

## Cheetah Species Survival Plan – Husbandry Manual

### XV. Nutrition

#### A. Dietary Requirements

Unique nutritional requirements of felids must be recognized in feeding captive cheetahs, including the need for high protein and fat diets, inclusion of dietary vitamin A (as retinol), arachidonic acid, taurine, and niacin. General reviews of felid nutrition (Scott, 1968; MacDonald et al., 1984) provide indirect evidence that the domestic cat remains the best model for establishing dietary composition parameters (National Research Council, 1984) for the cheetah, but a detailed summary of feeding habits with chemical analysis of natural prey items would supply useful comparative data.

The exact nutritional requirements for all nutrients are not known specifically for cheetahs; therefore, requirements are extrapolated from data on domestic felids (NRC 1978). Diets are formulated, prepared, and fed; some meet dietary needs while others do not and result in cheetahs with nutritionally related medical problems (e.g., chronic disease, nutritional disorders or poor reproductive performance). Fortunately, most nutritional disorders are of only historical significance due to improved nutritional management (Slusher et al., 1965). This does not exclude other possible nutritionally related disorders observed in cheetahs such as veno-occlusive disease and copper deficiency.

Commercially prepared carnivore diets (see Nebraska Brand Feline and Canine Diet insert) or properly supplemented carcass meat should be considered the dietary staple for cheetahs. Composition should closely adhere to nutrient specifications as outlined above. Recent studies with zoo felids have reported excesses of vitamin A and phytoestrogens, and deficiencies of taurine in various commercial preparations. Responsive manufacturers are correcting these potential health problems by reducing retinol to levels of approximately 15,000 IU/kg (dry basis), minimizing the addition of estrogenic plant materials, and increasing the addition of taurine, particularly in heat-processed meat products. No vitamin supplements should be necessary with properly formulated and stored commercial diets.

The commercial preparations are formulated from the comparative dietary requirements and received some field-testing for varying periods. The advantage of the commercial diets is that they are readily available, require little or no labor in preparation, and are assumed to be formulated with a sound nutritional basis. Economics determine the components of these diets as the ingredients vary with the change in cost of producing the diet. Thus, the guaranteed analysis remains the same, but the diet may vary in raw ingredients. The guaranteed analysis label does not guarantee that the ingredients of the diet are actually utilized or available for utilization by the cheetah.

#### B. Daily Diet/Quantities

Adult cheetahs are fed to maintain body condition, with general maintenance energy requirements = 140 kcal (body mass in kg) 75 (Kielber 1964). Thus a female averaging ~30 kg requires 1800 kcal/day, whereas a 40 kg male requires 2200 kcal. Based on survey information, however, the

general energetic equation may substantially over-estimate metabolizable energy (ME) requirements for the cheetah, and it appears that animals can maintain healthy body condition by consuming 800-1000 kcal/day. Using commercial diets containing about 2000 kcal/kg (as fed basis) daily, with a digestibility coefficient of 0.84, meal size equals 1.2-1.4 kg daily for adult cheetahs.

Most management programs have found that cheetahs' appetites and body conditions improve if they are fasted one to two days a week. Either no food is fed on these days or shank or other large bones are fed. Feeding bones (femur bones, oxtails, chicken necks, rawhide) has an additional function in promoting periodontal health (see Dental section). One fast day per week is recommended, which increases the meal sizes to 1.4 and 1.6 kg for females and males respectively.

Diet quantities should be increased 10-20 percent in animals housed outdoors during winter months, and decreased by the same amount during summer months when appetite drops.

Increase diet to ad libitum during lactation.

#### Nebraska Brand Feline Diet

(A product of Animal Spectrum Inc., P.O. Box 6307, Lincoln, NE 68506-0307)

Nebraska Brand feline food has been formulated to be fed as the sole ration to non-domestic carnivores, principally in the family Felidae. Nebraska Brand feline food is a complete and balanced diet fortified with all the necessary vitamins and trace minerals, as well as proper levels of calcium and phosphorus.

#### Ingredients

Horsemeat, horsemeat by-products, bone meal, liver, fish meal, soy grits, dried beet pulp, dried eggs, brewer's dried yeast, salt, D-activated animal sterol (source of vitamin D3), vitamin B12 supplement, vitamin E supplement, menadione, sodium bisulfite (source of vitamin K activity), riboflavin supplement, niacin, calcium pantothenate, choline chloride, thiamine, pyridoxine hydrochloride, folic acid, copper oxide, cobalt carbonate, manganous oxide, ethylene diamine dihydriodide, zinc oxide.

#### Nebraska Brand Canine Diet

(A product of Animal Spectrum Inc., P.O. Box 6307, Lincoln, NE 68506-0307)

#### Ingredients

Horsemeat, meat by-products, dried beet pulp, salt, D-activated animal sterol (source of vitamin D3), vitamin B12 supplement, vitamin E supplement, menadione, sodium bisulfite (source of vitamin K activity), riboflavin supplement, niacin, pyridoxine hydrochloride, folic acid, copper oxide, cobalt carbonate, iron carbonate, manganous oxide, ethylene diamine dihydriodide, and zinc oxide.

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**Guaranteed Analysis**

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Crude protein	Min 19.0%
Crude fat	Min 7.0%
Crude fiber	Max 1.5%
Ash	Max 2.5%
Calcium	Min 0.6%
Phosphorus	Min 0.5%
Moisture	Max 69.0%
Vitamin A min	2,500 IU/lb
Vitamin D <sub>3</sub> min	750 IU/lb

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### C. Food Preparation

Food preparation and handling is an area of special concern. If the diet is mixed within the institutions, all ingredients should be scrupulously maintained free of contamination from chemicals, pests, or microorganisms. Frozen ingredients are properly thawed to reduce bacterial growth and diets fed as soon as possible after mixing. Commercial diets are thawed under clean conditions, free from external contamination, and fed immediately after thawing. Some institutions actually feed the diet while still frozen allowing cheetahs to eat as it thaws. Avoid allowing raw diets to warm to room temperature for long periods of time prior to feeding. The practice promotes the rapid growth of bacterial organisms.

The food is weighed and daily records kept as to how much is offered to each individual cheetah and how much is consumed. Determination of ration amounts is a dynamic process to meet changes in metabolic needs, such as in seasonal needs, illness, pregnancy and lactation, and growth. Proper body weight, especially to avoid obesity, should be maintained by dieting alterations. These changes should reflect not only energy needs, but also vitamin and mineral needs. Records of stool consistency assist in determining if the diet is poorly digested or possibly inducing diarrhea indicative of enteric disease. The food is offered on a non-contaminated surface. In most situations feeding is done on the floor of the enclosure. Feeding stations should optimally be off the floor or substrate.

### D. Chuck Meat Supplements

If diets are mixed within the institution they are supplemented to provide one percent calcium (dry matter basis), particularly if bones are not consumed. This is equivalent to about 7 g Ca per kg meat; a non-phosphorus containing supplement such as CaCO<sub>3</sub> (40% Ca) should be used. For this particular example, 17.5 g of CaCO<sub>3</sub> would be added/kg of fresh meat. If meat is lean (<25 percent fat) and/or well trimmed, vitamins A and B may need to be supplemented at recommended levels. Do not supplement with vitamin A if liver is consumed in any amount. Ten to twenty grams fresh liver per thousand grams lean meat supplies about 10,000 IU Vitamin A/kg dry matter, similar to felid requirements. Vitamin B may be particularly necessary in diets based on meats containing polyunsaturated fats (any non-ruminant), at levels providing 50-150 IU/kg dry matter.

Whole prey items should be small enough, or fed at suitable intervals, to permit consumption in total. Although little information concerning the contribution of gut contents in prey items to

overall nutrition of predators is available, complete rather than selective consumption of prey species is recommended to prevent previously documented nutrient imbalances (i.e., rickets in carnivores fed muscle or organ meat exclusively; hypervitaminosis A from excess liver ingestion). Observations of captive cheetah feeding suggest gut contents are not consumed in total.

#### E. Feeding Behavior

Llndburg (1988) presented excellent arguments for the augmentation of live prey to animal exhibits to enhance natural behaviors, as well as health effects previously discussed. Certainly obesity due to lack of activity in captivity is a major problem for zoo carnivores, including cheetahs. The above suggestions require commitment in terms of labor and/or capital investment, but may prove valuable.

Intraspecific competition at feeding may be minimized by providing more feeding stations, or separating animals for meals.

The goal is good diet formulation based on sound nutritional concepts and quality sources of dietary components. In addition, communication between the source of the diets, the veterinary staff, and the keepers will allow monitoring of health status, early evidence of nutritional deficiencies, or potential toxic problems. Only then can dietary inadequacies be assessed. The most common type of poisoning in large felids is from barbiturates used to euthanize feed animals. Felids feeding on such carcasses may show varying signs from mild ataxia to general anesthesia that may last for days. The liver from such carcasses are especially high in barbiturate levels and cause more severe signs (Bush et al., 1987).