Wildlife Nutrition

A Publication of Canada's Accredited Zoos and Aquariums
Nutrition Advisory and Research Group (CAZA-NARG)

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It is Official: Summer

We are now into one of the busiest times of year for most zoological organizations. Warmer temperatures often mean more visitors to our faciltiies.

Warmer weather also may also bring challenges to maintain our animals at a temperature most comfortable for their physiology. The first article in this issue speaks directly to that challenge by presenting research on heat stress in moose. Heat stress can have a deleterious affect on gastrointestinal function, therefore it has direct relationship to wildlife nutrition.

Have a great season!!!

Deb McWilliams

Photo credit: ***WWF Canada***

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Moose and Heat Stress

Globally, researchers have been examining the possible effects of climate change on the behaviour of free-ranging, wild animals. One area of study has been the effect of extreme temperatures on wildlife, especially the effect of higher ambient temperatures and the development of heat stress. Heat stress occurs when elevated environmental temperatures make excessive demands on an animal's physiological ability to maintain a normal body temperature (thermoregulation). Species will differ in their physiological ability to tolerate elevated environmental temperatures.

Why is heat stress a concern? Heat stress can result in weight loss; gastrointestinal distress; loss of fertility (males and females); decreased immune function with an increased vulnerability to disease and parasites; and, heat stress can progress to death from hyperthermia.

In this article, I would like to present the results of some research on the effect of heat stress on moose species both in the wild and in captivity. A group of researchers studied captive moose and investigated the factors in the development of heat stress. The results may assist us to better understand the captive environmental conditions needed by moose and allow improvement on husbandry provisions.

McCann, Moen and Harris published the results of their work in 2013 in the Canadian Journal of Zoology . These researchers studied the responses to elevated temperatures of four captive moose (2 males and 2 females) in captivity. In general, the responses to heat stress of the four moose are similar to that of any species: the animals selected shady areas when hot and they reduced feed intake when heat stressed. The researchers, however, were also able to provide information specific to moose in captivity:

1. Moose, as large animals, have a low surface-to-volume ratio meaning their physiologies can slow heat transfer from the environment. While a slow heat transfer may initially confer an advantage during high environmental temperatures, the result in captivity is actually a ***delayed response*** to higher temperatures. For example, in captivity, this means an animal that may initially appear comfortable at a certain temperature in a sunny condition when – in fact – it may need to move to a cooler, shady area to prevent heat stress.
2. Moose can become heat stressed at 14º C to 20º C if shade or wind (evaporative cooling) is not available. Even if shade and/or wind is available, moose can become heat-stressed at 18º C and severely heat-stressed at higher temperatures. Not all researchers agree on the upper limit for heat stress. Renecker and Hudson (1986) and Karns (1997) say -5º C in winter and 14º C in summer is the critical temperature limit for heat stress to develop in moose.
3. Very young or very old moose and moose with health problems (including high pathogen loads) may be more susceptible to heat stress.

The information in this study is directly relevant to our captive moose and provides us with some valuable information. In captivity, our animals only have the options we provide for them. In addition to moose, all animals need to be housed in areas that provide temperature gradients and allow for behavioural thermoregulation like moving to a shady area to allow cooling or moving into a sunny area to warm.

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Problems Wanted!!

Each issue of "Wildlife Nutrition" will present and discuss a specific dietary challenge submitted by readers. Any aspect of the nutrition of captive wildlife will be considered for publication. The dietary challenge may be a question, situation or nutritional pathology. The identity of the submitting individual and/or their organization will be confidential. Please submit to:

Wildlife Nutrition
info@caza-narg.ca

Housing for animals that historically have been adequate may need to be changed to allow our animals more options with changes in weather patterns and seasonal temperatures. Captive housing should allow for behavioural thermoregulation and the required conditions may differ according to the species in question. For example, in the wild, moose use these methods to reduce heat stress:

a) Limit exposure to the sun (solar radiation).
b) Use aquatic areas to stand, wade and swim in water.
c) Seek shady areas, especially dense forested areas.
d) Utilize evaporative cooling by exposing themselves to wind.
e) Reduce daily activity including travel and feeding.
f) Increase nocturnal activity when the temperatures are lower.

If captive housing does not allow for behavioural thermoregulation, then indoor shelters with air conditioning and/or cooling mats may need to be provided.

References

Karns PD. 1997. Population, distribution, density and trends. In: A.W. Franzmann and C.C. Schwartz (eds.), Ecology and Management of the North American Moose. Smithsonian Institute Press, Washington, DC, USA. pp. 125-139.

McCann NP, Moen RA & Harris TR. 2013. Warm-season heat stress in moose (*Alces alces*). Canadian Journal of Zoology, 91: 893-898.

Renecker LA & Hudson RJ. 1986. Seasonal energy expenditure and thermoregulatory responses of moose. Canadian Journal of Zoology, 64: 322-327.

Recommended Reading: Gastrointestinal Function, Health and Diet

Wildlife nutritionists emphasize the importance of gastrointestinal function on the overall health of animals. The relationship between gastrointestinal function and health is especially important for captive wildlife because, in captivity, we cannot provide the wide variety of nutritional resources available in the wild.

A recent issue (17(2), 2014) of the Veterinary Clinics of North America Exotic Animal Practice focused entirely on gastroenterology in exotic species. Many of the articles included some discussion about the pathology that results when captive wildlife is not fed appropriate diets. While it is not possible to present all of this information in this newsletter, let us look at some of the topics included in this issue.

Although the issue focuses on smaller animals and birds, the list of species (in alphabetical order) discussed in the issue is comprehensive: chinchilla, fish (salmon, koi, catfish, sharks, rays, skates), gerbil, hamster, mouse, rabbit, raptors (falcons, hawks, eagles, kites, osprey, vultures, owl), rat, reptiles and the sugar glider. Also comprehensive, and informative, is the description of gastrointestinal design and function in this issue.

Unfortunately, as we know, the pathology that can result from inappropriate nutrition is extensive. Some of the pathology discussed in this issue include: (in alphabetical order)

1. **Dental Disease:** abnormal wear, fractures, gingivitis (inflammation of gums), malocclusion (overgrowth), stomatitis (inflammation of mouth and lips).
2. **Gastrointestinal Dysfunction and Disease:** cecal stasis, diarrhea, dysbiosis (bacterial imbalance), dysfunction of gut lymphoid tissue, gastric ulcers, impaction, intussusception (part of an intestine or bowel slides into another part), malabsorption, rectal prolapse,
3. **Nutrient Deficiencies and Toxicities**: vitamins and minerals, protein, energy (kilocalories, calories)
4. **Body Condition**: obesity, overweight, poor muscle tone, underweight

While some of the information provided in this issue may be familiar and not all of it directly applicable and/or accepted practice, I do recommend it to be of interest to any person with some responsibility for nutrition of any of the species covered in the volume.

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*Antelope species, caribou (reindeer), deer, elk, giraffe, goat species (most, including ibex and mountain goats), moose, mountain sheep, musk oxen

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For further information:

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