The Animal Welfare Act requires that primates be given access to food at least once per day and to water no less than twice daily for at least 1 hour each time unless otherwise required by the attending veterinarian, or as required by the research proposal approved by the Committee at research facilities (Animal Welfare Act). The two water provision time periods must be separated by a reasonable amount of time of at least several (3 or more) hours (Willems 2009). Food and water amounts earned in the laboratory do not count towards the twice daily water or once daily food requirement per USDA APHIS (Willems 2009). Animals may not be both food and water restricted simultaneously.

UCAR accepts the need to regulate access to food or water to motivate primates to participate in behavioral tasks. In order to use food or water scheduling, investigators must
1. document consideration of alternatives and
2. provide a written justification in the Protocol based on scientific or study driven need for food or water restriction

If no acceptable alternatives exist, UCAR requires that
1. the least restrictive schedule that will achieve the scientific objective be used and
2. each NHP receive food and water daily.

UCAR also requires animals to be transitioned to ad lib food and water and be maintained ad libitum for at least one week before being changed from food restriction to water restriction, or vice versa. Ad libitum access to food and water means that food and water is freely available to the animal without condition at all times.

Animals undergoing food or water restriction must be monitored to assure that they remain healthy. This is done by daily assessment of general condition, and at least weekly assessment and documentation in the housing room of body weight. In addition, all NHPs are given a veterinary assessment at least every 6 months. Animals that reach certain thresholds must be reported to DLAM and will be reassessed by the veterinary staff to determine whether they are healthy enough to continue on water or food schedules. See flow chart below.

| Normal Appearance and/or BCS of 2.5 or more (≥ 8 yrs) BCS of 2.0 or more (< 8 yrs) and/or stable, consistent weight established by DLAM | NO INTERVENTION |
| Abnormal Appearance and/or Abnormal Behavior and/or BCS of 2.5 or less (≥ 8 yrs) BCS of 2.0 or less (< 8 yrs) and/or ≥ 10% weight loss | Consult with a DLAM veterinarian |

1. Possible veterinary evaluation
2. Increased monitoring/weighing
3. Potential temporary increase in water/food amounts
4. Potential temporary removal from water/food scheduling
Below are more detailed descriptions of requirements for maintaining food or water scheduled primates. For all these requirements, exemptions can only be obtained with approval of the veterinary staff. It is up to the veterinarians to determine whether individual animals are healthy enough for exemptions, and it is up to the veterinarians to determine what increased monitoring or other conditions will be required during the exemption.

**DETERMINATION OF BODY CONDITION SCORE and MEAN BASELINE BODY WEIGHT**

All adult NHPs at the University should be maintained at a lean to optimal body condition score (BCS) of 2.5-3 (Clingerman 2005) as monitored by research and veterinary staff. Researchers wishing to maintain adult animals below a BCS of 2.5 through food or water restriction must provide a scientific reason in the Protocol as an exemption to this Policy. DLAM and the PI will monitor NHP age, body condition score and weight to meet the Animal Welfare Act requirements to maintain health especially in growing immature macaques less than 8 years of age. Investigators working with young animals should specifically address, in their Protocol, their expectation for any retardation of growth rate and adult size. While UCAR accepts that some stunting may occur, young animals are still expected to grow and maintain a body condition score above 2.0 (Clingerman 2005).

The monthly average body weight of a subadult (less than 8 years old) macaque must increase as they age. A baseline body weight is established as the animal’s weight during ad libitum food and water and at an ideal body condition score, and this baseline weight is used to initiate food or water restriction. At the beginning of each month, the research staff calculates a mean average weight from the previous month for use in evaluating weight trends and determining minimum food or water requirements for that month. The mean baseline body weight calculated for the current month may not be below the previous month in a subadult monkey unless approved by the University Veterinarians. The subadult macaques must grow along a positive weight trend. If the mean monthly weight has decreased, the higher mean body weight must be used to calculate minimum food and water amounts. For all food or water restricted animals, the lab must adjust the minimum, daily water and calorie amounts each month based on the new monthly mean baseline weight. An adult macaque (greater than 8 years old) may be maintained at a body condition score of 2.5 indefinitely with no weight gain. DLAM veterinary staff in conjunction with the researcher may establish a new baseline body weight at each semiannual health assessment or at any other point as the animal’s weight changes based on the veterinary staff’s evaluation of the individual animal’s ideal body weight.

**MINIMUM WATER REQUIREMENTS**

In general, NHPs fulfill their daily water requirements (sensible and insensible losses) with 20ml/kg body weight. UCAR requires that each NHP either earns or is supplemented to no less than 20ml/kg/day of mean body weight from the previous calendar month. Water equivalents of fruit or vegetables may be used to partially meet the NHP’s fluid requirements. As identified in people, 20% of the daily water intake is generally obtained from food (Food and Nutrition Board 2004). Water equivalents can be found in Bowes and Church’s Food Value of Portions Commonly Used (18th edition, Pennington JAT and Douglass JS, ed., Lippincott, Williams and Wilkins: Philadelphia, 2005). Therefore, no more than 20% of the minimum daily water requirements may be provided in the form of fruits/vegetables. The fluid content in fruit or vegetables is dependent on the weight of the individual piece of food so the Investigator must calculate this each time fruit or vegetable is used to meet an animal’s daily minimum requirement and record the calculated fluid content on the Water Restriction Log in the housing room. Investigators are required to use the Water Restriction Log attached to this document.
In any case, an NHP should only be restricted to the level that is required for acceptable participation in the laboratory. Behavioral tasks in the laboratory should be adjusted to ensure they are not too complex for the age or ability of the animal. UCAR encourages investigators to provide water in excess of these minimums whenever possible. Non-working day water provisioning should generally provide animals with substantially more than the daily working minimum. When the animal will not participate in laboratory activities for a sustained period, the animal should be transitioned back to ad libitum food or water.

MINIMUM FOOD REQUIREMENTS

In general, the total caloric intake of a food-regulated animal is 50-70% of that associated with ad libitum feeding (ILAR 2003). Depending on activity level, immature macaques require 110 kilocalories per kilogram of body weight, and adult macaques require 65 kilocalories per kilogram of body weight for maintenance (Knapka 1995). UCAR requires immature macaques (<8 years old) to receive a minimum of 55kcal/kg of mean body weight per day and adult macaques to receive a minimum of 33kcal/kg of mean body weight per day. An animal’s daily intake must be entered in the Food Restriction Log in the animal housing room. Investigators are required to use the Food Restriction Log attached to this document and provided by UCAR.

In any case, an NHP should only be restricted to the level that is required for acceptable participation in the laboratory. UCAR encourages investigators to provide food in excess of these minimums whenever possible. Non-working day food provisioning should generally provide animals with substantially more than the daily working minimum.

PROVISIONING OF FOOD AND WATER BEFORE AND AFTER SURGERY OR GENERAL ANESTHESIA

UCAR requires that all NHPs undergoing major invasive surgery be transitioned to ad lib water and food by the day prior to general anesthesia. Fasting prior to surgery should be limited to the least amount of time required (generally 6 to 16 hours). The animal must be maintained on ad lib food and water for at least one week following a major invasive surgery or as long as drugs requiring free access to food and water for appropriate metabolism (i.e. NSAIDs, certain antibiotics) are administered, whichever is longer. If a researcher wishes to restrict an animal during this post-operative period, he or she must receive an exemption from UCAR in their Protocol or consult with DLAM veterinarians.

TRANSITIONING FROM SCHEDULED/RESTRICTED TO AD LIB

To prevent water intoxication and cerebral edema or gastric upset and bloat associated with large volumes of water or food, NHPs must be transitioned to an ad lib schedule over a period of 1-3 days. Food or water scheduled animals may initially consume large volumes of food or water following a return to an ad lib schedule. The greater the level of restriction, the longer the transition period should be.

DLAM should be consulted immediately if an NHP displays any abnormal behavior, vomiting or diarrhea, incoordination, or collapse during the transition period.

MONITORING AND REPORTING REQUIREMENTS
Researchers are encouraged to weigh food or water restricted NHPs each time the animal is chaired, but required to weigh them not less than every 7 days. This weight must be recorded in the Food or Water Restriction Log in the animal housing room. Amounts of food or water that the animal earned or was given in the cage must be recorded (as a total amount) in the Food or Water Restriction Log in the animal housing room daily.

**If the body condition score of an adult animal falls below 2.5, or if an NHP loses 10% of its body weight from the monthly mean, a weekly weight or a weight from the semiannual health assessment, this must be immediately reported to a DLAM veterinarian.** The veterinarian will assess changes in body condition and may review serum chemistry values (e.g. serum protein, hematocrit, electrolytes) to determine the animal’s clinical health and appropriateness of the current level of food or water restriction. As a result of this evaluation, the veterinarian may require the NHP be transitioned to *ad libitum* food or water, or else prescribe some higher daily requirement for the individual animal. Alternatively, the veterinarian may determine that the animal’s current body condition is acceptable.

When juvenile and subadult macaques are given body condition scores of less than 2.0, DLAM veterinarians will assess the individual animal and consider growth trends, the level of restriction, the animal’s laboratory performance, and blood parameters as deemed pertinent by the Attending Veterinarian. Food and water restriction may continue without change if the animal has no signs of malnourishment, has an overall positive growth trend, and no signs of distress such as stereotypical behaviors.

DLAM performs a health assessment of all NHPs at least semiannually, and each animal’s body weight is plotted on a growth curve to monitor growth compared to age-matched controls. At least annually, information regarding blood parameters (plasma osmolality, sodium, BUN, creatinine, hematocrit, and plasma protein) is obtained. At this time, a DLAM veterinarian, in consultation with the Investigator, may prescribe a higher food or water requirement depending on the animal’s age, body condition score, other physical examination findings (such as increased skin turgor, pale mucous membranes, etc.) or blood parameters. In general, all investigators must comply with this policy. However, individual investigators may provide a scientific reason for requesting an exception to this policy in their Protocol.

*UCAR voted that a veterinarian may provide an exemption to weekly weighing of water/food scheduled macaques under specific conditions which may include: novel training equipment within the cage, primate play places and when the macaque is provided with more than the minimum amount of food and/or water as described by this policy. This provision will be done on a case by case basis and with the oversight of the veterinarians.

**REFERENCES**


