

Invasive malignant fibrous histiocytoma in a cow

Eva A. Sartin, DVM, PhD; Judith A. Hudson, DVM, PhD; Guillermo A. Herrera, MD; Anne M. Dickson, DVM; Dwight F. Wolfe, DVM, MS

- Horn base neoplasms are rare in cattle in the United States.
- Traumatic and chronic inflammation may be predisposing factors for development of neoplasia in cattle.

A 7-year-old 500-kg Santa Gertrudis cow was admitted to the clinic because of weight loss and a mass (approx 25 cm in diameter) on the left side of the poll that had first been noticed as a nonhealing wound at the dehorning site 3 months earlier. Radiography revealed a large, soft-tissue mass associated with the left cornual process. Lysis of the frontal bone was evident rostral to the caudodorsal margin of the orbit. The outer plate of the frontal sinus was destroyed, allowing extension of the mass into the frontal sinus. Gas was evident in the cornual diverticulum of the frontal bone. Radical surgical debulking was performed to remove necrotic material, search for possible foreign bodies, and obtain biopsy samples. A large portion of the mass was removed, leaving a cavity approximately 10 × 15 cm. Foreign material, other than fragments of necrotic frontal bone, was not found. Because of substantial hemorrhage, the cavity was packed with several rolls of gauze. Fibrosarcoma was diagnosed from the biopsy samples. The cow was considered to have a poor prognosis; thus, it was euthanized and necropsied.

The soft-tissue mass contained extensive areas of necrosis and hemorrhage. It had deformed and expanded the tissues of the left aspect of the poll and extended rostrally to the laterodorsal angle of the left eye. Firm, white-tan, neoplastic tissue extended through the left aspect of the frontal bone, focally compressing the left portion of the cerebral cortex and filling the left caudal and rostral portions of the frontal sinus. Neoplastic tissue also invaded and effaced the structure of most of the ethmoid and nasal turbinates on the left side. Mandibular, retropharyngeal, parotid, and tracheobronchial lymph nodes were moderately large and bulged when cut.

Histologically, it was evident that neoplastic cells had invaded the cranial cavity and formed a mass in

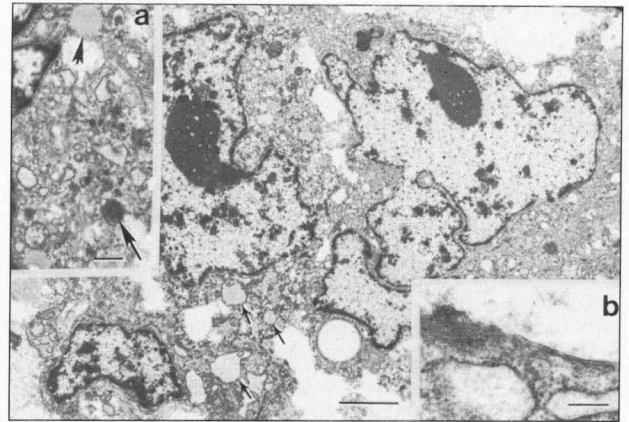


Figure 1—Photoelectron micrographs of a section of a malignant fibrous histiocytoma from the horn base of a cow. Neoplastic cells had large irregular nuclei with abundant euchromatin. Notice the dilated cisternae of endoplasmic reticulum containing punctate material (small arrows), scattered lysosomal vacuoles (large arrow, inset a), and lipid (arrowhead, inset a) in the cytoplasm. Collagen is adherent to the basement membrane (inset b), and a few extracellular, loosely arranged, collagen fibrils can be seen above the basement membrane. Uranyl acetate and lead citrate. Bar = 1 μ m; inset a, bar = 500 nm; inset b, bar = 200 nm.

the meninges, which focally compressed the left portion of the cerebral cortex. Edema and gliosis were seen in adjacent neural parenchyma. Regional lymph nodes were hyperplastic and lacked evidence of metastases. The neoplasm was composed of loosely to compactly arranged pleomorphic to spindle-shaped cells, which were separated by a scant amount of eosinophilic matrix. The cells had long, eosinophilic, cytoplasmic processes and 1 or more large, oval to pleomorphic, vesicular nuclei with margined chromatin and multiple nucleoli. Up to 10 mitotic figures were seen per 400 \times field. Ultrastructurally, neoplastic cells were irregularly shaped and had large, irregular nuclei with abundant euchromatin (Fig 1). The cytoplasm contained peripheral myofilaments, scattered lysosomal vacuoles, lipid, and dilated cisternae of endoplasmic reticulum containing punctate material. Collagen was adherent to the basement membrane, and a few extracellular, loosely arranged, collagen fibrils were observed.

Horn base neoplasms are rare in cattle in the United States. In this cow, initial clinical differential diagnoses included chronic inflammation, granulation tissue, and neoplasia. Radiographic findings of an invasive mass causing bone destruction and invasion of the frontal sinus strongly supported a diagnosis of neoplasia. Horn cancer, a squamous cell carcinoma that develops at the

From the Departments of Pathobiology (Sartin, Dickson), Radiology (Hudson), and Large Animal Surgery and Medicine (Wolfe), College of Veterinary Medicine, Auburn University, AL 36849-5519, and the Department of Anatomic Pathology (Herrera), University of Alabama, Birmingham, AL 35233-7331. Dr. Herrera's present address is Department of Pathology, Louisiana State University, Shreveport, LA 71130-3932. Dr. Dickson's present address is 138 Fairways Cir, Baldwinsville, NY 13027-3360.

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horn base of Zebu cattle, is an important economic problem in India. Trauma, actinic rays, hormones, genetic predisposition, and viral agents have been suggested as factors that might predispose to its development.¹⁻³ In contrast, the neoplasm in the cow of this report was a malignant fibrous histiocytoma. Only a few connective tissue tumors have been reported in cattle.⁴ In 1 report⁵ of a horn base fibrosarcoma, it was believed that a bovine syncytial virus may have played a role in tumor induction. Ultrastructural examination did not detect virus in the cow of this report.

It is not known whether the dehorning site had been traumatized (eg, such as by butting or rubbing) or chronically inflamed before the mass appeared. However, the 3-month history of a postdehorning lesion indicated that normal healing did not occur. Traumatic injuries, chronic inflammation, and burns, which could result in local proliferation of undifferentiated mesenchymal cells, could develop into neoplastic lesions in any species. Chronic local infection or inflammation and delayed healing precede development of neoplasia within scar or burn injuries in human beings,^{6,7} horses, and dogs.⁸⁻¹⁰ Furthermore, trauma and chronic inflammation are apparent predisposing factors in posttraumatic ocular sarcomas and postvaccinal sarcomas of cats.^{11-17a}

Ultrastructurally, neoplastic cells in this cow had fibroblastic, myofibroblastic, and fibrohistiocytic characteristics; thus, this neoplasm was most likely a malignant fibrous histiocytoma. The phenotypic heterogeneity of the fibroblast and mechanisms that may be responsible for its different phenotypic expressions have been the subject of much research.^{18,19} Cytokines associated with growth activities and components of the extracellular matrix may exert prominent effects on fibroblast functions and may, therefore, be involved in fibroblastic differentiation. Factors affecting changes in the extracellular matrix and cytokine release such as inflammation could modulate fibroblast phenotypic expression. It has been suggested that macrophages may be capable of phenotypic modification by expression of muscle proteins and acquisition of ultrastructural myofibroblastic characteristics.²⁰ Because myofibroblasts are in granulation tissue and because cells with phagocytic function will populate chronically inflamed wounds, it seems reasonable that these cell types could be expressed in neoplasms arising from such lesions.

^aDubielzig RR, Hawkins KL, Miller PE. Myofibroblastic sarcoma associated with rabies vaccination in a cat (abstr). *Vet Pathol* 1992;29:438.

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