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BRIEF COMMUNICATION

DIPROSOPUS IN A HOLSTEIN CALF

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Defective twins can be classified as free or attached symmetrical, and free or attached asymmetrical.<sup>9)</sup> The incidence of bovine congenital duplication is estimated as one in 100,000 births.<sup>7)</sup> Diprosopus, i. e. duplication of the face, is a type of attached symmetrical twinning. The degree of duplication reportedly varies from case to case.<sup>2,4-6,8,13,14)</sup> The present report describes the clinical and anatomical features of a live-born diprosopic calf.

This male diprosopic Holstein calf was delivered in the posterior presentation in April, 1987 at a dairy farm in Hayakita, Hokkaido. The dam had had previously one normal calf. This defective calf possessed two faces with four eyes, two muzzles and two ears (Figs. 1 & 2). The faces were jointed 3 cm caudal to the medial eyes. No duplication was observed in the neck, thorax, abdomen and limbs. The left face was more oriented towards the axis of the body than the right face. Similar coat colour pattern was observed on the two faces. The two lateral eyes showed both palpebral and corneal reflexes, while the two medial eyes revealed corneal opacity and were non-functional. The calf showed the suckling reflex and could drink milk from both mouths. However, some milk often dripped from the nares of the opposite side. A synchronous movement of the jaws and tongues of both heads was observed during suckling. The calf had always been recumbent and unable to raise his heads. On the sixth day after birth, the calf succumbed to weakness, and necropsy was then carried out.

The calf had two mandibles that were not attached to each other (Fig. 3). The medial rami of the mandibles were shorter than the lateral rami. No cleft palate was observed in either oral cavity. The two tongues were jointed at the base, rostral to a single epiglottis, and had a single hyoid bone (Fig. 4). The calf possessed a single

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trachea and esophagus.

The right carotid artery displayed normal branching patterns. However, the left carotid artery branched off into one large artery caudal to the occipital artery (Fig. 5). This artery extended to the midline and bifurcated into right and left branches near the medial rami of the mandibles. No abnormalities were detected in the heart.

The vertebrae were not duplicated. The cranium had only one cranial cavity and magnum foramen. However, the brain consisted of two cerebrums and cerebellums (Fig. 6). A brainstem bifurcated at the medulla oblongata. Two ponses and trapezoid bodies were observed. The longitudinal section of the brain showed duplicated third and fourth ventricles. The anterior cranial nerves, namely, olfactory (I), optic (II), oculomotor (III), trochlear (IV) and trigeminal (V) nerves, were duplicated (Fig. 7), whereas no duplication was found with the other cranial nerves (VI-XII). A basilar artery bifurcated into right and left branches at the caudal border of the trapezoid body.

The serum of the calf was collected after colostrum ingestion. Serum neutralizing antibodies of the calf and the dam to bovine viral diarrhea-mucosal disease (BVD-MD) and Akabane viruses were titrated. The calf and the dam had positive levels (256 and >4096, respectively) of neutralizing antibody to BVD-MD virus only. However, no BVD-MD virus was isolated.

Chromosomal examination was conducted on the calf by the tissue culture method<sup>1)</sup> using a piece of skin collected from each face. Chromosomal analysis of both samples showed a 60, XY, normal male karyotype (Fig. 8).

Partial twinning is presumed to arise from fission and/or fusion of embryos.<sup>11)</sup> The etiology of diprosopus was thought to be due to the presence of an excessively large block of chordamesoderm,<sup>5)</sup> or the failure of the anterior neuropore to close properly.<sup>4,10)</sup> In contrast, dicephalus, i. e. duplication of the head region, may be caused by atypical hatching of blastocyst<sup>11)</sup> or anteroposterior compression of the embryonic disc.<sup>3)</sup> In the present case, the same sex-chromosomal complement was obtained from both faces. This result may be consistent with the hypothesis that conjoined twins are monozygotic twins that were imperfectly separated.<sup>12,15)</sup>

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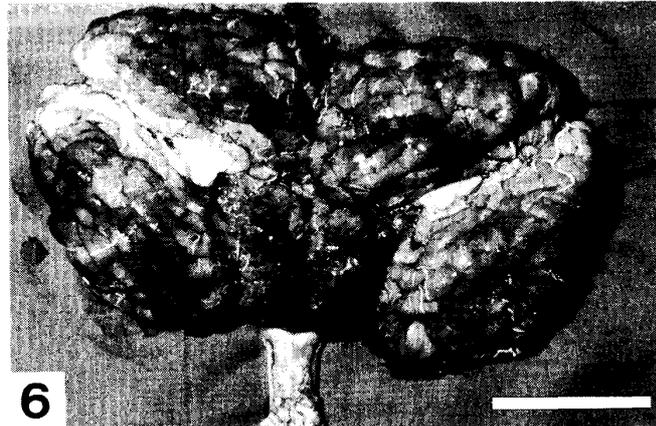
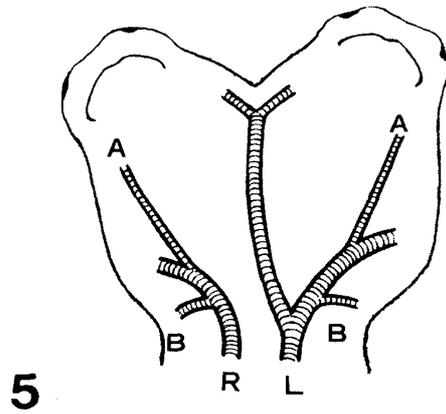
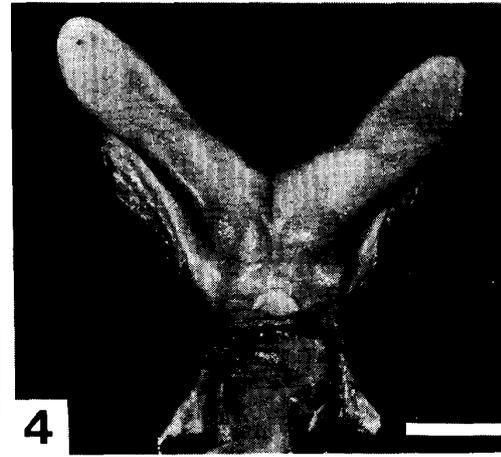
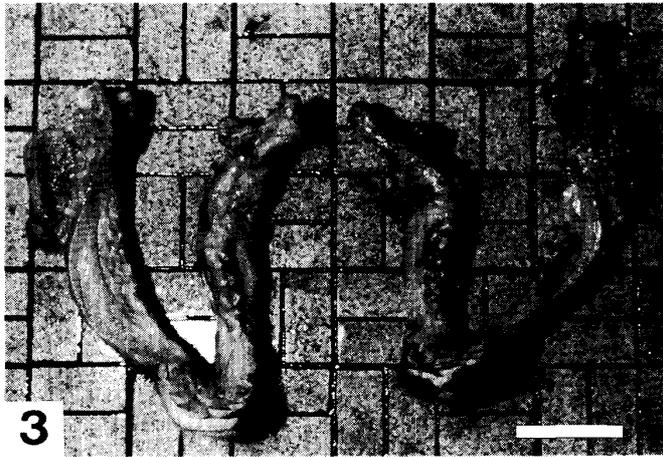
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## EXPLANATION OF PLATES

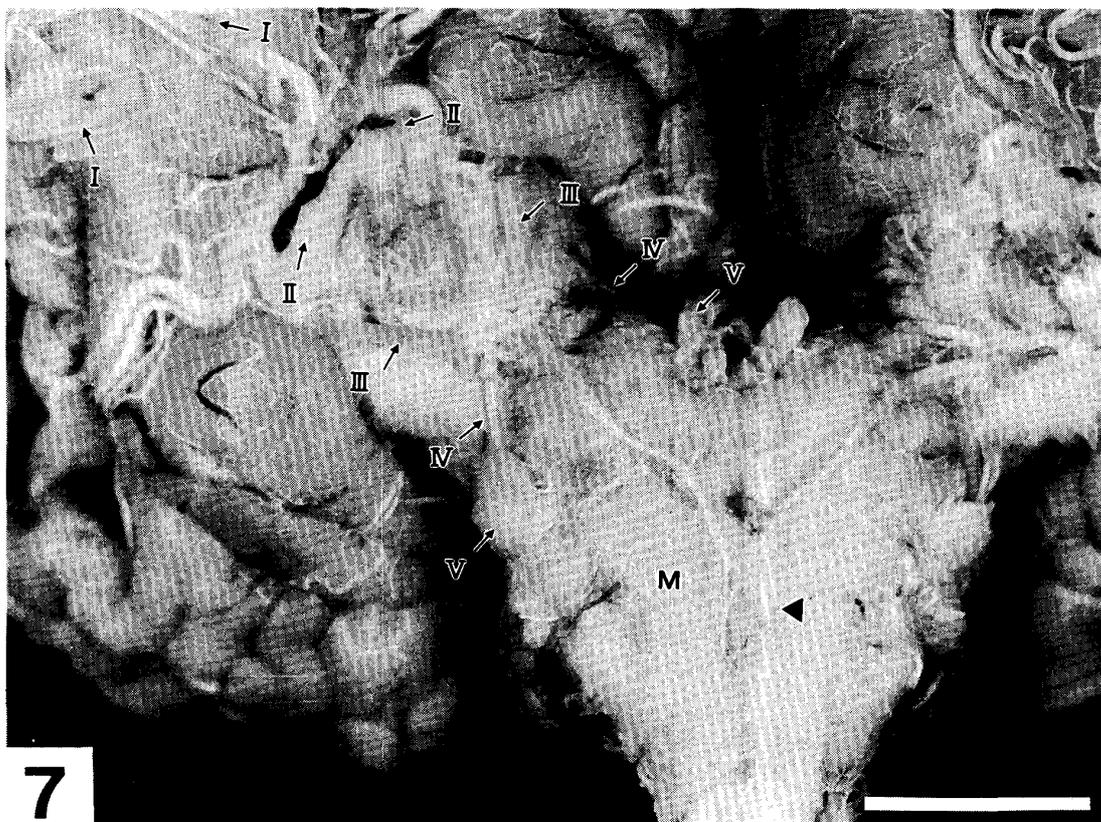
## PLATE I

- Fig. 1 Male diprosopic conjoined twin calf. Scale = 30 cm.
- Fig. 2 Duplicated face of the twin.
- Fig. 3 Two mandibles. Scale = 5 cm.
- Fig. 4 Dorsal view of the tongues, fused at the base. Scale = 5 cm.
- Fig. 5 Diagram of a ventral view of the carotid artery.  
R; right carotid artery. L; left carotid artery.  
A; linguofacial artery. B; occipital artery.
- Fig. 6 Dorsal view of the brains showing two cerebrums and two cerebellums. Scale = 5 cm.



## PLATE II

- Fig. 7 Ventral view of the brains, fused at the medula oblongata (M). Duplicated cranial nerves I – V are indicated in the right brain. Arrow head indicates basilar artery. Scale = 2 cm.
- Fig. 8 Male karyotype, 60, XY obtained from a tissue culture of the diprosopus.



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