Multicentric Ganglioneuroma in a Steer

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Ganglioneuroma and neuroblastoma are tumors of similar origin; the latter is a rapidly growing, undifferentiated malignant type which may mature and differentiate into the former, a well-differentiated and usually benign type. Though both are neuroectodermal tumors, ganglioneuromas are composed of medullated or non-medullated nerve fibers and distinct mature ganglion cells [15], and in man, are found especially along the paravertebral line in the thorax and abdomen [1].

Ganglioneuroma is a rare tumor in both domestic [9] and laboratory [13] animals. Most reports have concerned the benign tumor in rats [5, 11, 14], hamsters experimentally exposed to ethylnitrosourea precursors [12], dogs [7, 10], pigs [10], horses [8, 10] and man [10, 15]. Ganglioneuromas in cattle and buffalo also have been reported [4, 6, 9, 10]. In cattle, most tumors developed from abdominal sympathetic plexus or elsewhere in the autonomic nervous system [9]. One tumor in a ten-month-old Hereford steer was located over the first lumbar segment of the spinal cord [4], while ganglioneuromas in three buffalo were found on the bulbar conjunctiva [6].

Described here is a ganglioneuroma in an apparently normal five-year-old Brahman steer which had multiple lesions on serosal surfaces and one lesion in a sternal lymph node.

Numerous pedunculated, pale, firm, discrete tumors varying in size from 1 to 12 cm in diameter were found at slaughter on the parietal pleura, peritoneum, greater omentum, and spleen (figs. 1, 2). The tumors were more frequent in the abdomen than in the thorax. A similar nodular tumor was observed in one sternal lymph node (fig. 3). No other lesions were reported. The adrenal glands were not submitted for detailed examination, thus the possibility of adrenal lesions cannot be excluded.

Representative portions of all lesions were fixed in 10% buffered neutral formalin, embedded in paraffin, sectioned at 6 µm, and stained with hematoxylin and eosin (HE), cresyl violet, Alcian blue-methyl green pyronin [3], Luxol fast blue and Glee’s silver impregnation.

Histologically, the tumor in all locations consisted of Schwann’s cell cords which stained poorly with Luxol fast blue and formed interlacing fascicles resembling a neurofibroma. In
Fig. 1: Discrete multinodular ganglioneuroma lesions in diaphragmatic peritoneum. Bar = 5 cm.
Fig. 2: Ganglioneuroma lesions of capsule of spleen (cut). Bar = 5 cm.
Fig. 3: Sternal lymph node; tumor lesion causing distension of cut surface. Bar = 1 cm.
Fig. 4: Microscopic appearance of ganglioneuroma which consisted of whorls and bundles of interlacing fascicles and numerous scattered ganglion cells (arrows). HE.
Fig. 5: Higher magnification of fig. 4; frequent pleomorphic ganglion cells scattered among Schwann’s cell nuclei. HE. *Inset:* Darkly impregnated ganglion cells, including the presence of neuritic processes. Glee’s silver impregnation.
addition, however, diffusely scattered mature ganglion cells were numerous, and six to seven of these cells were found occasionally per high power field (fig. 4). Most of these neurons had degenerative changes and contained faintly acidophilic cytoplasms and prominent nuclei with nucleoli which often were placed eccentrically (fig. 5). Distinct neuritic processes of ganglion cells were demonstrated readily by the silver impregnation technique (fig. 5, inset). Cresyl violet and Alcian blue-methyl green pyronin demonstrated Nissl's granules. The neoplastic tissue in the sternal lymph node was infiltrating into adjacent lymphoid tissue, much of which had been replaced by the neoplasm. More mature ganglion cells per high power field were observed in the nodal lesion than in the serosal lesions.

Although our histological findings primarily were consistent with those of others who described ganglioneuromas in various species, we found no reports of multiple ganglioneuromas in cattle. A multicentric neuroblastoma with multiple neoplastic foci in the lungs and extension of similar neoplastic tissue into musculature of the shoulder-brisket region of a six-year-old cow has been described [2].

The resemblance of this neoplasm to bovine neurofibromatosis—with ganglion cells as an additional cell type—was noted [H. Lüginbühl, personal communication] thus the term ganglioneurofibromatosis of multicentric origin also was considered as an appropriate diagnosis.

Routine abattoir inspection indicated that the adrenal glands were not involved in this steer, thus it seemed likely that the neoplasm arose from ganglia elsewhere in the autonomic nervous system. It is interesting that recent reports [4, 6] refer to an early report of bovine ganglioneuroma in the adrenal medulla [2], but perusal of that report of a neuroblastoma reveals no adrenal involvement. While it is probable that the lesions we observed represent multicentric origin, metastasis via lymphatics (especially in regard to diaphragmatic serosa, and the sternal lymph node), and perhaps also by direct transplantation, is possible.

No clinical history on this steer was available, but routine preslaughter veterinary inspection revealed no overt signs.

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References

Congenital Encephalopathy in a Calf

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Congenital encephalopathies of cattle have been associated with a number of in utero viral infections, including bluetongue virus, bovine viral diarrhea virus, and Akabane virus [2, 3, 6, 11]. Cases of unknown cause also have been described [4]. The following report describes cerebral malformations in a three-month-old Angus calf in which brain lesions closely resemble those described in calves experimentally infected with bluetongue virus at 125 days of gestation [7].

The calf had been blind since birth and was euthanized because of progressive depression and incoordination. The calf was thin, with widespread serous atrophy of fat. A small fistulating abscess was present over the withers and another between the omasum and the ventral sac of the rumen.

Extensive abnormalities were present in the cerebrum. The lateral ventricles were dilated and surrounded by a layer of cerebral parenchyma of variable thickness. Several cavities