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Integrated Mosquito and Malaria Control

Malaria control during Panama Canal construction

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History of Malaria Eradication

The Panama Canal (1)

- The Isthmus of Panama was an ideal environment for mosquitoes. The high temperature varies little during the year. The rainy season lasts for nine months and the interior of the Isthmus is tropical jungle, ideal for mosquito breeding. The Panama Canal extends diagonally across the Isthmus of Panama from south-east to north-west, a distance of 42 miles from shore to shore. At Panama, the anti-malarial work was principally rural, located for 47 miles along the line of the railroad between Panama and Colon. The population was about 80,000 living within half a mile of the railroad and occupying some 30 villages and camps or isolated houses. Malaria was so abundant that in Colon, it was estimated that one-sixth of the population was suffering from malarial attacks during each week.

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History of Malaria Eradication

The Panama Canal (2)

An integrated program of mosquito control was initiated that involved seven basic programs that were strictly enforced. These were, in order of importance:

- **Drainage:** All pools within 200 yards of all villages and 100 yards of all individual houses were drained. Subsoil drainage was preferred followed by concrete ditches. Lastly, open ditches were constructed. Paid inspectors made sure ditches remained free of obstructions.
- **Brush and grass cutting:** All brush and grass was cut and maintained at less than one foot high within 200 yards of villages and 100 yards of individual houses. The rationale was that mosquitoes would not cross open areas over 100 yards.
- **Oiling:** When drainage was not possible along the grassy edges of ponds and swamps, oil was added to kill mosquito larvae.

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The Panama Canal (3)

- **Larviciding:** When oiling was not sufficient, larvaciding was done. At the time, there were no commercial insecticides. Joseph Augustin LePrince, Chief Sanitary Inspector for the Canal Zone developed a larvacide mixture of carbolic acid, resin and caustic soda that was spread in great quantity.
- **Prophylactic quinine:** Quinine was provided freely to all workers along the construction line at 21 dispensaries. In addition, quinine dispensers were on all hotel and mess tables. On average, half of the work force took a prophylactic dose of quinine each day.
- **Screening:** Following the great success in Havana, all governmental buildings and quarters were screened against mosquitoes.

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The Panama Canal (4)

- **Adult killing:** Because the mosquitoes usually stayed in the tent or the house after feeding, collectors were hired to gather the adult mosquitoes that remained in the houses during the daytime. This proved to be very effective. Mosquitoes that were collect in tents were examined by Dr. Samuel T. Darling, Chief of the Board of Health Laboratory. Cost of adult mosquito killing was $3.50/per capita/per year for whole population of the strip.

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The Panama Canal (5)

Results

- The results of this malaria program were such that yellow fever was totally eradicated. Death rate due to malaria in employees dropped from 11.59 per 1,000 in November 1906 to 1.23 per 1,000 in December 1909. It reduced the deaths from malaria in the total population from a maximum of 16.21 per 1,000 in July 1906 to 2.58 per 1,000 in December 1909.
- Among the work force, the percentage of employees hospitalized due to malaria was 9.6% in December 1905, 5.7% in 1906, 1.8% in 1907, 3.0% in 1908, and 1.6% in 1909.

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Questions?

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