The Mongolian Gerbil: Natural History, Care, and Maintenance

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DURING THE SHORT TIME it has been in the United States, the gerbil has become an increasingly popular animal. Its pleasant disposition and cleanliness have made the gerbil a good pet, and its other qualities make it an excellent research animal. This article will discuss the gerbil species most commonly available in the United States—*Meriones unguiculatus*, or the Mongolian gerbil.

The genus *Meriones* was first described by Illiger in 1811. The Mongolian gerbil, or clawed jird, was first identified by Milne-Edwards in 1867. Its scientific name, *Meriones unguiculatus*, has an interesting translation. Meriones was a Persian warrior-god who wore a "battle helmet adorned with boar tusks." The species name means "clawed" (Robinson 1975a). It is quite a ferocious title for such a docile little animal.

The species is native to the area in and around Mongolia. It arrived in the United States in 1954 when eleven pairs of gerbils were obtained from the Central Laboratory for Experimental Animals in Japan to begin the first breeding colony. Dr. Victor Schwentker, who recognized the need for better laboratory animals, was directly responsible for the acquisition of the gerbils. Schwentker founded Tumblebrook Farm, which became a breeding and supply center for these animals (Robinson 1974).

Use in Research

The usefulness of the Mongolian gerbil for research is not a recent discovery. As early as the 1880s, Metchnikoff, a Russian bacteriologist, used *Meriones* in his research on tuberculosis (Robinson 1974). In 1933 the gerbil was used in an attempt to eradicate bilharzia, a form of schistosomiasis found mainly in the world's rural areas. The gerbil was used in further research on bilharzia during the 1950s and 1960s, especially in Egypt where the disease afflicted 75% of the population (Schwentker 1974).

Gerbils have a wide range of susceptibilities and some notably unique characteristics. They have been used in research with bacterial, rickettsial, and viral diseases, as well as in cancer research and related cytological diseases because of their susceptibility to these diseases (Robinson 1976a; 1977). Because they do not develop *otitis media*, an inflammation of the middle ear that other laboratory animals seem to contract, and because they exhibit a wide auditory range, gerbils are good subjects for auditory research (Daniel and Loesche 1975).

The gerbil has a unique fat metabolizing mechanism that can take the smallest amount of fat and store it. They are excellent subjects for cholesterol studies because they develop high blood serum cholesterol levels in response to dietary cholesterol (Schwentker 1963).

Genetic studies have also been conducted with the gerbil. Gerbil family members are similar externally and anatomically, but their chromosomal count has a wide range from 40-72. The Mongolian gerbil has 44 chromosomes (Wahrman and Zahavi 1955).

The gerbil's high degree of heat tolerance, great capacity for temperature regulation (Robinson 1950), and high resistance to radiation (Chang 1964) make it useful in research on the effects of these variables.

The gerbil has found its way into psychological studies as well. Because they are extremely curious, gerbils are

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FIGURE 1. The gerbil can be held in cupped hands or by the base of the tail.

well-suited to behavior studies. They also surpass rats in the acquisition of a discriminated avoidance response in the Skinner box (Walters 1963). Research in territorial behavior has also been conducted with gerbils (Thiessen and Yahr 1977).

Natural History

The sterile conditions of a laboratory are quite different from the gerbil's native surroundings. The following observations on the gerbil's natural history were made by Kasuga of Kitasata Institute, Japan, and translated by Nomura (Schwentker 1974). The Mongolian gerbil lives in a very dry, sandy land, typical of Mongolia's inner regions. It lives in herds in a burrow referred to as a gallery, and is active day and night. Because large numbers of gerbils live in the gallery, six or seven openings lead down a slanting path into the ground. The gallery is about 4 cm in diameter and is spread over 3 to 4 meters. There are many branches and levels, with a round nest made of soft leaves in the center of the gallery. One or two large cylindrical areas near the nest are used to store food, which consists of buckwheat, millet, and other grain seeds. The seeds are stored for winter from September to March. During the spring and summer, gerbils eat the young leaves of these plants.

Behavior and Characteristics

The gerbil's size is between that of a mouse and a hamster. Adult males average about 80-90 grams in weight; females weigh from 70-80 grams. Their total length is usually from 21.0-24.5 cm. Gerbils have dark brown backs and lighter brown sides, with gray undercoats. Their undersides are white. Their eyes are dark and protrude slightly and their ears are small and narrow. Gerbils are docile and will seldom bite. Because they are curious, they have few fears. They are quiet animals; their tiny squeaks occur only during adolescence, courtship, and fights. Gerbils make a drumming sound by thumping their hind legs rapidly on the cage floor, but this is usually only a warning signal or a sign of excitement. Their activities are cyclical: burrowing, eating and grooming, alternated with rest periods. Their activity usually peaks after midnight. It is interesting that the activity cycle can be altered if the light-dark cycle is reversed.

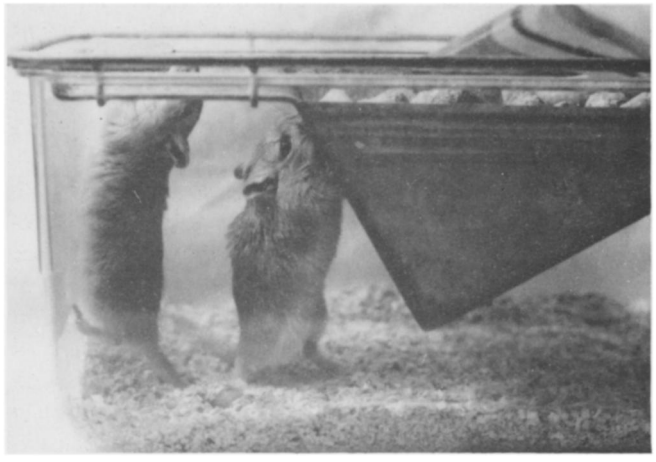

FIGURE 2. Gerbils are active day and night—eating, burrowing, playing and grooming.

Care and Maintenance

Gerbils are easy to care for and maintain, and this has been their ticket into homes, laboratories, and schools. They adapt readily to varying environmental conditions and have few requirements. Gerbil cages can be bought from manufacturers, but standard plastic or metal mouse or rat cages with solid floors are equally satisfactory. An inexpensive cage can easily be made at home. It should have a minimum height of 15 cm because gerbils often assume a semi-erect posture. A cage with 1,161 square centimeters of floor space is adequate for breeding a pair and a litter (Robinson 1975b). The 1975 edition of the Department of Health, Education, and Welfare's *Guide for the Care and Use of Laboratory Animals* recommends that a hamster weighing from 60-80 g should be housed in a cage 15 cm high with a floor area of 84 cm. The average weight of gerbils falls within this 60-80 g range, so a cage of this description would also be appropriate for housing a gerbil. Gerbils are gregarious, but care should be taken to avoid overcrowding. When gerbils begin to bite each other at the base of the tail leaving a bare spot, it is a sign that they need more space (Robinson 1975b).

Gerbils can tolerate temperatures ranging from over 37°C to below freezing (with adequate bedding). A comfortable temperature range is from 21-22°C, but exact control is not necessary. The amount of light available is

not important either; twelve hours of light is generally sufficient to encourage breeding. Humidity is a more important factor to consider. Because gerbils live in a naturally dry area, their fur stands out and may appear matted when the relative humidity exceeds 50%. This is not a critical condition however, and may even be caused on occasion by the water bottle leaking into the cage (Robinson 1975b).

Gerbils eat a variety of foods. Commercial rodent pellets are easy to obtain and suitable for gerbils. A gerbil colony will consume an average of 5 g per gerbil per day. Weanlings should be started on grains or seeds because they find it difficult to eat hard pellets. Gerbils may become too fat if they are fed on a diet of high fat content seeds, such as sunflower seeds. Fat deposited around the ovaries may interfere with reproduction, and adult males tend to add considerable body weight, especially after 24 months of age.

Water, which is extremely important to most other animals, is not as critical to the gerbil's well-being. Gerbils have a unique system of water metabolism that takes water from the foods they consume. In their natural habitats, they need no water because of this ability, but in the laboratory because of the low moisture content of pellet food, water should be provided. Fresh greens, such as lettuce, can be used as water substitutes. Going a few days without water will do little harm to gerbils, but experience indicates that water should always be made available to caged animals. Gerbils that have lost 10-20% of their body weight because of water deprivation will appear healthy, yet when they are examined ventrally the weight loss is more obvious. Their fur tends to camouflage weight loss. Animals on a tryptophan-free diet have lost up to 40% of their weight and returned to normal when placed on a regular diet. Diets containing mycotoxins and dimethylforamide also inhibit the rate of weight gain (Hastings and Llewellyn 1973; Llewellyn 1975; Llewellyn *et al.* 1974).

Cleaning the cages of laboratory animals is usually considered a "necessary evil." Because gerbils drink little water they excrete only small amounts of urine. Their fecal material is small and almost dry. Both urine and feces have little odor. Wood shavings and cedar chips, about 2-5 cm deep are generally used for bedding. Absorbancy is not a problem so whatever material is the most easily available and least expensive can be used. Bedding should be changed once or twice weekly. The easiest way to do this is to remove the gerbil from its cage by picking it up by the base of the tail. It can be held in cupped hands or set in the palm of one hand while the tail is being held in the other. Special care is necessary with young gerbils who may jump suddenly and fall to the floor. Gerbils are active animals and can jump as high as 30 cm and execute a broad jump of 60 cm (Robinson 1975b). Because they are curious, they are easily recaptured if they escape.

Breeding

Breeding gerbils is easy. They are monogamous; the female will seldom accept a new mate if she loses her first one. Sexual maturity is not reached until 10-12 weeks, but the testes may descend as early as the 35th day and the vagina may open at 45 days (Schwentker 1963). If they are paired when sexually mature, the female gerbil may reject the male's advances and even try to kill him (Robinson 1975b.). If gerbils are paired at about 8 weeks, however, there will be fewer rejections because they will have matured sexually together. Distinguishing between the male and female is sometimes difficult. Scrotal pouches are not always easily distinguishable on the male. Perhaps the best indication of "who's who" is the placement of the genital opening—it lies closer to the anal opening in the female than in the male. Gerbils breed throughout the year. Their gestation period is about 25 days. The female exhibits a reproductive condition known as *post partum estrus;* she is fertile again almost immediately after giving birth. Sixty percent of pregnancies occur at this time. Litters average 5 and usually 7 litters are produced over the 20 months of reproductive life (Robinson 1975b).

Gerbils in the Classroom

The gerbil's many characteristics make it an ideal animal for the science classroom. Its unique physiological qualities offer interesting topics for student investigations. The gerbil's natural history and ecological relationship with its environment would mesh well with a study of ecosystems. Water and food consumption studies, as well as behavioral studies, could also be undertaken by students. Gerbils fit into most metabolism chambers for oxygen consumption studies (Kimbrough and Llewellyn 1973). Having students care for animals provides a lesson in animal care, and at the same time, keeps the cages clean during the school year. Gerbils can be a valuable addition to any classroom.

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Nesting Birds

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watch how Americans systematically eliminate thousands of square miles of natural areas during the rest of the year. Such an approach can only be a demonstration of adult hypocrisy at its worst.

Through an interdisciplinary program that involves teachers from all subject areas, students can begin to see the necessity for integrating awareness of the environment into every phase of their lives; ecology is not especially reserved for scientists.

In addition, our program can be adapted to students at all levels—elementary, secondary, and college. The program can become more sophisticated as student awareness of scientific principles that underly conservation and ecology grows. Community colleges could set up programs that respond to the needs of the communities in which they are located.

In short, we provide our students with an excellent opportunity to appreciate the dependence of humans on their environment and on the other creatures that share the earth with us.

Acknowledgment—We are most grateful to the staff of Great Swamp National Wildlife Refuge for granting permission to conduct much of this minicourse on refuge property.

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