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# Cutaneous Fibromas of Moose (*Alces alces*)

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Cutaneous masses have been noted, but not described, in field studies of moose in North America (Murie, 1934, Univ. Mich. Museum Zool. Misc. Publ. 25: 18–20). These were probably cutaneous fibromas or fibropapillomas which have been reported in white-tailed deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*) (Sundberg and Neilsen, 1981, Can. Vet. J. 22: 385–388), and pronghorn (*Antelocapra americana*) (Sundberg et al., 1983, J. Am. Vet. Med. Assoc. 183: 1333–1334) which are native wild North American ruminants. This report describes cutaneous fibromas in North American moose and attempts to isolate a virus from the lesions.

Solitary black cutaneous masses with a firm white core were examined from 11 free-ranging moose collected at hunter check stations during the 1982 and 1983 Maine moose hunts. Lesions ranged from 1 to 12 cm in diameter. The surface of the lesions ranged from smooth to slightly verrucous to deeply ulcerated. There was no evidence of local or visceral metastases.

Microscopically, a moderately acanthotic and hyperkeratotic epidermis covered a dense matrix of fibroblasts and collagen devoid of adnexal structures (Fig. 1). Broad, short papillary projections extended from the surface of three cases (Fig. 2, Table 1). These projections consisted of a dense fibroblast and collagen matrix covered by hyperplastic epidermis, similar to other moose fibromas. The epidermis consisted primarily of thickened stratum spinosum and corneum. The stratum granulosum was uniformly 1–2 cells thick and contained fine basophilic granules. Scattered cells in all layers, but primarily the upper stratum spinosum and granulosum had moderate amounts of clear cytoplasm and eccentrically placed, crescent-shaped nuclei. Focal hyperplasia of the stratum granulosum, was not present in any moose fibroma examined. The mesenchymal component of these lesions, which was the prominent feature, consisted of numerous fibroblasts with large oval vesticular nuclei and scant, lightly basophilic cytoplasm with indistinct borders (Fig. 3). These cells were separated by dense bundles of irregular collagen. Numerous small vessels traversed the mass. Both epithelial and mesenchymal cells had

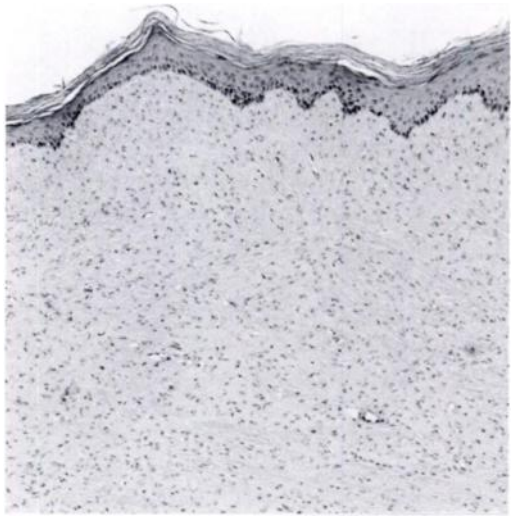

FIGURE 1. Mildly hyperplastic epidermis covering a fibroma from a moose in Maine. H&E, ×65.

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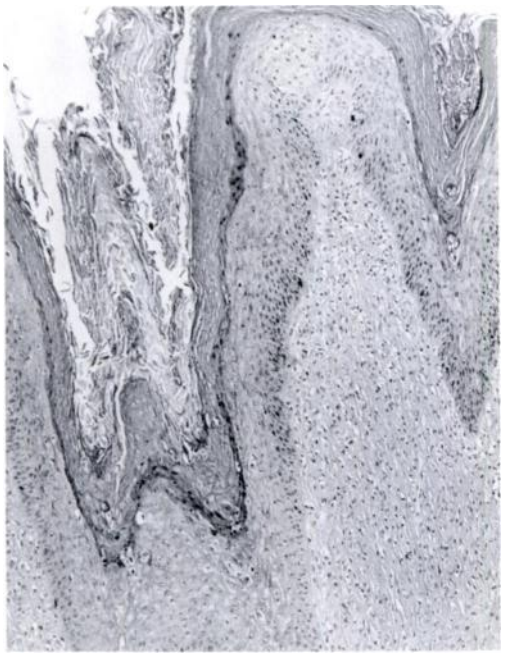

FIGURE 2. Short, broad papillary projections on the surface of a fibroma from a moose in Maine. H&E, ×65.

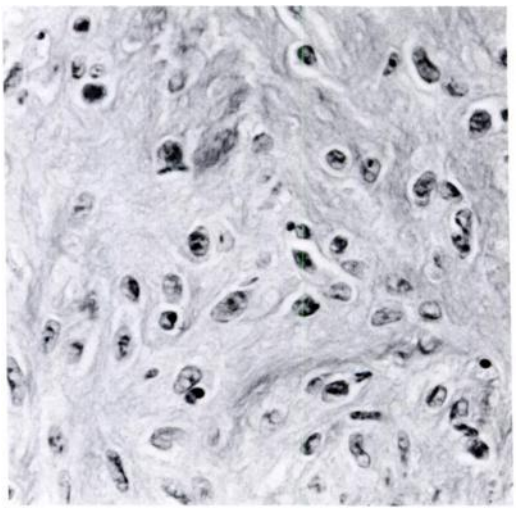

FIGURE 3. Numerous fibroblasts separated by dense collagen bundles in a fibroma from a moose in Maine. Masson's trichrome. ×400.

a low mitotic index (one to two per high power field). Inflammation was either associated directly with ulceration or consisted of a mild diffuse lymphocytic infiltrate with aggregates around small vessels. All fibromas were circumscribed with no evidence of local or vascular invasion.

Paraffin-embedded fibromas were sectioned at 6 $\mu$m and examined by the peroxidase-antiperoxidase technique for papillomavirus group-specific structural antigens, as previously described (Sundberg et al., 1984, Am. J. Vet. Res. 45: 1441–1446). Fibromas of mule deer and white-tailed deer were used as positive controls and normal moose skin ($n = 8$) were negative controls. Normal rabbit serum was substituted for the rabbit anti-papillomavirus primary serum as another negative control. Positive nuclear staining was present in the positive control deer fibromas but in none of 11 moose fibromas and none of eight normal moose skin sections.

Epidermis was trimmed from seven frozen moose fibromas collected in 1982 and three fibromas collected in 1983. Attempts were made to isolate papillomavirus as described previously (Lancaster and Olson, 1978, Virology 89: 372–379). Molecular hybridizations were assayed by the Southern blotting technique (Southern, 1975, J. Mol. Biol. 98: 503–517). Bovine papillomavirus type 1 (BPV1) DNA was used as a molecular probe as well as a positive control on electrophoretic gels. Low molecular weight DNA, which migrated with BPV1, was not observed in the moose fibroma extracts. Papillomavirus DNA could not be detected in the moose fibroma extracts by the Southern blot technique under low stringency conditions. The technique of negative stain electron microscopy (Sundberg et al., 1984, op. cit.) was also used to screen for virus. No virions were observed.

Moose fibromas examined in this study closely resembled white-tailed deer fibromas microscopically, which often do not contain virus (Sundberg et al., 1984, op. cit.). In the Northeastern United States,

TABLE 1. Characteristics of cutaneous fibromas of moose from Maine, 1982–83.

| | Case number | Sex | Age (yr) | Location | Histologic features | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Epithelial Hyperplasia | Ulceration | Chronic inflammation | Papillary projections |
| 1982 | 1058 | M | Adult | NA | Mild | Yes | Moderate subepithelial | No |
| | 1084 | M | 10.5 | NA | No epidermis | NA | No | NA |
| | 273 | M | 3.5 | Inguinal region | Mild | No | Mild subepithelial | |
| | 1053 | F | 6.5 | NA | No epidermis | NA | No | NA |
| | 427 | M | 9.5 | NA | Mild | No | Mild subepithelial | No |
| | 431 | M | 9.5 | NA | Mild | Yes | Mild subepithelial | No |
| | 253 | F | 3.5 | Right lateral thorax | Moderate | Yes | Mild subepithelial | Yes |
| | 126 | M | 5.5 | Side of neck | No epidermis | NA | No | NA |
| 1983 | 505 | M | 6.5 | Shoulder | Moderate | No | Mild subepithelial | Yes |
| | 786 | M | 3.5 | Left shoulder | Mild | No | No | Yes |
| | 148 | M | 2.5 | Right shoulder | Mild | No | Mild subepithelial | No |

NA = not available.

where these moose fibromas were obtained, cutaneous fibromas are common in white-tailed deer (Sundberg and Nielsen, 1982, J. Wildl. Dis. 18: 359–360). A papillomavirus has been isolated and characterized from fibropapillomas affecting European elk (*Alces alces*) (Moreno-Lopez et al., 1981, Virology 112: 589–595) which is distinct from the papillomavirus affecting white-tailed deer and mule deer (Lancaster and Sundberg, 1982, Virology 123: 212–216). More specimens need to be examined to find moose fibromas which contain papillomavirus from which virus can then be characterized and compared to those affecting other cervids.

Paraffin-embedded blocks of tissue have been deposited in the Armed Forces Institute of Pathology, Washington, D.C. 20306, USA (AFIP #1953887).