Biology and Husbandry of Hamsters

DLAR Staff Training
Overview

- History
- Taxonomy
- Anatomy and physiology
- Reproduction
- Handling
- Behavior
- Diseases
- Uses in research
History
The Golden or Syrian Hamster
“Hamsters”

- Syrian or Golden (*Mesocricetus auratus*)
- Chinese (*Cricetulus griseus*)
- Armenian (*Cricetulus migratorius*)
- European (*Cricetus cricetus*)
- Dzungarian (*Phodopus sungorus*)
- South African (*Mystromys albicaudatus*)
Inbred Strains (*M. auratus*)

- **BIO (R)14.6**: muscular dystrophy
- **BIO (R)4.24**: obesity, adrenal tumors
- **BIO (R)12.14**: sex-linked hindlimb paralysis
- **LHC/LAK**: prion diseases
- **Nude**: no thymus, hairless
Anatomy and Physiology
General Information

- Cheek pouches
- Two-compartmented stomach
- Flank organs or scent glands
- Hibernate
- Susceptible to dental caries
- Adrenal glands larger in males
- Short gestation period (15-16 days)
- Short wide snout
Cheek Pouches

- Not present in other laboratory rodents
- Storage of “bedding to babies”
- Blood vessels easily seen
- No lymphatic drainage?
- Transplant site
Stomach

- A = non-glandular forestomach
- B = glandular stomach
- C = pancreas
- D = spleen
- E = liver
Reproduction
Sexing
Mating Systems

- Hand mating
- Monogamous pairs
- Harem
- Intermittent mating
Reproduction

- Sexual maturity: 35 - 42 days, however, males are not usually bred until 10-14 weeks of age and females at 6-10 weeks of age.
- Estrous cycle: 4 days
- No fertile post-partum estrus. Fertile estrus occurs 2-18 days post-weaning
- Gestation: 15-16 days
- Litter size: 5-10
- Weaning: 21 days
Handling
Handling & Restraint

- For cage change, either pick up by scruff or cup in your hands
- To restrain, grasp a handful of skin and make the hammy smile
Behavior
Behavioral Idiosyncrasies

• Solitary
• More nocturnal than other rodents—don’t wake them up suddenly
• Females can travel several kilometers in estrus
• Aggressive: females dominate males, and larger females dominates smaller ones
• Hibernate if temperature drops below 5°C (41°F) for extended periods.
• The ability to hibernate is associated with reproductive conditions and selection of laboratory bred hamsters for continuous production has resulted in strains which seem to have lost the ability to fully hibernate.
Conversion Formula

°F to °C
Deduct 32, then multiply by 5, then divide by 9

°C to °F
Multiply by 9, then divide by 5, then add 32
Diseases
Viral Diseases

- Lymphocytic choriomeningitis (LCMV)
- Minute virus of mice (MVM) and Pneumonia virus of mice (PVM)
- Sendai virus
Bacterial Diseases

- Most cause diarrhea and intestinal pathology (commonly called “wet tail” and more technically known as proliferative ileitis)

- Tyzzer's disease is caused by the bacteria, *Clostridium piliforme*. *C. piliforme* lives in the intestine and is spread from animal to animal through fecal contamination of food and water. The bacteria can produce spores, which can survive for years in the environment, and are very resistant to heat and many disinfectants. The spores are shed in the feces of infected animals.

- *Campylobacter, Clostridium, Escherichia, Helicobacter, Lawsonia, Salmonella*
Parasitic Diseases

- Pinworms (Syphacia mesocriceti, obvelata)
- Tapeworms (Rodentolepis nana, Hymenolepis diminuta)
- Mites (Notoedres, Sarcoptes, Demodex)
Tumors

- Kidney and bladder tumors
- Brain tumors
- GI tumors
Uses in Research
Neuroscience

- Sexual behavior, hormone control of development, olfactory cues
- Circadian activity
- Vision
- Aging, muscular dystrophy, scrapie
Special Considerations

- May need reverse light cycle to facilitate studies
- Should be housed individually
- Long-term investment makes each hamster very valuable
Cancer

- Hamsters develop tumors in response to many viruses, such as adenovirus
- Cheek pouches are a site for tumor transplantation
- Hamster cells can be a source of LCMV
# Hamsters

## Care and Feeding

<table>
<thead>
<tr>
<th>Breeding/Lactation</th>
<th>Number of Adults</th>
<th>Number of Young</th>
<th>Cage Dimensions&lt;br&gt;Length</th>
<th>Cage Dimensions&lt;br&gt;Width</th>
<th>Cage Dimensions&lt;br&gt;Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growing</td>
<td>1 pair</td>
<td>8-10</td>
<td>50 cm</td>
<td>25 cm</td>
<td>15 cm</td>
</tr>
<tr>
<td>Experimental</td>
<td>8-10</td>
<td></td>
<td>60 cm</td>
<td>60 cm</td>
<td>8 cm</td>
</tr>
</tbody>
</table>

### Feeding Recommendations

- Daily Feed Usage: 10-14 gm. Feed free choice. No supplemental feeding necessary
- Water Requirement: Ad libitum
- Begin Dry Food Consumption: 7-9 days

## Environmental Data

<table>
<thead>
<tr>
<th>Room Temp.</th>
<th>Humidity</th>
<th>Light</th>
<th>Litter Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 °C</td>
<td>45-55%</td>
<td>10-12 hrs./day</td>
<td>Treated shavings, corn cobs, beet pulp, peat moss, or commercial bedding</td>
</tr>
</tbody>
</table>

## Biological Values

### Blood Chemical Composition

<table>
<thead>
<tr>
<th>Water</th>
<th>Calcium</th>
<th>Sodium</th>
<th>Chloride</th>
<th>Phosphorus</th>
<th>Potassium</th>
</tr>
</thead>
<tbody>
<tr>
<td>93.95 gm/100ml</td>
<td>---</td>
<td>144 mEq/L</td>
<td>106 mEq/L</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Magnesium</th>
<th>Cholesterol</th>
<th>Glucose</th>
<th>Serum Protein</th>
<th>Albumin</th>
<th>Globulin</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 mg/100ml</td>
<td>---</td>
<td>88.9-97.3 mg/100ml</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

Values are for plasma, except where noted

### Oxygen Consumption and Body Temperature

<table>
<thead>
<tr>
<th>Oxygen Consumption</th>
<th>Temperature</th>
<th>Breathing Rate</th>
<th>Heart Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed Weight 120 gm</td>
<td>38 °C</td>
<td>74/minute (33-127)</td>
<td>450/minute (300-600)</td>
</tr>
</tbody>
</table>

### Hematological Values

<table>
<thead>
<tr>
<th>Whole Blood Volume&lt;br&gt;(T-1824 dye)</th>
<th>Clotting Time</th>
<th>RBC Life Span</th>
<th>RBC Diameter</th>
<th>RBC Rate of Sedimentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>85 ml/kg</td>
<td>143 sec.</td>
<td>---</td>
<td>---</td>
<td>2 mm/hr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Blood pH</th>
<th>RBC</th>
<th>Hematocrit</th>
<th>Platelets</th>
<th>Hb</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.39</td>
<td>4.0-10.0 10³/mm³</td>
<td>49 ml/100ml</td>
<td>160-516 10³/mm³</td>
<td>12.0 gm/100ml</td>
</tr>
</tbody>
</table>

### Total and Differential White Blood Cell Counts

<table>
<thead>
<tr>
<th>Leucocytes</th>
<th>Neutros</th>
<th>Eosinos</th>
<th>Basos</th>
<th>Lymphos</th>
<th>Monos</th>
</tr>
</thead>
<tbody>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

## Life Cycle Information

<table>
<thead>
<tr>
<th>Weight Adult Male</th>
<th>Weight Adult Female</th>
<th>Weight at Birth</th>
<th>Breeding Age Male</th>
<th>Breeding Age Female</th>
<th>Estrus Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>85-100 gm</td>
<td>95-120 gm</td>
<td>2 gm</td>
<td>2 months 85-100 gm</td>
<td>2 months 95-120 gm</td>
<td>4 days, variations 4-15 days</td>
</tr>
</tbody>
</table>
Sources of Information

• AALAS Training Manuals and CD
• ACLAM text (Laboratory Hamsters)
• LabDiet Laboratory Animal Care Course
• Pathology of Laboratory Rodents & Rabbits