

## RAT RACT SHEET

### **I. Rats as laboratory animals**

The laboratory rat is a quiet, nocturnal rodent derived from the wild or Norway rat, *Rattus norvegicus*. Several rat stocks (stocks are outbred and strains are inbred) are available from commercial breeders for use in research. The most popular are:

1. The Sprague-Dawley albino
2. The Wistar albino
3. The Long-Evans rat (smaller than the above, pigmented with a black & white body)
4. The Fisher 344, inbred albino

Some unique physiological aspects of the rat include:

- Continuous growth of the beveled sharp incisors, with deposits of iron pigment causing a yellow color
- Epiphyseal plates never close
- Omnivores with a large cecum, no gall bladder, and a diffuse pancreas
- Coprophagy and cannibalism (of dead cage mates) are normal habits
- Mammary tissue is extensive, (neck & shoulder to perineal area) in the male and female
- Their 5 day estrus cycle and 3 week gestation make them a convenient model for reproductive studies
- Rats are obligate nose breathers and are susceptible to many respiratory pathogens for this reason
- Males' testicles are retractable and can be drawn up through the inguinal canal when exposed to cold ambient temperature. Normally, or when subject to hot temperature, the testicles relax into the scrotum
- Life span varies with stock and strain but is approximately 2 years if disease free environments are maintained

### **II. Miscellaneous diseases or conditions**

- A. Red Tears (chromodacryorrhea, porphyrin staining). The rats Harderian glands located behind the eyes secrete various porphyrins. The amount increases with age. These porphyrins give the tears a red color. The secretion dries around the eyes and resembles crusts of blood. The rats' tears are bacteriostatic and are produced by a cholinergic (parasympathetic) efferent pathway in response to stress and disease, 3-40 minutes after stimulation.
- B. Blindness (phototoxic retinal degeneration). Although there are inherited retinal lesions in specific strains of rats, rodents in general have very poor eyesight, and make use of facial vibrissae and olfaction to sense their environment. When you handle a rat let them know you are around by letting them smell and feel your hand before you attempt to grasp the animal.
- C. Malocclusion. This can occur in all rodents and rabbits and consists of an overgrowth of the incisor or molar teeth resulting from misalignment at birth or trauma at some time. Teeth can grow into the nasal cavity and cause blockage of the lachrymal duct so red crusts may appear around the eye. The rat cannot eat properly but will usually still be able to drink. This is easily controlled by using nail clippers to trim the overgrown portion.

- D. Mammary tumors. These are the most common visible tumors of the rat. The rats' mammary tissue is extensive so a tumor can occur on the shoulder just as frequently as it can near the teat where one would expect to see mammary tumors.
- E. *Streptobacillus moniliformis*. This is a gram – bacillus and the textbook cause of “rat bite fever”. The bacterium may be an inhabitant of the rat oral cavity and can be transmitted to man by a bite. If you are bitten by a rat carrying the organism and develop the disease, it is characterized by an inflammatory reaction around the lesion followed by regional lymphadenopathy which is followed by a systemic febrile illness characterized by malaise, headache, arthritis and a cutaneous rash. If mice are exposed to this bacterium they can develop hepatosplenomegaly, suppurative arthritis and frequently die. This is one of the reason why mice and rats should never housed in the same room.
- F. Sialodacryoadenitis Virus (SDAV). SDAV is a highly infectious enzootic or epizootic disease of rats, affecting the respiratory epithelium, salivary, lachrymal and harderian glands. Young rats, 2-4 weeks of age, are the most seriously affected but all ages and sexes are susceptible. Typical clinical signs include bulging eyes, either unilaterally or bilaterally, and swelling under the neck caused by edema and inflammation of cervical lymph nodes and salivary glands. Due to respiratory involvement, general anesthesia may result in high mortality. Infection results in long lasting immunity within 3-5 weeks with no known sequelae to interfere with future research endeavors. This virus does not exist in a latent, carrier state. Diagnosis is confirmed by demonstration of antibody titer and histologic lesions. Strict quarantine for 4-8 weeks with suspension of breeding are key to ridding the colony of infection.
- G. Sendai virus. Although mice are the most common and seriously affected Sendai host, the effects of this parainfluenza type I virus in rats, and its potential to exacerbate other respiratory diseases, must be considered as serious factors affecting research. Sendai in rats follows a similar clinical course as that seen in mice. It is rapidly spreading throughout the colony and may result in signs typical of respiratory disease-hunched posture, rough hair coat, and respiratory distress-but more often remains subclinical. Deaths due to routine anesthetic procedures, decreased litter size or growth retardation may occur. Quarantine and cessation of breeding from 4-8 weeks are necessary control measures.
- H. Pinworms (*Syphacia muris*). Pinworms are a widespread nematode parasite found in laboratory rodents. *S. muris* commonly infests the cecum and colon of the rat. Transmission is via ingestion of embryonated eggs, in the feces or fecally contaminated environment, or through direct contact with eggs adhering to the perianal skin of the infested host. Clinical disease is not usually seen although animals with reduced disease resistance or under stress either from shipping or research factors can show any of the following signs: retarded weight gain and growth rates, decreased reproductive capabilities, diarrhea, rectal prolapse, intussusception, and intestinal impaction. Although the rat is the common host of *S. muris*, this parasite is easily transmitted to mice housed in the same room, another reason for separation of species.

## RAT NORMAL VALUES

Weight, adult male	300-400g
Weight, adult female	250-300g
Birth weight	5-6g
Breeding age, male	10-11 weeks (300g)
Breeding age, female	10-11 weeks (200g)
Estrus cycle	Polyestrus <sup>2</sup>
Length of cycle	4-5 days
Gestation	20-23 days
Weaning age	23-26 days
Mating systems	usually pairs or harems
Litter size	8-12
Daily water requirement	ad lib
Daily food requirement	ad lib or 12-15 grams
Daily water consumption	~ 10ml/100g BW
Daily food consumption	~ 10g/100g BW

### Physical values:

Heart rate, beats/min	260-450, 350 average
Respiratory rate, breaths/min	80-150, 92 average
Body temperature, Celsius	35.9-37.5
Blood pressure	84-134/60 mmHg
Whole blood volume	54-70ml/kg, 6-7% BW
Safe bleed (weekly)	5.5ml/kg

### Blood sampling sites:

Retro-orbital plexus  
Tail-lateral veins or central caudal artery  
Jugular, saphenous, lingual veins

Anterior vena cava

Cardiac puncture (terminal procedure under anesthesia)

### Routes of injection:

Intramuscular (IM): quadriceps, biceps femoris

Subcutaneous (SC/SQ): scruff at nape of neck

Intraperitoneal (IP): lower right quadrant of abdomen

Intravenous (IV): lateral tail veins, jugular, saphenous

Intradermal (ID): dermal layer of skin, usually dorsal trunk

<u>Injection sites</u>	<u>Volume/site (adult)</u>	<u>Needle gauge</u>
Intramuscular	0.3ml	= or < 21g
Subcutaneous	5-10ml	= or < 20g
Intraperitoneal	5-10ml	= or < 21g
Intravenous	0.5ml	= or < 23g
Intradermal	0.1ml	= or < 21g