CLASSICS OF SCIENCE: Campaign Against Yellow Fever

Hygiene—Public Health

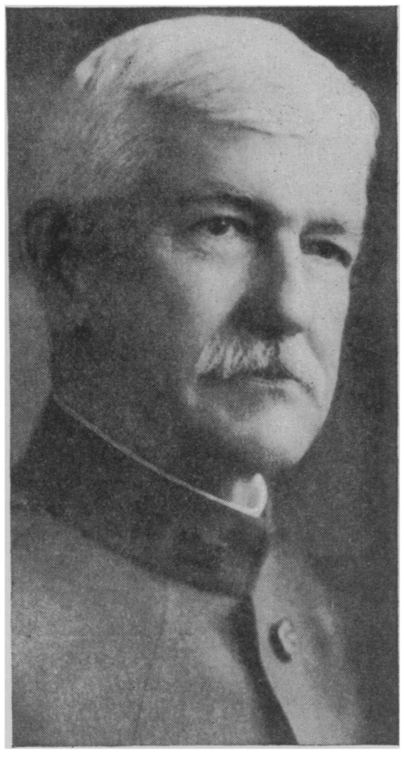
October 3 was the 74th anniversary of the birth of Gorgas, whose own directions for ridding a community of yellow fever are used as the Science Classic this week.

A Few General Directions with regard to Destroying Mosquitoes, particularly the Yellow Fever Mosquito. By W. C. Gorgas, Colonel, Medical Corps, U. S. Army, Washington: Government Printing Office, 1904.

Before the year 1900 it was universally believed that yellow fever was carried from person to person and spread generally by a germ, which up to the time had not been discovered. The germ was supposed to travel from person to person by contact with those sick of the disease, or by means of clothing or other articles which had been near the sick, and its development was believed to be greatly favored by all conditions which increased filth. There were a good many facts in the spread of the disease which were difficult to account for under this supposition, but nevertheless it was the best explanation possible, and, as I said, was almost universally accepted, both by physicians and people generally. . . .

At this time the military authorities had had entire control of Habana for about two years. An army doctor had been placed in charge of the health department and given the means and power to do what he thought most likely to free the city from yellow fever. Yellow fever in Habana was a disease like consumption in Galveston or New Orleans—always there, and always one of the principal causes of death in the city. And this had been the state of affairs as long as anything had been known with any accuracy, either about yellow fever or about the health conditions of Habana; and these things were pretty accurately known for more than a hundred years immediately preceding the time I refer to. When we organized our health department, we believed, as did everybody else, that yellow fever was caused by filth, dirt, and general insanitary conditions, so we went to work doing our very best to correct these conditions. With these efforts Habana very rapidly became a healthy city, as much so as many of our large cities in the United States, but yellow fever did not seem to be affected.

The second year of our control yellow fever was very severe in Habana, but did not attack the native



SURG.-GEN. WILLIAM CRAWFORD GORGAS, one of the world's greatest sanitary geniuses

Cuban because he was generally acclimated. Only the foreigner, therefore, was subject to the disease. During the year 1900 many of our prominent American civilians and military officials died of the disease, and the very cleanest and best parts of the city and the people who lived best and took the best care of themselves were most affected. When the army board published their discovery to the world the health department of Habana recognized that it and all the rest of the world had been on the wrong track with regard to yellow fever, and they determined to change their methods and attack the mosquito as the cause of the disease.

They had been convinced by the work of the army board that a human being could only get yellow fever by being bitten by a particular kind of mosquito—the stegomyia—which had previously bitten a man suffering from yellow fever. They therefore arranged that as soon as a man sickened with yellow fever, employees from the department went to the house and screened it with wire netting, so that those mosquitoes that were in the house could not get out and those outside could not get in. A smudge was then made of sulphur, tobacco, or insect powder, as best suited to the circumstances, in the affected house, and in all those immediately around it, with the intention of killing all mosquitoes present. By this method it was hoped that both the mosquitoes that had bitten the man and caused the disease would be killed, and also those that had bitten the man after he was taken sick, and had thus become themselves infected and able to spread the disease. For the purpose of doing this screening a building was arranged much like a fire station in one of our cities, where wagons, wire screens, carpenters, and men with material for making smudge, were always kept on duty, who proceeded at once to the place where a yellow fever case was reported to exist.

Wigglers Need Air

This method was very successful in its results. After its adoption very few cases occurred where the disease spread from the person infected to others in the neighborhood. It was also determined to destroy as many as possible of the yellow fever mosquitoes in the city. It was known that the female mosquito had to have water on which to lay her eggs, and that these eggs could not hatch without water; that this water had to be very quiet and well protected for the hatching process to take place; that the eggs took about three days to hatch; that after hatching the insect had to live the life of a fish in this water for five or six days. During this fish stage they are known as larvae, and are well known to everybody in the South, for they are nothing but the common wigglers always found in standing rain water during the summer months. Now, while in this wiggler stage the insect has to have air, and for this purpose must every little while come to the surface. At the end of five or six days the wiggler changes into the full-grown mosquito.

It is known that this particular species of mosquito—the stegomyia, or the yellow fever mosquito—lives and breeds almost altogether in houses and in their immediate neighborhood, and (*Turn to next page*)

Campaign Against Yellow Fever—*Continued*

does not leave the house for any great distance. With this knowledge of its life history, the department found it easiest to destroy the mosquito in its wiggler stage, and the most useful means in this direction they found to be the doing away with all the little deposits of water in and near inhabited houses, which the wiggler must have in order to develop into the mosquito. The methods herein described were not settled upon, as might appear from this account, all at once and at the beginning, but many other methods of waging war against the mosquito were tried, found impracticable, and dropped.

Cover Water Cisterns

With the object of doing away with the breeding places of the yellow fever wiggler all the houses and yards of Habana were carefully examined and all tin cans, empty bottles, and trash of the same kind, which were generally found filled with rain water, and full of yellow fever mosquito larvae were carefully carted off. Then the necessary openings in all cisterns were covered with mosquito netting, so that the mosquitoes could not get in to lay their eggs. Among the poorer people, who had only barrels and other similar receptacles for rain water (and in Habana every family had something of this kind), the health department arranged these necessary receptacles for them by placing a wooden cover on the barrel, leaving a hole in the center of this cover for the entrance of water, and covering the hole with wire netting, so that mosquitoes could not get in. To enable them to draw off the water without opening the barrel a cheap wooden spigot was placed in the lower part.

Now from the peculiarity of the wiggler, that he has to come to the surface of the water every few seconds to get air, if we put anything on the surface of the water that prevents him getting this air, he drowns just as certainly as a man would who is kept under the water. Ordinarily kerosene oil, a tablespoonful or two to a cistern, spreads over the surface of the water and kills the wiggler in this way. He can not break through the scum of oil to get air. But oil very rapidly evaporates and has frequently to be renewed. So oil was only used in Habana where no other method was successful. The privy pits in all the houses there were in the center of the court, covered generally with heavy flagstone. These pits not being in general accessible to the inspectors had to be treated with oil. Once a month, a couple of ounces of oil were poured into the pipes leading to the pits.

To insure that these methods and ordinances were carried out, the city was divided into districts of about a thousand houses each, so that an inspector would get over each district in the course of a month, inspecting at the rate of about thirty houses a day. This inspector had with him two men who used the oil as above described. He had with him printed blanks on which he entered the condition of the premises as to wigglers. These reports were turned in every night to the office of the health department and were consolidated from day to day. At the end of the month we could therefore tell the condition of Habana as to wigglers. At the first report on this subject (I think in March 1901), we found that we had in Habana in the neighborhood of 26,000 different water deposits which contained wigglers, most of them of the yellow-fever variety.

Wiggler Breeders Fined

After once going over the city and carefully explaining to the people the dangers of allowing wigglers on their premises, and after having fixed up for the poor all the water barrels which they were obliged to keep for holding their rain water, the mayor of the city issued an ordinance stating that anybody who bred wigglers on his premises would be fined $10. These two methods of destroying yellow fever mosquitoes, namely, that of killing the grown mosquito in the neighborhood of every yellow-fever patient with a smudge and of looking after the wigglers in all rain water deposits about the house, were steadily enforced during the year 1901. The results were better than we had dared to hope. Few cases occurred in which yellow fever spread from a case cared for in this way. Yellow fever rapidly decreased, and on September 28, 1901, the last case of yellow fever occurred in Habana, and since that time—now more than two years—not a single new case has developed in the city.

There were still, of course, a great many yellow-fever mosquitoes in Havana, but these methods of destroying the wigglers had greatly decreased the numbers of mosquitoes. The report of January, 1902, after about ten months of this mosquito work, showed that within the city limits less than 300 premises had wigglers upon them. This I think a very fair measure of the results accomplished by one year's work, namely, that the number of deposits containing wigglers had been decreased from about 26,000 to about 300.

William Crawford Gorgas was born in Mobile, Ala., on October 3, 1854. During the Civil War he was going to school in Richmond and already hoping and planning to have a military career. However these plans were opposed by the family and he studied medicine, taking his degree from the Bellvue Hospital Medical College in 1879. The following year he gratified his military ambitions by entering the Medical Department of the U. S. Army. The younger lieutenant was sent to Ft. Brown, near Brownsville, Texas, where a yellow fever epidemic was raging, to take care of the civilian population. One of his patients, Miss Marie Cook Doughty, afterwards became his wife. Gorgas contracted yellow fever himself at this time, and the fact that he and Mrs. Gorgas were both thus immune to the disease was helpful when his duties took him to Havana and Panama. Recognition of his practical knowledge of yellow fever transmission resulted in his being appointed chief sanitary officer of Havana in 1898. Gorgas was quick to recognize the value of the work done by the Army board under Walter Reed, in implicating the mosquito as transmitter of yellow fever. "If it is the mosquito," said Gorgas, "I am going to get rid of the mosquito." He did, using the methods in the preceding discussion. When the project of the Panama Canal came up, the chief difficulty was known to be the prevalence of yellow fever and malaria which made the place practically uninhabitable. President Roosevelt sent Gorgas down there to clean it up for the engineers who would follow to construct the canal. In 1915 Gorgas and his associates in the Isthmian Canal Commission received a vote of thanks from Congress for their distinguished service in this connection. This recognition of sanitary achievement by the State is one of the few such in all history since Hippocrates was awarded a civic crown by the citizens of Athens for averting a pestilence from that city. During the World War he served with great distinction, directing the sanitation and hygienic measures among the troops at training camps all over the country. After the war, he continued his work toward yellow fever eradication. In 1920 he sailed for England, en route to Africa, where he was to investigate yellow fever conditions there. He became ill in London and died there July 4, 1920. Funeral services were held in Westminster Abbey, and his body now rests in Arlington National Cemetery. During his illness in London, the King of England visited his bedside to confer on him the highest honor that it is possible for the King to bestow on anyone not a British subject.