Braz J Vet Pathol, 2024, 17(1), 34-38
DOI: https://10.24070/bjvp.1983-0246.v17i1p34-38

BJVP
Brazilian Journal of Veterinary Pathology
ISSN 1983-0246

Short Communication

Retrospective study of congenital anomalies in cattle from 2008 to 2020, necropsied at the Center for Teaching and Diagnosis of Bovine Diseases, UNAM, Mexico

Kaylin L Moctezuma[1,*], Mario A Bedolla Alva[2], Guadalupe Arjona-Jiménez[3]

[1] Department of Pathology, SoBran, Silver Spring, Maryland, USA
[2] Center for Teaching and Diagnosis of Bovine Diseases, National Autonomous University of Mexico, Mexico City, Mexico.
[3] Juarez Autonomous University of Tabasco, Villahermosa, Tabasco, Mexico

***Corresponding author:** kaylin.l.moctezuma.ctr@health.mil
Submitted: January 11th, 2024. Accepted: February 13th, 2023.

Abstract

From the files of the necropsy archive of the Center for Teaching and Diagnosis of Bovine Diseases (CEDEB), UNAM, a retrospective study of the cases of bovines sent to the post-mortem room was conducted, which covered a period of 13 years from 2008 to 2020, with the aim of identifying which are the main congenital diseases diagnosed in the post-mortem study. For the data analysis, the individual's age, breed, and morphological diagnosis were considered. From 2008 to 2020, 2000 animals (100%) of which were divided into developmental stages: lactating calves, weaned calves, heifers, adults, and abortions; 40 (2%) of those animals were diagnosed with one or several developmental anomalies, the majority of cases were from lactating animals. The predominant congenital diseases were cardiovascular, locomotor, and gastrointestinal. From the group of congenital diseases of the cardiovascular system, they affected most stages of development, such as lactating calves, weaned calves, heifers, and adults.

Keywords: bovines, congenital anomalies, abortion, lactating calves, weaned calves, heifers, adults.

Developmental anomalies of genetic etiology or due to external agents can cause intrauterine death, and the developing organism will be reabsorbed, aborted, stillborn, die in the neonatal period, be limited in reproduction, or present a slight deviation from the usual pattern of its kind. The success of the survival of the embryos of any animal species during their embryonic stage depends on them having the appropriate genetic information and an optimal environment to develop (3, 6). In the presence of alterations in the genetic material or of harmful agents, alterations in development or congenital malformations will likely occur. A congenital alteration is then defined as those structural and/or functional defects present at the time of birth. Some of them cause embryonic death, others are not diagnosed until birth, and many others are discovered later in life. These defects originate from the failure of some of the different levels of organization of the body during embryonic development, ranging from the molecular to the organic (3, 4).

A review of the CEDEB necropsy archive logs was carried out, where the cases of congenital anomalies of bovines referred from 2008 to 2020 were chosen. The data obtained were the date of receipt, case number, age, and morphological diagnosis; regarding the age of the animals, they were classified by stages of development: lactating calves (1 day to 2 months); weaned (3 months to 10 months); heifers (11 months to 2 years); adults (over two years) and abortions (0 to 9 months of gestation). A photographic record was taken of the gross lesions identified, and finally, the data analysis was done using descriptive statistics.

Braz J Vet Pathol, 2024, 17(1), 34-38
DOI: https://10.24070/bjvp.1983-0246.v17i1p34-38

Most congenital diseases, such as cardiovascular or musculoskeletal anomalies, were observed in lactating animals. The cause of death of the specimens was associated with these conditions or the combination of several, which are not compatible with life. Of the total number of animals inspected in necropsy, 2% (n=40) in 2000 had congenital anomalies detected. The breed primarily involved was Holstein. The sex of the individuals could not be determined due to lack of information.

Based on age, congenital anomalies were identified in the following stages: abortions 7.5% (n=3), lactating calves 65% (n=26), weaned calves 22.5% (n=9), heifers 2.5% (n=1) and adults 2.5% (n=1) (Fig. 1), that is, the majority of congenital diseases occurred in lactating animals, which agrees with Agerholm et al, who worked with 107 animals of varying ages, of which 78 were lactating (1).

Of the 30 congenital anomalies detected in post-mortem examinations, 27% (8/30) correspond to the cardiovascular system; 17% (5/30) to the gastrointestinal system; 6.66% (2/30) to the reproductive system; 6.66% (2/30) to the urinary system; 13.33% (4/30) to the nervous system; 26.66% (8/30) to the locomotor; and 3.33% (1/30) to eye anomalies (Table 1 and Figs. 2-4); of the total congenital anomalies detected, 85% (n=34) of the animals only suffered from at least one and 15% (n=6) showed several anomalies at the same time. These results teach us that the combination of several congenital pathologies in a single specimen is incompatible with life, as reported earlier in calves (5, 8, 9).

Of the congenital anomalies diagnosed, the most frequent was the intraventricular septal defect with 31.37% (16 times diagnosed); followed by the Eisenmenger syndrome and the ventral mesenteric cyst (each anomaly was diagnosed three times) with 5.88%; Freemartin and palatoschisis (each anomaly was diagnosed twice) represent 3.92%; and each remaining congenital anomaly accounted for 1.96% because it was detected once upon inspection. In other studies, it is also agreed that cattle's prominent congenital heart diseases are the interventricular septal defect and Eisenmenger syndrome. Burzynski et al. (2) analyzed 47 cows with heart diseases; 18 of these animals presented congenital anomalies, and the anomaly that was diagnosed most frequently was the interventricular septal defect. In another study carried out in 2000, 469 cases of congenital heart diseases were analyzed; the interventricular septal defect was the one that was detected most frequently (198 cases, 42.2%) (6).

The findings found in the post-mortem examination of this study indicate that the diagnosis of congenital diseases in cattle covers only 2% (40 animals) of 2000 bovine necropsies carried out from 2008 to 2020. The main developmental anomalies in cattle belong to the cardiovascular and musculoskeletal systems. Regarding congenital diseases of the cardiovascular system, the main anomaly is the defect of the interventricular septum, affecting mostly lactating animals; however, several cases have also been recorded in weaned calves and one case in a heifer. Likewise, the diagnosed congenital diseases of the musculoskeletal system vary because one case of each developmental anomaly was recorded. In this type of work, the more cases received, the

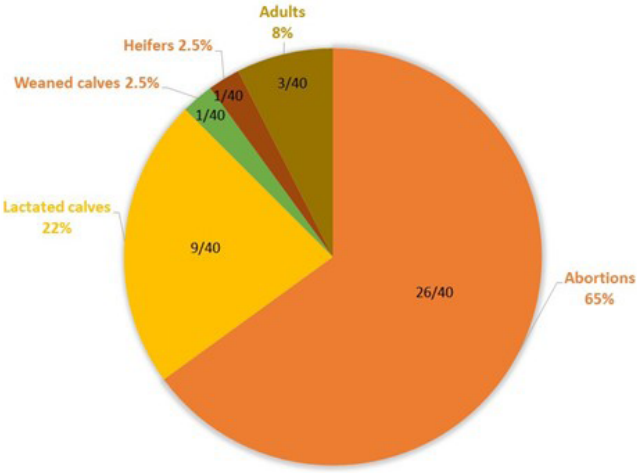

Figure 1. Developmental stage of analyzed cattle showing congenital anomalies.

Table 1. Congenital diseases detected in the post-mortem study.

Apparatus/ system	Congenital anomalies detected in the PM study	Percentage
Cardiovascular	Interventricular septal defect Persistent truncus arteriosus Extreme tetralogy of Fallot Total anomalous pulmonary venous connection Absence of right cranial vena cava and persistence of left cranial vena cava Cardiac cushions defect	27% (8/30)
Gastrointestinal	Atresia coli Atresia ani Recto-vaginal fistula Ventral mesenteric cyst Congenital eventration	17% (5/30)
Reproductive	Freemartin Uterine segmental aplasia	6.66% (2/30)
Urinary	Bilateral renal dysplasia Urachal cyst	6.66% (2/30)
Nervous	Dandy Walker malformation Arnold Chiari malformation Cerebellar hypoplasia Hydrocephalus	13.33% (4/30)
Locomotor	Chondrodysplasia Diprosopia Arthrogryposis Brachygnathia Kyphosis Lordosis Complex vertebral malformation Palatoschisis	26.66 (8/30)
Eye	Anophthalmus	3.33% (1/30)

Braz J Vet Pathol, 2024, 17(1), 34-38
DOI: https://10.24070/bjvp.1983-0246.v17i1p34-38

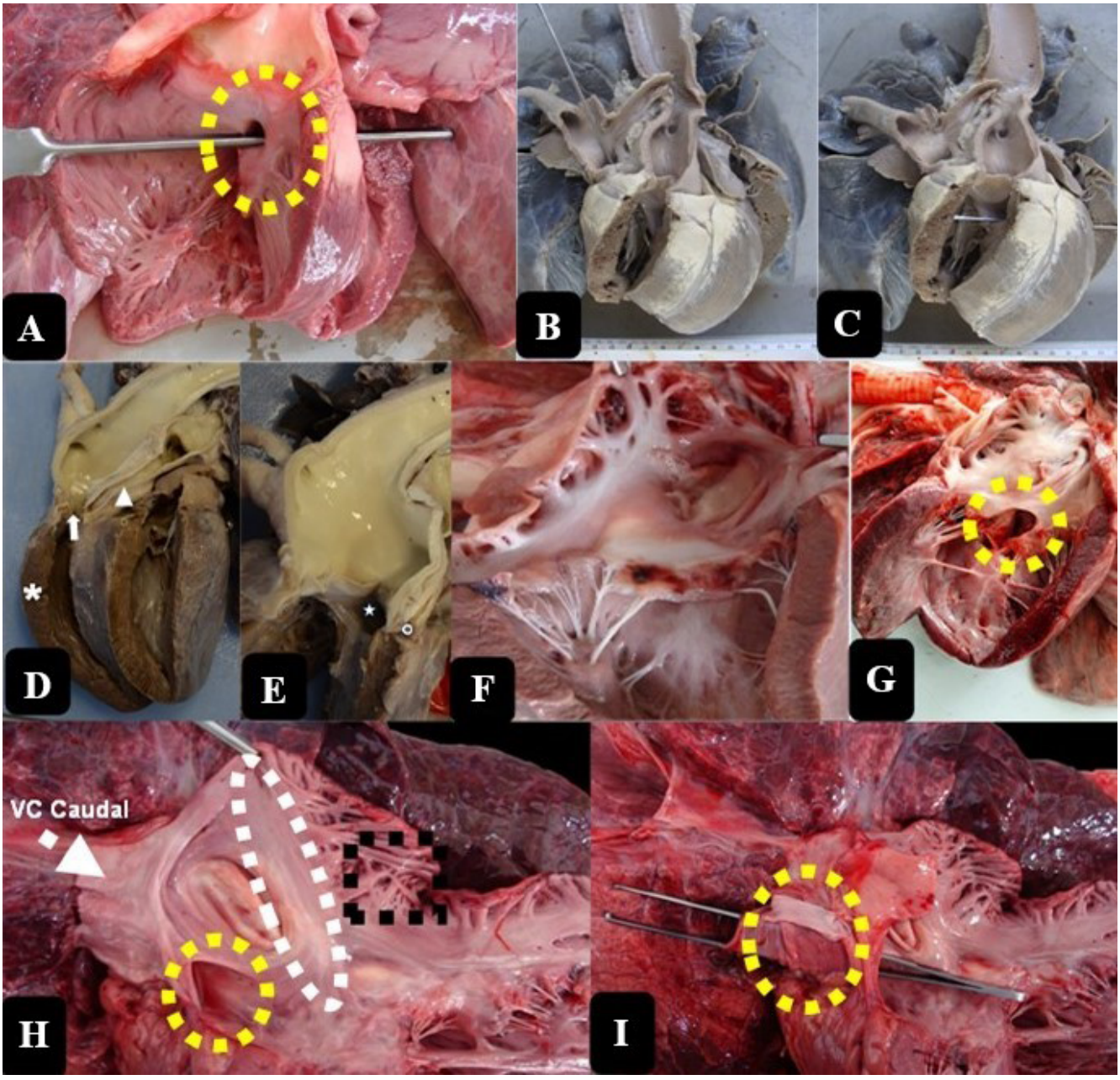

Figure 2. A- Gross picture of the interventricular septal defect. B e C- Persistent truncus arteriosus: from both ventricles, a truncus arteriosus emerged that rode a defective interventricular septum. From this trunk, two left and right arterial branches emerged that headed to the left and right pulmonary lobes, respectively. Furthermore, the brachiocephalic trunk emerged directly from the right ventricle. This brachiocephalic trunk had a valve at its origin and a branch communicating with the truncus arteriosus. D e E- Extreme tetralogy of Fallot: right ventricular hypertrophy (asterisk), aortic dextraposition (arrow), pulmonary artery hypoplasia (arrowhead); ventricular septal defect (star) and atresia of the pulmonary semilunar valve (circle). F- Total anomalous pulmonary venous connection. G- Cardiac cushions defect. H- The absence of the intervenous tubercle (white oval) is donated, as well as the cranial vena cava (box) and the dilate coronary venous sinus (yellow circle). I- The lumen of the persistent left cranial vena cava and the dilated coronary vein are exposed (circle).

better the understanding of diseases in bovine production, which will allow the study of pathology to be a commonly used tool in productive practice.

Conflict of interest

The authors declare no competing interests.

Braz J Vet Pathol, 2024, 17(1), 34-38
DOI: https://10.24070/bjvp.1983-0246.v17i1p34-38

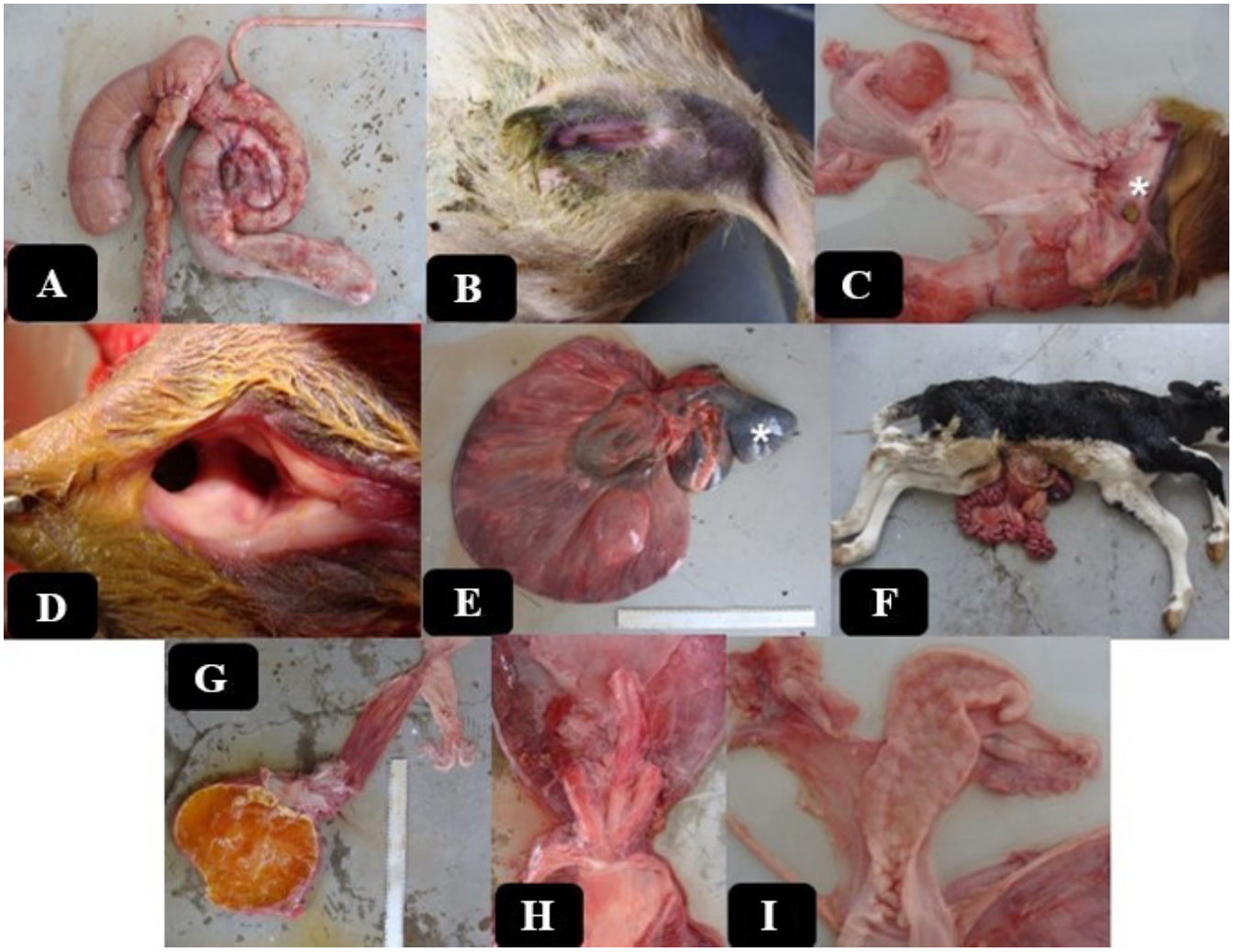

Figure 3. A- Atresia coli in the spiral loop. B- Anal atresia. C- Recto-vaginal fistula (asterisk). D- Vagina with rectal fistula. E- Ventral mesenteric cyst in the liver (asterisk). F- Congenital eventration. G- Urachal cyst. H- Freemartin. I- Uterine segmental aplasia.

Acknowledgments

We thank the farmers who sent the animals for post-mortem study.

References

1. Agerholm JS, Bendixen C, Arnbjerg J, Andersen O. Morphological variation of "complex vertebral malformation" in Holstein calves. J Vet Diagn Invest. 2004;16(6):548-553. doi: 10.1177/104063870401600609
2. Buczinski S, Francoz D, Fecteau G, Difruscia R. A study of heart diseases without clinical signs of heart failure in 47 cattle. Can Vet J. 2010;51(11):1239-1246.
3. Corsello G, Giuffrè M. Congenital malformations. J Matern Fetal Neonatal Med. 2012;25(Suppl 1):25-9. doi: 10.3109/14767058.2012.664943
4. Dittmer KE, Thompson KG. Approach to investigating congenital skeletal abnormalities in livestock. Vet Pathol. 2015;52(5):851-61. doi: 10.1177/0300985815579999
5. Gülbahar MY, Yüksel H, Soygüder Z, Erçin ÖF. Dicephalus, Arnold-Chiari malformation, spinal dysraphism and other associated anomalies in a newborn Holstein calf. Turkish J Vet Anim Sci. 2005;29(2):565-70.
6. Ohwada K, Murakami T. Morphologies of 469 cases of congenital heart diseases in cattle. J Japan Vet Med Assoc. 2000;53(4):205-9. doi: 10.12935/jvma1951.53.205
7. Rojas Lleonart I, Silveira Prado EA, Rojas Borroto L, Oramas Torres E. Malformaciones congénitas: consideraciones sobre su presentación fenotípica. Revista Electrónica de Veterinaria. 2010;11(4):1-13.
8. Silva LF, Rabelo RE, Santos GP, Aguiar OLR, Sonne L, Barros CSL, Sant'Ana FJF. Multiple congenital encephalic malformations in a calf. Braz J Vet Pathol. 2016;9(3):103-7.

Braz J Vet Pathol, 2024, 17(1), 34-38
DOI: https://10.24070/bjvp.1983-0246.v17i1p34-38

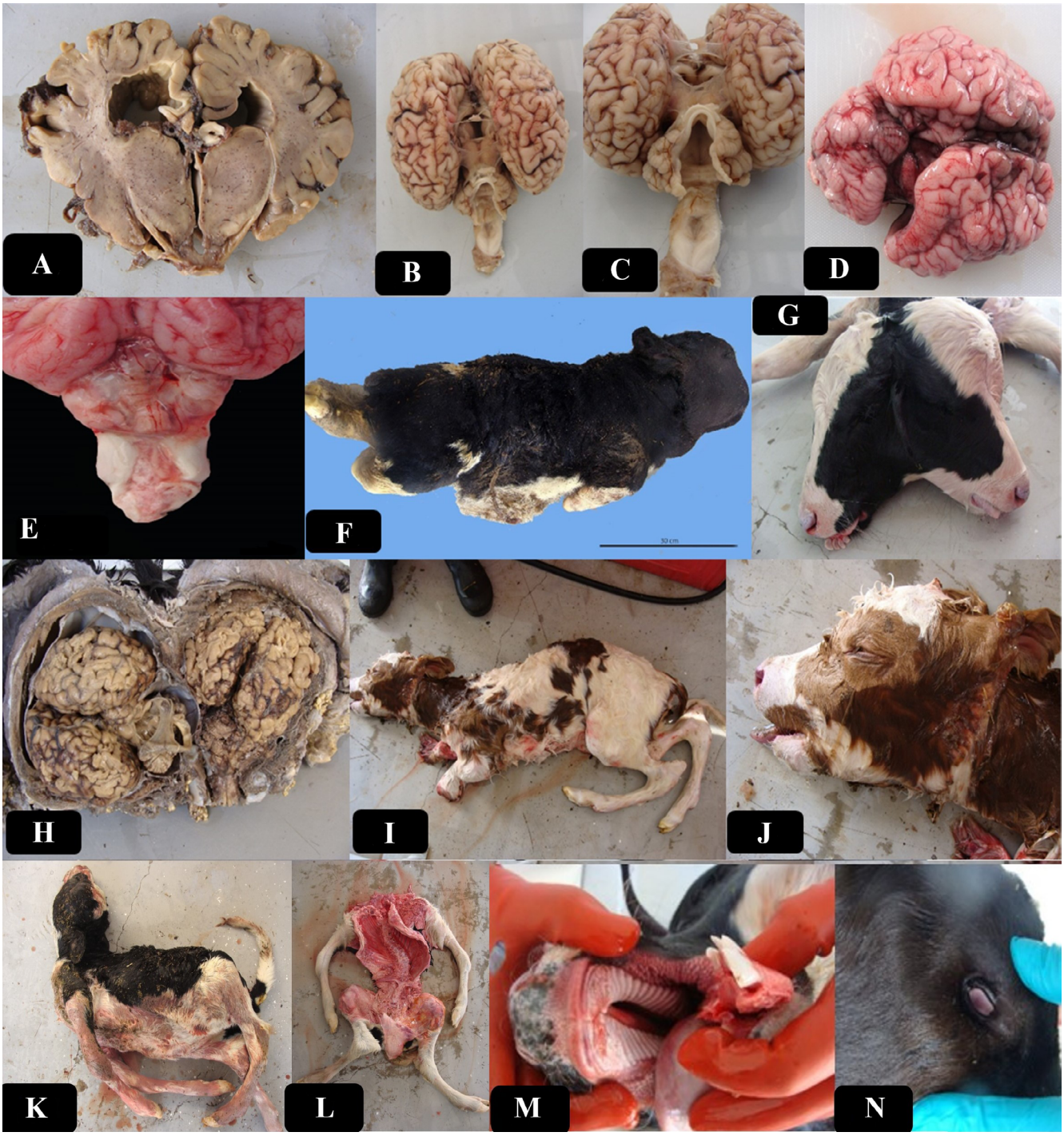

Figure 4. A- Hydrocephalus. B- Dandy-Walker malformation. C- Absence of the cerebellar vermis. D- Arnold-Chiari malformation. E- Cerebellar hypoplasia. F- Chondrodysplasia. G- Diprosopia. H- Both heads had a brain, but only one of them continued with the spinal cord. I- Arthrogryposis. J- Brachygnathia. K e L- Complex vertebral malformation. M- Palatoschisis. N- Anophthalmus.

9. Uzar T, Szczerbal I, Serwanska-Leja K, Nowacka-Woszuk J, Gogulski M, Bugaj S, Switonski M, Komosa M. Congenital malformations in a Holstein-Fresian calf with a unique mosaic karyotype: a case report. Animals (Basel). 2020;10(9):1615. doi: 10.3390/ani10091615.