

## INFECTION OF LABORATORY-REARED AND WILD COTTON RATS WITH CAT TAPEWORM LARVAE<sup>1</sup>

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Live-trapped cotton rats (*Sigmodon hispidus komareki* Say and Ord) were bred in a laboratory colony to obtain young to be used in stocking outdoor pens located on an area contaminated with radioactive wastes and on an uncontaminated area. The pens were constructed for studies of radionuclide uptake and effects of low-level ionizing radiation on the blood of native small mammals. A preliminary experiment was initiated to determine the effectiveness of the pens for retaining cotton rats and to ascertain activities and intraspecific behavior of *Sigmodon* in the pens. Twenty of the laboratory-bred cotton rats were caged singly in an unheated shed during the latter part of November, 1961, to precondition the animals to cold weather. Sixteen of these rats (weight average 97 g) were released in groups during January, 1962, into several pens on the uncontaminated mammal study area.

A 100- $\mu$ c Ta<sup>182</sup> wire (1 mm diam x 6 mm long) encapsulated in a nylon cylinder (3 mm diam x 8 mm long) was implanted subcutaneously in the scapular region of each of the 16 cotton rats just prior to release. A modified large hypodermic needle filled with a plunger was used to insert the cylinders in the desired location similar to the method described by Kaye (1960). A radiation survey meter was used to detect the radioactive wires in the penned rats.

All the cotton rats in the pens died within 4 to 14 days after release. The bodies were located shortly after death since movements and activities were studied daily by detection of the Ta<sup>182</sup> tags. Fifteen of the sixteen animals were examined at necropsy. All fifteen were found to have liver cysts containing larvae of *Hydatigera taeniaeformis* (Batsch), a carnivore tapeworm. The identification was confirmed by Dr. Reinard Harkema of North Carolina State College, who suggested an approximate age of 45-60 days for the larvae. The number of cysts per liver ranged from 4 to 67, with an average of 24. The cysts measured ranged from 4 to 8 mm in diameter. Each cyst contained one worm; several of the worms were measured and ranged from 5 to 16 mm in length. The larval worms had a scolex with 4 suckers and a low rostellum bearing 2 rows of hooks. The hooks on one larvae numbered 16 in the anterior row and 17 in the posterior row. Behind the scolex was a strobila consisting of a variable number of segments (~ 20 to 60) and ending in an elongated bladder-like cyst.

Since the rats had not lived in the pens long enough

for larval tapeworms to have developed to this size from infection in the field, it was felt that the rats must have become infected during the growth period in the cages. The 15 *Sigmodon* involved were offspring of 3 different mothers. One mother had died. Another which had borne 11 of the infected rats was sacrificed, and no tapeworms were found. No larval tapeworm cysts have been found in any other cotton rats bred in the laboratory. It was recalled that feral house cats (*Felis catus*) had been seen several times in or near the shed in which the rats were acclimated. Ten cats from the adjacent area were live-trapped, sacrificed, and examined for parasites. Seven of the ten harbored adult *Hydatigera taeniaeformis* in the intestine in numbers ranging from 1 to 25. It was concluded that the laboratory-raised *Sigmodon* has ingested ova or segments of the tapeworm derived from cat feces, with subsequent development of larval tapeworm cysts in the livers of the rats.

The death of all rats in 2 weeks or less in the field was puzzling because cotton rats in subsequent experiments survived for months in the pens during cold weather. It may be that the preconditioning exposure to winter weather was not adequate or that a combination of rain and low temperatures was particularly unfavorable. On the other hand, the tapeworm infection may have been a contributory factor to the mortality.

A review of the parasitologic records of 42 wild cotton rats trapped in the same general area as those used as breeding stock for the infected young described above revealed only one rat with liver infection by larval *H. taeniaeformis* and there was only one larval cyst in that case. In 1964, 10 cotton rats obtained by live trapping were examined for endoparasites. Seven of these were from the environs of a populated area near Lenoir City, Tennessee. Five of these rats had liver infections with larval *H. taeniaeformis*, the cysts numbering 1, 1, 1, 5, and 22, respectively. The three obtained from a "wild" area were free of the parasite.

These results suggest that cotton rats in areas adjacent to human activity with associated house cat populations will readily acquire the larval form of *H. taeniaeformis*. House cats hunt intensively in a relatively limited area but wild carnivores range more widely. Rats from wilder areas are apparently not as commonly exposed to contamination by feces of house cats or wild carnivores. Also, we do not know if wild carnivores of this region have *H. taeniaeformis* infection as commonly as do house cats. A number of wild carnivores have been reported as hosts of adult *H. taeniaeformis* while the larval forms are known from a variety of rodents

(Wardle and McLeod, 1952; Yamaguti, 1959). Such larval infections have been observed in *Sigmodon hispidus* in adjacent states such as Georgia and North Carolina (Harkema and Kartman, 1948).

The advantages of radioactive tags in the study of the penned cotton rats were well illustrated since, in addition to being able to locate the live animals, it was possible to retrieve the bodies soon after death. Radioactive tags could be used similarly in parasitological studies by releasing tagged uninfected animals into infested areas, retrieving the tagged animals after selected times, and determining rates of parasite infection.

### SUMMARY

Both wild and laboratory-bred cotton rats, *Sigmodon hispidus*, have been found to be intermediate hosts of the cat tapeworm, *Hydatigera taeniaeformis*, when living or caged in areas subject to contamination by house cat feces. The larval tapeworms encyst in the livers of the cotton rats in varying numbers. It appears that the rate

of infection in cotton rats in East Tennessee may depend on the proximity to human habitations with associated house cats. Implantation of radioactive tags in cotton rats led to ease of recovery of the bodies when deaths occurred in large field pens.

### ACKNOWLEDGEMENT

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### LITERATURE CITED

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### NEWS OF TENNESSEE SCIENCE

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Dr. Richard R. Overman, Professor and Chairman of the Division of Radiation Biology at the University of Tennessee College of Medicine, has been named Assistant Dean for Research Affairs.

A pilot institute in atomic and nuclear physics for international relations experts, conducted by the Oak Ridge Institute of Nuclear Studies, is scheduled tentatively for April 12-30, 1965, in Oak Ridge.

The institute, designed to help international relations generalists develop an appreciation of science and an understanding of its major concepts and problems, as they relate to nuclear energy, is supported by the Carnegie Endowment for International Peace and the U. S. Atomic Energy Commission. William J. Trainor, President of the American Foundation for Continuing Education, will be director of the institute. The program will be conducted by the ORINS University Relations Division.

Dr. John W. Barrett has been named head of the new four-year degree program in forestry in the University of Tennessee's College of Agriculture at Knoxville. Dr. Barrett will direct the addition of the third year of the forestry and wildlife management curriculum for the fall quarter this year, with the fourth year to follow in the fall of 1965. The College of Agriculture has offered a two-year forestry program for many years. Dr. Barrett comes to U. T. from the State University College of Forestry at Syracuse University, where he has been Professor of Forestry and Director of Summer Camp. His career in forestry includes teaching, research, administration, and field work with both public and private agencies.

University of Tennessee students majoring in physics will have a unique opportunity to participate in research projects at the University. The National Science Foundation has awarded \$16,800 to the Department of Physics to provide stipends for eight undergraduate students to become associated with specific research, according to Dr. Alvin H. Nielsen, Dean of the UT College of Liberal Arts and Head of the Physics Department. The grant is for one year, with intent of renewal for two additional years. Dr. Nielsen, who is director of the grant, said that it will be used to seek out exceptional students majoring in physics who, in connection with their studies, "might stimulate their knowledge and interest by becoming a part of special research projects." The \$16,800 is the third award from the National Science Foundation in support of the UT program in physics. Nine physics majors have already participated in the program through a variety of research being conducted by University faculty. Some have become involved in the work to the extent of writing and presenting papers on the research before meetings of scientific organizations.

Dr. Aaron J. Sharp, University of Tennessee Botany Professor, has been named 1965-66 president-elect of the Botanical Society of America. He served as treasurer of the society for 1958 to 1962 and as vice president in 1963. Dr. Sharp recently was awarded a \$27,500 National Science Foundation grant for study in Japan. During September and October, he studied at the University of British Columbia and at the University of Washington.

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