

A Survey to Assess Potential Human Disease Hazards Along Proposed Sea Level Canal Routes in Panamá and Colombia.

I. Introduction

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MAN began considering construction of a sea level canal somewhere in Central America at a very early time. Balboa visualized such a thing in 1513 and a Scot trading company which became established on the Atlantic coast of the Darién area of Panamá in 1699 also planned for one. In 1870, the US Navy was commissioned to conduct a survey for a sea level canal in the Darién region. When the French started construction of the present Panama Canal, they too had a sea level canal in mind. Again, when the United States took over construction from the bankrupt French company, it was intended that a sea level canal would be constructed. However, economics and limitations of the technology of the time resulted in a lock-type canal being built.

One of the main factors that caused the French company to fail was the delay in construction resulting from disease among the workers. When the United States took over, medical studies and investigations were conducted to determine the nature of the problem and how it could be handled so that work could continue. History has recorded the outstanding success that Colonel Gorgas achieved in ridding the area of disease, so that full-scale work could be resumed and the canal completed.

In 1964, under Public Law 88-609, Congress authorized a study to be made to assess the feasibility of constructing a sea level canal in Central America. The sum of \$17.5 million and a three and one-half year time period for completion of the study were authorized. President Johnson appointed a commission of five prominent citizens to conduct the study. The Chief of Engineers, US Army, at the request of the commission became the engineering agent

and a field director's office was established in the Canal Zone.

The Surgeon General, US Army, aware of potential health hazards associated with such an undertaking, recommended their assessment. He emphasized the prior medical problems encountered in constructing the present Panama Canal. In addition, much experience had been gained concerning the occurrence and impact of disease upon such operations, as a result of military activities in various parts of the world during the World War II, the Korean War, and in Vietnam. To forestall a repetition of conditions such as those faced by Colonel Gorgas, information was needed concerning the diseases likely to be of importance in the proposed route areas.

A review of the literature revealed gaps in basic knowledge concerning the occurrence and ecology of disease in the vicinity of the proposed canal sites. A review of Colonel Gorgas' work revealed that malaria, yellow fever and dysentery were the main problems he had encountered. However, there was not sufficient detail recorded concerning numbers of cases, severity and duration of disease, effectiveness of therapy, preventive measures, etc., to be of direct application to present-day planning. The contractor who had surveyed the Inter-American Highway through the Darién Gap also made some interesting medical data available, though it was broad in nature and unrefined, making detailed evaluation difficult. As plans for engineering studies of the proposed sea level canal progressed, it became clear that medical feasibility studies were needed to determine: (1) what significant diseases were present in the indigenous human population; (2) what diseases transmissible to humans were present in vertebrate and invertebrate animals acting as potential reservoirs; (3) what potential modes of transmission existed between reservoirs and the human population; and (4) what vectors were involved and how they could be controlled or eliminated. From a medical viewpoint, it had to be determined whether adequate therapy and immunizations were available for certain diseases which might be encountered, considering that native populations would have to be moved during construction and a large labor force imported. Finally, ecological information

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was needed in order to predict how construction of this magnitude would alter the existing conditions.

It became obvious that the need was for an overall medical support and preventive medicine plan, both for the construction phases and for the operational period following completion. In order to compare the feasibility of any proposed routes, comparative medical costs for support and preventive medicine programs had to be ascertained.

The Medical Program

A medical program emerged in two parts: medical support of all field personnel engaged in the feasibility studies¹ and medico-ecology studies. The two areas designated for data collection were the Darién region of Panamá and the Atrato-Truando region of northwestern Colombia.

Discussions were held with members of the staffs of Gorgas Memorial Laboratory, Middle America Research Unit, Smithsonian Institution and Preventive Medicine Division of Panama Canal Company, in order to utilize their collective experience in tropical medicine research in Middle America. Prior data collection efforts involving population or patient sampling and collection of disease vectors previously had been done only during the dry season. There were only a few areas in Panamá or Colombia where any ecological studies were being or had been carried on, and these were not in the locales of the proposed canal routes. A comprehensive medical survey was indicated extending over a seven to ten year period, in order to compensate for cyclic seasonal fluctuations. The cost of conducting such studies was high however, and the feasibility studies program had only a two-year time table for data collection, with a very modest amount of money. After due deliberation, the staff decided that the best way to obtain the most information would be to do an intensive survey in the two-year period, including dry and rainy seasons, and focus attention on those vertebrates and invertebrates most closely associated with human beings. Personnel from Gorgas Memorial Laboratory and Middle America Research Unit were very helpful in providing guidance and information which enabled certain crucial decisions to be made. A program evolved which would provide for a broad surveillance of the most commonly found or potentially important diseases; namely, malaria, yellow fever and arboviruses. Diarrheas, worm infestations, Chagas' disease, etc., were given secondary consideration. The program could be modified

to go into depth at any point it was deemed necessary. Particular attention was paid to rodents and other small mammals and common insects which are closely associated with humans.

Gorgas Memorial Laboratory was given a contract to process the material which US Army Medical Department personnel would collect in the areas of interest. Despite the fact that some scientists who were consulted considered it a waste of time and money to do such a limited study, the decision to proceed was based chiefly upon the idea that with so little known about the areas in question, any information, positive or negative, would be of value. Information gathered would serve as a basis for further detailed study, when the choice of site and beginning date for construction were determined.

An important portion of the medico-ecology studies was a surveillance program for virus diseases. At no cost to the Engineering Feasibility Studies, Gorgas Memorial Laboratory initiated a virus surveillance program, in which everyone coming into Panamá and going to the field data collection areas provided a pre-entry blood sample. Attempts were made to collect repeat specimens at three-month intervals and/or when any personnel left the area upon completion of their studies or period of work. This was accomplished for most individuals who spent extensive periods of time on the routes, but repeat bleedings were not obtained from many visitors, consultants, and subcontractors who were on the routes for single short visits. When anyone became ill, blood was drawn and sent to Gorgas Memorial Laboratory for comparison with the first sample.

The ensuing articles will describe portions of the medico-ecology studies, methods used and findings of significance in various areas of medical interest. Because of initial delays in getting started and later funding limitations resulting from economy moves taken by Congress in Fiscal Year 1968, studies, planned for two years, were conducted in eastern Panamá for only about one year and in northwestern Colombia for only about nine months. Enough interesting and significant information was obtained indicating potential problem areas during and after construction to enable a meaningful medical feasibility report to be written.

References

- ¹Stacy, H. G. Medical support of studies for a sea level canal. *Milit. Med.*, 134:1355-1362, 1969.