Reports

Gold-198 Wires Used To Study Movements of Small Mammals

Abstract. Eastern harvest mice, *Reithrodontomys humulis humulis* (Audubon and Bachman), were tagged with subcutaneously inserted 20 gauge gold-198 wires 10 mm long and varying in activity from 0.7 to 4.5 mc. None of the tags inserted by this method were lost or had any apparent effect on the animals. The movements of the tagged mice were successfully traced with a portable Geiger counter.

The use of radioactive tags as tools to trace the movements of small mammals is a comparatively new technique (*1*). Before the use of isotopes, investigators relied upon live-trapping as the chief means of determining the home range of a small mammal. The most apparent limitation of the live-trapping technique is obvious, for an animal must be trapped at least ten times to obtain a representative estimate of its home range (*2*). The isotope tagging method can provide considerably more information about the individual animal than live-trapping. It also permits studies to be conducted at night and in all types of weather, it eliminates multiple handling and trapping, and it does not restrict spatial movements (*3*).

Cobalt-60 and phosphorus-32 are the only isotopes previously utilized in studies of small mammals (*1*). Selection of Au^{198} was made because gold possesses a short half-life of 2.7 days as well as an adequate gamma energy of 0.41 Mev. Because a tag may be lost, a short half-life is a decided safety factor (*4*). Gold-198 provides this safety factor but does not detract from the useful life of the tag.

The lowest activity of tags used in this investigation was 0.7 mc, which allowed detection of the mouse at a maximum distance of 9 feet with a portable Geiger counter (RCA model WF-12A). Each of the harvest mice tagged with a 0.7 mc source was detectable for 1 week. By the seventh day the decrease in detection distance to about 1½ feet necessitated capture of the mice in order to retrieve the gold wires. One mouse was tagged with a 3.9 mc source and was easily followed for 10 days before radioactive decay of the tag made it necessary to recapture the mouse. The highest activity of a single tag was 4.5 mc, which permitted initial detections up to 20 feet. However, during the first two days this tag proved to be less desirable than tags of lesser activity because the high level of radioactivity exceeded the capacity of the Geiger counter, which made it difficult to establish the precise locations of the mouse. In this instance the animal was allowed to remain free for 10 days before recapture.

To be tagged, a mouse was transported a short distance from a study plot to the laboratory, where it was anesthetized with ether and placed ventral side up on an operating board. A wire bit under the upper incisor teeth and a rubber band over the hind legs immobilized the animal. A 16-gauge hypodermic needle was inserted subcutaneously in the lower abdominal region. With a pair of 5-inch forceps, a 10-mm piece of 20-gauge Au^{198} wire was extracted from a lead container and placed in the exposed orifice of the needle. Next, a 5-inch piece of 20-gauge steel wire was used to push the gold wire through the hypodermic needle and implant it under the skin of the mouse. Both the steel wire and hypodermic needle were then removed, leaving only a tiny puncture in the skin. The mouse was placed in a small cage to recover before it was returned to the study plot and released at the point of capture. The entire procedure, from removal of the trap from the field to release of the mouse, required less than 1 hour.

Labeling operations were performed from behind a lead shield which protected all parts of my body except arms, head, and neck. The use of the lead shield may be superfluous, for the activity of Au^{198} is low and the exposure time was only a minute or two. At no time during the investigation was my film badge dose meter overexposed.

For field use, the detection tube of the Geiger counter was extended 24 inches in front of the instrument by affixing the tube to the distal end of a stick which was attached, at the other end, to the counter itself. This arrangement permitted a wider radius of detection than did holding the tube in one hand and the counter in the other. Head phones proved to be extremely helpful, since any increase over background radiation was first audible before it became apparent on the meter. Night work, moreover, made the use of headphones essential.

To facilitate location of a tagged mouse, transverse cords were extended at 10-foot intervals across a rectangular-shaped study plot. The aisles thus formed were used to conduct a systematic search for a tagged mouse. The usual procedure was to sweep the Geiger counter from left to right as the investigator, by trial and error movements, attempted to locate the source of radiation. Care was exercised when approaching the mouse to avoid alarming it. Usually, while it remained hidden under the thick grass or in a nest, the mouse could be approached to within 4 feet. When this proximity was possible, the Geiger tube could be extended to within a few inches of the hidden mouse. Each location was marked for reference with an inscribed paper tag attached to the end of a piece of coat-hanger wire. During the course of the study, 180 locations of tagged mice were made by this procedure. Only on a few occasions did the hidden mouse seem to be disturbed by the presence of a person (*5*).

STEPHEN V. KAYE*

Department of Zoology,
North Carolina State College, Raleigh

References and Notes

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* Present address: Ecological Research Section, Health Physics Division, Oak Ridge National Laboratory, Oak Ridge, Tenn.

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Limit the report proper to the equivalent of 1200 words. This space includes that occupied by illustrative material as well as by the references and notes.

Limit illustrative material to *one* 2-column figure (that is, a figure whose width equals two columns of text) or to *one* 2-column table or to *two* 1-column illustrations, which may consist of two figures or two tables or one of each.

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