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Lizards as laboratory animals

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Introduction

Reptiles are not a regular sight in laboratories because their use is limited to difficulties associated with captive breeding and maintenance.

Despite these difficulties, lizards are used in metabolic (3), endocrinological (4) and bacteriological studies. Metabolic pathways which can be demonstrated only with difficulty in birds and mammals because of their high metabolic rates may be investigated in details in lizards which has a significantly lower metabolic rate depending on the ambient temperature. Also, the lizard is used in comparative biology as an example of reptiles. The species most commonly used is *Lacerta vivipara.*

Taxonomy

CLASS	REPTILIA
ORDER	SQUAMATA
SUBORDER	SAURIA
FAMILY	LACERTIDEA
GENUS	*Lacerta*

General biology

Lizards are long slender bodies reptiles with scaly skin, long tail and four legs. They possess a transverse cloacal opening with the paired copulatory organs located in the tail making it look swollen especially in males (1). The eyelines are movable and the tongue does not retract into a basal sheat. Also they possess an external ear opening and the lower jaw is whole.

Courtship between sexes and rivalry is common among males during early spring. These are brought about by the action of sex hormones which in turn are influenced by the environmental conditions, such as photoperiod and temperature (2).

Prior to mating, the male seizes the neck of the female in his jaws. Then he curves his body beneath the female and his vent is brought opposite that of the female. Fertilization is internal via the paired intromittent organ of the male and during coition, the male cloaca is held in position by secretion from glands on the under surface of the thigh known as femoral glands (2). By the time the eggs are laid, they are at an advanced stage of development so the time between the laying and hatching of eggs is relatively short. This type of parturition is known as ovoviviparity. Although placentation is almost entirely a mammalian feature, rudimentary forms have been reported found in the female lizard. This feature is an adaption to temperature conditions which allows the young to survive in the cold. At birth, the embryo possess a special egg-tooth which is used to pierce the shell; the egg-tooth is shed within a day or two after birth (1).

At about late summer when the young are born, they measure about 37 to 47 mm. in total body length (head and body 17 to 22 mm; tail 20 to 25 mm.). By the autumn, when they go into hibernation, they measure 70 to 80 mm. in total body weight. In summer of the next year, the males can be distinguished from the females by the colouration of the belly and the swelling of at the base of the tail. However, sexual maturity in the male is attained in 22 months when total body length is about 128 mm. (2).

Integument

The skin is dry and scaly with 2 main layers an outer epidermis and an inner ectoderm. The resulting folding of these two produces the scales which is in a continuous sheet of tissue. This is impermeable to water and help with osmoregulation (2).

The skin is shed periodically all at once and the slough is eaten by the animal.

Sources of supply

Care should be taken when selecting reptiles for laboratory use to prevent the use of rare or endangered species. However, if this cannot be avoided the national legislation will require sufficient justification before the project can be allowed.

Although there are companies producing reptiles on a commercial basis it is hoped that in future, more breeders go into reptile breeding to meet the demand.

Other sources are zoos and private enthusiasts, and information on the availability of captive-bred stock can be obtained from herpetology-related societies. Another source of supply is from the wild, but this is not advisable because of conservation problems unknown disease status and difficulties in obtaining import/export licences (1).

Thermoregulation

Although reptiles are poikilothermic, they nevertheless regulate their temperature because they are only active within a specified temperature interval. Thermoregulation be achieved by alternating periods of basking and shading from the heat source (5).

Husbandry

Poor husbandry, usually through ignorance, is, either directly or indirectly, the major cause of disease in captive lizards. The veterinary care of these animals must, therefore, be based on a knowledge of basic biological and environmental requirements of the animal. This knowledge is of vital importance in both the prevention and cure of diseases in lizards (6).

Accommodation

In keeping lizards in cages, hygiene must be top priority to prevent the spread of epizootic diseases.

Cages can be made of glass or many other materials and if glass is used, it should be constructed using silicone rubber. Care must be taken that the lids are secure and escape proof with adequate ventilation (7).

Cage furnishing should be kept to a minimum absorbent paper as a floor covering which renders cleaning easy. Feacal matter, urates and shed skin should be removed as soon as is convenient and can be taken out with the paper for disposal (8).

During periods of rest, many lizards prefer to hide undercover. Pieces of plastic pipe or flower pots may be used if they regularly disinfected. Alternatively, cardboard food cartons may be used as shelters and disposed of when soiled. This will enhance the animal's environment and welfare (7).

Temperature

The lizard can tolerate a wide temperature range but within this range there is the optimum temperature at which their bodies function most actively. This is known as the preferred optimum temperature (PBT) (5). In order to allow the animal to regulate its body temperature in captivity. A temperature gradient is required within the vivarium. This achieved by providing a "hot-spot" in one area of the cage and maintaining the air temperature within the animal's PBT. Background heating can also be provided and this can be in form of a gas or electricity central heating systems (8).

To prevent overheating, the room should be thermostatically controlled and at the end of the day, the supplementary heat source should be removed.

Lighting

Correct lighting is of major importance to the animal as temperature stimulates activity and appetite and often it triggers certain physiological processes, eg. breeding or preparation for hibernation.

Both photoperiod and the quality of light are important, if stress is to be kept to a minimum, particularly if reptiles are to breed. For example, the animal requires exposure to ultra-violet "B" (uvb) light in order to syn-

thetize vitamin D_3 which is essential for the utilisation of dietary calcium (8).

Humidity and Ventilation
The relative humidity required for captive lizards is about 60–75 % and the relative humidity can be elevated by once or twice daily by spraying a mist of water. This can also be achieved by directing humidified air into the cage (8).

Hibernation
Hibernation is a torpor induced by an annual metabolic cycle which is genetically determined and this initiated by photoperiodic changes. Although it has been claimed that artificial hibernation may be important in the success of captive breeding of lizards, it has yet to be proved.
However, hibernation can be induced in the laboratory by gradually reducing the temperature in October, and stopping feeding about the middle of the month. By the end of October, the ambient temperature should be around 10°C. The animal should then be placed in a ventilated box and stored for the next four month at a temperature not below 5°C. After this period, the animal is returned to the vivarium and the temperature is gradually raised to about 25–30°C (8).

Marking
Identification can done using photographs of body pattern, toe clipping, tattooing and notching (8).

Handling
At room temperature, lizards are fast moving and practise autotomy. Thus they should be handled with great care to prevent damage. They should be grasped gently, but firmly, initially by cupping the hand over the whole body, then by manipulating the hand until the thumb and forefinger are holding the animal just behind the head so that the weight of the body is held in the hand whilst the tail is hanging loosely to the rear of the hand (5).

Sexing
The male is usually larger and more colourful than the female during the breeding season. The pre-anal, anal and femoral pores are often more developed and numerous in the male. Males have a pair of hemipenes situated in the base of the tail making it look bulgy (7).

Feeding
Lizards are easily maintained on a diet of mealworms, crickets, locusts and wax moth larvae and this can be supplemented with other invertebrates eg. spiders, caterpillars and butterflies. It is also very important to administer supplementary vitamins and minerals (8).

Surgial methods
Recording temperature
The body temperature can be measured by inserting the bulb of a small size thermometer into the cloaca (7).

Blood collection
Blood samples can be obtained from several sites, these include the ventral tail vein (9). Microcapillaries can be used to collect blood from toe clips and the orbital sinus (10).

Anaesthesia
Prior to sedating, it is important to know the exact bodyweight. This is not only for assessing postoperative fluid loss but also for calculating an accurate dose.
When under anaesthesia and during recovery, the animal should be kept at its PBT. Before anaesthetizing, the animal should be starved for 18 hours and should be handled gently as not to stress it (11).

Euthanasia
Lizards can be killed by injecting an overdose of barbiturates or by decapitation and also by deep freezing (8).

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