COMPLEX VERTEBRAL MALFORMATION (CVM) IN AN HOLSTEIN CALF:
CLINICAL AND RADIOLOGICAL (X-RAY AND CT-SCAN) ASPECTS

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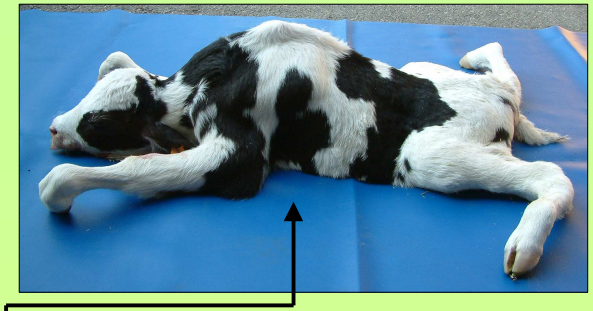
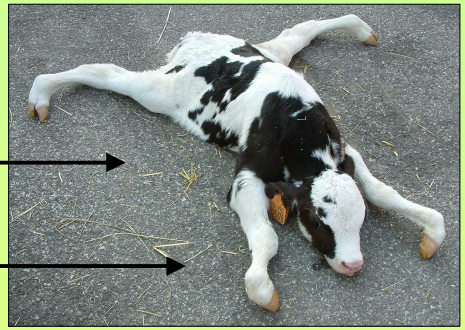
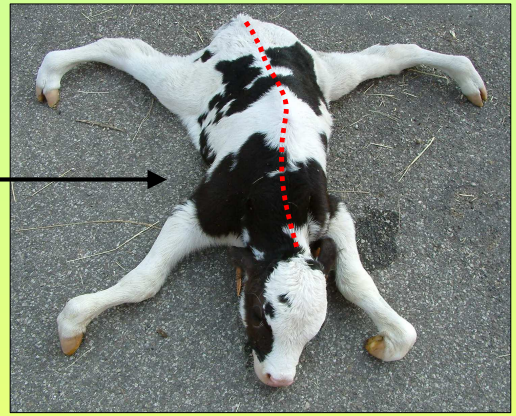


Case report

This report deals with a **two-day-old female Italian Holstein calf** submitted because of incapacity to stand up due to **serious systemic arthrogryposis.**
It constitutes the first case of CVM described in an Italian Holstein calf.





Main clinical findings

Reduced body weight: 19.4 kg.
Frog-like decubitus: the calf lay down in a flat position with extended limbs.
Systemic arthrogryposis: both metacarpho-phalangeal and metatarso-phalangeal joints were symmetrically contracted, whereas the carpal region was bilaterally extended.
Abnormal vertebral column: the cervical part was shorter than normal; the thoracic spinous processes were prominent, whereas the lumbo-sacral tract resulted concave; the tail was bent and measured 15 cm; the thoraco-lumbar part was clearly deviated (scoliosis).
Incapacity to stand up: despite repeated attempts to stand up, the calf was unable to.
If supported by assistants, its feet rested on the dorsolateral face of the pastern on the ground; the head hung down between the forelimbs.

Minor clinical findings

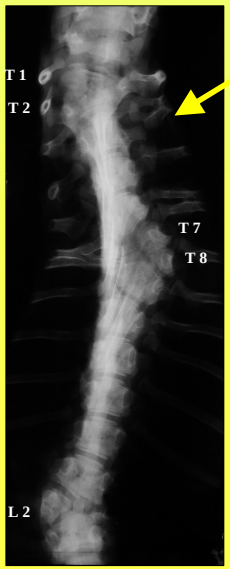
Light dyspnea with abnormal sounds upon auscultation: increased and rough bronchovesicular sounds, tracheal/tubal breathing in a small area.
Slight tachycardia: without other clinically detectable cardiac anomalies.

Genealogic analysis:

both parents had a familial relationship with the sire **Carlin-M-Ivanhoe Bell**, considered one of the biggest spreaders of CVM. Sire of the calf was **Macassar CV**, already tested for CVM and identified as a carrier ("CV").

Genetic diagnostic confirmation:

Direct DNA-based analysis (DNA-PCR): calf resulted as homozygous for CVM-mutation, whereas the dam was a heterozigous carrier.



Main radiologic findings

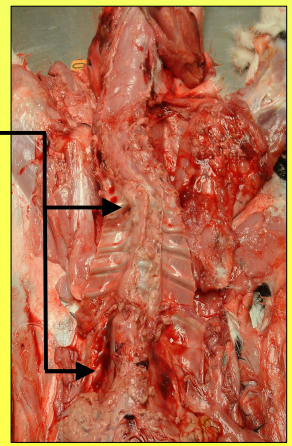
Multiple anomalies of the vertebral column: abnormal number of vertebrae (7 cervical, 12 thoracic, 7 lumbar, 5 sacral, 11 caudal); fusion of vertebrae C6 and C7; presence of hemivertebrae in the thoracic (T1, T2, T7, T8) and lumbar (L2) regions; scoliosis.

Computed tomography

CT images of the column provided sharp details of the cervical and thoracic malformed vertebrae. Cross-section of the malformed vertebrae indicated the **absence of homogeneity and uniformity.**

Main necropsy findings

S-shaped deviation of the vertebral column at the level of the thoracic and lombar tracts.
Complex malformation of the heart: atrial and interventricular septal defects, patent ductus arteriosus.



CVM *stems from a simple autosomal recessive inherited defect spread in the Holstein population by former elite US Holstein Carlin-M-Ivanhoe Bell. Homozigous animals die during pregnancy, are premature or stillborn, or die shortly after birth, displaying a wide range of phenotypic expressions. As vertebral lesions may be minimal and the columna of almost normal appearance in many cases, radiological examination of the vertebral column is recommended. A gene-based test enables definitive diagnostic confirmation as well as the detection of carriers of the defect to be made.*