Care and housing of laboratory animals II.

A/ Needs and care of rodents.
B/ The animal facility: hygiene, organization, work processes.
C/ Disinfection, sterilization, quarantine.
D/ Breeding, documentation, marking

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Objectives: To summarize the knowledge, guidelines and rules regarding the care of rodents and animal facilities. Moreover, to overview the techniques of disinfection, sterilization and documentation of breeding.

NEEDS AND CARE OF RODENTS

Small laboratory mammals: mouse, rat, guinea pig, hamster, rabbit

These are the most frequently used experimental animals: relatively small place, great reproductive performance, short gestation time,

Main characteristics:

Mouse and rat: body weight, life span, sexual and breeding maturity, gestation time, litter size, food and drinking water consumption, behaviour, badly tolerated environmental factors.

Guinea pig: lack of C vitamin synthesis; supplementation with C-vitamin is necessary

Rabbit: food pellet, supplementation with hay

Food, drinking water: ad libitum

Standard food pellets: mice and rats can be fed with the same food pellets.

Factors influencing food consumption: age, growth, gestation, lactation, temperature, length of daylight, microbial contamination of the environment

They are usually manufactured of natural products: cereals, meals, seeds, premixes.

Constituents: proteins (limiting aminoacids), carbohydrates, fats, mineral substances, vitamins, fibers, utilizable energy content. Storage, food mistakes.

Drinking water: fresh water daily (but minimum twice a week). Daily water consumption of mice and rats

ANIMAL FACILITY

It ensures an appropriate, controlled living condition, sterile or poor in microbes environment

Three hygienic categories:

“A” category: germ-free isolator: for keeping germ-free, gnotobiotic animals

“B” category: specified pathogen free (SPF) animal facility: for keeping SPF animals

“C” category: conventional animal facility; improved “C” category: minimal disease (MD)

The structure and rooms of the animal facility: animal rooms (for breeding or keeping experimental animals), additional serving out rooms (washing up, desinfecting, store-, personnel and technical rooms) and their organization, barrier systems. Architectural characteristics (easily washable, disinfectable surfaces), illumination, noise, temperature, humidity, ventilation (ventilating engine, air conditioning, air overpressure, sterile filtration of air)

Animal cages (mouse, rat: metal grid cover, polypropylene, polycarbonate, polyester-carbonate boxes); population density

Drinking: glass or transparent plastic bottles with mouthpieces; automated drinking systems

DISINFECTION

Sterilization, disinfection. Disinfecting procedures (physical: heat, irradiation, filtration; chemical). Disinfecting agents. Reducing microbe counts, sterilization of feed, drinking water,
bedding materials. Personal hygiene, hand disinfection, getting dressed, reducing the movement of personnel.

Working processes in the animal facility: Bedding materials, changing bedding, washing up and disinfecting cages and covers. Feeding, drinking animals, washing up and disinfecting drinking vials. Cleaning and disinfecting rooms. 

Waste handling: dangerous waste

BARRIERING IN AND OUT ANIMALS, QUARANTINE
The incoming non-SPF animals must be placed in quarantine in the animal facility.

Duration: the incubation time of the possible infectious diseases (usually 1-4 weeks).

Separation of animals, separate personnel, barrier ing out
In case SPF animals arrive in an SPF or conventional animal facility, only conditioning and acclimatization is necessary (8-16 days).

BREEDING OF RODENTS
Outbreeding: The breeding of related individuals must be avoided: genetically variable population [<100 breeding pairs (minimum: 16): the possibility of breeding relatives must be totally excluded (accurate registration!)); >100 breeding pairs: rotation or random breeding; the inbreeding coefficient (F) is <1%]. The individuals of an outbred population are heterozygous and anisogeneic (they have variable genotypes).

Breeding of relatives: there is a common ancestor within four successive generations in the pedigree.

Inbreeding: Strict inbreeding: serial brother and sister or parent offspring matings → increasing homozygosity (genetic drift). It also occurs in a closed breed.

Inbred strain: If inbreeding is continued for more than 20 consecutive generations, an inbred strain develops, in which 98.4% of genetic loci are homozygous (F=98.4%). The individuals of an inbred strain are homozygous and isogeneic (they have identical genotypes). Because of the possible spontaneous mutations, inbred strains must be maintained by brother by sister matings.

Strict registration is needed (time of mating breeding pairs and deliveries, numbers of newborns and fostered offsprings, their denomination, fate and use).

Males and females waiting for breeding are separated and kept in different cages until mating (2-3 months of age).

Based on the analysis of the breeding data, the most productive lineage is selected retrospectively: selection of the best "ancestor pair".

Males and females waiting for experiments are collected in separate cages (maximum of age difference 1-2 weeks) and registered separately.

Harem breeding (random): 4-5 females and 2 males are kept and bred in one cage. It must not be used for further breeding and maintaining the strain, only for producing experimental animals in one generation.

Registration of animals: registration books of breeding, experimental animals, animal numbers and food.

Marking of rodents: ear marking with incision, punching, clips, in larger animals chips can also be applied.