

# FOOD, BEHAVIORAL ENRICHMENT, AND PRIMATES: SOME GUIDELINES

*from the Nutrition Advisory Group Subcommittee on Enrichment*

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Primates are prominent animals in captive collections. The United States Department of Agriculture (USDA) mandates that dealers, exhibitors, and research facilities develop, document and follow an appropriate plan for environment enhancement adequate to promote the psychological well-being of nonhuman primates (APHIS, USDA 1992). Zoos have long recognized the importance of enrichment for captive primates. Most zoos use food as a behavioral enrichment tool. Since, as a general rule, most wild primates spend much of the day foraging for food, the use of food as behavioral enrichment for captive primates can be effective if it is done carefully, monitored and revised based on experience.

The Nutrition Advisory Group (NAG) has a responsibility to provide reasonable guidelines for food used for enrichment for captive animals held by AZA accredited institutions. The NAG subcommittee on Food Used for Behavioral Enrichment has prepared guidelines specific to primates. The guidelines provide: 1) the reasons enrichment foods must be incorporated into the daily ration as part of the diet, 2) guidelines for the inclusion of behavioral enrichment foods in primate diets, 3) criteria for evaluating appropriate behavioral enrichment foods, 4) comments on the use of *treats* and 5) comments on the use of browse. The guidelines are designed to be a quick and easy reference for zoo professionals on how food can be used for enrichment without compromising the nutritional integrity of the diet. The guidelines do not recommend specific foods or feeding regimes.

**Key: behavioral enrichment, primates, food, nutrition**

## ***Introduction***

Zoos have long recognized the importance of enrichment for captive primates. The United States Department of Agriculture (USDA) mandates that nonhuman primates be housed in environments that promote psychological well-being. Many zoos use food as a behavioral enrichment tool. As most wild primates spend much of the day foraging for food, the use of food for behavioral enrichment can be effective. However, great care must be exercised to ensure that the benefits outweigh the potential hazards. Mechanisms to evaluate the consequences of providing enrichment foods should be included in any enrichment plan.

This paper provides some basic guidelines concerning the use of food as an enrichment tool for primates. It should not be regarded as an endorsement of using food as a primary enrichment tool. Indeed, the authors urge primate caretakers to consider all aspects of their charges lives when designing enrichment schemes, and caution against relying solely on food to provide psychological well-being.

### ***Nutrition first***

Diets for captive primates should be formulated with both nutrition and behavioral enrichment in mind. However, satisfying the nutrient requirements of the animals must be the primary goal of the diet.

Providing psychological enrichment should not be at the expense of the physical health and well-being of the animal.

The order Primates contains a wide variety of species. Body size ranges from 40g in the mouse lemur to 200kg in adult male gorillas. Wild diets vary extensively as well. Primate species can be primarily insectivorous, frugivorous, or folivorous. There are even primates that are gum-feeding specialists. Accordingly, there is a wide range of gut morphologies, feeding behaviors, and food preferences among primates. These factors need to be carefully considered when formulating diets, and enrichment schemes involving food.

The presentation of the diet is one area where considerable creativity can be applied to stimulate animals without compromising nutrition. As simple a strategy as providing whole produce instead of cutting it up can provide stimulation, especially to small primates that would have to work to remove the peel or outer skin. Scattering and/or hiding the food can increase the time and effort spent foraging. Using simple "puzzle-box" type feeders can also be effective.

Diets need not be complicated to provide stimulation and novelty. Consider offering different foods on different days; a simple diet that offers 6 -10 major food items on a rotational basis can be considered to be as diverse as a diet that offers more foods, but the same ones every day. In all cases, any offered food should be evaluated as to its effect on the nutrient density of the diet.

### ***GENERAL GUIDELINES FOR THE INCLUSION OF BEHAVIORAL ENRICHMENT FOODS IN THE DIETS OF PRIMATES:***

1. Criteria for evaluating appropriate behavioral enrichment foods and food presentation:
  - a) foods or presentation of the foods should encourage natural foraging behaviors -this is especially true in zoos, where the behavior of the animals serves an educational purpose.
  - b) foods or presentation of the foods should extend the amount of time an animal spends feeding/ foraging without increasing the estimated metabolizable energy intake.
  - c) foods should be easy for the institution to obtain and use -an enrichment scheme that is rapidly abandoned serves no purpose.
  - d) food cost vs benefit should be considered.

- e) the enrichment scheme must be re-evaluated periodically to ensure both are providing behavioral enrichment for the animal without compromising the overall nutrient profile of the diet.
- f) animals need to be monitored for potential health problems, including weight gain or loss.
- g) animals should be monitored for potential changes in social interactions, including aggression over favored food items.

Publications such as Animal Keepers' Forum and The Shape of Enrichment offer numerous ideas for enrichment items and how they can be used for behavioral enrichment. (Appendix 1). Additionally, the journal Zoo Biology frequently publishes articles concerning the use of food for behavioral enrichment. (Appendix 1).

2. All food offered including food used for behavioral enrichment, must be incorporated into the daily ration as part of the diet. Food used for enrichment purposes can add significant calories and fat to the overall diet. It is inappropriate to add additional food items to the diet without considering the nutrient contributions of such items.
3. Treats (or management foods) are not the same as enrichment foods. Treats are used to elicit a specific response from an animal, as in training. For primates, a favorite item already included in the animal's formulated diet can be held back for use as a treat. Only in the rare case in which food is needed as a vehicle to medicate an animal is it appropriate to be given in addition to the formulated diet.
4. Browse used on a regular basis (more than twice a week or comprising more than 2% of the diet as fed), should be considered a dietary item. Nutritional analyses of browse species are difficult to find and interpret. Ellen Dierenfeld Ph.D., Wildlife Conservation Society and Nancy Irlbeck, Ph.D. Colorado State University (Appendix I) are currently working on analyses of browse, edible flowers and herbs. Either may be contacted for assistance with browse analyses. Joeke and Dierenfeld (1996) list analyses of some items used for browse for primates. Although browse can be wonderful for enrichment, fatalities have been reported in some species of primates as a result of browse consumption (Ensley et. al., 1982; Janssen, 1994; Robinson et. Al 1982). Some species of browse found safe for hoof stock have caused illness and death in some species of primates (Ensley et. al., 1982). It is critical for any institution utilizing browse to have a qualified person responsible for the identification of the browse. Zoo professionals are encouraged to contact either the SSP Nutrition Advisor (for SSP species) or a member of the AZA Nutrition Advisory Group for advice before feeding browse to their primates.
5. Enrichment foods should be used in moderation, especially when weaning animals are present. It is imperative that as infants and juveniles mature and begin experimenting with adult foods that they are exposed to nutritious choices. Although exposing young animals to a variety of foods is important, zoo professionals must closely monitor the consumption of the complete feed (*e.g.*, biscuits, canned primate diet, etc..) portion of the diet to ensure the animals food choices are not detrimental to the animals health. The disastrous consequences of juvenile primates weaning to foods with inappropriate nutrient content have been cited in the literature (Ialeggio et.al., 1995).

6. For primates weighing more than 2 kg, enrichment foods may account for 5-10% of an animal's daily caloric intake. The actual nutrient intake from all items in the diet should be periodically reviewed to insure the animal is consuming a balanced diet (minimum review for adult animals at maintenance is once yearly; juveniles and reproductive females, 3- 4 times each year).
7. Enrichment foods for small primates (weighing less than 2 kg) should be formulated into the diet, accounting for all nutrients added to the diet by the enrichment foods. Small primates such as marmosets and tamarins can consume only small amounts of food on a daily basis. The dry matter intake of a small primate is approximately 5% of their body weight (Power, 1991; Power and Oftedal, 1991) or 22.5 gms for an animal that weighs 450 gms. That 22.5 gms of dry matter must contain all the nutrients the animal requires to sustain itself.
8. Enrichment foods offered to animals housed in groups must be monitored daily to ensure adequate intake of essential dietary items by each member of the group. Within all groups of social primates there are dominant and subordinate animals. Dominant animals are capable of monopolizing the more palatable portions of the diet, which may not provide complete nutrition (Power, 1992). Additionally, aggression over favored food items can be more detrimental to the physical and psychological well-being of the animals than the absence of those items. To reduce the chances of over-consumption of enrichment foods by anyone group member, complete feeds such as the primate biscuits or canned primate diets should be fed prior to any enrichment foods. Keepers should monitor the intake of the complete feeds and provide enrichment foods based on the actual consumption of the complete feed portion of the diet by each animal in the group.
9. Enrichment foods for all geriatric primates, regardless of animal size, should be formulated into the diet, accounting for all nutrients added to the diet by the enrichment foods. Humans experience age-related changes in body composition as well as reductions in cardiac, respiratory, hepatic, and renal function that may influence nutritional needs. Further, in elderly humans a slowed-rate of homeostatic regulation and enzyme induction may affect nutrient requirements. There is good evidence that the energy needs of elderly humans are reduced; however, there is not yet a good basis for recommending that the nutrient requirements of healthy elderly humans are different from those of their younger counterparts, unless disease is present (Harper, 1978). To reduce the energy intake in elderly humans and maintain nutrient intake levels that are optimal for health, the elderly human needs to consume a diet with a higher nutrient-to-energy ratio than does the younger human (Roe, 1987). It is reasonable to assume that the same is true of aged non-human primates. Under these assumptions, it is most appropriate for geriatric primates to receive carefully formulated diets that take into account age-related feeding limitations (*e.g.*, dental problems) or disease. Additionally, all nutrients in the geriatric primate's diet, regardless of body weight, should be accounted for in order to ensure an adequate nutrient-to- energy ratio intake without causing obesity .
10. Enrichment foods may be inappropriate in the diets of some injured or diseased primates. Dependent upon the injury or disease, the nutrient requirements of the affected primate may be very different from its unaffected counterpart. Zoo professionals are encouraged to seek

the advice of a veterinarian and nutritionist before including any foods for the purpose of enrichment in the diets of injured or diseased animals.

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