Canadian Cooperative Wildlife Health Centre

Centre Canadien Coopératif de la Santé de la Faune

Wildlife Health Centre Newsletter

National Information Line 1-800-567-2033

Volume 10 Summer 2004 Number 1

In this issue:

Canada's National Wildlife Diseases Strategy is Taking Shape

More than 50 wildlife disease experts met in Ottawa in April 2004 to develop action plans for the implementation of the National Wildlife Disease Strategy, which is currently under development. The Strategy will be used by governments at all levels to minimize the harmful effects of wild animal diseases.

The rapid pace of disease emergence in Canada and around the world at the beginning of the 21st century has created new challenges for public health, livestock health, wildlife management and national and regional economies. In the first six months of 2003, wild animal diseases were second only to war in claiming attention and causing exceptional expenditure by governments around the world.

Severe Acute Respiratory Syndrome (SARS), caused by a virus attributed to small wild carnivores in Asia, had cost the world economy approximately $136 billion as of June 2003. Other wildlife diseases, such as Bovine Tuberculosis, West Nile Virus, Monkey Pox and the Ebola Virus have affected international trade, caused human illness, strained response capacities and cost millions of dollars. It's estimated that about 70% of new or newly important diseases affecting human health and human economies worldwide have a wild animal source.

In Canada, governments and industries have invested heavily in eradicating Chronic Wasting Disease from Canadian farms. The effects of West Nile Virus and Avian Flu have also placed burdens on public health care budgets and the national economy.

The National Wildlife Disease Strategy is a collaborative initiative to develop a coordinated and integrated approach to wildlife disease management in Canada. Federal, provincial and territorial departments and agencies are working with non-government organizations, universities, and industry to finalize and implement this national plan.

"The Strategy will provide a firm foundation for researchers, wildlife managers, and animal health practitioners to develop effective wildlife disease management strategies, particularly by promoting scientific research and collaboration and communication among participating agencies," said Damien Joly, a research associate with the University of Wisconsin's Department of Wildlife Ecology, who attended the Ottawa workshop.

The Strategy includes six goals: the prevention of emergence of new wildlife diseases; the early detection of new wildlife diseases; rapid response to new wildlife diseases; effective disease management; education and training; and communication. Officials in the public health, agriculture and trade, and wildlife resource management sectors developed draft action plans for each of the goals at the workshop.

Wildlife scientists rubbed shoulders with veterinarians, academics, representatives of NGOs and governments, and communications experts at the three-day session in Ottawa. "I found it to be quite a unique gathering of professionals from diverse backgrounds and areas of interest," said Dr. Todd Shury, a wildlife health specialist with Parks Canada. "I think the resulting document will provide a useful template for the next scary wildlife disease that will ultimately confront the Canadian public over the coming years. I hope we can build on the strong personal linkages developed at the workshop to manage wildlife disease more effectively," he said.

The strategy is overdue, according to Dr. Vince Crichton, a senior scientist with the Manitoba government. "Being a practicing wildlife biologist who has preached the importance of diseases for many years, it is most gratifying to see that the issue is now getting the attention that it deserves," he said.

Workshop participants identified a number of priorities for immediate action, including determining lead responsibility and clear authority for the strategy, ensuring that it is adequately funded, and putting effective surveillance and response mechanisms into place.

"SARS, West Nile virus, BSE and chronic wasting disease have made it evident that effective disease surveillance and management must consider man, domestic animals and wildlife," said Gordon J. Glover, a veterinarian from Assiniboine Park Zoo in Winnipeg. "Our ability in Canada to monitor wildlife health status and respond appropriately to changes in health have not kept pace with the increased risk of disease introduction," he said.

Participants agreed that the role and capacity of the Canadian Cooperative Wildlife Health Centre (CCWHC) should be expanded, and that it should act as the central hub for implementation the national strategy. The CCWHC already provides a national inter-agency program of wildlife disease surveillance and technical data to inform policy and program decisions related to wildlife conservation and management, public health and agriculture. It is located at Canada's four veterinary colleges and funded by federal, provincial and territorial agencies and others.

The National Wildlife Disease Strategy and the six action plans have been endorsed by the Canadian Wildlife Directors Committee. They will be reviewed by federal, provincial and territorial Deputy Ministers of wildlife, forests, and fisheries and aquaculture in June and by Ministers later this year.

As workshop participants headed home, they felt positive about the outcomes of the workshop, and the path ahead. "The atmosphere was generally supportive and cooperative and, dare I say, there was a bit of excitement and optimism," said Helen Schwantje, a wildlife veterinarian with the Government of British Columbia. "It was time well spent."

Trevor Swerdfager, Director General, Canadian Wildlife Service, Environment Canada

The National Wildlife Disease Strategy and the six action plans are available for review and public comment on the Canadian Wildlife Service's website at: http://www.cws-scf.ec.gc.ca/cnwds/index_e.cfm

Report of the Expert Scientific Panel on Chronic Wasting Disease in Canada

On June 10-12, 2004, an international panel of scientists met in Saskatoon to review all available information relevant to Chronic Wasting Disease in wildlife in Canada. The Panel's report (available on line at <http://wildlife.usask.ca>) was released on 4 August and received considerable attention from stakeholders and the media.

Executive Summary of the Panel's Report: This document represents a summary of discussion, conclusions, and recommendations of an Expert Scientific Panel convened to: 1) provide a synopsis of chronic wasting disease (CWD) in free-living cervids in Canada, 2) evaluate the ecological and socio-economic implications of CWD in Canada, and 3) make recommendations on research and management actions to minimize and mitigate the effects of CWD in cervid species.

The emergence of chronic wasting disease, a transmissible spongiform encephalopathy potentially affecting mule deer, white-tailed deer and elk, is arguably the most important issue in the management of free-living cervids in North America. The disease has the potential to reduce cervid populations in the long-term, and to create major socio-economic impacts as observed in other areas in North America.

CWD has been detected in western Canada only recently, first in 1996 in farmed cervids and subsequently in 2000 in free-living cervids in Saskatchewan. Epidemiological investigations and surveillance programs of farmed cervids identified 40 game farms in Saskatchewan and 3 game farms in Alberta with the disease. CWD is thought to have been introduced into farmed cervids in Saskatchewan during the late 1980s by the importation of CWD-infected elk from South Dakota. Management programs to eradicate the disease in farmed cervids appear to have been successful and there are currently no known infected farms in Canada. Environmental contamination of some CWD-infected premises continues to pose a potential threat to wildlife. Of most significance, the presence of CWD in wild deer in some areas is a potential source of infection for farmed cervids and poses a continued threat to the long-term economical viability of cervid farming.

In Canada, CWD in free-living cervids appears restricted to three relatively distinct geographic foci in Saskatchewan, although surveillance efforts in many areas are inadequate to detect the disease at low prevalence. Hence, the disease may yet be detected in other areas. Intense, risk-based surveillance to determine the distribution of this disease should be a high priority over the next few years. Demonstration of a more widespread distribution of CWD within Saskatchewan or elsewhere in Canada would affect management responses to this disease. Results over the last two years in the Saskatchewan Landing area, Saskatchewan, indicate CWD is well established in the local mule deer population. In spite of initial attempts to reduce deer densities by increasing hunting harvest, deer densities in most areas of western Canada are more than sufficient to allow CWD to spread and increase in prevalence.

The range of species that may be infected with CWD is not known with certainty. Information from the USA would indicate all mule deer, white-tailed deer and elk are susceptible to the disease. Infection in moose has been recently confirmed experimentally, but similar data for caribou are not available. CWD does not appear to pose a risk to cattle or bison. The risk to humans appears to be extremely low. Nonetheless, the World Health Organization and other government health agencies recommend that any animals with a TSE disease not be consumed by humans.

The panel concludes that the emergence of CWD in free-living mule deer and white-tailed deer in Saskatchewan warrants an aggressive regional and national management and research response to prevent further spread of CWD and to control or eliminate the disease in wild cervids. The recent introduction of CWD in Canada, and its restricted distribution, provides Canada with a unique opportunity to manage CWD before it is too late.

Once established in a population of free-living cervids, control or eradication of CWD is extremely difficult. Preventing establishment of new foci of CWD should be given the highest priority, which entails preventing the movement of CWD-infected cervids and infectious material to new areas. To prevent natural spread from endemic areas, and to reduce potential environmental contamination with infectious prions, severe population reductions of deer, to levels of <1 animal/km^2 of critical habitat, will likely be required for at least a decade.

Complete removal of deer in local areas may eliminate focal introductions of CWD. Deer densities that can prevent spread of CWD, and sizes of buffer zones to contain CWD, are largely unknown at this time. Management programs will need to be developed using a research framework, and updated as we learn about this disease.

Canada is at a critical juncture in its response to CWD in free-living cervids. The Panel recognizes the success of the federal CWD program for game farms and

envisions a comparable investment in the management of CWD in wildlife. Significant investment in CWD management and research by federal and provincial governments, within a national framework, is required and urgent in order to develop an effective response to this emerging disease.

Expert Scientific Panel on Chronic Wasting Disease:
Dr. Trent Bollinger, CCWHC, SK, Canada
Dr. Peter Caley, CSIRO, Canberra, Australia
Dr. Evelyn Merrill, Univ. of Alberta, AB, Canada
Dr. François Messier, Chair, Univ. of Saskatchewan, SK, Canada
Dr. Michael W. Miller, Colorado Div. of Wildlife, CO, USA
Dr. Michael D. Samuel, Wisconsin Coop. Wildl. Res.

CCWHC - International: Costa Rica

[In April 2004, Dr. Maria Forzan, CCWHC-Atlantic Region, traveled to Costa Rica to work with colleagues engaged in establishing a national program of wildlife disease surveillance. A key component of this new program will be use of the CCWHC database and related information technology to manage data that the new surveillance program will generate. Here, Dr. Forzan describes her visit to Costa Rica.]

Last fall 2003, Dr. Mario Baldi contacted the CCWHC asking for help in setting up a wildlife surveillance network in his home country, Costa Rica. Because I am a native Spanish speaker, I became the primary contact between the CCWHC and Dr. Baldi. Although the CCWHC has no resources dedicated to international work, we felt we could help by providing access to the CCWHC database, sharing our experience with disease surveillance programs, and through some training and education. The database access would be established at the Facultad de Medicina Veterinaria of the Universidad Nacional in Costa Rica (UNA). Education initially would be geared towards veterinary students and, later, toward field personnel.

After several months of discussion and planning, I traveled to Costa Rica in April to meet the surveillance program team, set up database access, and help give a short course on wildlife diseases and surveillance to the veterinary students at UNA. The course included use of the CCWHC database, and techniques in field necropsy and sample collection. Approximately 35 students registered for the 3-day course. The Veterinary Student Association at UNA, headed by Ana Cecilia and María Pía Martín booked seminar rooms, organized coffee breaks and refreshments, and paid the expenses of the course by collecting a small fee from the attendees.

Figure 1. Dr. Juan Alberto documents disease in a Boa

The course was given by myself, Dr. Baldi, and the two veterinary pathologists at UNA, Drs.Alexis Berrocal and Juan Alberto Morales. Together with Dr. Carlos Jimenez, a virologist and Dr. Magali Caballero, director of the Veterinary School and the school's bacteriologist, they are very keen on exploring and documenting wildlife diseases in Costa Rica. In past years, they have done as much wildlife disease work as possible, but resources to support this work are very limited.

During my visit, access to the CCWHC database was successfully set up in the pathology and virology departments of UNA. All those involved in the project were impressed with the capacity of the database for managing records wildlife diseases. Thus, we have made this small contribution to wildlife disease surveillance and management in Coast Rica. However, much more help is needed. Although assistance continues to be sought from many national and international sources, there currently are no resources to support wildlife disease surveillance in the country. A few thousand dollars in annual surveillance operating funds would make a huge difference to wildlife conservation and management, as well as to human and domestic animal health, in Costa Rica. In the meantime, our Costa Rican colleagues will carry on a limited program of wildlife disease surveillance with such resources as they can find. We all hope to maintain and expand the link established between UNA and CCWHC, and look forward to future collaborations.
(Maria Forzan, CCWHC - Atlantic Region)

Figure 2. Dr. Mario Baldi and students at the wildlife short course

DISEASE UPDATES

Atlantic Region

Protozoal infection of the brain in Northern Gannets

Of 143 carcasses of Northern Gannets (*Morus bassanus*) examined at the Atlantic Veterinary College (AVC) between 1988 and 2003, six, including three in 2003, were found to have fatal inflammation of their brain (encephalitis). In two of the three 2003 cases, protozoan-like microorganisms also were found in the affected areas of the brain.

Northern Gannets are strictly marine birds that forage mainly along coastlines of eastern Canada and New England in summer and off the Carolinas and further south in winter. Although the protozoan found the 2003 gannets have not yet been identified, Spalding and coauthors described encephalitis associated with the protozoan *Sarcocystis* sp. in a Northern Gannet from Florida (2002, Journal of Wildlife Diseases 38:432-437). Various species of this parasite are commonly found in wildlife and domestic animals. They cycle between herbivorous intermediate hosts (typically found as cysts in muscle) and carnivorous final hosts (typically as coccidia in the intestine). The *Sarcocystis* found in the Florida gannet was closely related, if not identical, to a *Sarcocystis* species for which the definitive host is the Virginia Opossum (*Didelphis virginiana*). Spalding and coauthros suggested that, because the normal life cycle of the opossum *Sarcocystis* is land-based, discharge of waste water from the human environment into coastal habitat could have need the a source of infection.

Encephalitis associated with *Sarcocystis* and with another protozoan with a similar life cycle, *Toxoplasma gondii,* also has been described in Sea Otters (*Enhydra*

lutris nereis) along the coast of California (Kreuder et al., 2003, Journal of Wildlife Diseases 39:495-509), and Harbour seals (*Phoca vitulina richardsi*) along the coasts of California, Oregon and Washington have been found with encephalitis caused by *Sarcocystis* (Lapointe et al., 1998, Journal of Parasitology 84:1184-1189). In these instances, coastal freshwater runoff or municipal sewage discharge were suspected to be the sources of infection. (Pierre-Yves Daoust, CCWHC regional centre)

Capture Myopathy in River Otters Associated with Transmitter Implantation and High Concentrations of Mercury in Tissues.

During a life-history study of River Otters (*Lutra canadensis*) in southwestern Nova Scotia, wild otters were caught in live-traps and retrieved within 24 hours. Intra-abdominal radio-transmitters were implanted in these animals under anaesthesia and aseptic conditions, and the otters were released back into their habitat. Two of these otters died within 24 hours after surgery and the cause of death was massive muscle damage, a phenomenon called "capture" or "exertional" myopathy. This diagnosis was based on post mortem examinations that revealed brownish urine (2 animals), very high muscle enzymes in serum (1 animal tested), which indicate leakage from damaged muscle cells, and microscopic evidence of damage to skeletal and heart muscle (1 animal). We think that the stress of capture, handling and anaesthesia was severe enough to result in strong muscle contractions that were sustained for a long enough time to damage the otters' muscle cells. This pathological process has been known for many years to occur in wild herbivores subjected to capture and restraint, and it now is being recognized in a much wider variety of animal species, including otters (Hartup et al. 1999. Journal of Wildlife Diseases 35:542-547).

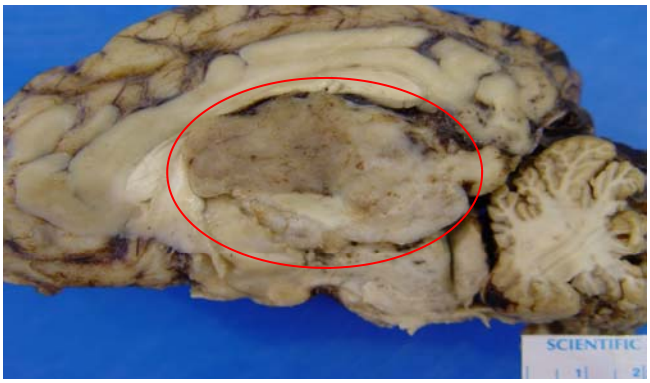
Fish-eating animals in southwestern Nova Scotia may have the highest burden of total mercury in North America (Klenavic 2004. MSc Thesis, Trent University). These two otters had total mercury levels that were higher (10.2 parts per million [ppm] and 25.0 ppm, respectively) than the highest levels recorded previously (mean, 3.80 ppm; range, 0.84-6.88 ppm) (all values on a wet weight basis). In environments with high levels of total mercury, selenium is known to accumulate together with mercury in body tissues as inert chemical complexes. Selenium itself is important in metabolic processes that protect animals against the kind of tissue damage that occurs during capture myopathy. Thus, it is perhaps pertinent to wonder whether accumulation of mercury in large amounts, as had occurred in these otters, may also interfere with the normal function of selenium and thus make animals more susceptible to capture myopathy.
(Tommy O'Brien and Tim O'Brien, Tri-County Veterinary Clinic, Nova Scotia; P-Y Daoust, CCWHC regional centre)

Primary Brain Tumors in Two Free-ranging Cervids

Case 1 - White-Tailed Deer: On February 22, 2002, the Department of Natural Resources and Energy office in Blackville, New Brunswick was called to investigate a healthy looking wild White-tailed Deer (*Odocoileus virginianus*) which was circling and running into bushes, behaviour it had been exhibiting for about a week. The deer was killed humanely and examined. A pale grey mass of tissue was found in brain, and was identified as a brain tumor, and, more specifically, as an oligodendroglioma.

Case 2 - Moose: An adult female Moose (*Alces alces*) was observed unalert and dragging its hind leg through the snow on February 14, 2004 in western Newfoundland. The animal was killed humanely by the investigating conservation officer from the Newfoundland Wildlife Division and its head was sent to the Animal Health Division, St. John's, for examination. An oval mass of tissue was found in the brain. The mass was determined to be a brain tumor, classified as an astrocytoma.

Figure 3. Brain Tumour (Astrocytoma) in Moose (Case 2)



Brain tumors have been reported a few times in free-ranging cervids, including white-tailed deer and elk (*Cervus elaphus*). However, the literature is sparse with respect to neoplasms in wild moose, and, to our knowledge, this is the first report of a primary brain tumor identified in this species. Case 1 here also appears to be the first oligodendroglioma reported in this White-tailed Deer..

Many times, cervids exhibiting abnormal gait or other behaviour are not submitted for necropsy because they are assumed to be suffering from traumatic injuries or parasitic diseases (e.g. *Parelaphostrongylus* or *Elaphostronglylus* - "brainworm"). The identification of two previously unreported brain tumors as the cause of the neurological problems in this moose and white-tailed deer highlights the value of a complete post mortem examination to provide accurate diagnoses, adding to our understanding of wildlife diseases.

(S. McBurney, CCWHC Atlantic Region; J. Goltz, Provincial Veterinary Laboratory, Fredericton, New Brunswick; and H. Whitney, Animal Health Division, Newfoundland Department of Forest Resources and Agrifoods)

Kidney Failure in Snowshoe Hares - More Specimens Needed

In the past two years, three Snowshoe Hares (*Lepus americanus*) dead from acute kidney failure have been examined, one each from St. Esprit, Cape Breton, NS; Loon Lake, Central NS; and Fortune, Eastern PEI. All three hares were in good body condition, and, in each animal there widespread destruction of kidney tissue, classified microscopically as acute tubular necrosis (ATN).

ATN typically is caused by failure of blood supply, as from blood clots in vessels, or one of several poisons. In none of these cases could the cause of ATN be determined In fact, ATN is rarely seen in wild animals. To identify it in three snowshoe hares from three different regions of the Maritime provinces over a relatively short time period demands further investigation as to the cause. We therefore encourage the submission all Snowshoe Hares found dead and in a reasonably fresh state.

(S. McBurney, A. Ferraro, PY. Daoust, CCWHC, Atlantic Region; and L. Ferns, Department of Agriculture and Fisheries, Truro, NS)

Quebec Region

MARINE MAMMALS EMERGENCY NETWORK - ST. LAWRENCE RIVER

A new Marine Mammal Emergency Network, that includes governmental agencies and Quebec private groups working with marine mammals, was established last spring. The mandate of this network is to organize, coordinate, and implement strategies to reduce accidental mortality of marine mammals, to rescue distressed animals, and to examine dead animals. The members of the network are Biodôme de Montréal, Fisheries and Oceans Canada, Parks Canada, Parc Aquarium du Québec, Groupe de recherche et d'éducation sur les mammifères marins, Station de recherche des îles Mingan, Bas Saint-Laurent Marine Mammal Ecowatch Network, and Institut national d'écotoxicologie du Saint-Laurent. The Quebec Regional Centre of the CCWHC offers veterinary expertise to this network. This network will improve surveillance efforts related to mortality and morbidity in marine mammals of the St. Lawrence estuary. For more information, or to report a marine mammal dead or in difficulty, please contact *Urgences mammifères marins* (1-877-722-5346). (Stéphane Lair - CQSAS / CCWHC Quebec Region)

ST. LAWRENCE BELUGA HEALTH SURVEILLANCE PROGRAM: 2003

In 2003, we examined eight belugas found stranded on the shores of the St. Lawrence Estuary. Two were new born animals found at the end of July. Since there were no pathologic conditions that could explain these strandings, it is assumed that these two calves died after having been abandoned by their mothers (inexperienced mothers, calves too weak to follow, etc.).

Traumatic lesions were observed in two adult belugas and probably were responsible for these strandings. A seventeen-year-old-male had an open fracture of the upper jaw while a seventeen-year-old-female had seven fractured ribs which had caused multiples perforations of the lungs. This female, found stranded in October, was actively lactating, indicating that she had given birth during the summer. Her calf also would have died after the death of its mother. While it is not possible to determine the exact cause of the fractures observed in these two animals, collisions with boats are the most probable explanations, emphasizing that marine traffic may have an important impact on this cetacean population.

Two animals died of bacterial infections. An adult male found in August had severe pneumonia associated with *Edwardsiella tarda*. The bacterium present in several organs, indicating a multi-system infection (septicemia). A 23-year-old pregnant female found stranded in June had a debilitating and fatal bacterial infection in the third thoracic vertebral bone (osteomyelitis). A cancerous tumor also was found in this female. Microscopic examination of the lungs revealed a mass of cancerous cells, indicating that a cancer elsewhere in the body had spread to the lungs. The location of the original cancer was not found.

The beluga surveillance program is made possible by contributions from Fisheries and Oceans Canada, Parc marin du Saguenay Saint-Laurent, Groupe de recherche et d'éducation sur les mammifères marins, and Institut d'écotoxicologie du St-Laurent. (Stéphane Lair - CQSAS / CCWHC Quebec Region).

Reovirus in Crows - An Emerging Disease ?

In January and February 2004, American Crows were found dead at a roost at the Pittock Conservation Area in Woodstock in southwestern Ontario. Dead crows from this roost were submitted to the Canadian Cooperative Wildlife Health Centre (CCWHC) at the University of Guelph by staff of the Oxford County Board of Health, the Upper Thames Region Conservation Authority and the Brantford Society for the Prevention of Cruelty to Animals. In all, 22 birds were examined by the CCWHC.

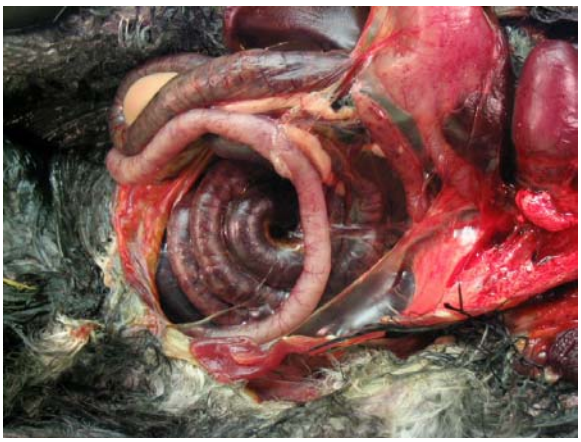
The majority of birds were in good nutritional condition and about half of them had striking evidence of disease. Hemorrhage and inflammation of the intestines was the most common abnormality noted, and often was accompanied by inflammation and necrosis in the spleen. These findings suggested bacterial or viral infection.

No significant bacteria were isolated from the crows. Several of the birds were tested for West Nile virus and all were negative. Birds with severe lesions were tested for highly pathogenic avian influenza virus and were negative. Autopsy results have given no indication of poisoning. Some birds were tested for exposure to avitrol, a common bird-dispersing agent, with negative results. Lethal consumption of road salt was ruled out and the autopsy findings did not suggest either rodenticide poisoning or antifreeze consumption.

However, tests for possible virus infection revealed reovirus infection in cell multiple organs (liver, spleen, kidney and intestine) in 4 out of 7 birds tested. At this time, it is not known with certainty that this virus is responsible for the lesions and deaths observed in these crows. However, evidence is accumulating to suggest that it may well have been the cause. Recently, scientists at the National Wildlife Health Centre (NWHC), USGS, Madison, WI have identified reovirus as the cause of death in American Crows at several locations from east to west across the United States, beginning in 2000. Autopsy findings have been similar to those described here for the Ontario outbreak (USGS-NWHC unpublished data; Carol Meteyer, NWHC, pers.comm.). Work now is underway at the NWHC to fully characterize the reoviruses isolated from these dead crows. We can anticipate that this work will result in better diagnostic tools with which to determine the significance of this newly-discovered pathogen.

D. Campbell, I.K. Barker, G. Wobeser, CCWHC; D. Ojkic, Animal Health Laboratory, University of Guelph

Figure 4. Hemorrhage and Inflammation of the Intestines of an American Crow infected with reovirus



Electrocution of aquatic animals due to malfunction of a submerged pump

Investigators from the Ontario Ministry of the Environment were called out to investigate a mortality event in a small stream in south-central Ontario. A number of fish of a variety of species, 1 toad, 3 green frogs, 1 painted turtle and 1 snapping turtle all were found dead within a 10 metre radius of a submerged irrigation pump which ran intermittently. The pump was located in a pool in a small stream which contained both pools and moving water, and which fed into a larger river.

The majority of the dead animals were collected and submitted to the CCWHC for autopsy. The snapping turtle was a large, mature adult weighing approximately 14 kg. All of the animals were in adequate nutritional condition, with no evidence of disease.

An electrician examined the pump and detected 14 volts of electricity leaking from the system. It was concluded that electric current leaking from the pump either killed the animals outright or stunned them sufficiently that they drowned while unconscious.

Electrocution in water is a relatively common hazard to people working in water around electrical equipment, such as dock lights. The diagnosis is difficult to make, as there are rarely any characteristic lesions, such as the thermal burns seen in dry electrocution events. Rather, as in this case, a diagnosis is made through ruling out other possible causes of death, and by identifying a source of electrical current to which the victims might reasonably have been exposed.

Greg Athron, Ontario Ministry of the Environment; D. Campbell, CCWHC

Knotted Tree Squirrels

In May 2003, Gary Hoium, a veterinarian in Weyburn Saskatchewan, was called to a senior citizens' residence to investigate four squirrels joined together by their tails. He succeeded in capturing, anaesthetizing, examining and disentangling these animals. The squirrels were nearly-grown juvenile Eastern Fox Squirrels. Their tails were entangled and knotted together in complete "half-hitch" knots. Dried, crusted faecal matter and debris covered and reinforced the knots. Once separated, the tails appeared to have dislocated, or possibly fractured, vertebral bones, and thus to have suffered some permanent damage. After treatment, these four squirrels were released at the location where they had been captured. Subsequent discussion of this seemingly unusual case of knotted tails with several wildlife veterinarians revealed that knotted, tangled tails are surprisingly common in Eastern Grey Squirrels throughout their range. This probably applies to fox squirrels as well, since the ranges of these two look-alike species overlap considerably. Staff at the Calgary Zoo treated 6 groups of entangled grey squirrels over a six year period: 3 knots of four-squirrels each, 2 of five squirrels, and 1 of six squirrels. In several cases, the tails were severely damaged and required amputation. Numerous Internet web sites also document this phenomenon and provide instructions for disentangling the affected squirrels. A similar phenomenon is widely reported in young Norway Rats.

All sources appear to agree on how these entanglements occur. Sticky material of some kind, such as tree sap, weeping wound exudate or diarrhea, is thought to cause an initial adhesion among tails. Movement of young squirrels around each other inside their nest knots the tails around these initial contact points. Struggling squirrels then pull the knots ever tighter.

The Weyburn case was first reported in the September 2004 issue of *Blue Jay*. The photograph shows 8 grey squirrels with knotted tails found dead near Toronto and examined by Doug Campbell, CCWHC- Ontario Region.

Figure 5. Eight grey squirrels with knotted tails found dead in Ontario

Antifreeze poisoning in raccoons

During the first half of 2004, we diagnosed ethylene glycol (automobile antifreeze) poisoning in two raccoons found dead in abandoned farm buildings. The source of the antifreeze ingested by these animals was not determined. Ethylene glycol is highly toxic to animals and is a relatively common cause of poisoning in dogs and cats. Toxic doses can be as little as a few milliliters per kilogram of body weight. Animals typically die of kidney failure, but clinical signs can include tremors and seizures, and thus antifreeze poisoning can be confused with rabies or distemper. The diagnosis of antifreeze poisoning is made by identifying chemical crystals produced by metabolism of the ethylene glycol by microscopic examination of the kidneys. Spilled or improperly stored antifreeze is attractive and readily ingested by animals; it represents a hazard to wildlife as well as to pets and young children. (Trent Bollinger, CCWHC Western and Northern Region).

Lead Poisoning in Bald Eagles

Use of lead shot to hunt waterfowl was banned in the United States because it resulted in poisoning of Bald Eagles when these birds fed on waterfowl carrying lead pellets in their flesh. Subsequently, lead shot was banned for waterfowl hunting in Canada. Nonetheless, eagles in western Canada continue to be exposed to toxic quantities of lead, and, in some cases, the source of lead is consumption of lead shot. On November 22, 2003 an adult male Bald Eagle was found dead near Outlook, SK. The bird was in good nutritional condition but its gizzard contained 21 lead pellets and 1 steel pellet, all of a size most frequently used for waterfowl. This eagle died of sudden, acute lead poisoning associated with rapid ingestion of a large amount of lead in an area in which there is heavy waterfowl hunting. The most likely source of the lead pellets that killed this bird is waterfowl killed or crippled with lead shot. A second adult female Bald Eagle was found dead near Yorkton, SK, December 19, 2003. This eagle was emaciated. Lead levels in its tissues were sufficiently high to indicate that it died of long-term, chronic lead toxicity. The source of lead in this case could not be determined, as is usually the situation with chronic poisoning. However, lead shot is the most likely source of lead in this case also; the bird was found dead shortly after the hunting season. (Trent Bollinger, CCWHC Western and Northern Region).

The Canadian Cooperative Wildlife Health Centre was established and is supported by: Federal, Provincial and Territorial governments, the Max Bell Foundation; the Canadian Wildlife Federation; Ducks Unlimited Canada; Syngenta Crop Protection Canada Inc.

This newsletter is published twice annually by the CCWHC. Contents may be used without permission; please acknowledge the Canadian Cooperative Wildlife Health Centre Newsletter. Material in this newsletter has not been peer-reviewed and therefore should not be cited in the scientific literature. For further information, contact the nearest Regional Centre listed below.

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RECENT BACK-ISSUES

Vol 8-1 a) News b) Radio-telemetry for detecting and understanding disease - Update on West Nile Virus in North America Disease Updates*: Atlantic* - French heartworm in red fox and domestic dogs in Newfoundland - Raccoon rabies reachew New Brunswick - Neurological disease in moose in Nova Scotia - *Quebec* - Brain abscesses in white-tailed deer - *Ontario* - Suspected predation by ravens on nesting painted turtles - *W/N* - Marine mammals in British Columbia - Chronic wasting disease in free-ranging mule deer in Saskatchewan

Vol 8-2 a) News b) Research Group for Arctic Parasitology (RGAP): Heading North with CCWHC. Enhanced passive surveillance for West Nile Virus infection in wild birds in Canada - 2001. Disease Updates*: Atlantic* - Barbiturate poisoning in a bald eagle - Newcastle disease in pigeons, PEI - Avian tuberculosis in a thick-billed murre - Lyme Disease in Newfoundland; *Quebec* - Type C botulism outbreak on the shore of the St. Lawrence; - *Ontario* - Suspected cyanide poisoning in birds - Ethylene glycol - zinc phosphide - Type E botulism, Lake Erie - Parvovirus in raccoons - Canine distemper virus in mustelids; *W/N Region* - Newcastle disease and avian cholera in cormorants without epidemic mortality - polioencephalomalacia in wild ungulates

Vol 9-1 a) News b)West Nile Virus 2002 Disease Updates: *Atlantic* - Brain disease in Newfoundland moose - Insecticide poisoning in birds - Injury caused by a snare; *Quebec* - Raccoon distemper in Montreal - 2001 Epidemic mortality of common carp in the St. Lawrence River; *Ontario* - Type E botulism in fish eating birds - Winter songbird deaths due to salmonellosis - Late spring deaths of purple martins - Collision of songbirds with a tower; *W/N* - Range extension for Chronic Wasting Disease - Lead poisoning in trumpeter swans - High moose mortality from Winter Tick - Avian Cholera in Double-crested Cormorants - *Bartonella* in Ground Squirrels in Saskatchewan; *TECHNICAL BULLETIN - Drug Residues in Wild meat - Addressing a Public Health Concern* (enclosure).

Vol 9-2 Type E Botulism in Fish-Eating Birds on Lake Huron and Lake Erie 1998-2003 - Chronic Wasting Disease in free-ranging Cervids in Western Canada. Disease Updates: *Atlantic* - Esophageal Lesions in Crows - Surplus Killing of Roseate Terns and Common Terns by a Mink; *Quebec* - West Nile Virus (WNV) Infection in Quebec Raptors: 2003 Season; *Ontario* - Mortality in Great Black-Backed Gulls near Presqu'ile - Type E Botulism Update - West Nile Virus Update - Adenovirus Encephalitis in a Wild Fox; *Western/Northern* - Newcastle Disease Virus in Double-crested Cormorants in Alberta in 2003 - West Nile Virus and Sage Grouse - The Research Group for Arctic Parasitology (RGAP), November 2003 - Death of a Grizzly Bear caused by Capture and Handling in West-central Alberta. *Announcement* - Diagnosing Disease in Wild Animals, February 25-27, 2004, Saskatoon, SK

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