

WILDLIFE TOP 10 IN 2010: HOT TOPICS, NEW CHALLENGES, PROMISING SOLUTIONS

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Wildlife veterinary medicine is broad in scope and practice. As a discipline, it is the purview of professors and private practitioners, ranchers and regulatory veterinarians, conservationists and curators. That said, what constitutes an urgent and compelling issue for a head veterinarian at a rehabilitation clinic may greatly differ from what creates job security for a state wildlife veterinarian; a burning question for a wildlife health researcher at a university may be of little interest to a veterinarian who owns a farmed cervid practice. More often than not, however, perspectives and interests intersect or even converge. For example, when it comes to a problem like bovine tuberculosis in wild white-tailed deer in the upper midwest, crisis truly builds community among the seemingly disparate interests of state wildlife veterinarians, rehabilitators, ranchers, and hunters. Wildlife veterinarians as a whole share a concern for critical issues, problems, and solutions. Currently, top of mind for wildlife veterinarians around the United States, regardless of their particular jobs or focuses, are the following “Top 10” list of hot topics, new challenges, and promising solutions (in no particular order of importance).

POLLINATORS

In late 2006, worker bees started disappearing en masse from hives. Called *colony collapse disorder* (CCD), the etiology of this syndrome remains undetermined, although hypotheses include viruses, mites, environmental change-related stressors, contaminants, and exposure to genetically modified crops. The disorder is impacting the \$14.6 billion in commercial fruit, nuts, and other flowering crops that depend upon honeybees for pollination. While CCD is being investigated by the honeybee industry, agricultural extension officers and entomologists, there is tremendous concern among wildlife veterinarians for this disease as well as another emerging disease devastating another pollinator in the US: bats. First reported in 2007 in New York, a disease called *white nose syndrome* (WNS) has spread quickly to eight states and now affects at least five species: little brown, eastern pipistrelle, northern long-eared, small-footed, and Indiana bats. Researchers believe this fungal disease has already killed an estimated 500,000 to one million animals, and in some places it has decimated up to 97% of an affected colony. It is characterized by fluffy white lesions on the noses of bats, which are mats of a filamentous fungus in the *Geomyces* genus. Possible contributors to the emergence of the disease include

toxins, changing environmental conditions, or an as-yet undetected virus.

THE OCEANS

Several diseases have emerged in marine organisms in the last few decades. Some have caused outbreaks that have impacted thousands of animals (e.g., morbillivirus, toxoplasmosis); toxins have affected large proportions of populations of brown pelicans (organochlorines), California sea lions (domoic acid), and Atlantic bottlenose dolphins and manatees (brevetoxin). Increasing vessel traffic has led to more strikes on mammals; lost and abandoned fishing gear has been documented to entangle and “ghostfish.” There are many examples of where and how wildlife veterinary medicine is being applied to solve or ameliorate these problems, including marine mammal, bird, and turtle rehabilitation, oil spill response, derelict fishing gear recovery, and research.

Another potential but contentious solution to ocean impacts: mariculture. While the techniques and equipment for farming fish in the ocean have been tried and tested in other countries, the US federal and coastal state governments are grappling with concerns about the potential environmental impacts, including the potential for disease transmission from farmed to wild fish. To be sure, there are diseases now firmly established in wild fish populations that were introduced from farmed fish stocks (e.g., whirling disease in wild trout). It will be critical for veterinarians to partner with the mariculture industry and permitting agencies to develop and apply husbandry and hygiene measures to address these concerns, hopefully in ways that ensure that not lost in the debate is the fact that mariculture presents the potential for substantial relief from harvest pressures on wild fish populations.

ZOONOSES

Among the most closely monitored zoonotic pathogens in the world are the viruses that have emerged only relatively recently from wildlife species. Human immunodeficiency virus has been traced to the jump of simian immunodeficiency virus from nonhuman to human primates. Outbreaks of Ebola virus and Marburg virus—highly lethal human diseases with case fatality rates approaching 90%—are also linked to contact with infected nonhuman primates. West Nile virus was unknown to the Western Hemisphere until first detected in captive exotic birds on the East Coast of the US in 1999. The SARS outbreak in East Asia in 2002–2003, caused by a previously unrecognized corona virus, and the emergence of Nipah virus in Southeast Asia in 1999, were traced to wildlife reservoirs (civets and fruit bats, respectively). Wildlife veterinarians remain ever vigilant for new clinical presentations in free-ranging species, and/or the occurrence of known pathogens in new host species, and play key roles in not only the recognition of these events, but in their control, as well as their further study.

THE WILDLIFE–LIVESTOCK INTERFACE

Disease at the wildlife–livestock interface has single handedly swelled the ranks of veterinarians working for federal and state wildlife, natural resource, agricultural and regulatory agencies in the last 20 years— it is literally the bread and butter of wildlife veterinary medicine in the US today. The big three— bovine tuberculosis, brucellosis, and chronic wasting disease— are responsible for the majority of policymaking (and subsequent budgeting) at the state and federal levels in wild animal management, ranching, transport, and recreation. Diseases of wildlife have risen to the public consciousness largely because diseases shared by wildlife and livestock species garner more media attention, but also because these diseases impact individuals' lives, either through new regulations on hunting and feeding wildlife, limits on movement of ranched species, or simply the experience of viewing an affected animal in the wild.

THE WILDLIFE–SUBURBIA INTERFACE

Human development has severely encroached upon wildlife landscapes around the globe, and presents an ever-growing threat to the sustainability of wildlife populations, not only in terms of availability of feeding and breeding habitat and migration corridors, but also in terms of exposure to domestic animal (and human) pathogens. Recent examples include canine distemper outbreaks in African lions in close contact with domestic dogs; domestic cat FeLV exposure in Florida panthers; toxoplasmosis in southern sea otters; and bovine tuberculosis in white-tailed deer in the Upper Midwest. As human and domestic animal communities come into ever closer contact with wildlife, the potential for the emergence of a new disease in a vulnerable wildlife population grows, and vice versa (e.g., rabies transmission to pets; Nipah virus in swine).

IMMUNIZING FREE-RANGING WILDLIFE

While it is true that many infectious diseases can be successfully prevented in individual wild animals with vaccines, immunizing populations of wild animals requires methods and tools either not readily available or easy to apply to free-ranging animals. That said, the existence of pathogens carried by wildlife species that are of high zoonotic risk and/or of great economic impact to domestic animals, and of endangered wildlife populations for which disease presents a significant extinction threat, has spurred the development and application of vaccines for some diseases in some wildlife populations. Vaccines have been applied with varying success to control rabies in raccoons, anthrax in wood buffalo, brucellosis in elk, and distemper in black-footed ferrets. Researchers have also experimented with, or proposed vaccination protocols for, West Nile virus in birds, botulism in waterfowl, plague in prairie dogs, and even Ebola virus in great apes. Immunizing wildlife is controversial, expensive, and long term, and is really a last resort in confronting the disease havoc wreaked upon wildlife by human activities.

WILDLIFE TRADE

The global illegal trade in live wildlife and wildlife parts is the second largest illegal trade in the world, just behind narcotics and ahead of weapons and ammunition. Estimates are that the global trade in millions of individual mammals, birds, reptiles, and fish captured and sold for consumption, display, or private ownership generates somewhere between \$10 and \$20 billion per year. Not all wildlife trade is illegal: in fact, the United Nation's Convention on International Trade in Endangered Species (CITES) is an international agreement that implicitly promotes trade, aiming to "ensure that the international trade in wildlife and plants does not threaten their survival." Local trade in wildlife also occurs: bushmeat, or wildlife caught for local consumption, is of huge importance and concern in several countries in western and central Africa. Wildlife trade is a major issue for wildlife and regulatory veterinarians because of the threat it poses not only to the sustainability of populations under harvest pressure (e.g., sharks harvested for fins), but for the potential for introduction of a new pathogen in an area or species in which the pathogen has been previously unknown. For example, highly pathogenic H5N1 influenza was detected in England in an infected imported bird, which proved to be the tipping point for the European Union's decision to halt the importation of wild-caught birds.

CLIMATE CHANGE

Signals of the biological impacts of global climate change are already being seen in the abundance and distribution of species around the world, and it threatens the sustainability of numerous species and communities (e.g., polar bears, coral reefs). As well, we are beginning to see how climate change may be influencing the incidence and prevalence of disease in wildlife: avian malaria is infecting birds at ever higher elevations, effectively shrinking available malaria-free habitat for vulnerable species; harmful algal blooms are occurring with increasing frequency, causing toxin-related mortality events in marine birds and mammals; marine morbillivirus has been detected for the first time in the North Pacific, having likely moved from infected populations in the Atlantic via corridors in the Arctic open for the first time with melting of the Arctic ice cap. Veterinarians are only just now beginning to deal with the initial stages of what will likely be one of the most significant risk factors for disease outbreaks and disease emergence in wildlife in the 21st century.

ONE HEALTH

The concept that the health of humans, animals, and the environment are linked and should be considered holistically as "One Health" is not necessarily a new concept, but its full embrace by the human and veterinary medical communities is a relatively recent phenomenon, and is now influencing approaches to governance, policy, and education. The impetus has derived from the recognition that today's generation of people may be the first in recorded history to experience

a reduced life expectancy, and that to address growing and new needs for health research and delivery, the world could no longer afford to separate the disciplines. The American Medical Association and the American Veterinary Medical Association issued a joint proclamation on One Health in June 2007 and proceeded to establish the One Health Initiative with other health-related organizations and agencies.

TRAINING TOMORROW'S LEADERS

As a discipline, clinical veterinary medicine first focused on ensuring the vitality and utility of beasts of burden; in the 20th century, with greater economic affluence and more people living in urban environments, the focus of clinical veterinary practice shifted to administering health care to companion animals. In the 21st century, emerging diseases, global environmental

change, and new or increasingly complex interfaces among people, animals, and environments are shifting the veterinary medicine paradigm once again, this time towards ecosystem health. There is an ever-growing need for veterinarians with requisite skills, broad knowledge and firm dedication to free-ranging wildlife and the habitats upon which they depend, to serve as integral members of interdisciplinary teams of problem-solvers and health promoters. The last 10 to 15 years have seen an exponential increase in the number of students entering veterinary school with an abiding interest in wildlife, and a concomitant expansion of curricular offerings and training opportunities in these areas in many schools. This is helping to feed the burgeoning ranks of veterinarians in the public and private sectors practicing wildlife medicine and implementing wildlife health programs.