
The Epidemic that Never Was: Yellow Fever in Hawaii

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The Kingdom of Hawaii suffered a disastrous series of epidemics starting from the first contact with Captain Cook's crew and continuing to the present. Despite the huge volume of shipping to and through Hawaii, one plague failed to appear. Yellow Jack (yellow fever) engendered more fear in sailors of the 19th century than any other disease. By 1910 the details of transmission were well-known and Hawaii met all the requirements for an epidemic. On October 30, 1910, the first case of shipboard yellow fever arrived at Honolulu but quarantine averted the threat. On October 28, 1911, a Hawaiian man, employed as a quarantine guard, was reported to have yellow fever and efforts were initiated to control a possible epidemic. This was the only occurrence of yellow fever in Hawaii.

In 1911 Honolulu was a different place. The last decade of the 1800s had seen the overthrow of the monarchy, establishment of the Republic of Hawaii, and annexation of the Hawaiian Islands by the United States of America. Most everyone including the native Hawaiian population expected the Hawaiian race to disappear. At the same time the great powers of Europe and the U.S. were in an imperialistic mode spreading Western civilization, good and bad, around the globe. The changes in Hawaii were not sudden, of course, but had proceeded steadily for a century and a quarter. Despite the very large influence of the Europeans and Americans in the local political and business affairs of Hawaii, it was the push for control in the Pacific basin that made Hawaii a strategic prize important enough that the U.S. was willing to annex the territory of Hawaii. The U.S. had coveted and obtained the use of Pearl Harbor as a naval base a number of years before, but the Spanish-American war with its reach into the Philippines was the catalyst that finally brought the Hawaiian Islands into the American fold over considerable objection at home.

The Hawaii that Robert Louis Stevenson visited in 1893 (and complained about as being too modern) underwent a flood of changes before Jack London made his visit in 1915. Electricity, street cars, telephones, the transpacific cable, automobiles, the first airplane, production of movies, and dramatic economic activity following annexation highlighted the technological transformation of the islands. *Thrum's Annual* lists 1910 as a year of exceptional prosperity with a cash balance instead of the usual debt. Perhaps the appearance of Halley's Comet in that year had an influence, but 1911 was noted by *Thrum's Annual* as another year of marked prosperity notwithstanding conditions threatening the public health.

From a public health standpoint, Honolulu for years had been a disaster of major proportions. Eminent medical historian O.A. Bushnell has said it well:

Honolulu in 1820 was an ugly, barren, hot, and feculent town, a straggle of grass huts and a very few stone or adobe houses. Its residents sweltered amid clouds of dust or skidded along in mud often ankle-deep...Foreigners might sweat and complain...[but were] too impatient for an early escape from this dismal port to care about

beauty, or comfort, or civic pride. Natives, knowing nothing about towns in other parts of the world, thought that this was how all seaports must be...From the beginning Honolulu's residents seemed determined to earn for their town the name by which eventually it was known to sailors throughout the seven seas: The Cesspit of the Pacific.

The kingdom of Hawaii suffered a disastrous series of epidemics beginning with the first contact with Captain Cook's crew and continuing to the present. The reduction of the Native Hawaiian population was so severe and arguably so psychologically devastating that all hope was lost for the future of the race. Concomitantly, the vacuum was filled by all sorts of mariners, professional and indentured labor, as well as by religious and entrepreneurial opportunists. These travelers brought diseases to which the natives had had no exposure and thus *kanaka maoli* suffered dramatically severe consequences. The epidemics that rolled over the Sandwich Islands had indeed produced great concern for public health, producing such draconian measures as forced isolation of lepers on Molokai and the setting of sanitary fires to control bubonic plague. Those fires, burning out of control, destroyed 35 acres of Chinatown at an estimated cost of over \$3 million. Quarantine and strict control of port access were the usual but mostly futile attempts to solve health problems.

Honolulu pilots were authorized to inquire about the health of passengers and crews, especially as to smallpox, as early as 1836. Laws passed in 1839 provided for vital statistics and quarantine regulations. The next year, reporting of certain diseases was required within 24 hours. The first Hawaii Board of Health (1850) was appointed just two years after the beginning of the public health movement in London. The first sanitary commission was appointed in 1862 followed by legislation for isolation of lepers in 1865. Although animosity raged between ship's crews and the missionary-influenced government over the availability of female companionship, it was not until 1892 that the Board of Health was placed in charge of prostitution.

The Holocaust of 1900, the Chinatown fire, brought concern for public safety to a new level. Victoria Hospital was established in Kakaako for the destitute whose houses had burned in the fire. In 1901 the Tuberculosis Home opened (the next year it was renamed Honolulu Home for Incurables and later, Leahi Hospital). After annexation (1898) the U.S. Public Health and Marine Hospital Service was in charge of inspection, diagnosis and quarantine of vessels arriving in Hawaiian waters. The Territorial Board of Health was responsible for measures ashore, answering to the legislature and the Territorial governor who in turn answered to the U.S. Department of the Interior. Correspondence and reports of the chief sanitary inspector during the year 1911 reveal detailed and lengthy studies of the rat control program initiated some 10 years earlier because of an epidemic of plague that affected most of the islands. In fact Kalihi Camp had been established for detention purposes

during the plague epidemic of 1899 to 1900.

But the biggest contribution to a healthy Honolulu was a safe water supply, a sewage system and garbage disposal, all of which were completed in the first decade of the 1900s. The census of pure Hawaiians, however, dropped from 29,799 in 1900 to 26,011 in 1910 but also showed the beginning of an upsurge in part-Hawaiians. The Board of Health and physicians of Honolulu made little progress in educating the populace in proper health practices until some of Honolulu's citizens joined in to convince the governor to appoint a Sanitary Commission, marking the acceptance by the Territorial government of responsibility for the public health. The sanitary campaign of 1911 included: enforcement of a law against bovine tuberculosis, introduction by the Dairymen's Association of the electrical treatment of milk (Goucher system, first of its kind west of the Mississippi), tracing an outbreak of cholera to a taro patch in Manoa, and evaluation of a few cases of smallpox in Puerto Ricans. A mass meeting of citizens declared themselves for a clean city and supported a bill for a Board of Health emergency fund. Governor Frear appointed the Sanitary Commission with George R. Carter, former governor, as its head to investigate and advise on the health conditions of the city. Sunday, July 24 was a *clean-up day*. All public offices and places of business closed to permit everyone's sharing in the work for the common good. The Sanitary Commission's extensive report of 1912 marked the beginning of modern public health in Hawaii.

Despite the huge volume of shipping to and through Hawaii and the devastation by diseases from the outside world, one plague had failed to appear. *Yellow Jack!* Perhaps no pestilence engendered more fear in the sailors of the 19th century than the dreaded yellow fever, present in certain notorious tropical ports of the New World. Other diseases produced more deaths and more sudden epidemics on shipboard but some aspects of Yellow Jack were particularly awesome. First it was unpredictable—no one knew just when or if it would attack. Direct contact with infected persons did not seem to be a prerequisite. Once it appeared on shipboard it struck sporadically and indiscriminately, occurring in individuals at random over periods of months at sea. The disease was highly lethal, with no procedures known that could control it.

Ports in the Caribbean, South America, and Central America were especially dangerous but, strangely, not so sometimes. Furthermore, American cities were not immune. In 1793 the city of Philadelphia, the most modern city in the U.S., was virtually wiped out. The epidemic of 1878 killed 5,000 people in Memphis, Tennessee and 30,000 were driven out of the stricken city. That same year's epidemic was estimated to have cost the country \$100 million and New Orleans alone claimed a loss of \$10 million. Despite the lack of evidence of effectiveness, the common practice was to burn any ship's cargo where yellow fever was on board; burn bedding, clothing and anything contaminated with the black vomit or blood of the victims.

In contrast to the local perception that only Hawaiians were struck down by epidemic diseases, it was known that Yellow Jack cared not a whit if its prey were white, black, brown, or yellow. The victim's only comfort was knowing that if he or she did survive he or she was immune for life. Thus the population of Hawaii, and anyone coming from the temperate zones of Europe, America, and Asia (which supplied the overwhelming mass of immigrants to Hawaii) were mostly susceptible to yellow fever.

As with all scientific progress, unraveling the mysteries of yellow fever was the work of many, building on the achievements of others. Although we think of Walter Reed of the U.S. Army as the one who conquered yellow fever, making possible the U.S. success in constructing the Panama Canal whereas the French had failed, it was Dr

Carlos Finley, a Cuban physician in Havana, who handed to the American commission, headed by Dr Reed, a porcelain cup containing the eggs of *Culex* mosquitoes. Twenty years of work, unsubstantiated and mostly ignored, he bestowed on Reed on August 1, 1900. Finley, of course, was indebted to others who were pioneers in the fields of malarial and filarial parasites. The medical politics of the day was no less vicious than that surrounding the pursuit of the double helix and the discovery of the AIDS virus of more recent times. In spite of the congenial start, antagonism soon erupted over who should have the glory of discovery. To be fair, and perhaps romantic, we might call Finley the genius whose insight (guess?) came up with the correct answer, and he then passed on to Reed and Carrol the responsibility of supplying the proof and practical application of the new knowledge in control of yellow fever.

By 1910 the details of transmission of yellow fever, incubation in *Aedes aegypti* mosquitoes, and the potential for its establishment in a given locale were well-known. The modern view suggests that the organism was a native of West Africa and made its way to the New World after the advent of the slave trade. Nevertheless there was a delay in the appearance of yellow fever until the proper mosquito had been established in the Caribbean, Brazil, and Central America. The mosquito does not survive as a permanent resident unless the temperature remains above 72°F. It is domesticated in that it breeds only in artificial or protected containers such as water casks, cisterns, or perhaps pools trapped in leaves of plants. Hawaii met all the requirements including the presence of the *Aedes aegypti* mosquito, and it was prime territory for this Yellow Jack. Commercial trade routes brought many ships, U.S. and foreign, to Hawaii after having called in South America, the west coast of Central America and Mexico. The Panama Canal, opened August 15, 1915, exposed Hawaii to direct commerce from the Caribbean.

Dr J.S.B. Pratt, member of the Territorial Board of Health, undertook a six month working vacation in 1910 to study yellow fever and mosquito elimination methods in South America, Panama, and Mexico. That same year, considerable effort and attention was documented by official telegrams requesting clarification of the dangers and procedures to be followed with regard to yellow fever when ships arrived from the west coast of Central and South America. The replies from Washington were reassuring, noting that the ports of Santa Clara and Manzanilla had instituted strict fumigation measures and no cases had been detected in the last year. In fact, officials in Honolulu were quite worried that quarantine procedures were about to be relaxed. Indeed, on October 30, 1910 the first case of shipboard yellow fever arrived at Honolulu but quarantine averted the threat to the city (Report of the Governor of Hawaii to the Secretary of the Interior, 1911).

On October 21, 1911 the *Hong Kong Maru* bound for Yokohama carrying cargo from South America by way of Manzanilla, Mexico, put in for coal and supplies at Honolulu with a sickness on board. The sick passenger in steerage had boarded the vessel at Callao, Peru. The Japanese surgeon on board knew about the sick man but did not report it. The federal quarantine officer came upon the sick man during his inspection and called for help from more experienced doctors at the Quarantine Station. A diagnosis of yellow fever on shipboard was made, and oddly, it was aboard the same vessel that had brought the first case the year before. Quarantine guards were placed on board while the ship was thoroughly fumigated. Barges of coal were towed out to the ship and on return were also fumigated. The headline of the newspaper article that day asked: "NOW WILL CITIZENS MOVE? Beware of the Third Time Says Dr Ramus—City Must Be Mosquito Proofed" (*The Pacific Commercial Advertiser*, October 21, 1911).

The next event was more startling. Newspaper articles and the

Chief Sanitary Inspector's Report tell the story: A Hawaiian man was reported October 28, 1911 to have yellow fever. The diagnosis was made by Drs Ramus, Marshall, Currie, Hobdy, Pratt and Major Kennesly, the only doctors in the islands known to have had experience with yellow fever. The infected man was one of the quarantine guards placed on board during the fumigation of the *Hong Kong Maru*. He had become ill and left the ship without notification to return to his home at Kalihi Camp which by that time was no longer in use as a detention station. What remained of the camp were 40 shacks in three irregular rows in an area of 9 acres. This area and the inhabitants were placed in quarantine October 28. The patient was thought to have been sick for three days, the period of illness when the biting mosquito can acquire the virus. The incubation period in mosquitoes is approximately 7 to 12 days before it becomes infective for others. Therefore, it was calculated that at least a three or four day window of safety existed. In a circle 100 yards outside the infected camp, all the trees and shrubs were cut (starting outside and working inward) in order to remove any shade for the *Stegomyia calopus* (*Aedes aegypti*), a day mosquito which has a short flight distance of 100 to 200 yards. Next, everyone's clothing was inspected in the sunlight and shaken to expel mosquitoes. Clothing, boxes, and containers were brushed and dusted. After this each person with his or her effects was passed through to a quarantine station to stay until he or she could find new living quarters. He or she could remain at the station if indigent. The station was established and the quarantine area was staffed by the U.S. Army as requested by the civilian committee, which was established to deal with the public during this crisis. It was believed that the military was the only organization capable of adequately performing this task. After depopulation all the trees were cut except for a few fruit trees which were completely trimmed of foliage, shrubbery, and weeds, working from outside to the center. Lean-tos and shacks were torn down, carted to the beach and burned. Fumigation of all houses was done with sulfur dioxide. Three hundred fifty people were treated, 38 houses were fumigated (three times at least 8 hours apart) and, for an area of one mile outside, a vigorous mosquito extermination program was instituted (Report of the President of the Board of Health of the Territory of Hawaii for the 12 months ended June 30, 1912).

The patient recovered quickly and no other cases developed. The city did not recover quite so easily. A very moving editorial had appeared in *The Pacific Commercial Advertiser* the day the *Hong Kong Maru* arrived and the passenger with yellow fever was found. The editor praised the personnel of the United States Marine Hospital Service for protesting and resisting the relaxation of quarantine procedures for ships leaving Latin American ports. In the words of the editorial, "The enemy is at our door, more merciless than an army before a besieged city...It is a well-known fact that it sometimes takes a lot to arouse public opinion and the best and only way is to set before the people, who will have to take action some time—either cleaning up the mosquito or burying their dead—the seriousness of the situation..." It was pointed out in the accompanying articles that it was just plain good luck that the ship did not enter the harbor with the disease undetected, but it was bad luck that a southerly breeze was blowing onshore from the ship's anchorage.

A week later when the diagnosis of yellow fever was made in the local man, a mass meeting of the citizens led to appointment of a commission for eradication of the mosquitoes that transmit the disease. Military cooperation was promised. A special session of the legislature was called and the whole community plunged into the task. Well, almost everyone. Another article in the paper dated November 1, says that every white man of prominence in the city was present at the citizens' meeting but not one citizen of Hawaiian

or part-Hawaiian blood was to be found. Dr Currie of the U.S. Marine Hospital Service, who played a leading role in the New Orleans fight for self-preservation, was put in charge and something akin to martial law was established by the Board of Health. A list of 22 statements outlined what every citizen of Honolulu was to do to eliminate mosquitoes and their breeding places. It was thought that the only valuable plants that had to be destroyed were banana trees. Some people questioned the actions but, should the citizen not comply, then the authorities with the help of the National Guard would do the job for them. Deputy Sheriff Rose apparently resisted. He was given the choice of cutting his banana trees himself, using his firearm against the soldiers, or stepping aside and having the trees cut for him. In the latter cases he would end up in jail with the trees cut in any case and enduring the embarrassment of having broken the law he was sworn to uphold. The same treatment was to be meted out to Harry T. Mills of Kaimuki or any others who might follow their example. (Various articles in *The Pacific Commercial Advertiser*, October 21 to November 5, 1911.)

The annual report of the Board of Health for the year ending June 30, 1912, listed a grand total of 508,877 inspections of gutters, cesspools, privies, tin cans, pools, holes in trees, rice plantations, etc. Larvae were found in 20,529 of these. Legal notices served, 625; nuisances abated, 532; ditches dug, 50 miles. The report detailed the difficulties encountered when occasionally a citizen refused. The Attorney General's department was so crowded that prompt legal attention to these matters was not possible. The details of making a case were so subject to error that only a few came before the court, but in those cases a favorable decision was easily won. When citizens were served with a legal notice, they almost invariably corrected the matter complained of, but it appeared to be quite impossible to secure a uniform, automatic compliance with the law.

When the services of the military were no longer available, it became necessary to establish a permanent force of civilian inspectors. This was accomplished by February 1912. Eventually a force of 20 inspectors and 20 laborers was found to be sufficient for the entire city. The results were thought to be quite satisfactory. The day mosquito was reduced to negligible numbers and had disappeared completely in most parts of the city.

Some individuals sued for compensation for the loss of their property, mainly banana trees cut down.

From a distance in time of 90 years, it may be difficult to appreciate fully the fears of the Hawaiian community with regard to yellow fever. There were many *huikau* native Hawaiians and *little guy* provincials who perceived the threat as something big business, big government, and the haole were concerned with. But the governments of the Pacific Rim and the subcontinent of India at the turn of the century were not in this state of mind. They were intimately acquainted with the scourge of malaria, filariasis, cholera, plague and were nearly hysterical that yellow fever, never seen in their regions, would have a direct and free passage by way of the Panama Canal to the Pacific and Indian Oceans. The Rockefeller Foundation, organized in 1913 for "the well-being of mankind throughout the world," created the International Health Commission of the Foundation with Wickliffe Rose as its director. That winter Mr Rose went abroad to discuss with health officials a possible program for the newly created commission. He found great concern throughout the East regarding yellow fever. Dr S.P. James of the Indian Medical Service called for a permanent quarantine force in Panama, Hong Kong, or Singapore to be maintained at the expense of the English colonies in the East. He recommended a systematic attack on the mosquitoes. Sanitarians recognized that once yellow fever was introduced into the Orient, with its dense population of nonimmunes, incalculable damage would accrue. The

Foundation sought and obtained the service of Major General William Crawford Gorgas, Surgeon General of the United States Army. He had effected the eradication of yellow fever from Havana and the Panama Canal Zone, and now was more than eager to extend his efforts as director of the Yellow Fever Commission of the Foundation.

To date no other occurrence of yellow fever in the Pacific beyond the coasts of Latin America has been found. By definition there was an epidemic of yellow fever in Hawaii in 1911. By skill, luck, and public concern, that epidemic consisted of only one case. Hawaii has much to be proud of in the management of the epidemic that never was.

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4. O'Hanley P, et al. Viral zoonoses. In: *Scientific American Medicine*. New York, NY: 1988: V 1, 7 (XXXI), 4-5. In epidemic form mortality varies from 20% to 60%. The endemic infections have a mortality as low as 5%.
5. Fox R. *Milestones of Medicine*. New York, NY: Random House; 1950:147-152.
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Acknowledgement

Dr Robert Worth, former Chief of Communicable Disease Division, Hawaii Department of Health called my attention to the report of yellow fever in Hawaii.

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Historical Notes

physicians in Hawaii are a valuable resource for historians.

Individual accounts of past activities or developments in medicine are of great value because only a small amount of history is preserved in published accounts or materials. We welcome such materials and will work with individuals or families to determine what materials would be appropriate for the Archives.

The Auxiliary of HMA created a rich biographical resource of past physicians called In Memoriam—Doctors of Hawaii which tried to have information on every physician who practiced in Hawaii. The project ended more than 10 years ago, but this historical resource is still heavily used. To make this unique resource more accessible, we are putting the data base on the Internet on our Home Page.

The Hawaii Medical Library might be more known for the latest journals and resources for clinical medicine, but we are also working to preserve our medical history. We welcome donations to the collection including photographs relating to medicine, historical medical instruments, rare books, personal papers or memoirs on history of medicine in Hawaii, or you might like to volunteer to help work on these collections. Call the Library Archives section if you have any questions about the history of medicine.

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