



Nutrition

Panel Organizers

Amy Cutting,

Keeper, North America, Oregon Zoo, Portland, OR

Speakers

Barbara Lintzenich, Staff Nutritionist, Brookfield Zoo, Brookfield, IL

Keith Hobson, Research Scientist, Canadian Wildlife Service, Saskatoon, Saskatchewan, Canada

Gail Hedberg, Senior Veterinary Technician, San Francisco Zoological Gardens, San Francisco, CA

Mark Edwards, Nutritionist, San Diego Zoo, San Diego, CA

Else Poulsen, Arctic Ring Keeper, Detroit Zoological Park, Royal Oak, MI

Barbara Lintzenich, M.S.

Staff Nutritionist, Brookfield Zoo, Brookfield, IL

There currently is no agreed-upon standard diet for captive polar bears. Lintzenich offered advice on what to consider when developing diets for individual bears.

When developing diets for polar bears, you must look at several issues:

- Feeding ecology—polar bears are the most carnivorous of all bear species
- Gastrointestinal tract—polar bears are well-suited for a highly digestible diet
- Domestic model—cat, dog, marine mammal?
- Physiological state—is the bear thin, obese, pregnant?
- Management considerations—exhibit design, training, group feeding, behavioral enrichment needs
- Foods available

The Bear TAG Diet Survey (1996-2000) looked at diet offered versus consumed. It studied 21 animals in 33 institutions over a 4-day period. For complete data from that study, see the comprehensive conference proceedings, available soon on CD-ROM.

Keith Hobson, Ph.D.

Research Scientist, Canadian Wildlife Service, Saskatoon, Canada

Case study. Can looking at what polar bears eat in the wild help us create a diet for them in captivity? A new, noninvasive technique allows us to determine the types of food wild polar bears are eating so we can fully understand the nutritional ecology of polar bears.

We have many questions about polar bear nutrition that remain unanswered—for example, should we duplicate the seasonal, protein-sparing fast seen in Hudson Bay polar bears who come ashore in the summer and subsist mainly on kelp and berries?

We can't answer this type of question until we know exactly what polar bears are eating in the wild. Measuring isotope ratios can give us that information. After testing many types of tissue (hair/claw, muscle/blood, bone, and liver), the best sample for isotope testing turned out to be bear breath CO₂. It accurately showed the true composition of both wild and captive bears' diets and is a noninvasive technique.

In this study, keepers at the San Diego and Buffalo zoos cooperated by training their bears to give a breath sample for analysis, that could then be compared to the Churchill berry feeders. This was a clear illustration of the essential role training can play in research studies—as well as the cooperation possible between researchers and zoo professionals to improve bear husbandry.

Gail Hedberg, R.V.T.

Senior Veterinary Technician, San Francisco Zoological Gardens, San Francisco, CA

Case study. Can lack of a key amino acid (taurine) contribute to metabolic bone disease?

Metabolic bone disease can be caused by a calcium deficiency in the diet, an improper calcium:potassium ratio, IBD (inflammatory bowel disease), chronic disease of the kidney or liver, or inadequate Vitamin D.

Taurine promotes the absorption of fat and fat-soluble vitamins, regulates heartbeat, decreases stillbirths, and promotes cell-membrane stability. A taurine-free diet results in fractures and rickets.

After testing blood and maternal milk samples, this study found that taurine levels were 60% lower in captive bears than the two wild-caught cubs now at the San Diego Zoo. How does this lower taurine level correlate with fractures in captured bears?

Other questions: In the last 25 years, 50% of polar bear cubs have failed to survive. Is a sow with a taurine-deficient diet partly responsible? Should we add taurine to hand-rearing formulas?

Mark Edwards, Ph.D.

Nutritionist, San Diego Zoo, San Diego, CA

Case study. Two cubs at the San Diego Zoo were mother-reared until they were 93 days old, then hand-raised using a revised nutritional protocol.

We know that the *Ursus* species can form indigestible clots of casein—called lactobezoars—that are indigestible and can lead to death. In this case study, the San Diego Zoo revised its hand-rearing formula to have a reduced whey/casein ratio in an attempt to prevent this problem.

Differences between the zoo formula and mothers' milk:

- Solids: 50% in mothers' milk; 26-30% in San Diego Zoo formula

- Protein: comparable amounts
- Formula was lower in solids, fat, and energy, but higher in carbohydrate

The special formula was discontinued at 343 days. Previously observed complications with gastrointestinal obstructions of indigestible milk proteins were not evident with the revised hand-rearing formula. Although the actual rate of growth exceeded that predicted for fissioned carnivores, they were more consistent with growth rates predicted by formulas developed for pinniped carnivores.

This hand-rearing case provides objective information from which further formula and protocol modifications can be based, to more closely replicate nutrition support provided by the female.

Else Poulsen

Arctic Ring Keeper, Detroit Zoological Park, Royal Oak, MI

Case study. All zoo professionals are questioning the diets they are feeding their polar bears. How can we use diet to effectively solve problems such as overweight bears and fur loss?

Problems with the Detroit Zoological Park bears included:

- Overweight bears in summer
- Significant weight loss in winter, plus fur loss

How can we use diet to solve these problems? Should we try to mimic the circumstances of the wild? Hudson Bay polar bears experience warm summers and have a seasonal weight fluctuation. Should we mimic one weight gain and one weight loss per year?

In the older enclosure (pre-Arctic Ring), bears were fed chow, fish, and management foods, with decreased amounts in winter and increased amounts in summer—in direct response to the animals' hunger level. (In winter they hang out with nothing to do; in summer, they become more active and spent more time in the pool.) Problem: bears gained massive amounts of weight and became "pear bears."

After the move into the Arctic Ring of Life, bears used the pool a lot and developed more muscle but had huge hair loss the first year. They believe the hair loss was due to the stress of the move and lower protein levels.

To reduce the massive weight gain in the summer and minimize the heavy weight loss in the winter, Poulsen suggests a summer diet that is low fat, with 33% of total daily diet as Mazuri polar bear chow, with appropriate taurine levels and adequate protein. The winter diet should be high fat, with chow again representing 33% of total daily diet, appropriate taurine levels, and adequate protein. She also suggested we should think about providing seal meat to bears.