Primates

Most primates can be fed a diet based on commercial monkey biscuits or canned primate or marmoset diet (*Table: Nutrient Requirements of Nonhuman Primates*). Moderate amounts of assorted green vegetables, carrot, sweet potato, apple, banana, and orange also can be offered. Monkey biscuits and the canned products should comprise ³50% of the dry-matter intake of most species; fruits and treat items should comprise = 25%. High-protein monkey biscuits (25% crude protein) should be fed to New World primates to ensure that their higher protein requirements are met. Regular or high-protein monkey biscuits can be fed to Old World species depending on other components in the diet, although many larger Old World species such as gibbons, orangutans, chimpanzees, and gorillas readily accept higher fiber products. The laboratory primate biscuits are typically formulated with very low fiber levels (eg, 5%). Because many of the natural foods consumed by these species appear to contain very high fiber levels (eg, >20%), increasing the dietary fiber intakes of larger primate species is widely practiced. High-fiber biscuits should comprise at least 50% of the dietary dry matter, with leafy and green vegetables making up at least 40% of the dietary dry matter.

Cultivated fruits should be used sparingly for great apes and leaf-eating species because, compared with cultivated green vegetables, they are typically high in sugars and simple carbohydrates and low in protein and calcium. Monkey biscuits can be made more palatable for some species by soaking them in water or fruit juice. To prevent leaching of nutrients, the biscuits should be placed in a thin film of liquid so that the liquid is drawn up into the biscuit.

Other items commonly included in primate diets include hard-boiled egg, yogurt, and bread. Grapes, raisins, peanuts, crickets, and mealworms are treat items well liked by most species. Mouse pups are favored items for many smaller primates. However, callitrichid hepatitis in tamarins and marmosets has been associated with the feeding of newborn mice infected with lymphocytic choriomeningitis virus. Most zoos have discontinued the feeding of mouse pups to these New World primates. Sunflower seeds, instant rice, cracked corn, and shredded coconut can be scattered around exhibit or holding areas to promote foraging activity. Hay should be provided for nesting materials and diversion and to act as a foraging substrate. Many zoos offer meat to their great apes; although meat is often relished by the animals, there is no evidence it is necessary if the diet is properly balanced. Because hypercholesterolemia is seen in many captive gorillas, the feeding of meat may be contraindicated. For most primates, meals should be offered at least twice daily. Smaller species may benefit from even more frequent feedings.

New World primates use vitamin D_2 poorly. It is particularly important that these species receive an adequate source of stabilized vitamin D_3 (cholecalciferol) in their diet if they are not exposed daily to direct sunlight. Marmosets require up to 4 times the amount of vitamin D_3 required by other New World primates. Because of potential vitamin D toxicity, commercial marmoset diets should be fed only to marmosets. Several cases of rickets in some Old World species at weaning have been reported. This may be due to replacement of barred, outdoor primate exhibits with more naturalistic, but indoor, exhibits. While most free-ranging primate species probably satisfy their requirement for vitamin D by exposure to ultraviolet B (UVB) from sunlight, captive animals may rely entirely on a dietary source. Infants at weaning appear particularly at risk because milk levels of vitamin D are probably quite low, and many foods the young begin to eat are not fortified with this vitamin. Exposing the infant or juvenile to natural sunlight may be the best solution, because assuring that a dietary supplement is consumed by a young primate may not be possible. Skylight materials that permit the transmission of UVB are available for installation in zoo habitats, but aging skylights may block adequate UVB transmission. Lights that emit energy in the UVB range are not practical for use with primates.

All primates require a source of vitamin C. Because vitamin C (except for a recently available, more stable form) added to commercial monkey biscuits can begin undergoing significant destruction within 6 mo of milling, a supplementary source should be included in the diet (eg, green vegetables, oranges, multiple vitamins, fruit juice, or fruit-juice powders with added vitamin C).

Members of the subfamily Colobinae are perhaps the greatest challenge in the proper feeding of captive primates. Pregastric fermentation, similar to that in ruminants, occurs in the complex stomach of these species. In the wild, leaves make up a major part of the diet of most colobines (the more frugivorous red colobus is an exception). Therefore, natural diets are usually moderately high in fiber, and animals spend much time foraging. Offering a rich, rapidly consumable diet of monkey biscuits and fruit in captivity presents a situation quite different from that typically found in the wild and may be partly to blame for the frequent GI problems reported in these species. Also, some evidence suggests that a high percentage of colobus monkeys may be sensitive to gluten. A commercial, gluten-free, high-fiber monkey biscuit (25% neutral detergent fiber) has been developed for feeding captive colobines. A diet consisting of 50% high-fiber biscuit, 40% green vegetables and fresh browse, and 10% fruit is recommended for most colobines. Alfalfa pellets or good-quality alfalfa hay can be provided free-choice. If a suitable high-fiber biscuit is not available, fresh browse and/or high-fiber green vegetables such as kale, mustard greens, broccoli, celery, spinach, green beans, lettuce, and escarole should comprise ³50% of the diet, with regular monkey biscuits and canned primate diet comprising ~25% of the dietary dry matter. If a gluten-sensitive enteropathy is suspected, any product that contains wheat, barley, rye, or oats should be removed from the diet. Dietary changes always should be made gradually in colobines to allow their stomach microflora time to adapt.

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