

牛無形無心体1例の組織学および細胞遺伝学的観察

誌名	Japanese journal of veterinary science
ISSN	00215295
著者	菱沼, 貢 高橋, 芳幸 金川, 弘司
巻/号	49巻1号
掲載ページ	p. 195-197
発行年月	1987年2月

Histological and Cytogenetical Observations on a Bovine Acardius Amorphus

Mitsugu, HISHINUMA, Yoshiyuki, TAKAHASHI and Hiroshi, KANAGAWA

Department of Theriogenology, Faculty of Veterinary Medicine Hokkaido University, Sapporo 060, Japan

(Received 8 August 1986/Accepted 20 November 1986)

Jpn. J. Vet. Sci. 49(1): 195-197, 1987

KEY WORDS: acardius amorphus, cattle, chromosome.

Acardius amorphus is classified as a free and asymmetrical twin [6, 11]. It is characterized by lack of a functional heart and is always attached to the placenta of a normal twin. In cattle, many cases of acardius amorphus have been reported [7, 11]; however, the number of cytogenetical examinations is limited [2, 3]. This report describes the histological and chromosomal observations on a bovine acardius amorphus.

An acardius amorphus was born together with a normal female calf at a farm in Hayakita, Hokkaido, in February, 1986. The dam was a 5-year-old Holstein cow which had had previously 4 normal parturitions. The duration of gestation and the parturition were normal. The monster was delivered 2 hours after the female calf.

The monster, which was slightly flattened and ovoid in shape, was 17.0×11.0×11.0 cm in size (Fig. 1). It had an umbilical-cord-like structure of 9.0 cm in length and 4.0 cm in diameter, which was attached to an edematous amnion-like membrane. The umbilical-cord-like structure contained two large vessels, but the lumens were almost empty. The monster was entirely covered by skin with dense hairs of about 3.0 cm in

length, which were as long as the hairs of the co-twinning female calf. Two projections were detected near the umbilical attachment and on the opposite side of the body. The latter projection was hairless and covered with edematous membrane, while the former was partially haired. There was no evidence of putrefaction in the body.

The cross section of the body showed abundant connective and fat tissues with many small blood vessels. Diffused dark brown tissues were found in the central portion of the body. A small piece of bone, 4.5×2.0×1.6 cm in size, was observed in the center of the body. This bone had a same orientation as the umbilical-cord-like structure (Fig. 2). The bone was similar to a vertebra (Fig. 3). Articular-process-like structures were noted. However, spinous and transverse processes and vertebral foramen were not found. Corpus vertebrae did not develop. There were no recognizable organs such as a heart. Blood vessels in the umbilical-cord-like structure penetrated into the monster and then extended into it with many small branches; however, the lumens were almost empty. Connective tissue was observed on the cut surface of the two projections.

For light microscopy, tissue from the sub-

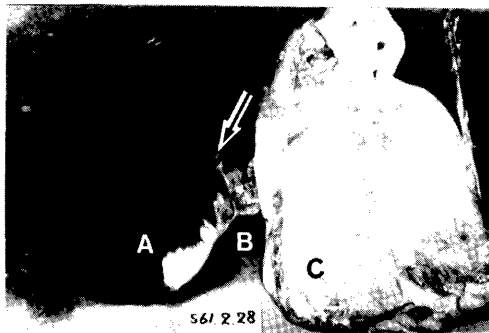


Fig. 1. The acardius amorphus (A) has an umbilical-cord-like structure (B) which was attached to an amnion-like membrane (C). One projection (arrow) is shown on the body.

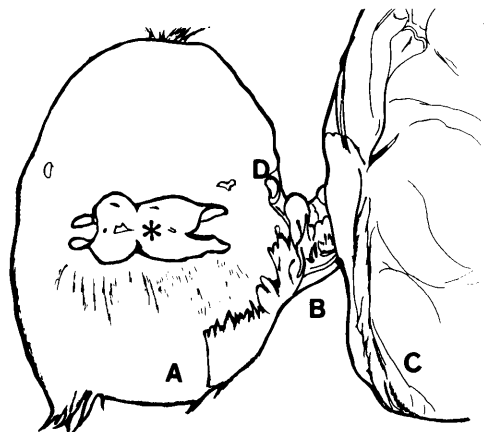


Fig. 2. Schema of a bone (*) located in the center of the body (A). B; umbilical-cord-like structure. C, amnion-like structure. D; surface projection.

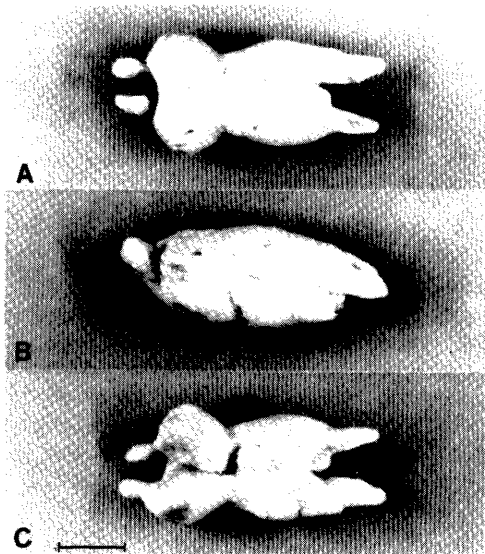


Fig. 3. Dorsal (A), lateral (B) and ventral (C) appearances of the bone. Scale=1 cm.

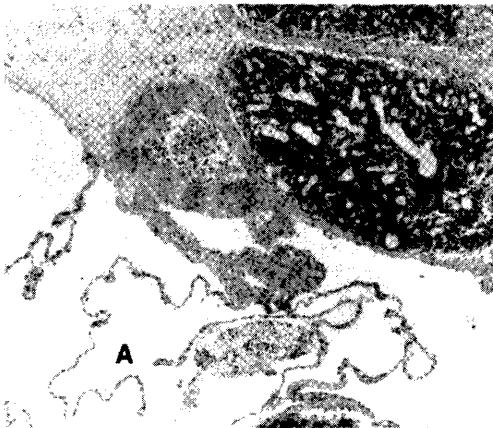


Fig. 5. Lymph-node-like structure (L) and alveolar-like structure (A). HE. $\times 52$.

cutaneous and the central portions of the body were fixed with 10% formalin solution. They were embedded in paraffin, sectioned at $4\ \mu\text{m}$ and then stained with hematoxylin and eosin (HE).

Microscopically, the subcutaneous tissue consisted mainly of connective tissue and muscle (Fig. 4). In the connective tissue, mononuclear cell infiltration was observed. There were many blood vessels, but the lumens contained only a few blood cells. No hematopoiesis was found in the tissues or in the blood vessels. The muscle

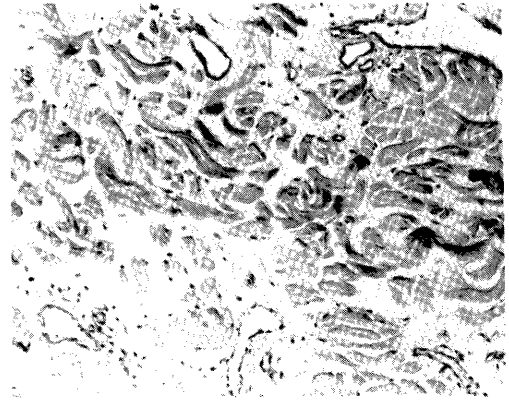


Fig. 4. Muscle with no cross striation and blood vessels with no blood cells. HE. $\times 96$.

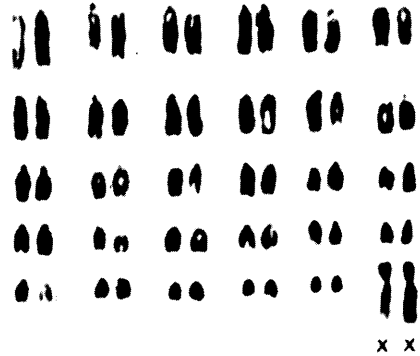


Fig. 6. Female karyotype, 60,XX, obtained from a tissue culture of the acardius amorphus. Giemsa stain. $\times 1460$.

consisted of bundles of long cylindrical multinucleated muscle fibers. The nuclei were found at the periphery of the cell under the cell membrane. However, no cross striation was detected. Fat tissues were abundant in the central portion of the body. These tissues had a lobular structure separated by connective tissue. Alveolar-like structures were also observed in the center of the body (Fig. 5). No trachea nor bronchi were observed. Microscopic examination of the dark brown colored tissue showed lymph-node-like structures that were separated into several lobules by connective tissue (Fig. 5). These lobules contained a number of lymphocytes but no germinal center was observed.

Chromosomal analysis of the acardius amor-

phus was performed using a piece of skin by the tissue culture method [1]. The karyotype of the female twin was also established by the blood leukocyte culture method [8]. Fifty metaphases were observed under the light microscope in each case.

The results of the chromosomal analysis showed that the monster had a 60,XX, female karyotype (Fig. 6). The co-twinning female calf also had a normal 60,XX karyotype. No chromosomal abnormalities such as a chimerism were detected.

The present histological examination revealed that the monster consisted of various tissues showing various degrees of development. These findings were similar to those of previous reports [4, 5, 7, 9, 10, 12].

In the present case, the monster had the same chromosomal sex as the female co-twin. Similar findings were reported by Herzog and Rieck [3]. However, such findings do not prove that the twins were monozygotic. Two eggs fertilized by X-chromosome-bearing spermatozoa could result in one female calf and one female monster. In order to examine the origin of the present twins, further investigations are required. Dunn *et al.* [2] reported that defective twins had opposite sexes with no chimerism and that the acardius amorphus had a 61,XX karyotype with an extra autosomal chromosome. They also suggested that the acardius amorphus could develop from dizygotic twins.

Two large blood vessels and many small vessels were observed in the umbilical-cord-like structure and in the monster, respectively. However, only a few blood cells were noted in the lumens suggesting the presence of anemia in the monster. Similar findings were previously reported [9, 10]. These observations may support the hypothesis that abnormality of the circulation causes a

disturbance of fetal development and results in a form of acardius amorphus. However, further observations on the undeveloped organs such as the heart are needed to prove this hypothesis.

ACKNOWLEDGEMENTS. The authors would like to express their appreciation to Drs. M. Kubo and K. Osaki, veterinarians of the Iburu-higashi Agricultural Mutual Association, Hayakita, Hokkaido, for their kind supply of the material. We also wish to thank Y. Takimoto and H. Yamagata of the Department of Theriogenology, for their technical assistance in the histological examination.

REFERENCES

1. Basrur, P. K., Basrur, V. R., and Gilman, J. P. W. 1963. *Exp. Cell Res.* 30: 229-232.
2. Dunn, H. O., Lein, D. H., and Kenney, R. M. 1967. *Cytogenetics* 6: 412-419.
3. Herzog, V. A., and Rieck, G. W. 1969. *Zuchthyg.* 4: 57-60.
4. Higaki, S., and Nishida, T. 1955. *J. Jpn. Vet. Med. Ass.* 8: 397 (in Japanese).
5. Kojima, Y., and Kawata, K. 1960. *Jpn. J. Vet. Res.* 8: 261-270.
6. Leipold, H. W., Huston, K., and Dennis, S. M. 1983. *Adv. Vet. Sci. Comp. Med.* 27: 197-271.
7. Miyagaki, M., and Hara, F. 1959. *J. Vet. Med.* 255: 550-553 (in Japanese).
8. Moorhead, P. S., Nowell, P. C., Mellman, W. J., Battips, D. M., and Hungerford, D. A. 1960. *Exp. Cell Res.* 20: 613-616.
9. Ohbayashi, M. 1951. *Jpn. J. Vet. Sci.* 13: 79-83 (in Japanese with English summary).
10. Oyamada, T. 1953. *Bull. Fac. Agric. Kagoshima Univ.* 2: 164-166 (in Japanese with English summary).
11. Roberts, S. J. 1971. Teratology. pp. 49-80. *In: Veterinary obstetrics and genital diseases.* 2nd ed., Ithaca, New York.
12. Yoshida, N. 1938. *Chuo-juigaku-zasshi* 51: 493-496 (in Japanese).

要 約

牛無形無心体1例の組織学および細胞遺伝学的観察(短報): 菱沼 貢・高橋芳幸・金川弘司(北海道大学獣医学部家畜臨床繁殖学講座)——ホルスタイン種雌牛が正常な雌子牛の分娩後に無形無心体を排出した。この無心体は、筋肉、肺、リンパ節および骨組織などから構成されていた。無心体および雌子牛の染色体構成は60,XXで、正常な雌の核型を示していた。