Zoo Nutrition with Budget Constraints!

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It is becoming apparent to the zoo community that a quality nutrition program is a key to improved animal health, and potentially added contentment of the animal. Improved nutrition can also lead to enhanced breeding programs. However, even realizing this, many zoological institutions can not yet justify the cost of a full-time nutritionist. Therefore, a question often asked is, "How can an institution implement a nutrition program without a nutritionist?" A consulting nutritionist may be a partial answer, however, there are some preliminary steps that can be taken to facilitate the process of making nutrition a reality. Some of these include: 1) Determine who will coordinate the nutrition program at the institution - it helps if this person has some influence in the zoo community; 2) Ensure that management supports or agrees to work with the coordinating individual; 3) Develop diet cards for each species to accurately determine the diet of each animal, including treats; 4) Purchase at least one scale to be kept in a central area (i.e., commissary) where it can be utilized to weigh diet amounts - "exactly how much does a scoop of feed weigh"?; 5) If forage/ feed is purchased in bulk, representative samples could be analyzed to determine nutrient content and verify quality; and 6) Bring in a visiting or consulting nutritionist to present the fundamentals of nutrition and to stress their importance in a workshop setting. With implementation and support of these steps, the "seed" to successful nutrition can grow.

Introduction

Good nutrition of any animal, and in particular captive wild animals, is one of the keys to creating a more healthy environment. If fed correctly, the incidence of disease is reduced, animals seem less prone to symptoms of stress and are better able to reproduce and nourish their young. Ideally a zoological institution would hire a trained zoo nutritionist that would be able to monitor the day to day events of feeding captive wild animals. However, there are few zoological institutions in the country that can, or are willing to, finance the cost of an “in-house” nutritionist – that is, if one were available. Another concern is that though there are institutions that support a consulting nutritionist, or would be willing to, few individuals are trained in the zoo nutrition area.

Zoo nutrition is very challenging. Trained nutritionists struggle to acquire the known nutrient requirements for a diverse population of animals, and succeeding in that, try to find a way to replicate those nutrients in a captive environment. Just knowing the nutrient requirements is not enough to successfully feed an animal. Finding a compliment of foods that will not only meet those nutrient requirements, are palatable to the animal, and meet behavioral needs is critical. Once an adequate diet is formulated, other factors including the zoo environment can compromise it. Public perception often requires the housing of family groups of animals – the traditional “Papa Bear, Mama Bear and Baby Bear".

Concerns with such housing, which may or may not be similar to that occurring in a natural habitat, creates additional challenges. Papa Bear has different nutrient requirements than Mama Bear. Depending on the reproductive status of Mama Bear, she may be in early or late gestation, early or late lactation, or in between stages. All physiological stages have different nutrient requirements. Baby Bear may be very young or in advanced stages of growth. Now add a Grandma Bear, an Auntie Bear and Cousin Bear, all at different physiological stages, but all housed together and consuming their nutrients from the same offering of food. Science has shown that animals cannot be relied upon to balance their own diets to meet their nutrient needs, so how do we feed them? As indicated earlier, zoo nutrition can be very challenging, and the zoo nutritionist needs to be a creative problem solver as well.

Even though zoo nutrition is challenging, there are many points of consideration that can be accomplished that will ultimately aid in the goal of feeding a nutritious diet. In the following pages, a simplistic scenario will be suggested that can be used to implement a nutrition program at a zoological institution without great financial cost.

1) Support for Nutrition Program

First and foremost, in order for a nutrition program to be successfully implemented, it is critical that the administration recognizes the importance of supporting such a program. Once the administration "believes", then the support of managing staff, curators and area supervisors is also essential. This type of program is "all or none". Without everyone's cooperation, implementation of a successful nutrition program is next to impossible.

2) Coordinator for Nutrition Program

Once a nutrition program has the support of zoo personnel, it is critical for "one" person to take responsibility for it. If “the” nutrition program becomes “public” property, I guarantee you that it will be used and abused by anyone with an issue – either positive or negative. The best scenario for success is an individual currently within the zoo community to take charge of the program. It would be advisable for that individual to have at least some training in the nutrition area, either human, domestic livestock or, ideally, zoo animal nutrition. This individual should also have status within the zoo environment and authority to make and enforce decisions. Without that authority to enforce decisions, often zoo personnel will not take them seriously. For example, what happens if the coordinating individual suggests a controversial diet change, and a keeper refuses to make the change? If the administration does not agree with the coordinator, all effectiveness of the program is lost.

3) Diet Cards

One of the most important points about maintaining an animal in any environment is its diet. Even without a nutritionist it is possible to record animal intake and maintain a record of it. For example, in a herd of ten antelope, it is difficult to actually know how much of each food an animal is consuming. However, if the amount eaten by the group is recorded and is divided by the number of individuals, you have an “estimate” of what each animal is consuming.

After determining exactly what an animal is being fed, some kind of recording system needs to be developed so that all diets are on record at the zoo. This includes all dietary components including treats, enrichment articles or food items used to transfer an animal. The time of day that food items are offered to the animals is also important. An example diet card is shown in Table 1. A diet card is extremely useful for various reasons. First, a diet card is helpful when an animal is transferred to another institution. The diet card can be sent along with the animal allowing the new keepers to gradually acclimate the animal to its new environment with same or similar foods. Second, if an animal becomes ill and is taken to the zoo hospital, having the diet "at hand" can be very helpful. Third, diet cards are also an excellent means of preventing the dreaded “diet drift”! Diet drift can be defined as “a gradual change of an animal’s diet over time due to human interference”. For example, a bobcat is offered a mouse as an occasional treat. The mouse is very palatable to the bobcat so it will be easy for the keeper to feed the mouse to the bobcat more regularly than they should. The problem compounds if a new keeper is trained by the original keeper, and begins to feed the bobcat the very same way, by adding the mouse daily. This often happens in primates with grapes. Grapes are actually “little bags of sugar”. Most primates have a sweet tooth and love “little bags of sugar” and let the keeper “know” that they really like them – thus, more and more grapes “creep” into the diet creating the phenomena – “DIET DRIFT”!

4) Standardize Dietary Amounts

Now, as the dietary ingredients and their amounts are recorded on the diet card system, another common phenomena become obvious. A keeper will indicate on a diet card that ten antelope are being fed three "scoops" of textured grain. Three scoops? Three scoops of textured grain means nothing if the size of the scoop and weight of the grain is unknown. It may seem unlikely, but a scoop or cup does not always measure the same! Do you know how many "different" scoops or cups there are? Due to human nature, trying to standardize all the scoops and cups between animal departments, does not work. A great amount of time and expense can be expended to do so, only to be seen that after a few weeks of time, all keepers are using their “favorite” scoop or cup again (often made out of a bleach bottle!). Thus, weighing out the amount of each feed required and then marking the favorite measuring utensil for the correct amount works well – and everyone is content. Keeping a scale at a central location (commissary) works well for keepers to check on their amounts of diet they are feeding. It is also helpful to post the following conversions:

One pound (lb) = 454 grams (g)
1000 g = 1 kilogram (kg)
1 kg = 2.2 lb

Notice too, that as the dietary ingredients are collected for each species, there is a major discrepancy in the size of fruits and vegetables. For example, a group of primates are fed two apples, an orange and two yams. Here enters another “quirk” of human nature. Now I am going to generalize, and every time I generalize, I am challenged, but if a keeper is weight conscious themselves, they will select smaller fruits and vegetables. If a keeper is

not as weight conscious, they will inadvertently select larger fruits and vegetables. Thus, knowing the weight of an amount of fruit to be fed can alleviate inconsistent amounts being fed to the animals. Take note too that an average whole apple may weigh 160 grams, but if it is chopped, one cup of apple weighs 110 grams. Likewise, an average banana weighs 200 grams, but a cup of chopped banana weighs 170 grams. Other examples of "challenging" amounts are a "handful" of greens or a "flake" of hay. The first question to be asked is, whose handful? What about one fish – a small or large fish? Table 2 indicates weights of common fruits, vegetables and other dietary staples.

5) Nutrient Analyses

One of the ways to monitor feed quality of feeds being delivered to the zoo is through nutrient analyses. For example, if hay quality is being questioned, feed analyses can quickly determine the validity of any claim. When buying complete diets such as primate biscuits from reputable companies, nutrient analyses of those items are not as important as with bulk items. Bulk items may include legume or grass forages and grain that is being fed to hoofstock. Ingredients should not be bought in bulk if proper storage facilities are not available or if they will not be used in a designated amount of time. There are two major reasons why it is advantageous to purchase forages and grain in bulk. First, by buying larger amounts it is more economical. Second, when larger amounts are purchased, they can be sampled and analyzed for nutrient content. This is particularly effective, as then a diet is formulated with ingredients of a known and consistent nutrient content of a feed that will be used for a longer period of time. Nutrient analyses are not as effective when completed on smaller amounts of an item, as usually by the time the feed analyses comes back, the feed has been converted to manure and washed down the drain!

When sampling forages, a bale corer is the tool of choice. These can be purchased or are available from a local Cooperative Extension office or feed mill. It is important that a **"representative sample of all the feed"** is taken, as that one sample will indicate the nutrient content for all feed from that delivery. For example with forages, a minimum of 10-15 cores of hay should be taken from different bales of the lot. The bales themselves should be sampled so that all regions of the bale, outer and inner portions, are represented. If grain is bought in bulk, "grab samples" of the feed can be taken from different regions of the storage bins. All collected samples from a feed source need to be incorporated, mixed and subsampled. Only after all of this has been completed should a "representative sample be sent in. Approximately 150-200 grams of the sampled feed is needed as a minimum amount for the representative sample. Keep in mind as you are sampling the feeds, that for many of the analyses that are completed, 0.5-1.0 gram of the sample will determine the nutrient content for a whole load of feed - thus good sampling is essential.

Proper feed storage is important in order to maintain feed and forage quality. Hay needs to be stored in a building or, at minimum, under a tarp to prevent bleaching and leaching of the nutrients from the hay. Bagged feed should be stored in a building out of reach of rodents and in a cool environment. High temperatures quickly result in loss of any added vitamins to the feed. Maximum storage time for bagged feeds should be three months or

less for maximum nutrient availability. Good quality hay can be stored for a minimum of a year without substantial nutrient loss.

If whole animals such as crickets, meal worms, live mice, rats or chicks are bought in large numbers, they need to be fed a well-balanced diet. If food animals are not fed appropriately, then they will not provide the needed nutrients to the animals consuming them.

As a final note, once a reputable lab is found for nutrient analyses, it is wise to continue using that lab for all future analyses. Since there are slight differences in laboratory technique between labs, the results of feed analyses from different labs will vary slightly. Thus for the best relative and consistent results, the same lab should be used for all samples.

6) Nutrition Workshop

Whenever possible, bring in a visiting or collaborative nutritionist to provide workshops for zoo personnel. This training will emphasize the importance that the institution is placing on nutrition. With this type of approach, zoo personnel will not only recognize the importance of a sound nutritional program and want to participate, but will often begin searching for new ways to improve the nutrition of the animals under their care. It should be cautioned that this enthusiasm, though desired, needs to be monitored by the nutrition coordinator. Often is the case that overzealous personnel actually implement changes that are of harm to the animals.

Summary

Now, if the preceding steps are followed, when a nutritionist is brought in to the zoological institution, it is much more efficient to be able to hand them a recorded set of diets. This saves the institution from paying a nutritionist to spend time collecting diets and weighing out scoops of feed.

As you have read these pages, there is one theme that continues to be emphasized time and time again, and that theme is that everyone has to “buy” into the nutrition program or it will not be a success. If the keepers do not believe in it, dietary changes or consistency in the diets will never become a reality. The best balanced diet is of no value if it is never fed to the animal. If administrators do not “buy” into the program, any changes will not be enforced and apathy will set in. For a nutrition program to be a success, it has to be a community effort with everyone doing their part. Therefore, a zoological institution can begin the initial stages of a nutrition program without nutritionist and on a limited budget.

Table 1. Sample of a Daily Diet Card.

Animal Species: _____ Date: _____

Dietary Ingredients:

Daily Diet Quantity - Group Amount:

Daily Diet Quantity - Amount for Adult Individual:

Treats/Additives:
AM
PM

Comments:

Table 2. Partial diet conversion chart - weights and volumes of common foodstuffs.

Whole food items:		
	Grams	**Pounds**
Grams		
1 mouse	**27.2**	**.06**
1 rat	**322**	**.71**
herring, ea	**141**	**.312**
1 egg	**63.5**	**.140**
shelled	**56.3**	
yolk	**19.5**	
Fruits and Vegetables:		
1 apple	**160**	**.33**
1 cup, chopped	**110**	
1 orange	**175**	**.385**
1 cup, chopped	**130**	
1 yam	**220**	**.48**
1 cup, chopped	**95**	
head of endive	**581**	**1.28**
1 leaf	**13.6**	
Complete Diets:		
1 cup omnivore	**89**	**.196**

1 cup trout chow	**107**	**.236**
Others:		
grass hay, 6" flake	**3250**	**7.15**

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