



Diagnostic Exercise

From The Davis-Thompson Foundation*

Case #: **193** Month: **July** Year: **2022**

Title: *Amorphus globosus* in cattle.

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Clinical History: An anomalous bovine fetus was submitted from a slaughterhouse for pathological evaluation at the Setor de Patologia Veterinária (UFRGS). No history was available regarding the dam, the gestation length, and the farm.

Necropsy findings: the fetus was represented by a round to oval mass nearly entirely covered by a white and black hair coat. The anomalous fetus measured 13x8x5cm in diameter, presented an umbilical cord, and had no limbs, neck, or head (Figure 1). Two openings (1-2cm in diameter) were observed in close proximity to the umbilical cord. These openings did not communicate with any internal structures. On cross-section, the mass was solid and white to light pink (Figure 2). No body cavities, differentiated organs, and bones were observed. The placenta was not available for evaluation.

Microscopic findings: Histologically, fetal tissues were represented by normal skin and appendages, and the internal structures consisted solely of well-differentiated collagen (Figure 3), blood vessels, and adipose tissue. The umbilical cord did not show any abnormalities.

Gross pictures



Figure 1. External examination of the anomalous fetus.

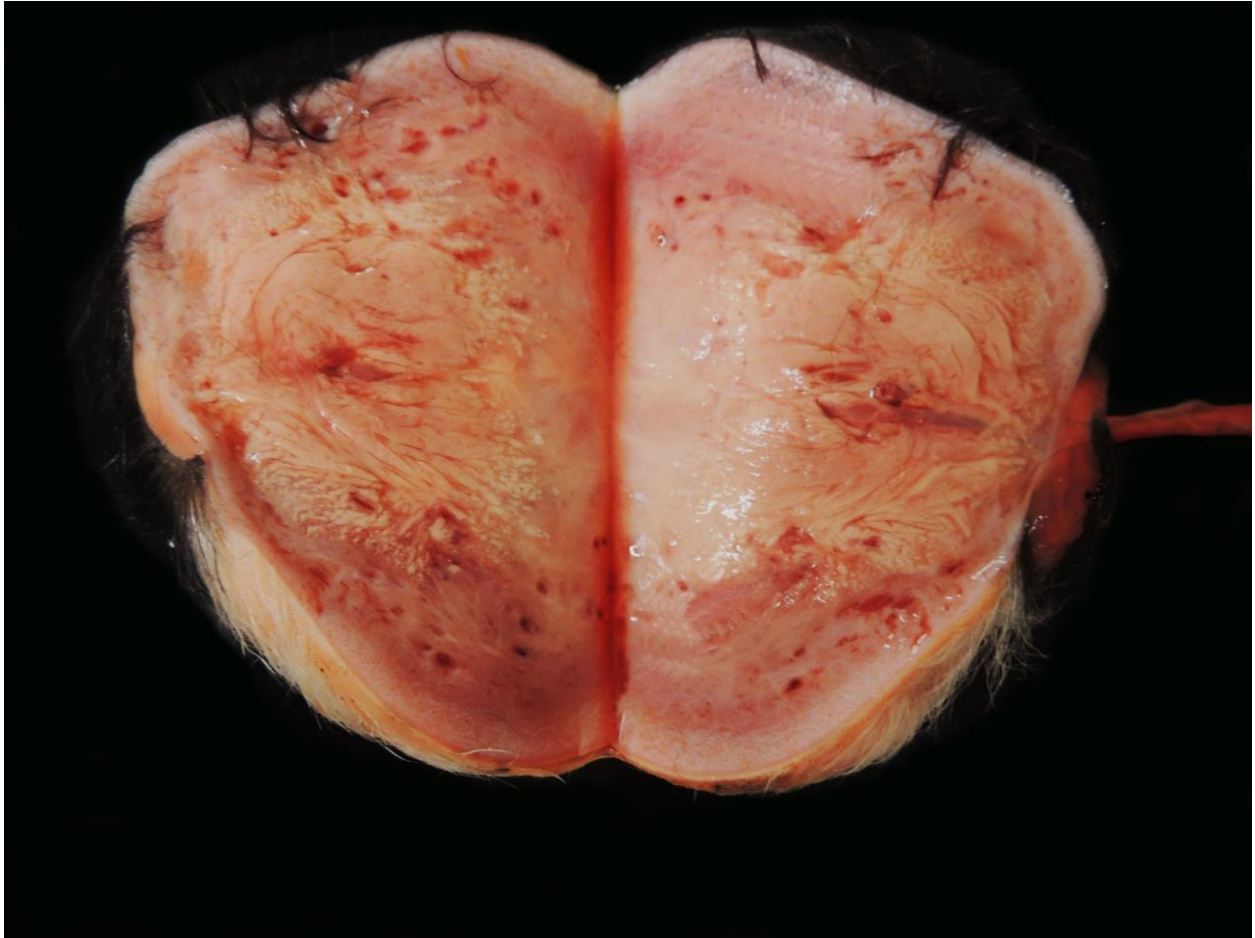


Figure 2. Cross section of the anomalous fetus.

Microscopic image:

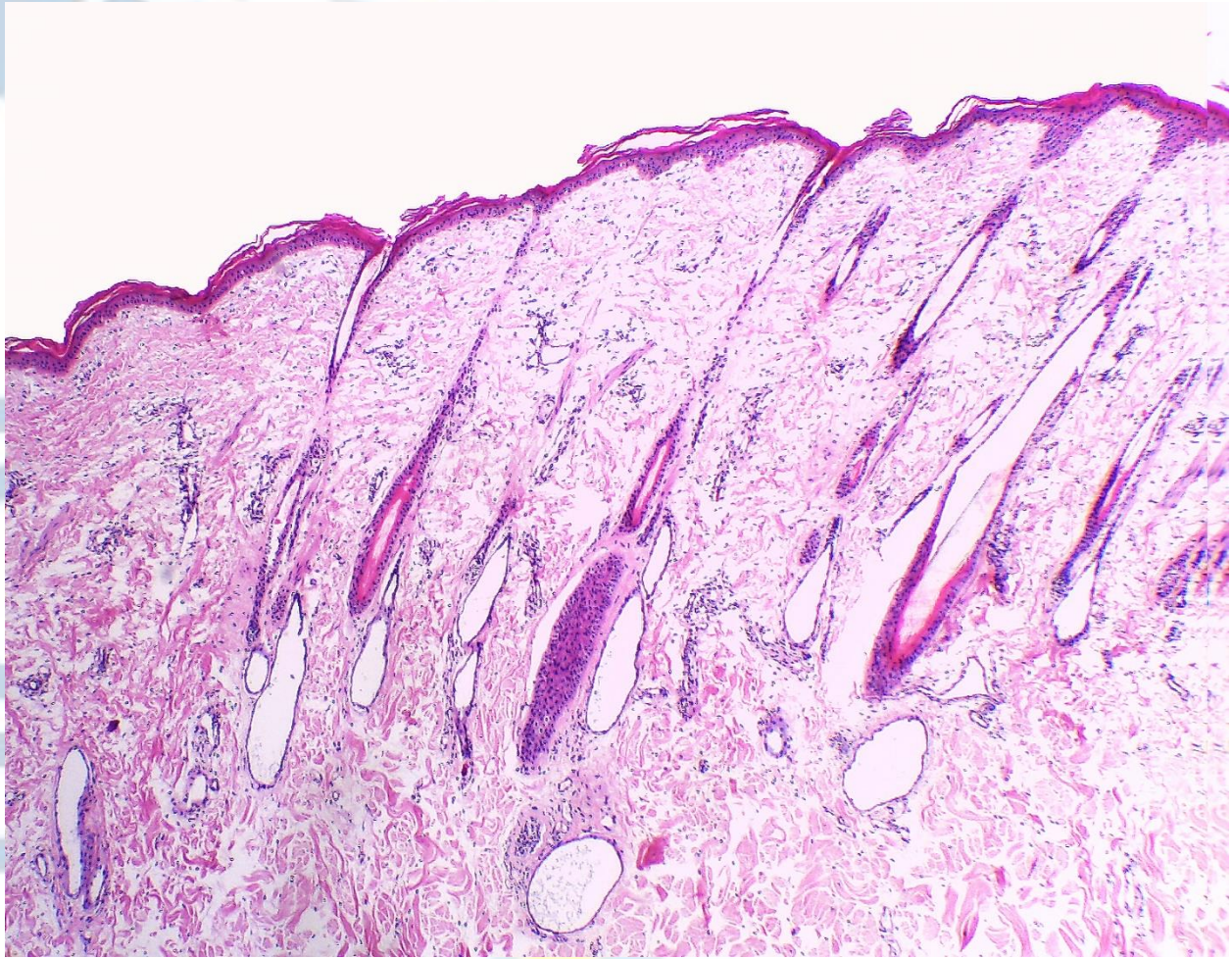


Figure 3. Fetus histological examination, H&E stain.

Follow-up questions:

- (1) *Morphological diagnosis: Amorphus globosus (also known as Globosus amorphus and acardiac twin).*
- (2) *Required gestation feature for the occurrence of the condition: Multiple gestation.*

Discussion:

Amorphus globosus (AG) represents an uncommon, lethal, and severe malformation that has been reported in cattle (4, 5, 7), and less frequently in goats (1), mares (2), and buffalos (6). The etiology of this condition is uncertain,

occurring in pregnancies with multiple fetuses, in which a seemingly normal twin is delivered along with a severely malformed fetus (AG). Fetuses are usually of the same sex, although AG cases in cattle of differing genetic sexes have been reported (7). In the case herein described, since the fetus was submitted from a slaughterhouse, no information in this regard was available. Likewise, the normal twin was not available for assessment. The gross appearance of AG may vary in domestic animals; however, these fetuses are usually represented by a round to oval mass of tissue covered by haired or non-haired skin, with no developed limbs and head and with no functional heart (1, 4, 5, 7). Some case reports of AG in cattle indicate the complete absence of internal organs (5), as observed in the case herein described. However, some reports of AG document the presence of vestigial non-functional internal organs and bones (7).

An analogous birth defect known as acardiac twin occurs in humans in around 1% of monozygotic multiple pregnancies (1/35,000 births in the overall population) (3). Even though there is great variation in morphological appearance in cases of acardiac fetuses in humans, general characteristics seem to be shared with the domestic animal counterpart (AG), including the occurrence of this condition in multiple pregnancies and the absence of a functional heart and other organs in the affected fetus (3, 8). In cattle, several hypotheses about the etiopathogenesis of this condition exist. However, the malformation remains poorly understood (7). Among the theories are chromosomal aberrations, failure in vascularization in early gestation, and separation of totipotent cells during embryogenesis from one fetus, leading to partial development of a second fetus (AG) (7).

More information regarding the pathophysiology of this condition is available for humans. Since the acardiac fetus is not capable of surviving on its own due to the lack of a functional heart, its intrauterine survival relies exclusively on the nourishment provided by the normal co-twin through a phenomenon named twin reversed arterial perfusion (TRAP sequence) (3). Vascular anastomoses are commonly present in monochorionic placentas, and when necessary, these communications may lead to shunt development to provide blood irrigation for one fetus with inadequate blood perfusion (3). In this scenario, the normal fetus, in humans called the pump or donor, directs blood flow to the recipient twin (acardiac fetus), generally through an artery-to-artery anastomosis (8). The directed blood, which shows low flow and poor oxygen concentration, irrigates the acardiac fetus and returns to the pump twin through a vein-to-vein anastomosis (8). Therefore, the recipient twin lacks functional placental tissue (8). Consequences such as heart failure have been reported in the donor co-twin in humans, likely associated with increased heart output and hypoxia caused by the TRAP sequence (8).

No studies regarding health problems occurring in the extra-uterine life of donor co-twins are available for cattle; however, unlike humans, most case descriptions indicate the birth of a healthy co-twin (5). Differences between humans and cattle regarding the occurrence and development of this malformation may be associated with two factors. a) acardiac fetuses occur primarily in monozygotic twins, which have rare occurrence in domestic animals, since multiple pregnancies are usually a result of several ovulations in these species; b) although not confirmed, the TRAP sequence may not affect domestic animals to the same extent as it does in humans, since dizygotic twins, which are more frequent in these species, usually do not share the same placenta (5). Even though rare, AG is an important differential

diagnosis in cases of severe malformation in bovine fetuses. Other differential diagnoses, in this case, include teratoma and mummified fetus.

References:

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