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Author(s): Jonna A. K. MazetDVM, MPVM, PhD, Scott H. NewmanDVM, PhD, Kirsten V. K. GilardiDVM, Dipl ACZM, Florina S. TsengDVM, Jay B. Holcomb, David A. JessupDVM, MPVM, Dipl ACZM, and Michael H. ZiccardiDVM, MPVM, PhD


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Historical Perspectives

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Jonna A. K. Mazet, DVM, MPVM, PhD, Scott H. Newman, DVM, PhD, Kirsten V. K. Gilardi, DVM, Dipl ACZM, Florina S. Tseng, DVM, Jay B. Holcomb, David A. Jessup, DVM, MPVM, Dipl ACZM, and Michael H. Ziccardi, DVM, MPVM, PhD

Abstract: Oil spills affect aquatic birds on individual, population, and ecosystem levels. Communities have responded to environmental accidents and have cared for oiled birds for as long as the damaging effects of oil exposure have been realized. Not until the Exxon Valdez disaster occurred, however, was there the political climate necessary to facilitate and fund organized oiled wildlife responses in the United States. Federal and California law now supports the infrastructure necessary to respond rapidly and efficiently to oil spills affecting wildlife. This improved infrastructure has resulted in access to appropriately designed and equipped facilities, trained staff and volunteers, and research improving medical management and bird survival.

Key words: emergency response, oil spill, petroleum, avian, seabird, wildlife

Oil Spill Response—Past and Present

Oil spills have occurred from the beginning of society’s utilization and dependence on petroleum. The detrimental effects of petroleum on seabirds were noted during World War II, and reports documenting efforts to care for oiled wildlife appear in the literature from the middle of the last century.1–3 From the earliest responses, caregivers expressed an intense desire to ensure effective treatment and survival of affected birds. In fact, methods for thoroughly removing oil from bird feathers and evaluating waterproofing of plumage were tested as early as 1973.4,5 Unfortunately, few resources were available for these types of evaluations prior to the advent of organized oil spill prevention and response programs. Efforts to effectively care for wildlife are still suboptimal in many places internationally.

While most communities affected by oil spills have attempted some sort of environmental cleanup and humanitarian efforts to save wildlife, the official policies for oil spill response vary widely throughout the world. For example, lack of health and safety protocols during the response to the 1997 Nakhodka oil spill in Japan contributed to the death of a local resident cleaning beaches, and children were given leave from school to clean up oil. Additionally, as recently as 1998, hunters were encouraged to shoot oiled ducks as they beached themselves on the Isle of Amrum, Germany, despite wildlife rescuers standing by ready and able to provide care. Several rehabilitation organizations have developed excellent oil spill response and wildlife care capabilities. However, until recently, most of these organizations were unable to effectively integrate into the oil spill cleanup structure and were generally limited by a lack of funding for wildlife issues.

In the United States, public sentiment and national policy regarding oil spills has been forever changed through the vivid images of environmental damage caused by the 1989 Exxon Valdez oil spill. Approximately 250 000 birds were killed in addi-
tion to thousands of marine mammals, fish, invertebrates, and coastal animals. In order to prevent future environmental disasters of similar scale and to provide the infrastructure necessary for response when petroleum accidents occur, the Oil Pollution Act of 1990 became federal law. California responded in turn with the Lempert-Keene-Seastrand Oil Spill Prevention and Response Act, also in 1990. These laws provide a mechanism for reimbursement of cleanup costs when the party spilling oil cannot be identified or is unwilling or unable to pay. As a result, care for wildlife exposed to petroleum in the marine environment is now guaranteed in the United States.

Improvements in Organizational Infrastructure

Legislation in California (1990) established the Office of Spill Prevention and Response in the Department of Fish and Game. This office is charged with implementation of oil spill regulations, spill preparedness, and organized response, including the care of oiled wildlife and research aimed at both improving treatments and understanding the effects of oil on wildlife. As a result, California’s Oiled Wildlife Care Network (OWCN) was developed in conjunction with the School of Veterinary Medicine at the University of California, Davis. The OWCN has enabled vast improvements in oil spill response primarily by ensuring construction of and access to appropriately designed and equipped wildlife hospitals staffed by professionals trained in oil toxicity and seabird and marine mammal husbandry. The Network is now capable of efficiently caring for thousands of birds affected at any one time.

With the construction of facilities and training of staff and volunteers, the OWCN has developed a well-organized response infrastructure. Experts in field rescue, bird identification, emergency stabilization, avian medicine, captive husbandry, rehabilitation, and postrelease monitoring are available to respond within hours of notification throughout the year. The Network’s research program has enabled improvements in care by evaluating and modifying response protocols, developing new medical therapies, and contributing to our knowledge base on the effects of oil and captivity on seabirds and marine mammals. In addition, radiotelemetry-based postrelease survival studies are providing data on response success and feedback that facilitates protocol modification.

Effects of Oil on Aquatic Birds

In order to respond to oil spills in an organized and efficient manner, factors affecting the birds and our capabilities to rescue them must be understood. Oil spills are damaging to aquatic birds on individual, population, and ecosystem levels. Response success, measured by bird survival, is largely dependent on speed of recovery; availability of facilities, staff, equipment, and supplies; weather conditions at the time of response; physiological status of exposed birds (e.g., molt); toxicity and persistence of the petroleum product spilled; type of habitat impacted (e.g., wetland, sandy beach); and species’ susceptibility to toxicity and captivity stress.

Petroleum mechanically disrupts the complex feather structure required for thermoregulation and buoyancy. As a result, exposed birds usually have difficulty swimming, flying, and foraging and are unable to meet their metabolic needs. Most affected birds are hypothermic, hypoglycemic, hypoproteinemnic, and lethargic on presentation. Anemia may also be evident or may develop during the rehabilitation process. Clinical signs include respiratory distress, seizuring, and diarrhea that is often bloody. Corneal ulceration and chemical burns of feathered and nonfeathered skin and mucous membranes are common. Depending on length of exposure, birds may also show weight loss. Possible histopathologic lesions include evidence of aspiration pneumonia, ulcerative gastroenteritis, hemosiderosis, hepatic necrosis, hepatic lipidosis, pancreatitis, renal tubular necrosis, salt gland hypertrophy, adrenocortical hyperplasia, adrenal necrosis, and atrophy of the cloacal bursa.

Rapid recovery of exposed birds from oiled habitats has proven to be critical for survival. Quick response through collection of birds by organized search and recovery efforts both on beaches and by boat gives the best chance for successful treatment.
Advancements in Treatment and Medical Management

The prevention of aspergillosis is a major priority in medical management of oiled birds. This is evidenced by the results of postmortem examinations of oil-affected birds in rehabilitation centers and the evaluation of husbandry requirements for captive collections of aquatic birds. Facilities housing aquatic birds prior to washing should be kept warm to prevent hypothermia (approximately 27°C) but well ventilated (approximately 15 air changes per hour) to reduce the occurrence of this fungal disease as well as the continued irritation and toxicity of petroleum fumes. To avoid disease, susceptible species are treated prophylactically with itraconazole (15 mg/kg PO q24h) during their time of indoor rehabilitation. This period generally does not exceed 1 week.

While the spill response facility should be designed to minimize the spread of infectious diseases and maximize efficient flow of people, species-specific husbandry needs must be met during the stabilization period prior to washing. Pelagic species should be housed in net-bottomed pens to avoid pressure sores, as these species are not accustomed to encountering hard surfaces. Inflatable “doughnuts” may also be used to avoid keel lesions in emaciated or immobile birds and may also be useful when housing species unaccustomed to being out of the water, such as loons and grebes. Colonial species can be housed in multiple-animal enclosures to reduce stress and maximize the use of space.

All birds should meet minimum health criteria (eg, adequate packed cell volume, total plasma protein concentration, blood glucose concentration, and no apparent infectious disease) prior to washing. The washing and rinsing procedure appears to be one of the most stressful steps in the rehabilitation process, and birds that have not been stabilized (usually requires 48 hours of indoor care) prior to washing often die. The exception to immediate stabilization arises when highly volatile products (eg, diesel, jet fuel) are removed through a quick-wash procedure designed to remove the bulk of toxic product quickly but not to restore waterproofing. Wash and rinse water must be available consistently at normal body temperature and at an adequate pressure to penetrate the feather layer to the skin. Water should be softened to 2–3 grains of hardness to allow complete removal of oil and to prevent mineral crystallization in the feathers that will result in a lack of waterproofing. Repeat washing because of incomplete oil or soap removal is associated with increased mortality.

Other important improvements in oiled bird medical management include the prophylactic use of laxatives (lactulose, 0.3 ml/kg PO q12h), digestive aids (papaya enzyme, 1 tablet PO q12h), and aggressive fluid therapy for feather-eating species like grebes as well as the development of warm-water circulating pools for exercise and reduced feather damage in chemically burned birds. Additional techniques and pharmaceuticals for reducing the stress associated with the cleaning and rehabilitation process are currently being evaluated.

The desire to improve oil spill response is evident worldwide with the development of new techniques for deoiling, including an automated bird washing machine and the attempted use of iron filings. While such methods hold promise for reducing washing time and the associated handling stress, they have not yet been optimized to remove all oil or restore waterproofing and are not currently available in applications suitable for many commonly oiled species.

The ongoing efforts to improve oiled wildlife response are paying off. Recent studies evaluating the success of organized, protocol-driven responses have shown vastly better survival rates than expected based on previous reports. Western gulls (Larus occidentalis) heavily oiled with crude oil from a platform spill in California in 1997 survived...
the full length of monitoring radio life (183 days). This survival was equal to or better than a nonoiled comparison group as well as a nonoiled comparison group subjected to full deoiling and rehabilitation protocols. A subsequent study on common murres (Uria aalge) is also indicating improved survival (S. Newman, unpublished data, December 2001), and penguins oiled recently in South Africa have reproduced in the wild (J. B. H., unpublished data, December 2001).

Conclusions

The Oiled Wildlife Care Network has facilitated the standardization of wildlife response in California and reduced the chaos previously associated with oil spills. Facilitated by state and federal legal mandates, we have been able to plan and train for oil spills occurring in all probable habitats and affecting different species of concern. This planning has allowed for the selection and scaling of equipment, supplies, and trained personnel. The Network is now capable of rapid and thorough search and collection; efficient animal intake processing and physical examinations; stabilization of body temperature and other physiologic abnormalities; medical monitoring and triage; reduction of stress and maintenance of fluid and caloric needs; complete removal of oil from feathers with the restoration of waterproofing; evaluation of physical well being, behavior, and foraging ability prior to release; and selection of an appropriate release situation depending on status of the environmental cleanup, weather, and species-specific requirements. Access to facilities specifically designed to care for oiled wildlife and the use of carefully developed protocols by trained veterinary professionals, staff, and volunteers has improved survival rates. Through continued research and monitoring of postrelease survival and use of this organized infrastructure, advances in efficient oil spill response and emergency medicine will continue.

References