

Identification of a Herpes-like Virus in Sea Otters During Rehabilitation After the T/V *Exxon Valdez* Oil Spill

by

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ABSTRACT.—During implantation of radiotelemetry devices in sea otters (*Enhydra lutris*) at the Seward Otter Rehabilitation Center, surgical team members noted ulcers in the oral cavity of each of five animals examined. Oral lesions were identified in 25 of 27 otters examined at the center. Histological evaluation of the lesions revealed focal areas of mucosal epithelial necrosis with associated intranuclear viral inclusion bodies. A herpes-like virus was subsequently identified ultrastructurally. The concern of releasing a virus of unknown origin and virulence into a naive wild otter population prompted management decisions restricting the movement of otters and jeopardizing the scheduled release of the otters on 27 July 1989. A team of veterinarians and otter capture personnel captured and examined 12 free-living adult otters off the coast of the southern Kenai Peninsula. Viral-induced oral lesions were identified in many of these animals establishing that the virus was indigenous to sea otters living in Alaskan waters; rehabilitated otters were released back into the wild.

On 15 July 1989, during implantation of radiotelemetry devices in sea otters (*Enhydra lutris*) maintained at the Seward Otter Rehabilitation Center (SORC), surgical team members observed ulcers in the oral cavity of each of five animals examined. Lesions consisted of variably sized, irregular white plaques and deep, often bilaterally symmetrical ulcers. In severely affected animals, the lesions coalesced to cover extensive areas of the labial, buccal, gingival, and glossal mucosa. Ultimately, oral lesions were identified in 25 of 27 otters examined at the SORC.

Although the oral lesions were often severe, the animals exhibited no noticeable changes in behavior or appetite. Nor were there notable changes in their clinical-pathologic values.

The primary concern after identifying a disease in such a high percentage of animals was the possibility that an infectious agent of unknown origin and virulence was involved. The potential exposure of the rescued otters to a pathogen, particularly a virus, originating either in domestic animals (such as canine distemper in the dog) or from other captured wild animals (such as the distemper-like virus in seals), was considered from the early days of the rehabilitation efforts. Because of this possible hazard, the question of rehabilitation and release back to the wild had been debated by parties involved in the rehabilitation process. Of paramount concern was the potential of releasing a pathogenic agent into a native population of sea otters. It was decided that the cause of the oral lesions should be identified before release of the otters from the rehabilitation centers. In addition, if the cause was determined to be an infectious agent, then proof that the infection was indigenous to wild otters was necessary. On 16 July, the day after the initial discovery of the oral ulcers, biopsy specimens of the lesions were shipped to the Armed Forces Institute

of Pathology (AFIP) in Washington, D.C., for histopathological evaluation.

On 17 July, while awaiting results of the histological examination, a pathologist familiar with the oral lesions at the Seward Center joined the radiotelemetry team in Valdez to examine the mouths of 12 sea otters to be implanted with radiotelemetry devices at the Valdez Otter Rehabilitation Center (VORC). No significant lesions were observed in these VORC otters.

On 19 July, results of the histopathologic evaluation were received from the AFIP; examination of the lesions revealed chronic ulcers with associated superficial bacterial colonies, as was expected. However, in the adjacent mucosal epithelium were separate foci of ballooning degeneration and necrosis with numerous Cowdry type A intranuclear inclusion bodies. The inclusions were morphologically consistent with those caused by herpesviruses in other species.

A tentative causative agent had now been identified in association with the lesions, but proof that the organism was a virus indigenous to sea otters still eluded investigators. On 19 July, a team composed of a clinical veterinarian and a veterinary pathologist was sent to an otter capture area off the southern Kenai Peninsula to join a capture team already in place. The purpose was to evaluate 12 otters in the wild with the hope of identifying oral lesions identical to those observed in otters at the SORC. Twelve otters were captured and examined between 19 and 23 July. Results of the clinical examinations were equivocal; small lesions were observed in the mouths of several otters, but none were bilateral (as many in Seward had been) and none were as severe as observed in Seward. Biopsies of the lesions were made and specimens sent to the AFIP. During this time, the AFIP reported that viral particles consistent with a herpesvirus

had been identified ultrastructurally in biopsy specimens from SORC otters.

While the team was in the field looking for evidence of the virus, a group composed of wildlife biologists and a virologist was in Anchorage examining the oral cavities of sea otters found dead immediately after the oil spill. These otters had been frozen and stored pending future scientific use or litigation. A few suspect ulcers were identified in two animals, and specimens were collected.

On 25 July, oral lesions similar to those seen at the SORC were identified in a sea otter pup transferred from the Jakolof Pre-Release Facility to Seward, suggesting that the virus was also causing disease in the otters maintained at Jakolof (subsequent evaluation revealed a number of affected animals at this facility).

It had now been established that a pathogenic virus was responsible for the oral lesions observed in otters at the SORC. Because the lesions were apparently confined to the oral cavity and did not cause a clinically significant disease, it was believed that the virus was probably indigenous to sea otters in Alaskan waters and of minimal health significance. However, because of the lack of unequivocal evidence of the organism in the wild otter population, it was decided that the animals could not be released. The planned release date was 27 July, and for logistical and political reasons it was important to meet this deadline. The virus had also created a management problem at the otter rehabilitation centers because movement of animals between the centers and to the Jakolof Facility had been suspended to prevent spread of the disease. Whether or not to bring additional oiled otters in from the wild was

also a dilemma because of the risk of exposing the animals to the virus. Most important, the lesions in the Seward animals were worsening; this was attributed primarily to the otters' close confinement, which resulted in stress and subsequent immunosuppression. In addition, high coliform counts in the tank water plagued the SORC.

On the morning of 27 July notification was received from the AFIP that viral inclusion bodies had been identified in biopsy specimens taken from the otters captured off the southern Kenai Peninsula. As a result of this information, the rehabilitated sea otters were released according to the established schedule.

Presently, lesions caused by this herpes-like virus have been identified in the oral cavity, on the lips and, in one case, in the cornea of an eye. We speculate that the viral lesions were secondarily infected by bacteria and then progressed to chronic ulcers. Generally, lesions in animals at the Seward and Jakolof centers—particularly at the former, were more severe than those observed in animals in the wild. This is attributed to the close confinement of animals at the SORC and to the high bacteria counts in the water at the center. Attempts to isolate the virus have thus far been unsuccessful.

The efforts involved in this investigation demonstrate the type of team approach and cooperation required to successfully evaluate the cause and significance of a disease process like that observed at Seward. Government and nongovernment scientists, managers, administrators, and technicians cooperated extremely well; this cooperation was largely responsible for the timely resolutions of the problem.

