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A BOVINE MONSTRA DUPLICATA

KARL A. STILES AND COLLIS M. SPENCER

Double monsters are pathological deviants from identical twins, in that the embryos are joined in some manner. The embryos may be symmetrically united and developed, or one of the individuals may be arrested in its development.

In describing the morphological relationships of the calf of this study, the right and left sides will refer to the animal's right and left respectively. From a superficial examination of this specimen it appears to be a single-bodied calf with two heads, an extra leg with two hooves protruding from the back a short distance caudal to the vertex of the two heads, and two tails. These facts indicate that there are two animals in this union, but this indication is not carried out on the ventral surface as there are only four teats and one opening for the umbilical vessels to enter the body.

After the animal was skinned, the theory that two animals formed this union was more strongly justified, due to the presence of two backbones, one extending from each head and remaining separate throughout its entire length. Another justification for this analysis is the extra leg. Upon a complete examination of this limb, it was found that two legs are present, but the scapulae are fused together at the spine of the scapula, and there is only one humerus, thus causing some of the muscles to be abnormal.

The muscles that were found to be abnormal are the extensor carpi radialis, common digital extensor, extensor digital communis, lateral digital extensor, ulnaris lateralis, and the flexi carpi ulnaris. These abnormalities are due to the location of the humerus. There is only one humerus for the two legs and it has become fused with the radius and ulna of the forelimb about half way down the shaft, leaving no condyles on the distal portion for the origin of the muscles previously mentioned. The muscles have their origin either on the heads of the radius and the ulna, or on the fascia which would normally connect them to the condyles of the humerus. The muscles are twisted at about a 90° angle due to the twisting of the manus.

The shoulder muscles of both animals on the fused scapula are all present; but due to the abnormalities of their points of attachment and of the bones, several abnormalities are noted. The body

muscles are not too well formed and it was difficult to differentiate between them. The abdominal muscles on the left animal are much thinner than the corresponding muscles of the right animal.

Upon opening the body cavity several outstanding abnormalities are immediately recognized. The first of these is the presence of two hearts in one pericardium. These hearts are closely associated; the heart of the right animal is curved, and appears to be lying on its side with the ventricles pointing cephalad; while the heart of the left animal is situated in the curve formed by the first heart.

Four lungs are present; two for each animal. The right lung of the right animal and the left lung of the left animal are much larger and are more nearly normal than the other two.

The viscera of the thoracic cavities of each animal with the exception of the hearts, are separated by a mesentery which extends from the pericardium caudally as far as the diaphragm. This mesentery supports the esophagus, the dorsal aorta, the ductus venosus of the left calf and the ductus venosus of the right calf.

One diaphragm is present. There are no indications leading one to believe that two diaphragms have united.

One large liver dominates the cephalic portion of the abdominal cavity, while the rest of the abdominal cavity is occupied by the much coiled small intestine, caecum, colon, and rectum.

A summary of the abnormalities in the digestive tract:

1. Spleen on the ventral surface of each stomach with hilus at the caudal portion.
2. A small intestine leaves each stomach but soon both are lying side by side and fusing form a common intestine.
3. One colon for both animals.
4. Rectum opens to the left of the vulva instead of dorsal to it as in the normal specimen.

Abnormalities of the urinary system:

1. Four kidneys are present; the extreme right kidney being the smallest and the size increasing to the left.
2. The ureter of kidney I (extreme right kidney) passes caudally and curves to the left, ending blindly on the cephalic end of the uterus.
3. Ureter of kidney II passes caudally along the right border of the kidney, ending blindly on a sheet of mesentery which lies beneath the vagina and to the right of the rectum.
4. Ureter of kidney III passes caudally along the ventral surface of the kidney, ending blindly on the mesentery mentioned above.
5. Ureter of kidney IV passes along the right side of the kidney and also ends blindly on this membrane.
6. Bladder is located ventral to vagina and closely associated with the

umbilical vessels. External opening of the urethra is in the ventral wall of the vulva.

7. The membrane in which the ureters end blindly forms a sac, which is filled with a green substance closely resembling the material found in the digestive tract.

Abnormalities in the reproductive system:

1. One pair of ovaries, identified by histological preparations, lie in the body cavity on the dorsal body wall, beneath and a little to the right of the second kidney. They lie midway between the spinal column of the left animal and the point where the ribs of the two animals come together, 30 mm. below the last rib. The tubes leading from the ovaries pass posteriorly together to a point opposite the caudal limits of kidneys two and three, where they separate.

The right tube passes upward and follows along the lateral border of the second kidney and disappears into the adipose tissue covering the kidney near the anterior end.

The left tube passes posteriorly close to the caudal limits of the second kidney and ends blindly in the membrane mentioned previously in connection with the urinary system.

2. An ostium is located on kidneys 1 and 4. Oviducts pass caudally and each enters the cornu uteri.

3. One uterus present, but each horn of the uterus opens into a separate vagina.

4. Vaginae at the caudal end have a common vulva.

5. Vulva opens to the right of the anus instead of ventral to it as in a normal animal.

Abnormalities in the circulatory system:

1. Abnormality of the hearts has been previously mentioned.

2. Common umbilical vein.

3. A common sinus in the liver into which the umbilical vein and the portal veins empty. An inferior vena cava to each heart leaves this common sinus. The inferior venae cavae fuse before they enter the auricles.

4. Due to the abnormalities of the hearts, the vessels which enter and leave the heart are not found in their usual positions.

5. Right iliac artery of left animal and left iliac of the right animal fuse.

6. Umbilical artery of the right calf does not pass through the umbilicus but ends blindly in the ventral body cavity.

The heads are normal and well developed, and their measurements are identical. The only abnormality of the head and neck is the relatively short necks of both animals.

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