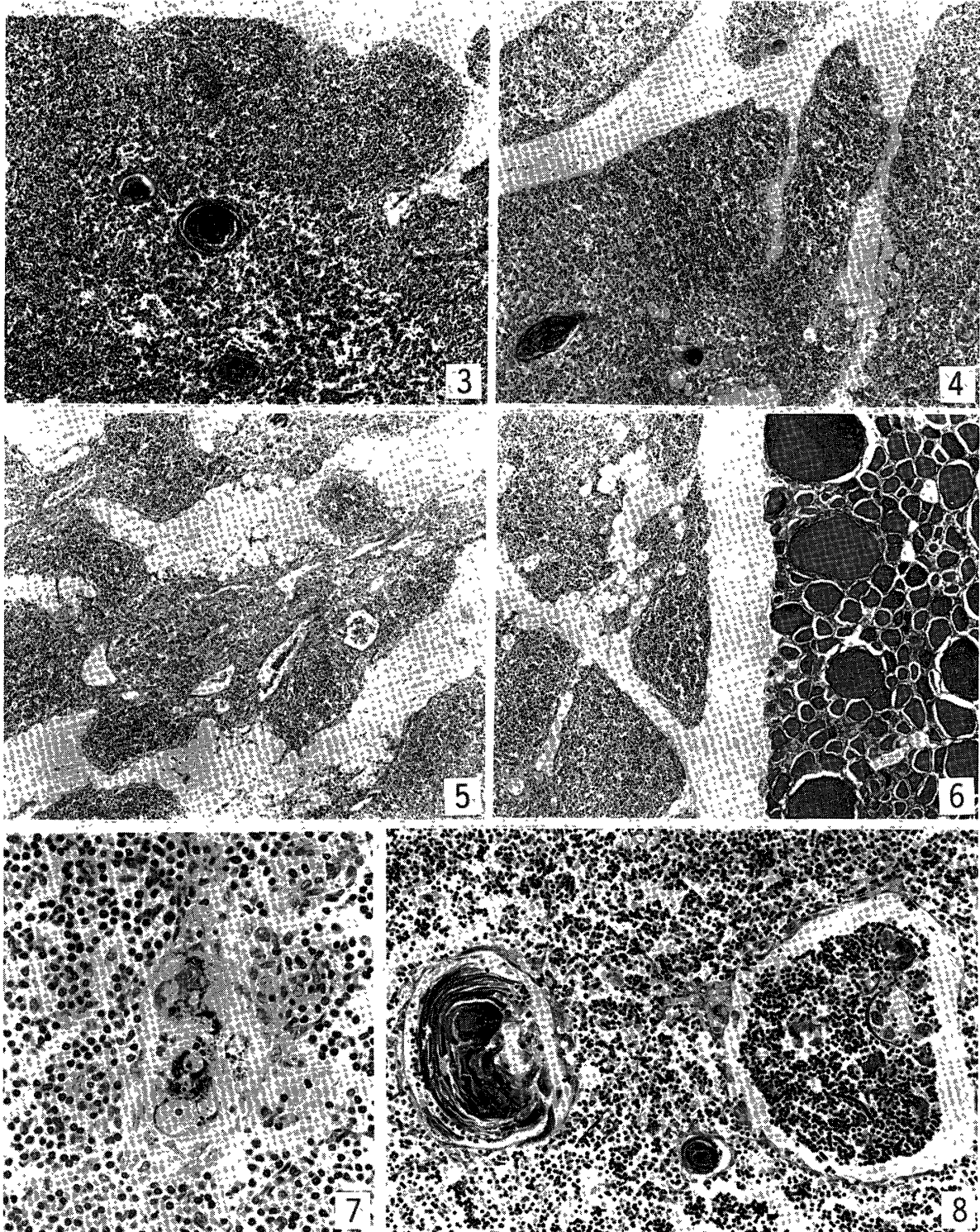


Plate II

