Baseline Histological Health Assessment of Substance Harvested Arctic Marine Mammals from the North Slope Borough Village of Wainwright, Alaska

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Significant Findings

- Formalin-fixed sections of lymph nodes, thyroid and adrenal glands, ovaries and testes were within normal limits. No histopathological lesions were identified that would suggest compromised immune function resulting from exposure to environmental contaminants.
- There was no histopathological evidence of infection with Trichinella spp. in formalin-fixed sections of tongue, muscle, or diaphragm.
- There was no histopathological evidence of renal colonization by Leptotira organisms.
- The various stages of myositis and mitral rhabdomyolysis were consistently observed in skeletal muscle sections from all species of Arctic mammals examined. Early swelling; loss of sarcomeric detail, fragmentation, clumping, inflammation and healing were all noted.
- Two cases suggestive of Sarcocystis neurona-like infection were identified in the skeletal muscle sections of bearded seals, but not in whales skis or non-human mammals.
- No classic lesions of Cytomegalovirus were observed in response in tissue cytology. Based on histopathological appearance of the tissue cysts, the researchers believe these particular sarcocystis are unlike others previously described in the marine mammal parasitology literature.
- A few lymphocytes were present in the fat necrosis and post-mortem liver of the beared seal. Deep to these seals were multifocal granulomatous lesions that were located within the entire bladder layer. Granulomatous parametrums with histological evidence of chronic hemorhagic and lack, muscle, support, and inflammation, as well antibiotic courses were found in two of the three bearded seals. These tests in two of the four bearded seal were associated with a trial of the in the introduction of microorganisms. However, acid-fast and rotifer-specific qPCR analyses failed to demonstrate positive staining for microorganisms.

Introduction: Marine mammal subsistence hunting for subsistence in the North Slope Borough Eskimos for thousands of years. The native culture stresses the importance of maintaining spiritual ties with the environment, respect for the animals that feed them and sharing with the community. In addition, the expenses associated with the consumption of non-traditional foods make subsistence hunting a necessity. The bowhead whale (Balaena mysticetus) is the largest part of the Eskimo diet due to Arctic coastal villages such as Barrow and Wainwright, Alaska, the ringed seal (Phoca largha) bearded and (Erignathus barbatus) and waters (Odobenus rosmarus divergens) are also important components of the subsistence diet. In addition, bearded seal skins are used for making the traditional skin-covered boat, beach, and seals, used dog training with seals from bearded and ringed seals are used for clothing and accessories while bones from the seal and walrus carcasses are used for making decorative art. The people of the North Slope are very concerned about the preservation of their cultural traditions and the future availability of subsistence resources. Dewarizing a seal, sorting, ship traffic and expanding of oil development in the Beaufort and Chukchi Sea have the potential to displace habitat critical to the survival of the animals that feed and clothe them. Warmer temperatures may permit the introduction and establishment of invasive species such as Brucella, Leptospira, Influenza A, Toxoplasma, Giardia, Cryptosporidia and Trichinella in the North Slope, wildlife population, presenting risks to the animals and the hunters. Scientists with the North Slope Borough Department of Wildlife Management in Barrow, Alaska are working closely with community members from the North Slope villages to monitor the health of subsistence resources with the intent of generating baseline data from areas yet impacted by industrial development. Diseases are expected of the bearded hunter. The migration patterns of the bearded seal are the most useful for the health of these animals, these tissue collections represent a rare and important opportunity, to gain valuable insight about the health and function relationship in marine animal anatomy and physiology and the histological characteristics of marine mammal tissues.

Objectives

A. Develop an appreciation and understanding of the morphological adaptations to the coastal and microclimatic environments that are part of the normal Arctic marine mammal musculoskeletal system.

B. Histological examination of formalin-fixed tissues for evidence of infectious diseases and immunosuppression caused by environmental contaminants.

C. Histological examination of formalin-fixed tissues for evidence of exposure to toxic substances and agents.

Materials and Methods:

Eleven hunter-harvested bearded seals and five walruses taken near the coastal village of Wainwright, Alaska (76° 38' 50" N 160° 58' W) were sampled by North Slope Borough scientists during the summer of 2009 marine mammal harvest. Wainwright is 72 miles southwest of Barrow, its basin is bordered by the Chukchi Sea. Approximately 586 people live in the coastal village, 90% are Yupik Eskimos. Communities are separated by VHF radio that tissue collection would take place, hunters insert or submitted tissues or contacted the scientists when harvesting was ready to commence, Alaska's Indigenous peoples are permitted to harvest traditional animals according to guidelines set forth by the 1982 Marine Mammals Protection Act. The North Slope Borough Department of Wildlife Management collects tissue for scientific studies from animals with the permission of Marine Mammal Permits (NMFS permit no. 184-1999-00, and NMFS permit #54335707, walruses). Carcasses were examined where possible and information concerning age, gender, time of death, and time of kill. Skin samples were taken from individuals to determine if the animal was a non-reproductive female or a male for prostate. Tissue samples were collected and stored in 10% neutral buffered formalin. Sperm samples were prepared for 7.1% ethanol fixation for histological examination. Tissues were preserved in 10% neutral buffered formalin, similar tissues from the same organs were frozen for future diagnostic tests. The formalin-fixed tissues were submitted to the North Slope Borough Department of Wildlife Management Lab in Barrow, Alaska and brought to the Colorado State University Veterinary Medical Diagnostic Center in Fort Collins, Colorado in January 2010. Tissue blocks were paraffin-embossed, sectioned and stained with Mayers hematoxylin and eosin (HE) and/or Masson trichrome.

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