

Rat Scenario



© criver.com



© criver.com

AWJAC 2009

Facility Overview – Laboratory 1

- Veterinary research laboratory
 - Emphasis on medical advances
 - Rodent-only animal facility
- Population dynamics
 - 90 females
 - 60 males
- Some replacement rats are bred at the facility, others are purchased as juveniles in groups of 10
 - Mandatory quarantine period of 14 days for incoming animals
- Long-Evans rats are used in this laboratory



Facility Overview – Laboratory 2

- Veterinary research laboratory
 - Emphasis on behavior and medicine
- Population dynamics
 - Relatively constant at 300 rats
 - 150 females
 - 150 males
- All replacement rats are bred at the facility
- Rats are Sprague Dawley



Personnel – Laboratory 1

- 2 full-time research technicians alternate caring for the rats
 - Both have B.S. degrees and collectively have >20 years working with rats
- Both technicians have been trained in rat handling and care protocols
 - Initial hands-on training and yearly online refresher courses
 - Institutional general and species-specific tutorials
 - Both regularly attend workshops and seminars related to lab animal care and are members of their local laboratory animal technician's association
 - Both assist with research data collection in addition to performing caretaking duties
- Rats receive ~10 h of care per week

Personnel – Laboratory 2

- 1 full-time animal technician
 - Technician has a B.A. and 10 yrs experience with lab rats
- 3 undergraduate part-time workers
- All have completed institutional animal care and use general and species specific tutorials
 - Full-time technician initially received hands on training at a workshop
 - Undergraduates receive training from full-time technician
- Rats receive ~8 h of care per week

Housing – Laboratory 1

- Same-sex pair lives in a single compartment cage
 - 10" W x 19" D x 8" H
 - (26 cm x 48 cm x 20 cm)
- Cage is transparent plastic with a slotted wire top
 - Filter tops may be added during performance of some medical experiments
- Bedding = cellulose pulp fiber (CareFRESH®) to a depth of 1" (3 cm)
- Temperature: 75 °F (24 °C); Humidity: 50%



Housing – Laboratory 2

- Rats live in two connected cages as member of a same-sex rat pair
 - Each cage = 10" W x 19" D x 8" H
 - (26 cm x 48 cm x 20 cm)
- Cage 1: nesting area with dark cover on top
- Cage 2: living/feeding area with slotted wire cover
- Bedding = pine shavings to a depth of 0.5" (1.25 cm)
- Temperature: 72 °F (22 °C); Humidity: 55%



Lighting

Laboratory 1

- Ceiling-hung fluorescent lighting
 - Light intensity is 400 lux 3.2' (1 m) above the floor
- 12 h light/12 h dark
 - on at 0600; off at 1800
- Cages are in a rack system
 - lowest rack 6" (15 cm) from the floor
 - highest rack 5' (1.5 m) from the floor

Laboratory 2

- Ceiling-hung incandescent lighting
 - Light intensity is 325 lux 3.2' (1 m) above the floor
- 12 h light/12 h dark
 - on at 0300; off at 1500
- All cages are kept on shelves 3.2' (1 m) from the floor

Nutrition

Laboratory 1

- Rats are *ad libitum* fed 2020X Teklad Rodent Diet
 - 18.5% crude protein, 6% fat
 - Soy-protein free
 - Feed is placed on slotted cage top
 - Feed is checked daily and added as needed
- Water is given *ad libitum* using water bottles
 - Bottles are checked daily and filled as needed
 - Changed with cages
 - 1M HCl is added to create a pH of 2.4

Laboratory 2

- Rats are *ad libitum* fed PMI 5001 Rodent Diet
 - 24% crude protein, 4.3% fat
 - Feed is placed on slotted cage top and on cage floor
 - Additional feed is added twice a week
- Water is given *ad libitum* using water bottles
 - Checked twice a week
 - Changed with cages
- Sunflower seeds are sprinkled on the cage floor as a treat 1-2x/week

Cage Cleaning

Laboratory 1

- Cages and water bottles are autoclaved twice a week
 - CareFRESH® bedding is autoclaved prior to use
 - Bedding is replaced at this time
- Technicians shift animals between dirty and clean cages
 - Transfer between cages is always done at the same time of day

Laboratory 2

- Cages and water bottles are autoclaved once a week
 - Bedding is replaced at this time
- Undergraduate students shift animals between dirty and clean cages
 - Different students may perform this task each time
 - Transfer between cages may happen at different times of day

Breeding Protocol – Laboratory 1

- Breeding pairs are created as needed to produce young animals for specific studies
 - Only physically sound rats are bred
 - Male and female are placed together in a breeding cage
 - Male is re-paired with original cage-mate 2 days before anticipated parturition
 - Female is re-paired with original cage-mate after weaning
- Pregnancy is detected by manual palpation
 - Females are examined 12 days after being paired with a male
 - 95% successful detection
 - Female is euthanized if unable to become pregnant after 2 estrous cycles



Breeding Protocol – Laboratory 2

- 10 monogamous breeding pairs are maintained for production of replacement animals
 - Records are kept regarding lineage of animals to allow for creation of optimal pairs (animals must be physically sound and not likely to pass on genetic disorders)
 - Pairs are created at 3 months
 - Male remains with the female through the birth and weaning of the litter
- Pregnancy is detected by weighing at 0900 each day
 - Female is considered pregnant after 5 days of consecutive weight gain
 - 90% pregnancy detection success
 - Female is euthanized if unable to become pregnant after 3 estrous cycles



Social Environment – Laboratory 1

- Dam stays with pups until weaning
 - Pups weaned from dam at 19 days of age
- Adult rats are housed in same-sex pairs
 - Rats that are purchased are paired as juveniles after being received from the supplier
 - Rats born on site are paired at weaning



Social Environment – Laboratory 2

- Dam and sire stay with pups until weaning
 - Pups are weaned at 21 days of age
- Littermates are housed together until 5 weeks of age
- Adult rats (except for breeding pairs) are housed in same sex pairs
 - Pairs are created at 5 weeks of age



Physical Enrichment

Laboratory 1

- Each same-sex pair is provided with:
 - A wooden block (replaced when cages are changed)
 - A PVC tunnel (autoclaved when cages are changed)
- Breeding pairs are given two Nesting Sheets™ each time the cage is changed
 - Low-lint, virgin wood pulp



Laboratory 2

- No enrichment is provided to same-sex pairs apart from double cage
- Breeding pairs are given 2 Nestlets™ each time the cage is changed
 - Virgin cotton fiber

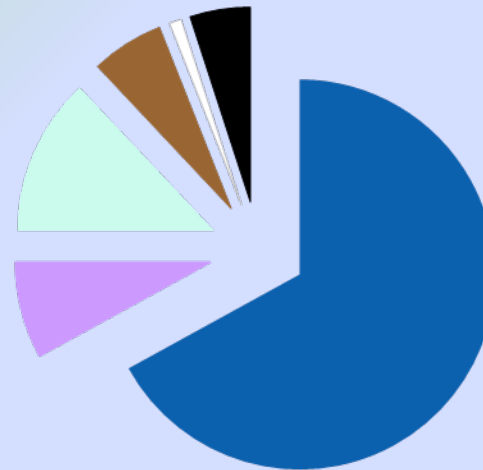


Time Budgets

Laboratory 1



Laboratory 2



Human-Animal Interactions – Laboratory 1

- Rats are handled daily to help them become comfortable with human handling and manipulations
 - Rat pairs are stroked, tickled, and played with by technicians for 5-10 minutes each day
- Rats approach the technicians' hands when they place them in the cage
- Rats are picked up around midsection with second hand supporting the rump
 - Rats sit quietly in the technicians' hands
 - Rats exhibit a curious and relaxed demeanor as evidenced by body tension and posture as well as ear, whisker, and eye movement

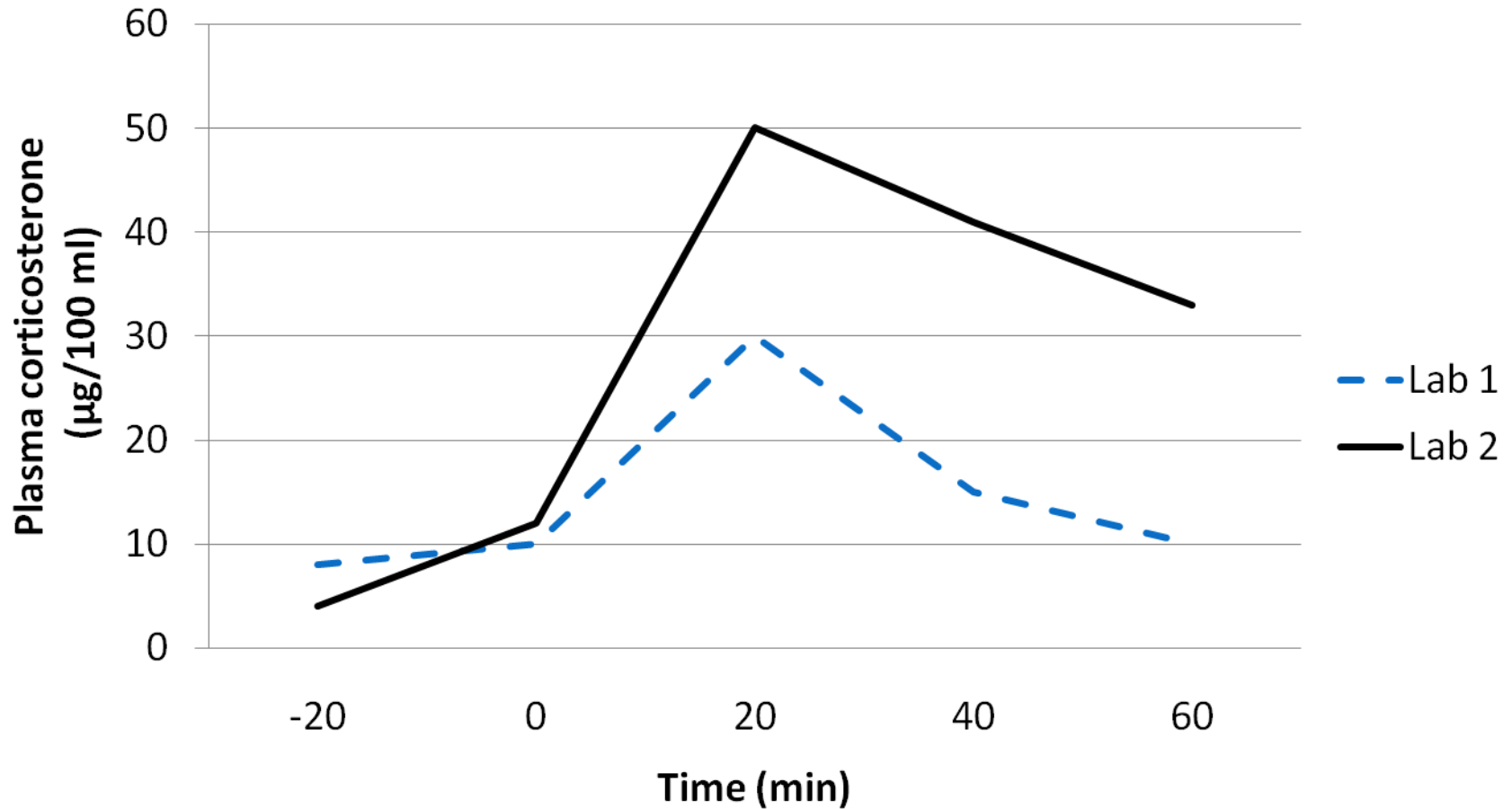


Human-Animal Interactions – Laboratory 2

- Rats are only handled during experimental procedures and during transfer between dirty and clean cages
- Rats avoid the technicians' or students' hands when they place them in the cage
 - Rats move between the cage compartments and try to hide in whichever half has not been opened
- Rats are picked up by the base of the tail then held with their bodies resting across the handler's arm
 - Rats typically struggle briefly after being picked up
 - Some rats try to jump down and have tense bodies



Responses to Handling



Plasma corticosterone levels in rats after being captured (time = 0) and handled for 2 minutes.

Veterinary Care 1

Laboratory 1

- Technicians observe rats daily and report irregularities to the vet
- Vet observes animals directly once per week
- Injured/ill rats are housed singly in a specific treatment room
- Rats with untreatable illness, injury, or pain are euthanized
 - Pentobarbital is administered (*IP) via sterile needle at 100 mg/kg dose
 - Rats are restrained and injected by a technician

Laboratory 2

- Technician and/or students observe rats daily and report anything unusual to the vet
- Vet observes animals following a report of a problem
- Injured/ill rats are housed singly in the same room with the rest of the colony
- Rats with untreatable illness, injury, or pain are euthanized
 - CO₂ chamber is charged to ~20% before rat is placed inside
 - CO₂ concentration is slowly increased at ~15% volume per minute

**IP = intraperitoneally*

Veterinary Care 2

Laboratory 1

- Inhalation anesthesia (isoflurane via nosecone) is used during surgeries
 - Special attention is given to breathing during procedures
- Post-operative analgesics are administered to all rats who have undergone surgery
 - Buphenorphine is injected (0.1 mg/kg, IM*) shortly before surgery
 - Buphenorphine continues to be given 1x daily for 5 days

Laboratory 2

- A combination of ketamine-xylazine is injected prior to surgery (80 mg/kg and 8 mg/kg respectively, **IP)
 - Ophthalmic ointment is applied to eyes after administration
 - Vet verifies rat is fully anesthetized (toe pinch) before starting surgery
- Post-operative analgesics are given to rats undergoing surgery as determined by researchers
 - Morphine is injected (3 mg/kg, ***SC) immediately after surgery
 - Acetaminophen is administered in drinking water for 3 days after surgery

*IM = intramuscularly; **IP = intraperitoneally, ***SC = subcutaneously

Morbidity and Mortality

Laboratory 1

- Each year per 50 rats:
 - 8 rats are treated for sickness/disease
 - 5 rats are euthanized for disease or injury
 - 2 rats die naturally

Laboratory 2

- Each year per 50 rats:
 - 5 rats are treated for sickness/disease
 - 3 rats are euthanized for disease or injury
 - 2 rats die naturally