Biology and Husbandry of Hamsters

DLAR Staff Training

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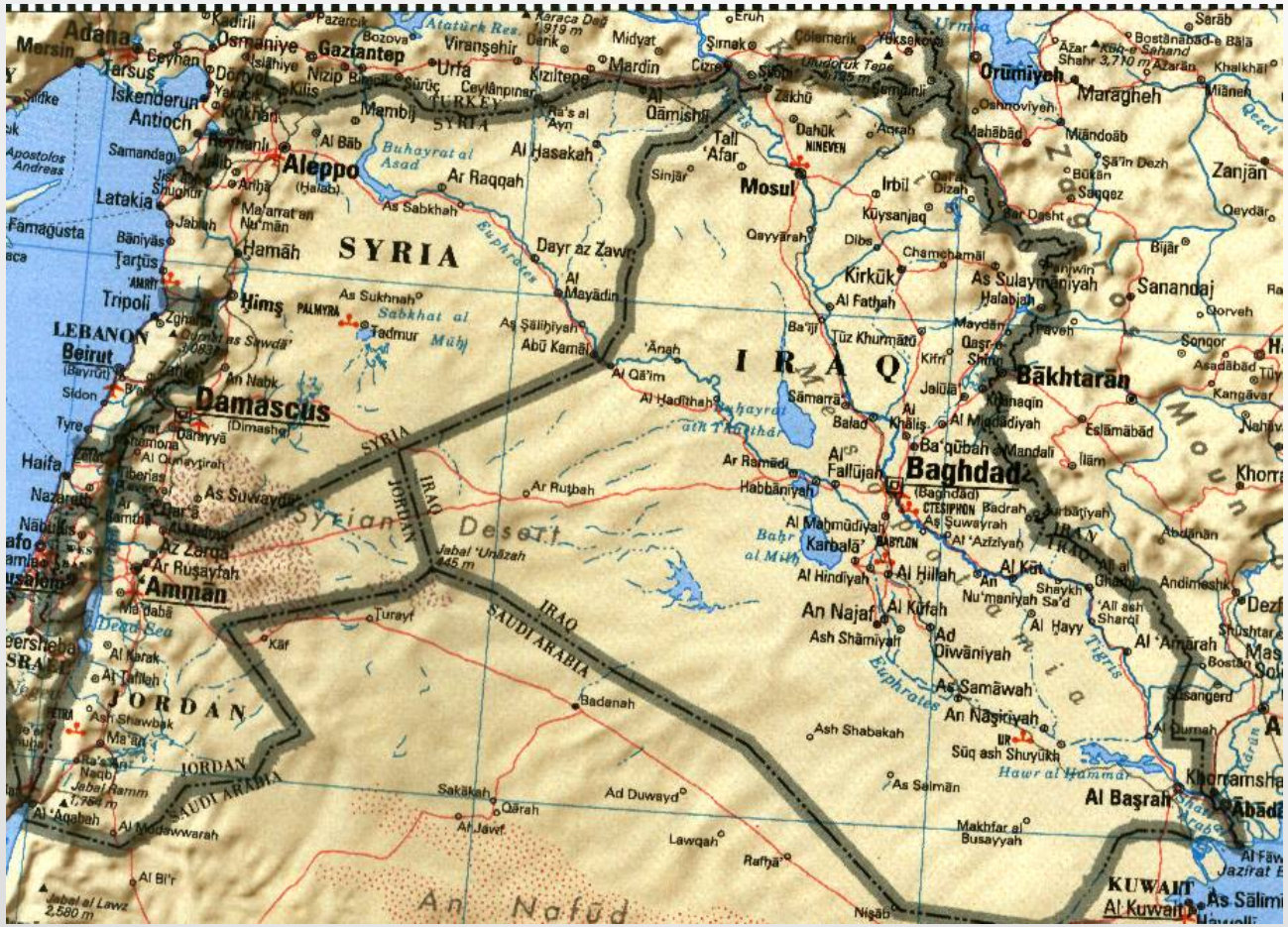
Overview

- 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

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General Information

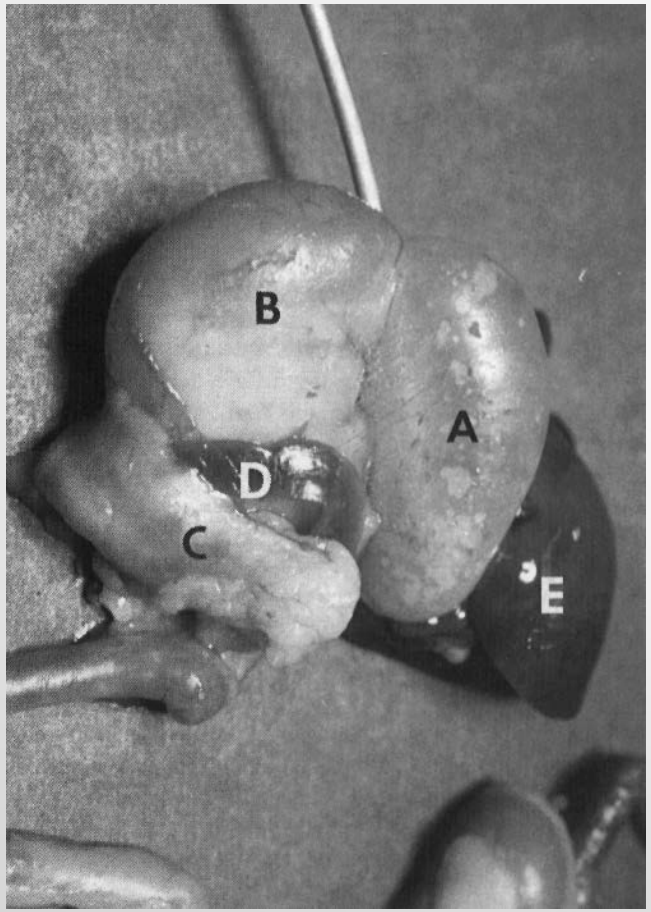
- Cheek pouches
- Two-compartmented stomach
- Flank organs or scent glands
- Hibernate

- 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

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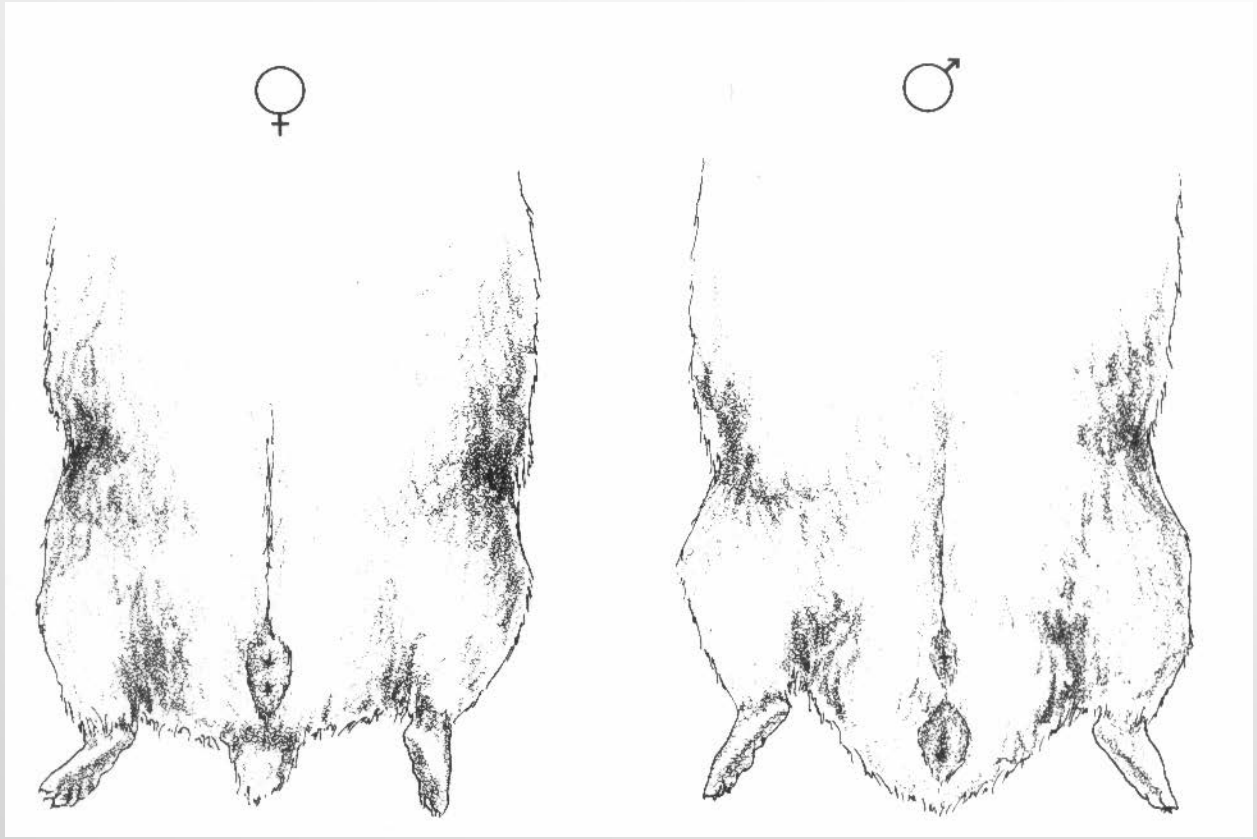
Sexing



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

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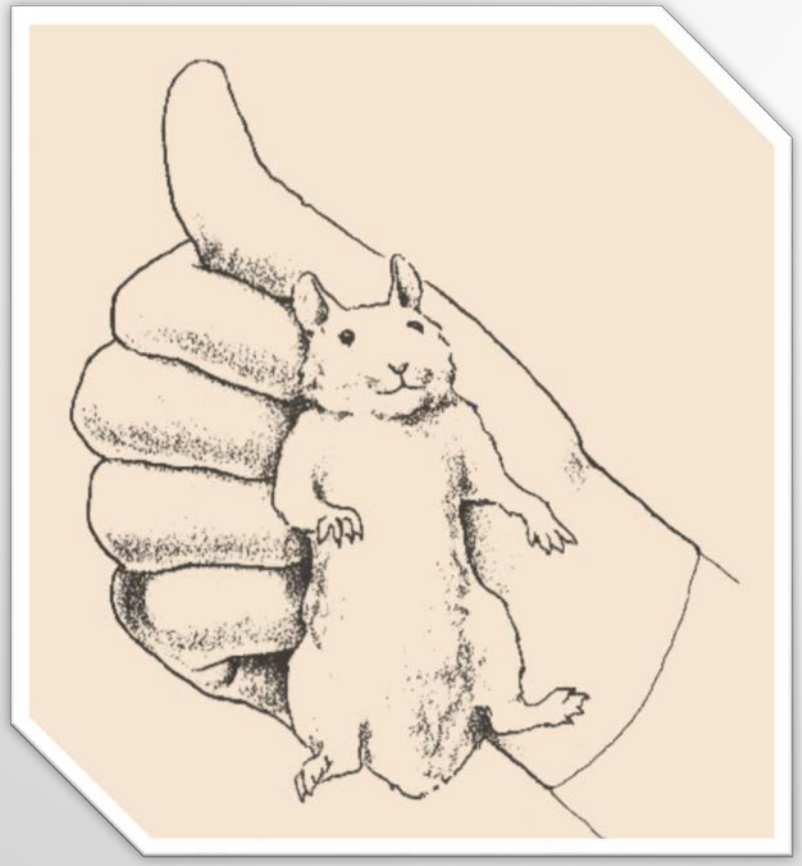
Handling & Restraint



- 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

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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

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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

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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

	Number of Adults	Number of Young	Cage Dimensions* Length	Width	Height
Breeding/Lactation	1 pair	8-10	50 cm	25 cm	15 cm
Growing	—	—	60 cm	60 cm	8 cm
Experimental	8-10		Variable		

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

	Room Temp.	Humidity	Light	Litter Material
Environmental Data	21 °C	45-55%	10-12 hrs./day	Treated shavings, corn cobs, beet pulp, peat moss, or commercial bedding

Biological Values

Blood Chemical Composition	**Water** 93-95 gm/100ml	**Calcium** —	**Sodium** 144 mEq/L	**Chloride** 106 mEq/L	**Phosphorus** —	**Potassium** —
Values are for plasma, except where noted	**Magnesium** 2.5 mg/100ml	**Cholesterol** —	**Glucose** 88.9-97.3 mg/100ml	**Serum Protein** —	**Albumin** —	**Globulin** —

	Observed Weight	Temperature	Oxygen Consumption	Breathing Rate	Heart Rate
Oxygen Consumption and Body Temperature	120 gm	38 °C	—	74/minute (33-127)	450/minute (300-600)

Hematological Values	**Whole Blood Volume (T-1824 dye)** 85 ml/kg	**Clotting Time** 143 sec.	**RBC Life Span** —	**RBC Diameter** —	**RBC Rate of Sedimentation** 2 mm/hr	
	Blood pH 7.39	**RBC** 4.0-10.0 10^6/mm^3	**Hematocrit** 49 ml/100ml	**Platelets** 160-516 10^3/mm^3	**Hb** 12.0 gm/100ml	

	Leucocytes	Neutros	Eosinos	Basos	Lymphos	Monos
Total and Differential White Blood Cell Counts	—	—	—	—	—	—

Life Cycle Information

	Weight Adult Male	Weight Adult Female	Weight at Birth	Breeding Age Male	Breeding Age Female	Estrus Cycle
	85-100 gm	95-120 gm	2 gm	2 months 85-100 gm	2 months 95-120 gm	4 days, variations 4-15 days

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Sources of Information

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