

Attempts to Breed the Nine-banded Armadillo (*Dasypus novemcinctus*) in Captivity—a Preliminary Report^{1,2}

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It has been established that the nine-banded armadillo is a good experimental animal model for growing *Mycobacterium leprae* (¹). Further, its relatively long life span of about 15 years and its unique method of reproduction by delivering identical quadruplets makes it well suited for the study of many aspects of leprosy.

At present animals caught in the wild are used for the experiments. These animals are of unknown age and may carry infectious disease such as salmonellosis, schistosomiasis, and leishmaniasis. Recently it has been found that they can even harbor a mycobacteriosis, the causative organism of which is indistinguishable from *M. leprae*. Therefore, it has become very necessary to have clean animals available from a breeding colony for the production of *M. leprae* and for research studies. However, until now attempts to breed the animal in captivity under controlled conditions have not been successful.

MATERIALS AND METHODS

It was felt that armadillos for breeding purposes should be kept in an environment with light, temperature, and weather as natural as in the farmlands of the state of Louisiana in the United States, where the animals have lived and multiplied in large

numbers for many years. Four open-air pens, each measuring 12 feet long, 10 feet wide, and 8 feet tall, were built in a farm area surrounded by trees at the National Hansen's Disease Center, Carville, Louisiana. The enclosures are made of chain-link fencing and are embedded four feet into the ground. There is a metal roof to protect the animals from the elements. A wooden, box-like cabin measuring 4 feet long, 3 feet wide, and 1 foot tall with a 1-foot-square opening for an entrance to and an exit from the cabin is provided in each pen. Several bags of paper cuttings were provided once every three months for use by the animals in building nests. The food, consisting of a mixture of cat chow, canned dog food, autoclaved dirt, and mineral salt soaked in water, is placed in flat trays near the cabin and is replenished every evening. Water is supplied daily in shallow, open, plastic containers.

All animals used in this experiment were freshly caught in the wild during the month of May 1982. They weighed between 3.5 and 4 kg and were apparently adults, but their exact ages could not be assessed. They were paired as a male and a female on the date of admission to the laboratory. There were three pairs: one was paired on 11 May 1982, another on 20 May 1982, and the third on 26 May 1982. One pair was kept in each of the three open-air pens; the fourth pen was used for isolation purposes.

RESULTS

The pens were inspected at least once a week. The animals made burrows in the ground not more than 2 feet deep and 3–4 feet long and used them to rest in during the day and at night. The old burrows were closed after some time and new ones were made several times during the year. Nests made of cut paper could be seen inside the

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burrows and in the cabin where the animals huddled together sleeping during most of the day. If disturbed, the armadillos would climb the fence up to the roof. After a time they would loosen their grip and fall to the ground, but they did not seem to be hurt in any way. Some gradually retraced their steps and reached the ground. No problems have been encountered in keeping them healthy and well fed in the open-air pens for the last 1½ years. All of the animals except one female were alive and well at the end of 1½ years in this environment. This female died after eight months and on autopsy was found to have impacted feces. Although a well-developed corpus luteum was seen in one ovary and the uterus was enlarged, no pregnancy was detected in this animal. Another female of a pair which started life together inside one of the pens on 20 May 1982 was found pregnant on gross examination on 16 February 1983. She was isolated by removing the male to the fourth pen. The pregnant female delivered quadruplets on 1 April 1983. Two of the young died during birth. The other two were raised by her; one was found dead in the water trough at three months but the other is still alive.

DISCUSSION

The morphological appearances of the reproductive organs in both the male and female nine-banded armadillo have been described by Talmage and Buchanan (⁵). Recently, the reproductive physiology of male and female armadillos has been extensively investigated (^{2, 3}) and artificial insemination has been attempted without success.

The reproductive cycle is somewhat unusual. The female ordinarily ovulates once a year around July. If conception takes place the fertilized ovum forms a blastocyst which then remains quiescent in the uterine cavity for 3½–4½ months, nourished by the secretions of the uterine glands. Around November of the same year, the blastocyst is activated, embeds in the uterus, and develops into four identical embryos with a single amniotic vesicle and a common placenta. The gestation period from the time of implantation until parturition is 4–5 months (⁴). Therefore, the total gestation period from the time of fertilization of the ovum to the

delivery of the fetuses can be as short as 7½ months or as long as 9½ months.

There have been isolated instances in our own laboratory and in zoological gardens in which an armadillo has conceived and has given birth, but this is a rare occurrence. In our laboratory during the last 11 years, with an average colony strength of about 150 animals, there have been only ten instances of pregnancy in which conception was likely to have occurred within the animal colony.

In this experiment, the female which delivered was in the breeding pen for 10 months and 11 days. The pregnancy can be accounted for in several ways: a) The animal could have been fertilized in the wild and come in with the blastocyst which remained in the uterus for a period longer than 4½ months, the longest silent phase of gestation known; b) the gestation period after implantation was longer than the required five months; or c) the animal became pregnant in the natural environment provided in the laboratory. We wish to think the animal was fertilized in the laboratory under controlled conditions by the known male. Further experiments are in progress.

SUMMARY

Three pairs of nine-banded armadillos were successfully kept in wire-fenced pens in natural surroundings with light, temperature, and weather as in the farms of Louisiana, a natural habitat of armadillos. One female delivered quadruplets after being in the experimental pen for 10 months and 11 days. It is possible that in this experiment breeding of nine-banded armadillos in captivity has been achieved under controlled conditions for the first time.

RESUMEN

Se logró mantener a 3 pares de armadillos de 9 bandas en un corral con cerca de alambre en condiciones naturales de luz, temperatura y el clima de las granjas de Louisiana, hábitat natural de los armadillos. Después de permanecer en el corral experimental por 10 meses y 11 días, una hembra dió a luz a cuádruples. Es posible que esta sea la primera vez que se haya logrado el embarazo exitoso de un armadillo de 9 bandas bajo condiciones controladas de cautiverio.

RÉSUMÉ

On a réussi à maintenir trois paires de tatous à neuf bandes dans des sites entourés d'une clôture dans un

environnement naturel, dont l'illumination, la température, et le climat étaient semblables à celui des fermes de Louisiane, le biotope normal des tatous. Une femelle a donné naissance à des quadruplets après avoir séjourné dans cet enclos expérimental pendant 10 mois et 11 jours. Il est possible que ce soit la première fois, lors de ces expériences, que l'on ait pu réussir la reproduction de tatous à neuf bandes en captivité, dans des conditions contrôlées.

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