

NOTES ON MALARIA CONTROL IN MANAGUA, NICARAGUA

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Managua, capital city of Nicaragua, has a population of 110,000 (1942). Situated in the Tropics, at an elevation of 180 feet above sea level, the city has a hot, humid climate. It is located on the southern shore of Lake Managua, a large intermontane body of fresh water. Along much of the lake front, especially in eastern Managua, a rocky lacustrine terrace defines the shoreline during periods of high water. In direct relationship to the amount of annual rainfall, the lake level has fluctuated as much as twenty feet in the past sixty years. As a result, varying widths of beach are exposed. The overflow from numerous springs along the base of the lake terrace and rain-water collect in natural and man-made depressions in the beach, and these pools, often protected by rank growth of swamp vegetation, form abundant breeding places for the malaria vector, *Anopheles albimanus*.

Past records of the National Sanidad indicate two yearly peaks in malaria incidence in Managua. Closely following the rainy seasons, the first peak occurs in July or early August while the second and higher incidence rate takes place in November and December. Most of the cases during the first seasonal increase are *P. vivax* while during the second period they are *P. falciparum*.

In 1942 the Institute of Inter-American Affairs and the Government of Nicaragua signed a basic agreement by which the Servicio Cooperativo Inter-Americano de Salud Pública was established as the Nicaraguan portion of the hemispheric cooperative health and sanitation program being carried on in 18 Latin American republics.

Immediately, projects were started to provide health centers, hospitals, medical posts, health education, nurse training, water supply, sewerage systems, general

sanitation, and temporary and permanent malaria control throughout the country. At Managua, one temporary and three permanent malaria control projects were established. The larviciding with diesel oil was necessary along the lake shore as an emergency measure because in 1942 Managua experienced its most serious malaria epidemic in many years. Also,

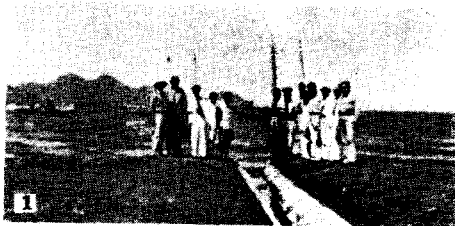


FIG. 1. Col. DeBayle, Institute and Servicio Engineers, and newspaper reporters inspecting drainage ditch.

FIG. 2. Diversion ditch taking form.

FIG. 3. One of the 17 drops along "Cauce Oriental."

the danger was heightened by the war-time scarcity of anti-malarial drugs.

Drainage of the exposed beach along the lake was undertaken. This work had been started in 1932 by the International Health Division of the Rockefeller Foundation. Ten years later, in December, 1942, the Servicio Cooperativo Inter-Americano de Salud Público continued this work and by November, 1943, these drainage facilities were completed. The project included the installation of 10,000 feet of 4-inch and 6-inch open-jointed, sub-surface drains which were connected with paved open canals for ground-water drainage. Work also included special structures, e.g., a 4-foot high masonry retaining wall 650 feet long, culverts, paved chutes, small bridges, and masonry inlet boxes.

The western section of Managua was drained ineffectively by a large, open ditch, called the Cauce Occidental, which had been built in 1890. This ditch followed a northwesterly direction skirting the city limits and discharged directly into Lake Managua. It intersected and drained surface run-off from all principal streets. In the fifty years since its construction, the Cauce Occidental had received little maintenance and at many points the channel was obstructed or seriously damaged. The problem was therefore one of restoration. The project included cleaning and regrading of 11,034 lineal feet of channel, construction of 3 rubble-masonry drops for grade reduction, and building two large concrete arch culverts [88 feet long]. Beginning work in March, the project was finished in June, 1943.

Still another malarious region needed attention. During the past 20 years, the city had grown rapidly from 40,000 in 1924 to 55,000 in 1933 to 110,000 in 1942. Principal urban expansion had been toward the south and east. However, continued penetration in this direction was retarded by the serious malaria problem in that sector of town. Malaria surveys conducted in 1932 by the Sanidad and Rockefeller Foundation and repeated

in 1942 by the Sanidad and the Institute of Inter-American Affairs showed the prevalence to be consistently higher in the eastern end of the city. Construction of another large ditch, Cauce Oriental, to drain storm waters into the lake from the settled region was begun in November, 1942, and completed in August, 1943. The original design was drawn by Magoon in 1933, modified by Lowe in 1935, and again modified by the Institute of Inter-American Affairs in 1942. The ditch was built 13,800 feet in length, trapezoidal in shape with the longer side at the top. An interesting feature in its construction is the use of 19 massive concrete drops, four to twelve feet in height, along the course of the channel. The hydraulic capacity of the Cauce Oriental is more than 1,000 cubic feet per second



FIG. 4. Terminal spillway and chute.

in the lower portion compared with 500 second feet for the Cauce Occidental.

In December, 1943, a third parasitic

index survey was conducted. The following tabulation indicated the results of the three surveys in Managua.

PARASITIC INDEX SURVEYS, MANAGUA, NICARAGUA

Per cent of blood specimens infected

	1931	1942	1943
Barrio de Silva.....	.....	70.5	10.5
Barrio Larreynaga.....	74.03	61.0	13.5
Barrio de Estrada y Pescadores.....	57.03	51.5	14.5
Barrio de la Cruz.....	59.36	34.2	6.5
Calle Colon.....	9.38	9.0	7.0
Barrio Trixione.....	.....	15.5	5.5
Barrio de la Perla.....	.....	13.0	8.0
Campo Bruce.....	.....	26.6	2.5

The average reduction from November, 1942, to December, 1943, was 76.4 per cent.