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Author: WOLKE, R. E.

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A CASE REPORT OF AN EPIDERMAL PAPILLOMA IN *Mustelus canis*¹

R. E. WOLKE, Marine Pathology Laboratory, University of Rhode Island, Kingston,
Rhode Island 02894, USA.

R. A. MURCHELANO, National Marine Fisheries Service, Middle Atlantic Coastal Fisheries
center, Pathobiology Investigations, Oxford, Maryland 21654, USA.

Abstract: A white, raised mass present on the caudal fin of a smooth dogfish shark (*Mustelus canis*) was identified as an epidermal papilloma with areas suggestive of carcinoma *in situ*. When examined by electron microscopy no structures or particles of viral origin were apparent.

INTRODUCTION

Neoplasms of fish are well recognized entities.^{1,2,4,6} Tumors have been reported in both the cartilaginous (Chondrichthyes, elasmobranchs) and bony (Osteichthyes, teleosts) fishes. Neoplasms appear to be more frequent and varied in teleosts than in elasmobranchs. Mesenchymal tumors, especially melanomas, are more frequent among the elasmobranchs than those of epithelial origin.¹⁰ While epidermal papillomas frequently occur in the higher fishes, no tumors of this type have been reported in the elasmobranchs.

The purpose of this paper is to describe an epidermal papilloma of the smooth dogfish (*Mustelus canis*) with areas suggestive of carcinoma *in situ*.

MATERIALS AND METHODS

A 94 cm smooth dogfish shark was captured by 3/4 Yankee Otter trawl offshore of Cape Hatteras, North Carolina (lat. 36°08', long. 75°36'), 25 April 1974.

Tissue for light microscopic examination was fixed in 10% seawater formalin, embedded in paraffin and sectioned at 6 μ m. Sections were routinely stained with

hematoxylin and eosin. Special stains included Mallory Trichrome, Feulgen and PAS methods.

Tissue for electron microscopic examination was obtained by deparaffinizing material embedded for light microscopy and re-embedding in Epon.

Sections of the tumor were submitted to the Registry for Tumors of Lower Animals, Smithsonian Institution, Washington, D.C.

RESULTS

Gross Pathology

A number of white, raised, umbilicated, rough surfaced excrescences were present on the right lateral aspect of the caudal fin. These masses were singular or in groups of five or six, randomly distributed, circular, and varied in diameter from two to 10 mm (Fig. 1). On cut surface, the tissue was white in color.

Histopathology

The normal epidermis of the smooth dogfish is composed of a non-keratinized stratified squamous epithelium overlying the base and sides of dentinal placoid scales (Fig. 2). The epidermis is quite

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thin (3 to 7 cells) and contains unicellular mucous glands. Distinct strata similar to those present in homeothermic vertebrates are not apparent; however, a basal cell layer lying immediately adjacent to the scale or dermis is present. Cells within this layer are ovoid to polygonal, contain large vesicular nuclei, a single nucleolus, and a frequently vacuolated cytoplasm. Their long axis lies at right angles to the underlying dermis or scale. Scattered within the basal layer and between the layer and the dermis are occasional groups of melanin-containing cells. Overlying the basal cells are layers of irregularly-arranged polygonal epithelial cells with homogeneous, non-vacuolated cytoplasm and smaller, deeply basophilic nuclei.

In areas of tumor growth, the epidermis surrounded scales and was greatly thickened due to extensive hyperplasia of the epithelial cells (Fig. 2). The hyperplastic epidermis overlaid thickened connective tissue papillae which gave the tumor its papillary configuration. Occasional foci of mononuclear inflammatory cells were present within the dermis. The tumor was not pedunculated but had a broad base of attachment. Small blood vessels were often present at the distal aspects of the finger-like projections (Fig. 3).

Cells of the basal layer had their long axis at right angles to the connective tissue papillae or the distal blood vessel. These cells, however, tended to have larger, denser nuclei and a non-vacuolated cytoplasm when compared to similar cells from normal epidermis. This long-axis orientation continued into the next three

or four layers of cells which had large, paler-staining, ovoid, nuclei and poorly outlined cytoplasm. Overlying cells were irregular in orientation and had round to ovoid basophilic nuclei. Outer layers were composed of squamous cells lying parallel to the outer surface. The cytoplasm was often vacuolated and the nuclei deeply chromatic. Cell borders were distinct and intercellular bridges present resulted in cells resembling the "prickle cells" of higher vertebrate stratum germinativum. Mitotic figures were rare in all the cell layers.

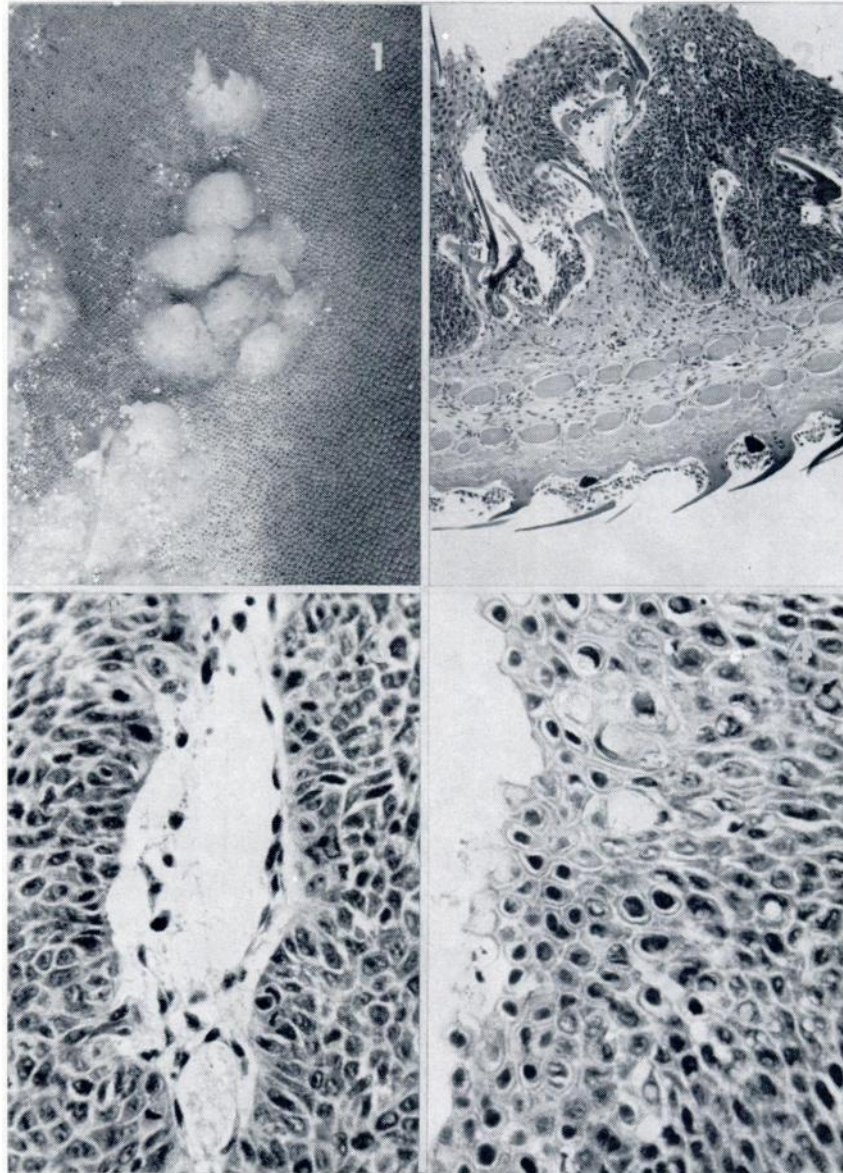
A focus of dysplasia suggestive of carcinoma *in situ* was present in one section (Fig. 4). The focus involved the outer most cell layers and was composed of a number of anaplastic cells with large, pleomorphic nuclei.

Electron microscopic examination of the tumor revealed essentially normal epithelial cells. No inclusions or viral particles were seen.

DISCUSSION

The papilloma is a benign tumor of epithelial cells which is frequently observed in homeothermic vertebrates. In poikilothermic vertebrates, its prevalence is high among the bony fishes.¹⁰ It is of interest to note the low prevalence of epithelial tumors affecting cartilaginous fishes and the apparent, heretofore, complete absence of reported papillomas in this group. It is doubtful that this prevalence accurately reflects actual occurrence. More likely it is related to the few careful post-mortem examinations conducted on these animals. Nonetheless,

1. Multiple, umbilicated, raised papillomatous masses on skin.
2. Section through caudal fin with papilloma at top of picture and normal epidermis at bottom. Note hyperplastic epithelium overlying thickened connective tissue papillae. X100 H + E.
3. Vascularized projection of hyperplastic epidermis. Note basal layer epithelial cells have dense nuclei, and pale, sparse cytoplasm and are oriented at right angles to blood vessel. X400 H + E.
4. Focus of dysplasia suggestive of carcinoma *in situ*. Periphery of tumor at left. Underlying cells are anaplastic with highly pleomorphic nuclei. X400 H + E.



one must consider the possibility that there may be something unique about these fishes which results in a lowered prevalence of neoplasia.

As one descends the phylogenetic scale, the histopathologic characteristics of the papilloma (i.e. thickened epithelium, irregular dermal papillae) are common to many species. These same characteristics were present in the elasmobranch papilloma. It is tempting to hypothesize that the similarities among species might extend beyond histological appearance and include etiology as well. Papillomas of man and many domestic animals are of viral origin. Wellings *et al.* in 1965¹⁰ reported virus-like particles within papilloma epidermal cells of the flathead sole (*Hippoglossoides elassadon*).

Similarly, a condition known as epidermal hyperplasia of freshwater fish has been reported in *Perca flavescens*, *Lepomis macrochirus* and *Stizostedion vitreum*. In the latter fish, virus particles were seen with electron microscopy.^{8,9} This epidermal hyperplasia resembles so-called fish pox of European cyprinids, which is also thought to be of viral etiology.⁵ Electron micrographs of shark papilloma epidermal cells revealed no particles or structures that might be construed as viral. However, it should be pointed out that the material was initially fixed in 10% formalin and re-embedded in Epon. While micrographs appeared to be of good quality and resolution, masking artifacts may have been present.

There are some gross and histologic similarities among the papilloma reported here and the epidermal hyperplasias and/or fish pox of freshwater fish. Grossly,

all three appear as raised white areas on the skin surface. The papilloma, however, was composed of discreet, round foci and its surface was umbilicated. Epidermal hyperplasia and fish pox are not so focally discreet or round and their surfaces are smooth, resembling a whitish, wax-like material.

Histologically, the papilloma consisted of more than simple epidermal hyperplasia. The dermis was thickened, thrown into finger-like projections and had focal areas of mononuclear inflammation. Walker⁵ reports no visible effect on the dermis in epidermal hyperplasia and Mawdesley-Thomas and Bucke⁵ and Lucky³ make a similar observation for fish pox.

Perhaps the most striking characteristic of this tumor is the focus of dysplasia suggestive of carcinoma *in situ*. There can be little question that the cells in this area are irregular, regressive, pleomorphic and dysplastic. Such a focus in a mammal would warrant a guarded prognosis and a probable diagnosis of carcinoma *in situ*. Only one malignant tumor, other than the questionable report of Stolk⁷ has been reported in an elasmobranch. This tumor, a splenic reticulum cell sarcoma, was submitted by O'Gara and Oliverio to the Registry of Tumors in Lower Animals, Smithsonian Institution, Washington, DC (RTLA 523). It is unfortunate that the shark's hazardous environment gives little chance for the debilitated animal to survive. Observations of the prevalence and biologic activity of neoplastic processes in these animals are difficult for the fish pathologist to acquire.

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