

OBSERVATIONS ON MOSQUITO AND MALARIA CONTROL IN THE CARIBBEAN AREA

PART 5¹ — VENEZUELA

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While attending the Fourth Pan-American Malaria Conference in Maracay, Venezuela, in January 1947 the senior author had the good fortune to observe the extensive malaria program under way in that country. It is apparent that progress in malaria control throughout the world has reached its peak in Venezuela, both in expenditure per capita and broadness of the program. The approximate cost of the 1947 program was \$2,500,000, or between 50 and 60 cents per capita. The total number of employees was about 1,200, including 31 DDT crews with from 7 to 9 men in each. In 1947 these crews treated regularly 87,238 houses (Fig. 1) in the States of Apure, Barinas, Bolivar, Sucre, Monagas, Anzoategui, Guarico, Miranda, Aragua, Carabobo, Yaracuy, Lara, Cojedes, Portuguesa, Trujillo, Zulia, and Territorio Amazonas (Fig. 3).

The Division de Malariología dates from 1935. Its remarkable growth and efficiency are due in no small measure to its able and energetic director, Arnoldo Gabaldon. Fortunately, he has had the excellent support of A. Arreaza Guzman, Director de Salubridad Pública; and Edmundo Fernandez, Ministro de Sanidad y Asistencia Social.

From 1931 to 1935, before the program was initiated, there were approximately 500,000 to 1,000,000 cases of malaria annually. Free treatments given to the pub-

lic dropped from 817,115 at 1,072 posts of distribution in 1943 to 487,833 at 2,449 posts in 1947. This drop in the demand for medication indicated a proportional drop in the number of malaria cases.

Organization and Program of the Division de Malariología.—The effective program for malaria control includes a school of malariology (Fig. 2), which gives three separate courses of study. The first course is a popular one giving some of the basic principles of malaria control to persons having the equivalent of a sixth-grade education. The second course is more intensive, and is designed for subinspectors. The third course is an advanced one for physicians, engineers, and inspectors.

Most of the subprofessional personnel in the Division have passed the first two courses, and have had enough field experience to give them a well-rounded understanding of the disease and the problems involved. Malaria control is being taught in the schools and broadcast over the radio, and thousands of informational leaflets are being distributed to publicize the program.

After DDT became available, an additional four-weeks' training course on residual spraying was initiated. The newly assigned chiefs of the DDT crews are required to spend 12 weeks as assistants to those who have had the required training and experience.

The Venezuelan Government offers annually one scholarship to each of the twenty countries comprising North and South America. Physicians, engineers, and others engaged in malaria control work are eligible. The scholarships provide \$180 a month, with \$100 a month additional for traveling expenses during the last two months of the course. These sums

¹ Parts 1, 2, and 3 have already appeared; part 4 will appear in a subsequent issue. Exigencies of space have dictated changing the order of publication of parts 4 and 5.

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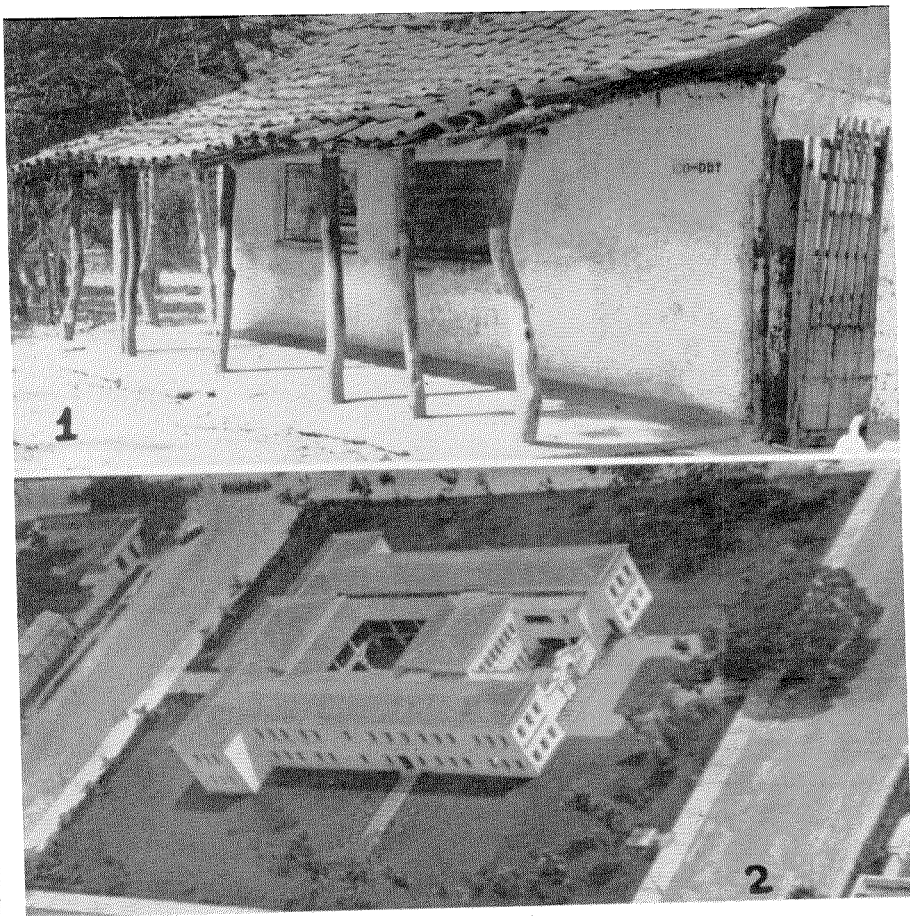


FIGURE 1. Houses sprayed with DDT are identified with symbols. The figure 100 represents the order in which the house was sprayed; the dash (1 or more) the number of sprays the house has received during the year.

FIGURE 2. Air view of the Division de Malariologia, Maracay, Aragua, Venezuela.

cover the expenses of the student for room and meals.

Manuals of procedures which have been prepared for most of the activities pertaining to malaria control are now in use.

Antimalaria activities:—The engineering activities of the Division for the Con-

trol of Malaria include the forestation of swampy areas with eucalyptus and other trees; the paving of ditches totaling more than 278 kilometers (172 miles) in some 30 towns; the filling in of swampy areas; and other comparable measures.

A laboratory for testing the materials

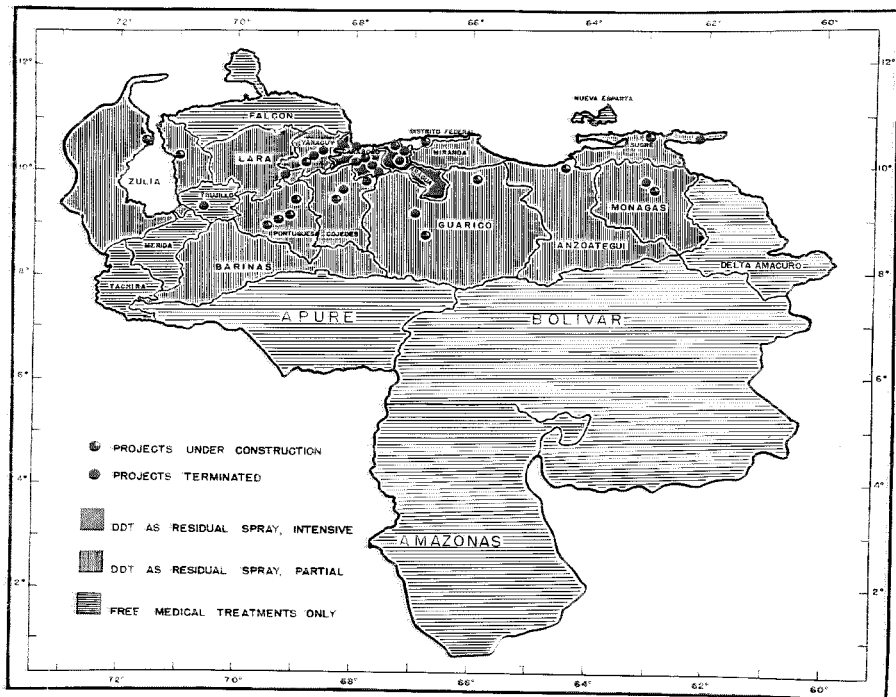


FIG. 3. Map of Venezuela.

used in paving ditches was installed in 1946. Here Panama inverts, pipes, half pipes, and other concrete structures are tested with a Universal Testing Machine of 200,000 pounds capacity.

Antimalaria Drugs:—Various antimalaria drugs were distributed without charge in schools, post offices, telegraph offices, and other places readily accessible to the public. In 1946, for example, 575,839 doses of metoquina (quinacrina) were distributed under this program. Several villages were selected for testing chloroquine. Preliminary reports show satisfactory reduction of malaria by this means.

Control of *Anopheles* Mosquitoes:—Until DDT became available late in 1945 to control *Anopheles* mosquitoes, oil and

paris green were the only larvicides used. The present plan is to use DDT residual sprays on practically all rural homes in northern Venezuela wherever malaria is a problem.

Cooperation with International Health Division of the Rockefeller Foundation:—Special mention should be made of the cooperation between the International Health Division of the Rockefeller Foundation and the Division de Malariología. A Section of Special Studies of the Foundation is studying the use of DDT in the field in order to lower the cost of application and to study and appraise the influence that spraying of houses with DDT may have on the general health and welfare of the people. This section is also examining the blood protozoa of local

birds, reptiles, and bats, and is continuing taxonomic studies, which have been under way for a number of years.

Species of *Anopheles* in Venezuela.—The principal vectors of malaria in Venezuela are *Anopheles albimanus* Wied. on the coast and *A. darlingi* Root in the interior. The other anophelines, according to Dr. Pablo Cova-García, are *A. argyritarsis*, R.-D., *A. pseudopunctipennis* Theob., *A. punctimacula* D. and K., *A. mattogrossensis* L. and N., *A. eiseni* Coq., *A. albitarsis* L.-A., *A. strodei* Root, *A. bellator* D. and K., *A. peryassui* D. and K., *A. neomaculipalpus* Curry, *A. kompi* Edw., *A. oswaldoi* Pery., *A. pessoai* G. and L., *A. boliviensis* Theob., *A. nimbus* (Theob.), *A. aquasalis* Curry, *A. rangeli*, G., C.-G., and L., *A. nuñeztovari* Gab., *A. benarrochi* G., C.-G., and L., *A. vargasi* G., C.-G., and L., *A. homunculus* Komp, *A. parvus* (Chagas),

A. thomasi Shan., *A. mediopunctatus* (Theob.), *A. apicimacula* D. and K., *A. cruzii* D. and K., *A. triannulatus davisi* P. and S., and *Chagasia bathanus* (Dyar).

Bibliography

- ANDUZE, P. J. 1941. Primer informe sobre entomología médica del Estado Bolívar (Venezuela) Serie I. La fauna culicidina. Descripción de tres especies nuevas (Diptera, Culicidae). *Rev. San. y Asist. Soc.* 6:812-836.
- GABALDON, A., and COVA-GARCÍA, P. 1946. Zoogeografía de los anofelinos en Venezuela: I. Los dos vectores principales. *Tij. s. Malaria* 10(1): 19-32.
- GABALDON, A. 1946. La División de Malariología en 1945. *Tij. s. Malaria* 10(2): 59-78.
- GABALDON, A., and COVA-GARCÍA, P. 1946. Zoogeografía de los anofelinos en Venezuela: II. Los vectores secundarios y los no vectores. *Tij. s. Malaria* 10(2): 78-127.
- COVA-GARCÍA, P. 1946. Notas sobre los Anofelinos de Venezuela y su identificación. XII. Conferencia Sanitaria Panamericana. No. 1, 11-208.