Bolivian Hemorrhagic Fever

The disease was first identified in 1962 during an outbreak that caused a large number of deaths in the agricultural community of Orobayaya, Province of Iténez, Department of Beni, which was abandoned by its 600 inhabitants. Subsequently, an even larger outbreak occurred in San Joaquin, the capital of the Province of Mamoré, also in the Department of Beni, and was the subject of an in-depth study by Bolivian personnel and by the personnel of the Middle America Research Unit (MARU) of the United States Public Health Service.

The incubation period of Bolivian hemorrhagic fever is from 7 to 14 days. Direct transmission by nasopharyngeal secretions was confirmed in at least two of the cases. Onset of the disease is gradual. From the beginning, high and sustained fever and myalgia are usually present. About 30 per cent of the patients have hemorrhages from the third day onward. Half the cases show hypotension and tremors of the tongue and hands from the fourth to the sixth day. Leukopenia, as well as thrombocytopenia, are invariably present.

Most cases occur during the dry season and at the peak of agricultural activity—the pattern demonstrated by the outbreaks in Orobayaya and San Joaquin. The disease attacks persons of all ages and of both sexes.

Morbidity is usually high; in San Joaquin it exceeded 30 per cent of the total population. The highest mortality occurs among the very young and the very old.

In 1963 the etiologic agent—the Machupo virus—was isolated both from human and animal tissues and the rodent Calomys callosus was identified as the reservoir of the virus. The San Joaquin outbreak was brought under control by exterminating this rodent. Later outbreaks in hamlets and farms were also associated with the presence of Calomys callosus in the victims’ houses and in their immediate neighborhood. However, in 1971 an outbreak occurred in a hospital in Cochabamba, a city situated outside the endemic area of the disease. The index case appeared to have contracted the infection on a ranch located in the community of Fortaleza, Province of Yacuma, Department of Beni. Five of the persons that were in contact with the patient during his stay in the hospital contracted the disease and four of them died.

Thus far it has not been possible to isolate the virus from any other animal species but Calomys callosus, its natural host. Between 1963 and 1966 the MARU research workers in Panama delimited the approximate area of dispersion of this rodent in Bolivia, which, in the Department of Beni, includes the Moxos plains; in the Department of Santa Cruz, the entire eastern and southeastern region, except for a strip that runs north to south and includes the foothills of the Mato Grosso; in the Department of Cochabamba, the northern part of the Province of Chapare; in the Department of Chuquisaca, the Province of Luis Calvo; and in the Department of Tarija, the Province of Gran Chaco. The total area involved is approximately 500,000 km².

The Machupo virus has been detected in Calomys callosus captured in the Provinces of Iténez, Mamoré, and Yacuma in the Department of Beni (an area of approximately 27,433 km² as a whole). In the Province of Velasco, Department of Santa Cruz, these rodents have been found to be infected with the Latino virus (Machupo II), which is an arenavirus apparently nonpathogenic for man.

In the experiments carried out, the Machupo virus did not produce acute disease in Calomys callosus of any age, regardless of the route of inoculation used. In sucklings, the virus multiplied rapidly in the lymphatic ganglia and the spleen, and between 7 and 10 days later was found in all the tissues (including the brain), and in blood, oral swabs, and urine. The infected animals did not grow as rapidly as their controls, but it is interesting to note that they showed chronic infection accompanied by persistent viremia and never demonstrated circulating antibodies.

In other investigations, adult Calomys callosus inoculated with Machupo virus responded in two ways: with chronic viremia, splenomegaly, and no antibodies, or without viremia (although the virus was present in the urine, buccal cavity, and other tissues), without splenomegaly, and with neutralizing antibodies two or three months after inoculation.

The presence of splenomegaly in infected Calomys callosus is an interesting characteristic that is observed from the second week after onset of the infection and appears to persist for many months. In the course of one epidemic, it was found that the weight of the spleen of those rodents was an important indicator of infection by Machupo virus. Spleenas of more than 0.25 g were positive. However, no virus was found in more than half the spleens that weighed between 0.20 and 0.25 g and in none of those that weighed less than 0.20 g.

Taking into account the diagnostic techniques available in recent years, the criterion used in field work has been to consider all cases of splenomegaly in Calomys callosus as an indicator of suspected infection; unfortunately, confirmation in these cases has not been possible. The percentages of suspected infection ranged from 55 to 93 per cent.

No human cases of Bolivian hemorrhagic fever have been registered since 1974.

(Source: Boletín Epidemiológico, Ministry of Social Welfare and Public Health, Bolivia, Number 75, 1981.)

Editorial Comment

Since the program to control Calomys callosus, no addi-
tional human cases have occurred, but the epidemiological background of the disease indicates the possibility of its reappearance. Recently, *C. callosus* with splenomegaly were found in the Province of Cercado, Department of Beni, and, as stated in the article, this indicator raises the suspicion that the virus infection persists.

### Publications

**Emergency Vector Control after Natural Disaster.**

This publication is a companion piece to the guide *Emergency Health Management after Natural Disaster* (PAHO Scientific Publication No. 407, 1981). Its specific purpose is to elaborate upon vector control sections contained in the parent guide, in the process laying down guidelines for senior technical officers responsible for postdisaster vector control measures. With this end in mind, the book has been written for individuals with a broad range of backgrounds in countries that might be struck by natural disasters. Besides helping government authorities confronted with vector (and pest) problems, the book should prove useful to evaluation teams seeking to determine the likelihood of postdisaster emergencies arising as a result of vector-borne disease.

The first part of the book, which is relatively short, describes the general nature of the postdisaster vector control problem, lists types of information that need to be kept current at all times, outlines appropriate postdisaster actions, and provides a list of common disease vectors together with their possible immediate and delayed effects. The text notes that disasters do not generate "new" diseases, but by altering the environment may increase the transmission rates of those already present. It also points out that regular vector control programs tend to employ static administrative procedures with limited flexibility. As a result, their response to disaster situations is apt to lack the necessary adaptability and innovation, and overreactions to the actual and potential risks of vector-borne diseases may occur. This needs to be recognized in determining the resources available for dealing with a postdisaster situation and in finding the best ways of using those resources.

The second and longest portion of the book describes measures for controlling various vectors—including *Aedes aegypti*, the vector of dengue and yellow fever; the anopheline vectors of malaria; *Culex quinquefasciatus* and other pest mosquitoes; and flies, rodents, and other creatures. The most detailed chapters, on *A. aegypti* and the anophelines, each contain sections on larviciding, adulticiding, and subsequent evaluations.

A short final section deals with vector control consultants—their recruitment, briefing, action upon arrival, training work, recommendations and reports, and follow-up activities. Annexes include a 35-entry bibliography, a list of suggested vector surveillance equipment and supplies, a detailed list of pesticides to use against a wide range of pests and vectors, and a lengthy guide to products—insecticides, rodenticides, insect repellants, applicators, and other equipment—giving the names and addresses of their producers.

It is recognized, of course, that every natural disaster has unique features, and that no guide can completely cover every situation. Thus, *Emergency Vector Control after Natural Disaster* limits itself to specific technical and administrative problems, without delving into the particular environmental, public health, political, and economic conditions prevailing in potentially affected areas. Despite these limitations, and despite the fact that it presents guidelines rather than definitive treatment of its subject, *Emergency Vector Control after Natural Disaster* should prove an important and useful work for all concerned with postdisaster outbreaks of vector-borne disease.