

# Leprosy in Hawaii.

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**I**T is obvious that the attainment of the ideal of medical science, the prevention of disease, necessitates the scientific application of control measures which are designed from a knowledge of the incidence, case and nature of the disease at issue. None of these fundamental criteria are well established with regard to leprosy. However, even though

these essentials were determined, the problem of prevention of the disease would be greatly influenced by the environment of the individual, and by his adjustment to that environment. His habitat, social-economic status, traditions, and other circumstances which are correlative with those of the community must be appreciated and considered in the formulation of pertinent sanitary codes and practices which will be successful.

In 1886, the advisors to the King of the Sandwich Islands (Hawaii) solicited information from the governmental authorities of India, and from other countries scattered throughout the world, concerning the prevalence of leprosy, the manner in which it was being treated and kindred matters. The natural history of leprosy was admittedly incomplete, and this effort to collect and assemble the observations which were available was made in order to apply such procedures as were current and adaptable under the particular local conditions.

Some progress has been made here, and elsewhere, by such a scheme, and perhaps more can be accomplished by a further summary of the conditions and methods used in different countries. This brief account of some of the circumstances which are relevant in Hawaii, is contributed with the desire to assist such progress.

Hawaii consists of a group of a large number of small islands. The archipelago is named from the largest island of the group. They are situated at about the same latitude as Bombay in India ( $20^{\circ}$  north) and are about twenty-three hundred miles west and south of San Francisco, California (or at longitude  $160^{\circ}$  west). The topography of each of the larger inhabited islands is that which is similar in other areas of probable volcanic origin, with a central mountainous ridge, whose rather abrupt slopes to the sea are furrowed with many small valleys. The altitude of the highest peaks approximately 14,000 ft. The ridges have a general north-westerly direction. The area of the islands which contain practically the entire population, is 6,400 square miles, or about nine-tenths the size of Wales. The climate is mild with annual ranges of temperature varying from a minimum of  $55^{\circ}$  to a maximum of  $85^{\circ}$  F. The temperature and humidity which prevail throughout much of the year are somewhat depressing during the morning and early afternoon hours, but they are made comfortable during the late afternoon and evening by the trade winds. These winds are from the north-east, and greatly influence the rainfall as well as the temperature. The rainfall is heaviest during the winter

months, and in several sections there is no rain except during these months. The average annual precipitation varies greatly within a few miles. This is exemplified on one island on which there are 200 in. of rain annually on the ridge of the mountains, and 20 in. at the sea level, which is not over five miles away. The mountains are more precipitous on the eastern and windward side, and the rainfall is very different on this, and on the leeward slope.

The industries of the islands are almost entirely agricultural. The crops are those of cane sugar and pineapples. Relatively few of the Hawaiian or Japanese population are now engaged in the production of these crops on a commercial scale, though the Japanese were formerly so engaged. Recently imported Filipinos have taken the places of the Japanese. Commercial fishing is carried on largely by the Japanese, but the production is not much greater than the local consumption. A large proportion of Hawaiians maintain small farm holdings, or are employed in minor salaried positions or as labourers.

The standards of living amongst many of them are similar though better than those which prevail among like classes in the sub-tropics or tropics. The families of the last generation have apparently averaged about 4.8 children. The houses have been, and, in an unfortunately large proportion, are still crowded. These circumstances prevail among both those in rural surroundings, and in the urban districts. The main article of diet, and often the only diet, is that of poi. This is a paste made by steaming and pounding the root of taro (*Caladium colocasia*) mixing it with water and allowing it to stand, with consequent fermentation for periods of from a few hours to several days. It is very often eaten by sucking off the amount which can be scooped up on the fingers. Yams, sweet potatoes, and some fish is consumed, and a smaller amount of greens, such as the young shoots of the top of the taro, and various sea weeds which abound are also eaten. Green vegetables are not attractive to them, and both meat and milk is relatively costly, and consequently is not available.

The government is that of a Territory of the United States, with a governor appointed by the federal authorities, and a legislature elected by the local voters. Laws governing the franchise are provided in the "constitution" granted the Territory, and all Hawaiians, not specifically disqualified, were extended the franchise when the country sought annexation to the United States. Individuals who are not of native origin or citizens of the United States are not

eligible to the franchise. Thus, among the voters those of Hawaiian blood form an important part of the electorate.

The total population of the Territory in 1930 (U.S. Census) was 368,336, distributed over seven of the islands. Of this total 137,582 were on the island of Oahu, in the city of Honolulu, a modern metropolitan district, and 19,468 were on the island of Hawaii, in the city of Hilo. The remainder were gathered in small villages of at most a few hundred, in communities on or near the large plantations, and in scattered groups or families. In other words, 43 per cent. of the population might be classed as urban, and 57 per cent. as rural. The aboriginal people were Hawaiians, a Polynesian strain, and probably numbered between 125,000 and 130,000 in 1832. In 1880 their numbers had fallen to about 45,000. During the past 30 years (U.S. Censuses) their numbers have further declined from 29,799 in 1900, to 22,636 in 1930. However, during this period those who are of a known mixture of Hawaiian and Asiatic or Caucasian races have increased from 7,859 in 1900 to 28,224 in 1930, thus making the number of those of Hawaiian and part-Hawaiian race 50,860 in 1930, or an increase of more than 35 per cent. during the past 30 years. The racial elements which form the larger proportion of the population have been brought to the Territory as labourers. Among those who were imported between 1852-1886 were the Chinese, who in 1930 numbered 27,179; between 1880-1915 the Portuguese, who in 1930 numbered 27,588; between 1885-1925 the Japanese, who in 1930 numbered 136,631, or 37.9 per cent. of the whole population; between 1910-1930 the Filipinos, who in 1930 numbered 63,052. Other races tabulated and classified in the 1930 census are Caucasian, 44,895; Porto Rican 6,671; Korean 6,461; Spanish 1,219; Negroes and others 780. Two striking facts are to be noted or considered in the above tabulation, namely: (1) that Hawaii has a population of greatly mixed races, the preponderance of whom are of recent asiatic origin, and (2) that the majority of the immigrants come from large endemic centres of leprosy. In other words, they probably furnish fertile soil for the development or dissemination of the disease.

Most of the people who have immigrated have come into surroundings, social and economic conditions and traditions, which were somewhat different from their own, and to which they were under immediate pressure to adapt themselves. Some of them may have brought leprosy to the islands. It is believed that the disease was introduced by

the Chinese, though this is not known, and probably cannot be definitely determined. The Hawaiian people call leprosy the Chinese sickness (Mai pake), suggesting that it was unknown among the aboriginal natives. The date of recognition of the first cases can likewise not be determined, but in 1865 the incidence in the islands was so great that the Hawaiian king was persuaded to establish an isolated settlement in which the sick might be compounded and segregated from the public. The Kalaupapa settlement was established in 1866 on a small peninsula (5,000 acres) on the island of Molokai, separated from the rest of the island by precipitous bluffs.

In this colony the patients live in accordance with the practices of the residents of villages of like size in Hawaii. They are provided by the legislature, through the Board of Health, with the necessary food, clothing, shelter, medical services, and entertainments, including cinema pictures, and they are allowed to operate their own automobiles, of which there are upwards of fifty. Facilities are also made available for religious worship, and prelates of the catholic and of several protestant beliefs are permitted to live in the settlement. The number of patients resident at any one time has varied from about 1,100 to 500. There are slightly fewer than five hundred at the present time. Approximately 7,200 have been segregated since the beginning of the colony.

The incidence of leprosy among Hawaiians was very high, and even as late as 1895 there were over 1,000 of them who were patients from among a population of about 40,000. An epidemic of such proportions, in which  $2\frac{1}{2}$  per cent. of the population is afflicted to such a degree that their disease is easily recognised would be apt to result in many cases which were not detected. It would appear likely also that most of the more susceptible individuals would be affected, thus leaving a comparatively resistant population. However, there would probably be many whose symptoms became prominent only after several years. There are at present about one in each hundred of the total Hawaiian population under supervision as active or quiescent cases of leprosy. The entire number of all races under supervision is about 800, or a little more than two per thousand of the general population.

The average number of admissions annually has been slowly falling for 20 years, but the number of established cases existing at any one time has not changed greatly during this period. One factor which may influence the declining

number and rate of admissions is the decreasing number of native Hawaiians. The highest rate of admissions is from among these people. The decrease in their total number is occurring through the operation of a high death rate amongst them, and through intermarriage with Asiatics and Caucasians. These latter mixed or part-Hawaiians have a much lower admission rate than the native Hawaiians. The economic and sanitary development of the islands and the increasing facilities of transportation and communication, with the accompanying changes in methods of living, may also play a rôle in the declining admissions. While the known rate of incidence is double that estimated to prevail in a number of countries in which leprosy is endemic, it should be recognised that large numbers of Oriental people have been rapidly imported. More recently the Filipinos have been coming at the rate of about 5,000 a year, and now represent about one-sixth of the general population. An increasing number of these Filipinos are found to have leprosy. Thus it is probable that both unrecognised cases and susceptible people are being brought to the Territory even now. Also the known incidence may approach the real incidence more closely than is likely in larger countries in which means of transportation and communication are less well developed.

In the consideration of the effects on leprosy in this community which may be produced by the biological and economic forces at work among the native Hawaiians, part-Hawaiians and newly arrived immigrants, it is interesting to contemplate the observations of the officers of the Board of Health concerning the gross birth and death rates, and the death rates from tuberculosis as they obtain locally. In their report for the past fiscal year, 1930, one finds that the birth rates among Hawaiians have fallen during the period 1926-1930 from 25.78 to 21.60; among Asiatic-Hawaiians the corresponding figures are 77.44 and 73.08; among Caucasian-Hawaiians, 65.30 and 62.57. The death rates during this period were: Hawaiians 30.09 in 1926 and 33.30 in 1929; Asiatic-Hawaiian 15.21 in 1926 and 18.61 in 1929; Caucasian-Hawaiian 14.72 and 17.28. The birth rate of the part-Hawaiians during the period was about three times that of the native Hawaiian, and the death rate but little more than half as much.

Since 1865, the laws of Hawaii have made it mandatory that cases of leprosy shall be segregated. To accomplish this it is provided that individuals suspected of having leprosy shall be reported by anyone having such information

to the Board of Health, which in turn must have the individual examined. The suspect is entitled under the law to have his examination conducted by three physicians at the expense of the government. One physician may be selected by him, another may be chosen by the Board of Health, and the third chosen by these two. Thus an impartial medical board is selected, and the opinion of the majority of these is final opinion. The individual may, however, elect to waive this privilege and accept the opinion of the official attending physician at the Receiving Station of the Board of Health, thus voluntarily submitting to certification. The number who come or are brought for examination and who waive the privilege of the more formal procedure is about 50 per cent. of those admitted.

Upon determination that the suspect is a case of leprosy, he must be certified and hospitalised if considered a menace to the health of the public. If, however, he is believed to be a closed and quiescent case whose presence at large is without danger to the health of the public, he may be certified, and placed under contract to continue at large subject to the direction, examination, and supervision of the Board of Health. A certification with such a disposition is determined only by a medical board of three physicians, which may be chosen as outlined above. But few cases are thus immediately released, since most of those who are submitted for examination are in need of hospitalisation. This is dependent in part upon the fact that leprosy is not usually suspected until it has become to some extent generalised, and is due, probably to a greater degree, to the delay of the patient, who very naturally postpones a procedure which may restrict his freedom and remove him from his home for a prolonged period.

If admitted to hospitalisation he is cared for at the Receiving Station, located in the environs of Honolulu. Here he is treated by physicians of the U.S. Leprosy Investigation Station, which is adjacent. These physicians are officers of the U.S. Public Health Service, engaged in studying the disease and methods for its control, and in co-operating with the local Board of Health in extending medical relief to the individual patient.

The period of observation and treatment in the Receiving Station, or hospital is, to a great degree, dependent upon the gravity of the affection, and the probability of recovery. Very few are transferred to the colony in less than a year after admission, and the mean length of their stay before such transfer, as determined by an analysis of a ten year

period, is 20 months. Those who desire to go to the settlement, or who are so crippled as to be permanently incapacitated may be transferred within six months from the time of admission. Those who refuse to remain under supervision at the hospital may be transferred at any time.

Close on 70 per cent of the cases admitted are those which may be classified as of the cutaneous type, of the second or third degree of involvement. This classification is determined by clinical appraisals. No attempt is made to group cases in accordance with the number of bacilli which may be found in a microscopic preparation, because of the fallaciousness of such a method. But cases which have recovered to such a degree, that they remain apparently quiescent clinically for several months, are carefully examined repeatedly to determine whether they are apparently free of bacilli in the skin and mucous membranes. If they are so regarded they may be released to out-patient status under supervision and control. Those who are released, and develop exacerbations or who fail to report for examinations are re-admitted to the hospital. The general care in this institution may be compared with that which is customary in sanatoria. All patients are well housed amidst modern sanitary and attractive surroundings. Not more than two individuals occupy a room in a cottage. The rooms are furnished with single beds, bedding, dressers and chairs, and the patient is permitted personal knick-knacks to make his room attractive. The cottages are of frame construction with broad porches, and several rooms, all of which have free openings to the outside, to broad corridors, and in some instances directly to the porches. The food is prepared by healthy attendants in a central kitchen and served in a semi-cafeteria style, that is, each patient comes to an appointed place to be served. All children under 15 years of age are given and are required to drink a cup of milk three times a day. Fruit, green vegetables and meats are served in abundance once or twice daily to all. However, it is exceedingly difficult to change food habits, and most patients consume large quantities of poi or of rice and meat or fish, and abstain from fruits or green vegetables. All necessary clothes are furnished, and ten dollars in cash annually for the purchase of incidentals.

The therapeutic measures which have been recognised as of presumptive value in the disease have been used at this hospital for many years, and research towards the improvement of treatment has been continuous. The close relation and control between the hospital and the Investiga-

tion Station have made it possible to appraise the value of the different remedies which have been evolved.

*Between 20 and 30 per cent. of patients* who have been admitted during the past ten years have recovered sufficiently to permit of their release under supervision. The majority of these should be classed as the neural type, which is so prevalent in India. Of those so released, very many have relapsed and been re-admitted, though they continued for several years under observation and treatment by specific remedies as out-patients. In other words, the return of patients to surroundings and circumstances in which they have previously developed leprosy has not been attended with continued quiescence of the disease, even with special therapy administered regularly for several years. On the other hand, patients who have had no special therapy, have become quiescent and remained so for equally long periods. The treatment of individuals as out-patients is more difficult of control than that of in-patients, and requires a follow-up organisation, to assure more than 30 to 50 per cent. attendance.

These evaluations have made it seem advisable to the Federal authorities to expand the facilities of the investigation station, and to the local authorities to enlarge and further equip the hospital. Expansion of the former will enable more intensive study of the nature of the disease, and of its mode of origin and dissemination; and an increase in the physical plant, armamentarium and personnel of the hospital will permit of greater concentration on the re-establishment of the general health of the individual patient, and on his rehabilitation in the community.

Greater provisions are being made to follow up cases of leprosy which have been released in order to assist their general welfare. During the past several years those who are released to out-patient status have been immediately given sixty dollars, and thirty dollars in each of the following two months, to assist them in re-establishing themselves. Such donations do not seem to accomplish the desired effect, and more recent efforts are being directed towards an organised division of follow up and rehabilitation.