

Squamous Cell Carcinoma Upgrade of the Epidermal Papilloma Reported in an Ozark Hellbender (*Cryptobranchus alleganiensis bishopi*)

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The hellbender, *Cryptobranchus alleganiensis*, is a carnivorous, totally aquatic, giant salamander in the Family Cryptobranchidae. Two other species are classified within that family: *Andrias davidianis*, the Chinese giant salamander, and *Andrias japonicus*, the Japanese giant salamander. The Ozark hellbender, *Cryptobranchus alleganiensis bishopi*, is an isolated subspecies that lives in the White River and the Black River drainage of Missouri and Arkansas. Another subspecies, the eastern hellbender, *Cryptobranchus alleganiensis alleganiensis*, ranges throughout most of the Allegheny Mountains.

Six neoplasms have been seen in the giant salamanders. Three of those cases were in *A. japonicus*: 1) squamous cell papillomatosis (Frye et al. 1989) (RTLA 3765); 2) a well-collagenized fibroma on a foot (Vaillant and Pettit 1902) and; 3) a pedunculated fibroma on a hand (Schwarz 1923). The other three neoplasm cases were as follows: 1) a Sertoli cell tumor in an eastern hellbender, *C. alleganiensis alleganiensis*, (Cosgrove and Harshbarger 1971) (RTLA 233); 2) a poorly-differentiated sarcoma in a long-term captive hellbender, *C. alleganiensis*, donated by F.L. Frye (RTLA 7141) and; 3) this case in an Ozark hellbender, *C. alleganiensis bishopi*, (RTLA 6035)

reported as an epidermal papilloma based on biopsy samples of three grossly rugose lesions (Trauth et al. 2002).

On necropsy, additional tumor tissue from the Ozark hellbender became available for study. Tissue sections from this new material revealed invasion through the basement membrane and other features consistent with squamous cell carcinoma. The purpose of this paper is to present the information corroborating this diagnostic upgrade.

MATERIALS AND METHODS

An Ozark hellbender, 56 centimeter total length, 1,947 g mass, with multiple warty lesions up to 1.5 cm greatest dimension on the tail, leg and back was collected in Spring River, Fulton County, Arkansas in 1994. The three lesions were biopsied, formalin-fixed, sectioned, mounted on slides and stained with hematoxylin and eosin. Microscopic examination of the slides revealed that all three lesions were non-invasive, papillary epidermal neoplasms.

The animal was maintained 4-1/2 months in a cold aquarium on minnows and crayfish. At necropsy, internal lesions were not apparent. Additional cutaneous tumor tissue was taken and microscope slides were prepared as above. The study of these slides provided the basis for this report.



Figure 1. Normal skin. Stratified squamous epidermis borders loose dermal connective tissue. The dermis contains a band of subepidermal melanophores and two types of epidermal-derived alveolar glands. In this view two large eosinophilic dermal glands frame a small mucus gland. Approximately 75X.

RESULTS

Normal skin consists of stratified epidermis bordering loose dermal connective tissue. The connective tissue contains a subepidermal band of melanophores and at least two types of alveolar glands (Figure 1). Biopsy sections of the lesions showed a range of papilloma development from an initial epidermal thickening with shallow epidermal pegs to an exophytic mass of neoplastic epidermis with long pegs interdigitating with thin fibrovascular dermal papillae (Figure 2). Necropsy sections of the lesions revealed destruction of the basement membrane and invasion of tumor cells into the adjacent fibrous tissue (Figures 3, 4). Tumor cells in some areas were undergoing squamous metaplasia (Figure 5) while in other areas they were attempting to form skin glands (Figure 6).

DISCUSSION

This inaugural case of neoplasia in an Ozark hellbender is diagnostically upgraded from epidermal papilloma to squamous cell carcinoma. The upgrade of the skin lesions on this animal from benign tumors, based on biopsy material, to cancer was made possible by the study of additional tissue that became available at necropsy. This illustrates that the limited amount of tissue available in a biopsy might not be adequate for a definitive diagnosis and should be supplemented with additional tissue as soon as practicable.



Figure 2. Papillary neoplastic epidermis is forming an exophytic mass. Trapped dermal glands are being carried along within one area of the tumor. Approximately 15X.

The cause of squamous cell carcinoma in other animals has been variously linked to exposure to carcinogenic chemicals, solar radiation, or oncogenic viruses. The Ozark hellbender squamous cell carcinoma cannot be positively correlated with any of these possibilities at this time.

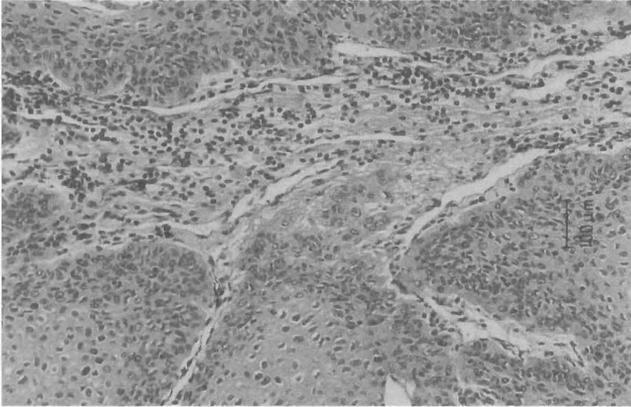


Figure 3. Three epidermal pegs of tumor cells are separated by tracts of fibrovascular tissue. The two outer pegs are sharply circumscribed by a basement membrane as in a benign tumor. In contrast, tumor cells compressing the central peg have breached the basement membrane and are invading dermal connective tissue as in a cancer. Approximately 75X.

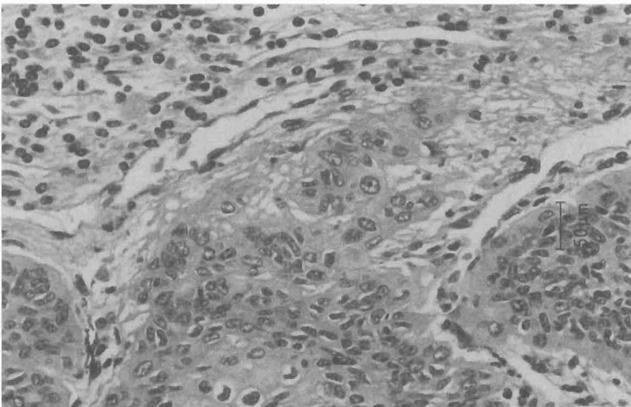


Figure 4. Higher magnification of Figure 3. Approximately 150X.

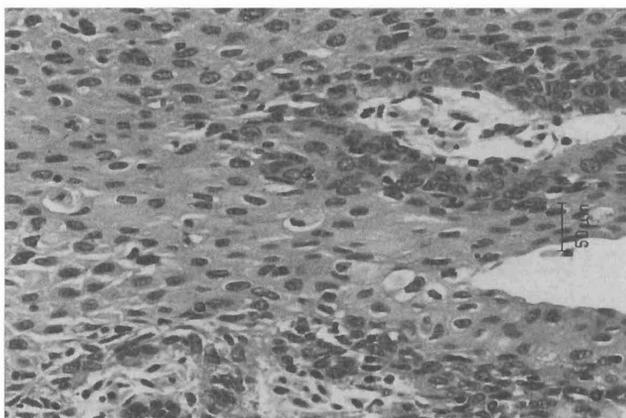


Figure 5. Tumor cells are becoming flattened or squamous. Approximately 150X.

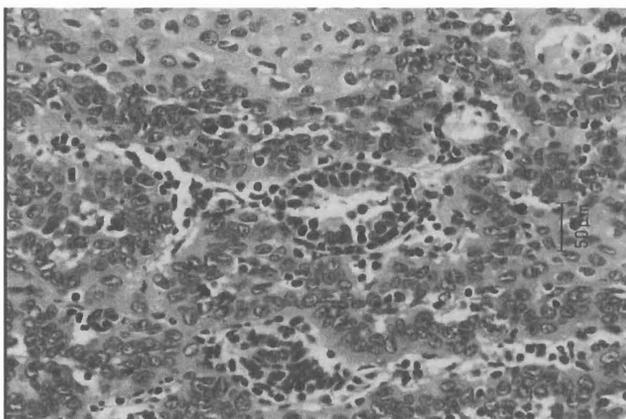


Figure 6. Some tumor cells are attempting to form glands. Approximately 150X.

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