Rabbits

Background

Laboratory rabbits belong to the order lagomorpha, genus oryctolagus. The scientific name of the domestic rabbit is oryctolagus cuniculus. Rabbit breeds vary markedly in size, with a range of 1-9 kg.

There is more than 40 breeds of rabbits that include New Zealand white, American Dutch, Californian, and Flemish giant. New Zealand breed is the most breed used in research and meat production.

Uses

Rabbits are growing in popularity both as pets and for hobby breeding. They are clean, attractive and relatively easy to handle. They seldom bite but can inflict deep scratches if not held properly. Humans frequently develop allergies to rabbit dander and urine proteins.

Rabbits are also used in research and drug testing. Their size and the relative ease of blood collection due to their large ear vessels make them suitable for many types of experiments. They are frequently used in immunology studies because they are capable of producing large amounts of polyclonal antibodies. Rabbits were used by Louis Pasteur in late 1800s to develop the first rabies vaccine.

Behavior

Rabbits are not generally aggressive toward people. They tend to be curious but easily startled. When frightened some rabbits may show aggression in the form of foot stomping and snorting, some may even bite.

Sexually mature rabbits are territorial and will fight if housed together. Rabbit can be litter-box trained, they typically choose one area of their cage for defecation and urination.

Depending on environmental conditions, wild rabbits are either nocturnal or diurnal. They usually feed at dawn and dusk and hide in their burrows during the heat of the day. Rabbits housed indoors in controlled environment tend to have alternating periods of wakefulness and rest throughout the day and night.

Anatomic and physiologic features
Rabbits have a compact body and heavily muscled legs. Their lightweight skeleton comprises only 7% of their total body weight. They have long ears and a short tail and covered with fur. The eye of the rabbit has an approximately 190° field vision. They have Harderian lacrimal glands behind their eyes, which help to lubricate the eyes.

Domestic rabbits resemble rodents in many aspects. The principal anatomic feature differentiating them is that rabbits have two pairs of upper incisor teeth. The esophagus of the rabbit is unique in that it has three striated muscle layers and no mucus glands.

Rabbits, like rats, cannot vomit. Their stomach is undivided in thin walled. The small intestine is relatively short. The large intestine consists mainly of the cecum, ascending colon, transverse colon and descending colon. For hindgut fermentation of their herbivorous diet, rabbits have a capacious cecum approximately 10 times the size of the stomach. There are two types of feces produced by rabbits: firm, dry daytime fecal pellets and soft, moist nighttime feces.

Table 1: biological and reproductive data for rabbits

<table>
<thead>
<tr>
<th>Adult body weight</th>
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<tbody>
<tr>
<td>Male</td>
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<tr>
<td>Female</td>
</tr>
<tr>
<td>Life span</td>
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<tr>
<td>Body temperature</td>
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<td>Heart rate</td>
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<td>Respiratory rate</td>
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<tr>
<td>Food consumption</td>
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<td>Water consumption</td>
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<table>
<thead>
<tr>
<th>Breeding onset</th>
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<tbody>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Estrous cycle length</td>
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<tr>
<td>Gestation period</td>
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<tr>
<td>Postpartum oestrus</td>
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<tr>
<td>Litter size</td>
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<tr>
<td>Weaning age</td>
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<tr>
<td>Breeding duration</td>
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<td>Chromosome number</td>
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**Breeding and reproduction**
The onset of puberty varies with breed. Small breeds generally mature earlier than large breeds. Females or does are initially bred between 4-6 months at a weight of 3-4kg for large breeds. Males or bucks are often bred at the age of 6 months. Does have 7-10 days of receptivity followed by a short period, 1-2 days, during which they are not receptive to the male. They are induced ovulators like the cat. There is no estrus cycle. Ovulation requires stimulus of mating and thus induced in nature. Sexual stimulation with copulation or in response to exogenous, gonadotropins, ovulation takes place. Sometime females may stimulate each other to the point of stimulation. This type of ovulation is expected in does becoming pseudo pregnant or sterile for few days. Ovulation is apt to occur within the range of 9-13 hours. But, generally it takes place at 10 hours following mating. It is thought that does may remain in constant heat throughout the year or in breeding season. But, it is known that follicles develop and regress in cycles of 15-16 days. There is a lack period when the doe may loose interest for the buck. Ovulation can also be induced through mechanical stimulation of vagina.

**Husbandry**

In a research facility, rabbits are normally housed in front-opening, stainless steel or plastic cages. Solid bottom flooring with small holes for excreta passage is being used with increased frequency. Adult rabbits must be provided with at least 0.5m² of floor space per rabbit and 36 cm of cage height to enable normal posture. Litter products used should be nontoxic and digestible because the rabbits may eat them.

The recommended temperature range for rabbits housed in research facilities is 16-22 ºC with a relative humidity of 30-70% and 10-15 air changes per hour.

**Handling and restrain**

Rabbits should be handled gently but firmly. They are prone to kick their hind limbs, which can cause deep scratches in the handlers. A rabbit should be picked up by obtaining a firm grip on the loose skin over the scruff of the neck with one hand. The other hand should be used to support the animal’s hindquarters and to limit back leg movement. If the hind limbs are not supported, the rabbits may break its lumbar spine, most commonly L7, the ears should not be used for picking up a rabbit. To carry a rabbit, a football hold provides a secure restraint technique. To accomplish this, use one arm to cradle the rabbit and firmly hold it against your body while allowing the rabbit head to be concealed in the bend of your elbow. Use the other hand to come over the back and gasp the scruff of the neck to provide slight pressure so the rabbit is less likely to struggle. Rabbits may slip and slide on stainless steel tables and may try to jump down, which could lead to a serious injury.
Identification

Cage cards should be used as a form of general identification. Individual identification methods include ear tags, ear tattoos, or placement of a subcutaneous microchip that is electronically encoded. Fur dyes can serve as a temporary method of identification.

Blood collection

Assuming the animal is mature, healthy and on an adequate diet, 10% of the circulating blood volume, which in most species is 7% of the body weight in grams, could be withdrawn.

The marginal ear, cephalic and lateral saphenous veins can be used to obtain small amounts of blood. These veins easily collapse with too much negative pressure. The auricular artery runs down the center of the ear pinna and is one of the best sites for collection of large blood samples. Warming the ear with warm water or heat lamp and gently stroking the base of the ear will stimulate blood flow.

Table 2: adult rabbit blood volumes

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<tr>
<td>Total blood</td>
<td>20-40</td>
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<tr>
<td>Single sample</td>
<td>2-3</td>
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<tr>
<td>Exsanguination</td>
<td>9-12</td>
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Urine collection

Urine can be collected as a clean catch sample or by gentle expression of the bladder. The rabbits must be sedated and restrained on its back and the abdomen is palpated to locate the bladder. Once the bladder is immobilized between the thumb and forefinger a needle with 22-23g attached to a syringe is slowly advanced from the midline into the bladder and urine is aspirated.

Metabolic cages provide an efficient way of collecting both urine and feces by providing a way to separate the two forms of excreta.

Urethral catheterization may be used to collect urine from anesthetized rabbits.
Drug administration

Palatable drugs may be administered to rabbits by incorporating them in the food or water. Liquid medication can be administered by placing the tip of a syringe in the corner of the mouth and slowly injecting small amounts repeatedly.

Subcutaneous injections should be administered under the loose skin between the shoulder blades. Intramuscular injections can be given in the lumbar muscles and in the large quadriceps and thigh muscles of the hind limbs. Intravenous injections are most frequently given in the marginal ear veins.