I. **Purpose:** The Brown University Institutional Animal Care and Use Committee (IACUC) recognizes that fluid and food regulation may serve as powerful and useful methods to modulate motivation. This policy has been developed to provide information to research teams, animal caregivers, veterinarians, and IACUC members on how to approach and manage food and fluid regulation in a manner consistent with maintaining animal health and welfare, while not compromising data collection. All food and/or fluid regulation must be approved by the IACUC and justified based on the scientific objectives of the study.\(^1\) The least amount of restriction that will achieve scientific objectives must be used.

II. **Definitions:**

- **Ad libitum** – Animals are offered access to a continuous supply of food and water and can eat / drink as much and as often as they want.

- **Baseline body weight** – The average weight before the restriction period began. Individual baseline fluid requirements under similar conditions (e.g., clinical health, environmental factors, level of physical exercise, etc.) vary depending on the species, gender, growth and developmental phase, body weight, social ranking and individual preferences.

- **Optimal body weight** is the weight of an animal with a body condition score of 4 – 6 out of 9 (See page 6 of this policy for guidance regarding Body Condition Scoring).

- **Regulation** is a deviation from the standard husbandry practices in the amount or availability of food or water. It can include scheduling and restriction as defined below. Special diets are not inherently considered regulation.

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\(^1\) Normal fasting for preparation for surgery is not subject to this policy.
• **Restriction** is the provision of rations such that the volume of food or fluid is strictly monitored and controlled (ILAR, 2003). Restricted feeding typically limits the total volume of food or fluid consumed for the purpose of reducing the animal’s weight to a level lower than that expected for an ad libitum fed animal.

• **Scheduling** of access to food or fluid limits the number of times or a length of periods during which the animal has access to food or fluid so that the animal consumes a normal portion but at intervals or durations that differ from standard husbandry practices (ILAR, 2003). This definition only applies if food or fluid is removed for a period of greater than 12 hours. Scheduled feeding is not expected to result in a subnormal body weight.

III. **Food Regulation**

1. The individual animal’s optimum food ration for growth, development, and weight maintenance must be assessed prior to initiating food restriction to develop a baseline pattern. Food regulation must be customized to the individual animal. The daily ration for each animal should be based on consumption, body condition, rate of gain, and life stage.

2. Prior to the implementation of food regulation, baseline body weight and body condition score (BCS) must be determined. *(See page 6 of this policy for guidance regarding Body Condition Scoring).*

3. Whenever possible, food regulation should be introduced gradually through a systematic limitation of intake over several days or weeks. It should be noted that not all animals will perform well with food regulation as a behavioral motivator.

4. Unless empirical data are established, no less than 85% of the animal’s determined daily ration should be fed. Regulation below 85% needs to be justified in the IACUC protocol and approved by the IACUC, and involve regular monitoring by the veterinary staff.

5. The number of feedings should be twice daily, given at least 6 hours apart. A minimum of 25% of the daily food ration should be given in the morning prior to testing.

6. If an animal is not completely consuming the restricted ration, no further restriction should be instituted, and the animal must be closely monitored for signs of illness and/or behavioral changes.

7. Food consumption, body weight, and body condition must be evaluated periodically and at intervals appropriate to the life stage. Young developing animals require more frequent monitoring (e.g., 2-3x weekly) than older mature animals who are performing stably (e.g., once weekly).

8. On days that animals are not tested, they should receive a full food ration divided into two equal meals.

9. The following parameters should be monitored:
   a. The amount of food provided and the amount of food consumed at each meal by the research team.
   b. The animal’s body weight must be obtained a minimum of once per week by the research team. Body weight should be obtained at approximately the same time each day, and obtained consistently relative to training (i.e., taken directly before training each day, as opposed to taken directly before training one day, then taken several hours before training on a subsequent day.)
c. Body condition should be evaluated and scored at each physical examination by Animal Care.

d. Ethograms should be completed by Animal Care on a regular basis if behavioral abnormalities are noted.

e. Clinical chemistry profiles (serum chemistry and complete blood count and differential) should be reviewed by Animal Care every 12 months or more frequently if clinical abnormalities are detected.

10. Endpoints

a. Any animal should be temporarily removed from food regulation if:
   - s/he has lost more than 15% of his/her projected optimal body weight;
   - s/he has an unsatisfactory body condition score (<4/9);
   - s/he has significant abnormal behaviors that have not improved with intervention; or has abnormal laboratory data.

   The animal may be returned to study when improvements in body weight or behavior have been made.

b. Animals should be permanently removed from food regulation if they continue to have significant problems in any of the areas identified in 10a. after being returned to food regulation after temporary removal more than twice.

11. Food regulation records of animals must be maintained to include:

a. The proposed individual full ration of food
b. The degree of regulation from full ration
c. The length of time for the regulation and results of monitoring parameters, such as body weight, BCS, behavioral assessments, and laboratory data
d. The individual animal’s preferred positive food reinforcements
e. The results of behavioral training

12. Records must be available for review by the IACUC, veterinarians, animal caretakers, and for Post-Approval Monitoring (PAM) activities.

IV. Fluid Regulation

1. Whenever possible, fluid regulation should be introduced gradually through a systematic limitation of intake over several days.

2. Animals should not be offered less than 20 ml/kg/day of fluid. This is an estimate of fluid loss related to daily biological processes (respiration, urination, defecation, etc.) for nonhuman primates.

3. Each animal should be provided with the opportunity to earn fluids to satiety during each work period. Animals failing to consume their calculated daily minimum fluid intake must be provided with supplemental fluids after the training session to ensure the minimum daily fluid intake level and hydration needs have been met.

4. Fluid regulation may result in a decreased appetite for dry diets; therefore, to the extent possible, fluids should be given during meal times to encourage consumption of more food and reduce body weight loss.

5. Animals must be returned to higher fluid balances at least 48 hours prior to undergoing surgical procedures. Increased fluids should also be provided for at least one week post-
operatively depending on the analgesics, antibiotics or anti-inflammatory agents used to treat the animal.

6. The following parameters should be monitored:
   a. Prior to initially placing an animal on fluid regulation, the animal should be given a complete physical examination by a veterinarian.
   b. When on fluid regulation, regardless of whether actively working or not, the animal’s body weight must be obtained at least once per week by the research team. The weight should be obtained at approximately the same time each day.
   c. A physical examination by a veterinarian with attention to the animal’s body condition and assessment of clinical chemistry profiles (serum chemistry, osmolality, and complete blood count and differential) should be performed at least every 12 months or more frequently if clinically indicated.
   d. Each animal should be observed daily during periods of fluid regulation by the research team and/or Animal Care. Special emphasis should be placed on food intake, consistency of stool, amount of urine (e.g., normal, no urine output) and behavior.
   e. Animals manifesting signs of dehydration, such as drinking urine, anorexia, scant or no urine output, scant hard feces, lethargy, incoordination, dry mucous membranes and corneas, reduced skin turgor or other changes in behavior (poor study performance) should be reported immediately to the veterinarian.

7. Endpoints
   a. If an animal loses 10% or more of optimal body weight while on fluid regulation, a veterinarian should assess the animal’s body condition and physical well-being.
   b. If an animal’s weight remains below 85% of optimal body weight for 24 hours despite intervention, the animal should be given ad libitum access to water until its weight has increased to greater than 90% of baseline or optimal body weight.
   c. Animals should be given unrestricted access to fluid if there is >15% BW loss from baseline, the BCS is <4/9, significant abnormal behaviors have developed, or clinical chemistry parameters are significantly out of normal range.
   d. The animal may be returned to study when improvements in body weight, BCS, and/or behavior have been made.
   e. Animals may be permanently removed from a fluid regulation study if they continue to have significant clinical concerns that fail to respond to veterinary intervention.

8. Fluid regulation records must be maintained as follows:
   a. Veterinary assessment of an animal’s well-being prior to study, maintained by Animal Care.
   b. The total daily consumption of fluid before and after regulation, inclusive of supplemental fluid sources and any high water content food provided. The water content from the fruits and other sources (i.e., jello) should be recorded if they count toward the minimum daily water consumption. These records will be maintained by the research team and/or Animal Care.
   c. The duration of the regulation and results of routine monitoring parameters, such as body weight, BCS, behavioral assessments, quality/quantity of urine and fecal
material, appearance of visible mucous membranes and corneas, skin turgor and laboratory data. These records will be maintained by the research team and/or Animal Care.

d. Body weight must be logged a minimum of once each week while an animal is on fluid regulation by the research team.
e. The results of behavioral training and testing, by the research team.

9. Records (e.g., animal medical records, fluid logs, behavior assessments, etc.) must be available for review by the IACUC, veterinarians, animal caregivers, and for PAM activities.

For additional information, please see the Association of Primate Veterinarians Food Restriction Guidelines for Nonhuman Primates in Biomedical Research and Guidelines for Use of Fluid Regulation for Nonhuman Primates in Biomedical Research.

V. References:
10. Willems, RA. 2009. Regulatory issues regarding the use of food and water restriction in laboratory animals. Lab Animal 38(10).
# Macaque Body Condition Scoring

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>EMACIATED</strong> – Very prominent hip bones (easily palpable and likely visible), prominent facial bones, spinous processes and ribs. Minimal to no muscle mass is palpable over ileum or ischium. Anus may be recessed between ischial callouses. Body is very angular, no subcutaneous fat layer to smooth out prominences.</td>
</tr>
<tr>
<td>2</td>
<td><strong>VERY THIN</strong> – Hips, spinous processes, and ribs are prominent. Facial bones may be prominent. There is very little muscle present over the hips and back. Anus may be recessed between ischial callouses. Body is angular, no subcutaneous fat to smooth out prominences.</td>
</tr>
<tr>
<td>3</td>
<td><strong>THIN</strong> – Very minimal fat reserves, prominent hip bones and spinous processes. Hips, spinous processes and ribs are easily palpable with only a small amount of muscle mass over hips and lumbar region.</td>
</tr>
<tr>
<td>4</td>
<td><strong>LEAN</strong> – Overlying muscle gives hips and spine a more firm feel. Hip bones and spinous processes are readily palpable, but not prominent. Body is less angular because there is a thin layer of subcutaneous fat.</td>
</tr>
<tr>
<td>5</td>
<td><strong>OPTIMUM</strong> – Hip bones, ribs and spinous processes are palpable with gentle pressure but generally not visible. Well developed muscle mass and subcutaneous fat layer gives spine and hips smooth but firm feel. No abdominal, axillary or inguinal fat pads.</td>
</tr>
<tr>
<td>6</td>
<td><strong>SLIGHTLY OVERWEIGHT</strong> – Hip bones and spinous processes palpable with firm pressure but are not visible. Bony prominences smooth. Rib contours are smooth and only palpable with firm pressure. Small abdominal fat pad may be present.</td>
</tr>
<tr>
<td>7</td>
<td><strong>HEAVY</strong> – Bony contours are smooth and less well defined. Hip bones, spinous processes and ribs may be difficult to palpate due to more abundant subcutaneous fat layer. May have fat deposits starting to accumulate in the axillary, inguinal or abdominal areas.</td>
</tr>
<tr>
<td>8</td>
<td><strong>OBESE</strong> – This animal will often have prominent fat pads in the inguinal, axillary or abdominal region. Abdomen will be pendulous when animal sitting or ambulating. Hip bones and spinous processes difficult to palpate. Bony contours smooth and poorly defined.</td>
</tr>
<tr>
<td>9</td>
<td><strong>GROSSLY OBESE</strong> – Obvious, large fat deposits in the abdominal, inguinal and axillary regions. Abdominal palpation is very difficult due to large amount of mesenteric fat. Pronounced fat deposits may alter posture/ambulation. Hip bones, rib contours and spinous processes only palpable with deep palpation.</td>
</tr>
</tbody>
</table>

*Ambulating*  
*Right Lateral Viewed from Back*