

The Presence Of a Pulmonary Fungus In Korean Rodents

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Rodents are assumed to be the reservoir of infection for hemorrhagic fever in Korea, the etiology of which remains unknown after 3 years of intensive study. A search for pathogenic agents in wild rodents led to the discovery of a pulmonary fungus, Haplosporangium. Tests so far fail to show that this organism has any relationship to the disease in man.

INFORMATION published by the Department of the Army on epidemic hemorrhagic fever (1) and unpublished data indicate that the disease is contracted in nature and that it is rarely if ever contracted in towns or villages, nor does it appear to be contagious in the human population. As a disease in nature, an animal reservoir seems possible though not essential. A further possibility, based on rather extensive observations of others, is that rodents serve as the most likely animal reservoirs because of

Dr. Jellison, parasitologist with the National Microbiological Institute's Rocky Mountain Laboratory, Hamilton, Mont., was a member of the Field Unit, Commission on Hemorrhagic Fever, Armed Forces Epidemiological Board, when this work was carried on. Laboratory facilities of the commission's field unit at the 48th Surgical Hospital in Korea were utilized. Rodents for examination were supplied by the field crews. Airman 1st Class Jack T. Moyer, 406th Medical General Laboratory, trapped many of the animals for the study and Sgt. Rosner, 5th Epidemiological Flight, aided in their examination.

their abundance and because of their close contact with human populations.

The Survey

In view of the possibility that hemorrhagic fever might be a mycotic infection, a survey for the presence of pathogenic fungi in rodents and other small mammals in Korea was initiated by the writer during the fall of 1953. Rodents for examination were supplied by the field crews of the Field Unit, Commission on Hemorrhagic Fever, Armed Forces Epidemiological Board. Most of the collections were made from known endemic areas; however, some animals were also examined from supposedly non-endemic areas.

In this survey, 2,103 rodents and shrews were examined. Of the 1,220 specimens that were determined as to genus and for which records are available, 986 (81 percent) were *Apodemus*; 52 (4 percent), *Mus*; 30 (3 percent), *Clethrionomys*; 27 (2 percent), *Rattus*; 22 (2 percent), *Micromys*; 16 (1 percent), *Cricetulus*; 13 (1 percent), *Microtus*; and one was a *Eutamias*. This collection also included 73 (6 percent) shrews of several genera but largely *Crocidura* with a few *Sorex*.

Determinations are not available for the additional 883 small mammals examined. Their distribution in the various genera is believed to be comparable to that of those shown above.

The Findings

Cysts of a fungus were found in the lungs of 53 separate animals or approximately 2.5 percent of all those autopsied. Infections varied from one to hundreds of cysts. Infected animals included *Apodemus agrarius*, *Apodemus peninsulae*, *Clethrionomys rufocanus*, *Cricetulus triton*, *Rattus* sp., and a single shrew of undetermined genus. A higher percentage of infection occurred in *Clethrionomys* than in other rodents. All rodents found infected came from areas presumably endemic for hemorrhagic fever.

A total of 171 of the 2,103 rodents examined came from two presumably nonendemic areas for hemorrhagic fever. These locations were 5 miles east of Seoul and in the Seoul City water works area 6 miles east of Seoul. No rodents from these locations were found to contain pulmonary fungus cysts.

"Hill 1468" near Kapyong was considered a highly endemic focus. Three of the 17 rodents collected on this mountain peak, October 28 to 29, 1953, were found to have lung cysts. A return trip was made on November 21 to 22, 1953, and 6 of the 14 rodents trapped were infected. *Clethrionomys* was quite abundant in this area and 7 of the 25 collected were infected. Some had very numerous cysts.

The lung cysts were cultured on two types of media favorable for fungus isolations including Littman's and Sabouraud's. Littman's proved to be the more satisfactory. The cysts consistently yielded a white, cottony, sporulating mold. About 40 separate isolates were made from 10 or more separate rodents.

On the basis of cystic stage in the tissue, mycelial growth, and conidiospore formation, the fungus has been tentatively identified as *Haplosporangium* sp. by Dr. Chester Emmons and Dr. Samuel Salvin of the National Microbiological Institute, the former in the Laboratory of Infectious Diseases, Bethesda, Md., and

the latter in the Rocky Mountain Laboratory, Hamilton, Mont. It may or may not be *Haplosporangium parvum* of Emmons and Ashburn (2), the species so widely distributed in the United States and Canada. *H. parvum* is the only pathogenic species of the genus known. It has been found in many kinds of animals (3) but has not been reported for man nor has it previously been reported from Europe or Asia.

Conclusions

Study of human cases of hemorrhagic fever, examination of autopsy material, and serological tests have so far failed to show that this organism has any relationship to the human disease.

REFERENCES

- (1) U. S. Department of the Army: Epidemic hemorrhagic fever. Tech. Bull. TB-Med. No. 240. Washington, D. C., U. S. Government Printing Office, 1953.
- (2) Emmons, C. W., and Ashburn, L. L.: The isolation of *Haplosporangium parvum* n. sp. and *Coccidioides immitis* from wild rodents. Their relationship to coccidioidomycosis. Pub. Health Rep. 57: 1715-1727 (1942).
- (3) Jellison, W. L.: Haplomycosis in Montana rabbits, rodents, and carnivores. Pub. Health Rep. 65: 1057-1063 (1950).

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