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SEALPOX QUESTIONNAIRE SURVEY

T. M. WILSON,^[1] N. F. CHEVILLE^[2] and A. D. BOOTHE^[2]

Abstract: Employing skin biopsies fixed in various ways, received in response to a questionnaire survey, sealpox was confirmed by light and electron microscopic examination in five captive California sea lions, *Zalophus californianus*, one free-living harbor seal *Phoca vitulina* and one South American sea lion, *Otaria byronia*.

A nodular skin condition of unknown etiology is common among captive California sea lions, captive Stellar sea lions and captive elephant seals. A probable source of sealpox in aquaria and zoological gardens is infected animals captured in the wild.

INTRODUCTION

An epizootic of a proliferative skin disease in captive California sea lions, which included the electronmicroscopic demonstration of dumbbell-shaped poxvirus virions in the lesions, was reported in 1969.⁴ Morphological studies of this seal poxvirus, employing negative stained preparations, revealed mulberry forms (M) and capsular forms (C). The orderly pattern of the surface filaments and the size and shape of the M form revealed a similarity to Orf virus (Contagious Pustular Dermatitis) and Bovine Papular Stomatitis virus.⁵ In December 1969, an international mail survey was made of aquariums and veterinarians working with pinnipeds, requesting skin specimens and information concerning the incidence of sealpox in free living and captive pinnipeds. This paper reports the results of that survey.

MATERIALS AND METHODS

In December, 1969, a sealpox questionnaire was formulated and mailed to 120 addresses. Included with each questionnaire was a reprint of the original case report of sealpox⁴ to emphasize that such a condition did indeed exist and the need for such a survey.

The mailing list was composed from the following sources: Directory of Public Aquaria of the World,² the Nutritional Survey List of Keyes¹ and some members of the American Association of Zoo Veterinarians.

Skin biopsies received in response to the questionnaire were fixed either in 10% formalin, or 2-2.5% glutaraldehyde or 10% formalin and embedded in paraffin. Specimens were processed for light microscopic examination by routine procedures which included paraffin embedding and staining with hematoxylin and eosin. Formalin fixed specimens were prepared for electron microscopic examination as described previously.^{4,6,7} Skin fixed in glutaraldehyde and stored in sucrose phosphate buffer was post-fixed in 1% osmium tetroxide for 1 hour, dehydrated through a graded series of alcohols, embedded in Epon 812, sectioned and stained with lead citrate.⁸ Examination was made with a Philips 200 electron microscope at 60 kv.

The light microscopic demonstration of eosinophilic intracytoplasmic inclusion bodies in epithelial cells and/or the electron microscopic detection of poxvirus virions in these inclusions were the criteria used for the diagnosis of sealpox.

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RESULTS

Of 160 forms distributed, 83 (51%) completed and partially completed questionnaires were returned. Sealpox was confirmed in five captive California sea lions, one free-living harbor seal⁶ and one South American sea lion⁷ (Table 1).

A complete and accurate clinical history was only available concerning the skin condition in the South American sea lions.⁷ The skin lesions were raised nodules about 5 mm to 2 cm in diameter distributed over the entire body surface. Histological examination revealed the dermis to be infiltrated by cords of epithelial cells, many containing solitary large eosinophilic intracytoplasmic inclusion bodies.

No reliable clinical information was obtained in the survey concerning the skin lesions in the California sea lions and the harbor seal, other than those conditions were evident as raised multiple skin nodules. Histologically these lesions were characterized by parakeratosis, hyperkeratosis and hypertrophy and hyperplasia of the stratum spinosum. Eosinophilic intracytoplasmic inclusion bodies were present in stratum spinosum cells.

Additional results from the survey indicated the frequent presence of solitary and multiple skin nodules in young and old captive California sea lions, captive Stellar sea lions, *Eumetopias jubata* and captive elephant seals, *Mirounga* sp. The etiology of these skin conditions was not determined.

In two cases of confirmed seal pox, numbers 5 and 7 (Table 1), respondents listed a commercial animal dealer in California as the recent source of the infected animals. Correspondence and a personal visit with this animal dealer revealed that seals with solitary and multiple skin nodules were frequently captured. In fact, seals with multiple skin nodules were often released rather than retained and shipped to exhibits.

Light microscopic and electron microscopic examination of tissue biopsies have unequivocally demonstrated the existence of a skin pox condition in male and female juvenile and adult captive

TABLE 1. Confirmed Cases of Sealpox — Questionnaire Survey

Seal no.	Common Name	Scientific Name	Age	Sex	Seal Location	Light microscopic Intracytoplasmic Inclusion Bodies	Electron microscopic Pox virions in Inclusions
1. California sea lion		<i>Zalophus californianus</i>	9 mos.	♂	California	+	+
2. California sea lion		<i>Zalophus californianus</i>	1 yr.	♀	California	+	+
3. Harbor seal		<i>Phoca vitulina</i>	sub-adult	♂	Alaska	+	+
4. South American sea lion		<i>Otaria byronia</i>	6 mos.	♂	Kentucky (South America)	+	+
5. California sea lion		<i>Zalophus californianus</i>	1½ yr.	♀	Missouri	+	+
6. California sea lion		<i>Zalophus californianus</i>	1½ yr.	♂	California	+	+
7. California sea lion		<i>Zalophus californianus</i>	yearling	♀	New York	+	*

* not examined

California sea lions. A skin pox condition was also diagnosed in a free-living harbor seal and a young male South American sea lion.

Evidence from this study indicated that a potential source of sealpox in aquaria and zoological gardens is infected animals captured in nature. The diagnosis of pox in a harbor seal and a South American sea lion represents to our knowledge the first reports in the literature of such a condition. The South

American sea lions were affected with the skin nodules while they were in South America and the introduction of a foreign animal disease should be of concern to authorities.

This survey also indicates the existence of a nodular skin condition of unknown etiology in California sea lions, Stellar sea lions and elephant seals. Despite repeated attempts, no information or biopsies could be obtained to elucidate the etiology of these lesions.

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