Studies upon leprosy. IV. Upon the utility of the examination of the nose and the nasal secretions for the detection of incipient cases of leprosy / by Walter R. Brinckerhoff and W.L. Moore.

TREASURY DEPARTMENT

Public Health and Marine-Hospital Service of the United States

STUDIES UPON LEPROSY

IV. UPON THE UTILITY OF THE EXAMINATION OF THE NOSE AND THE NASAL SECRETIONS FOR THE DETECTION OF INCIPIENT CASES OF LEPROSY

BY

WALTER R. BRINCKERHOFF, S. B., M. D.

DIRECTOR LEPROSY INVESTIGATION STATION, PUBLIC HEALTH AND MARINE-HOSPITAL SERVICE

AND

W. L. MOORE, M. D.

OF HONOLULU, HAWAII

Investigations made in accordance with the Act of Congress approved March 3, 1905

WASHINGTON

GOVERNMENT PRINTING OFFICE

1909

TREASURY DEPARTMENT

Public Health and Marine-Hospital Service of the United States

STUDIES UPON LEPROSY

IV. UPON THE UTILITY OF THE EXAMINATION OF THE NOSE AND THE NASAL SECRETIONS FOR THE DETECTION OF INCIPIENT CASES OF LEPROSY

BY

WALTER R. BRINCKERHOFF, S. B., M. D.

DIRECTOR LEPROSY INVESTIGATION STATION, PUBLIC HEALTH AND MARINE-HOSPITAL SERVICE

AND

W. L. MOORE, M. D.

OF HONOLULU, HAWAII

Investigations made in accordance with the Act of Congress approved March 3, 1905

WASHINGTON

GOVERNMENT PRINTING OFFICE

1909

UTILITY OF EXAMINATION OF NOSE AND NASAL SECRETIONS FOR DETECTION OF LEPROSY.

By WALTER R. BRINCKERHOFF, S. B., M. D.,
Director Leprosy Investigation Station, Public Health and Marine-Hospital Service,
and
W. L. MOORE, M. D.,
of Honolulu, Hawaii.

INTRODUCTION.

The following investigation was undertaken to determine if the theory of Sticker, that the nasal septum is the site of the initial lesion in leprosy, could be confirmed and be made the basis of a practicable public health procedure for the detection of incipient cases of leprosy in the community.[a]

It is obvious that if leprosy, in a great majority of cases, begins as a disease of the nasal septum, the detection of the incipient cases of the disease should be a comparatively easy matter.

In reviewing the literature bearing upon the question of the presence of an initial lesion on the nasal septum in leprosy, we have been struck by the fact that the majority of the investigators who have worked with the problem, with certain exceptions to be noted later, have based their conclusions upon the study of relatively advanced cases of the disease. We feel that the examination of such cases could not yield unequivocal data upon the question at issue, as the investigator would have to depend upon the unsupported and unverifiable word of the patient as to the sequence of the physical signs and symptoms of the disease in determining the site of the initial lesion in the individual case. In addition to this source of error the results gained by the examination of advanced cases of the disease are invalidated, to a greater or less extent, by the fact that the disease attacks such diversified structures as the skin, the mucous membranes,

[a] We wish to express our indebtedness to Dr. Robert Koch, of Berlin, for helpful suggestions.

and the nerve tissue. Each of these tissues presents a different reaction picture, and the relative age of the lesions in the different structures is well-nigh indeterminable.

In order to bring exact data to the solution of this problem, we felt that it was necessary to investigate only the earliest possible cases of the disease, and to seek for cases in the incipient stages of the affection by examining large numbers of individuals of a race in which we knew, from statistical data, a reasonable number of cases of the disease should be found.

The native race of the Territory of Hawaii furnishes unique material for such an investigation as we planned. One of us (W. R. B.) has shown, in a statistical study, that approximately 1 in 40 of living Hawaiians is officially known as a leper. After close observation of the methods of the territorial authorities in enforcing the laws of segregation, we have come to the conclusion that the incidence of the disease is probably higher than 1 in 40. We disclaim any intention to criticise the board of health for this state of affairs. We are of the opinion that it arises from conditions quite beyond their control.

In order to determine what probability there was of finding incipient cases of leprosy by a general examination of Hawaiians, a computation was made from the records of the board of health for the last five years to show how many lepers were probably at large among the native inhabitants of the Territory. From this figure an approximation was made of the probable number of natives that would have to be examined to find one leper, and the number of lepers at large per thousand of the native population. In this computation the inhabitants of the Territory of other races were disregarded, as the incidence of leprosy among them was not sufficient to lend itself to a statistical study of this sort. The results of this computation are given below:

TABLE I.—*Estimate of lepers at large in the native population.*

Average number of lepers apprehended per year from 1903 to 1907, inclusive	72
Average duration of disease before apprehension ..... years	4
Estimated Hawaiian population of Territory for the year 1906	35,000
Gross estimated lepers at large (annual average multiplied by duration of disease)	288
Death rate of lepers (based upon death rate in the territorial leper settlement 1903–1907) ..... per cent	11
Deduction for lepers dying at large (based on death rate of 11 per cent deducted yearly from estimated gross lepers at large)	71
Net lepers at large at the end of 1907	217
Estimated number of Hawaiians per leper at large (based upon population and net lepers at large)	165
Estimated lepers at large per thousand of the native population of the Territory	6

From the above figures we might expect to find a leper for every 165 Hawaiians examined, provided our method was perfect and the individuals examined were an average selection of the native inhabitants of the Territory.

It is probable that the "gross estimated lepers at large" is too small. The number is based upon two factors: (1) The duration of the disease in the patients segregated during the last five years; (2) the number of lepers apprehended per year. The former is probably approximately correct. The appearance of the cases which come up for examination coincides, in the majority of instances, with the history they give of the duration of their disease. The factor which we believe to be incorrect is the annual number of lepers segregated each year. The number given is, of course, the official figure obtained from the records of the board of health, and is correct in that respect, but it certainly does not truly represent the number of lepers who could be segregated each year if the board of health were given adequate power in enforcing the laws of segregation. It is not possible to bring forward absolute proof of this statement. We feel that we are justified in making it, however, from a variety of information which comes to us from different quarters, and from the fact that, according to the published statement of a former president of the board of health, segregation had been practically voluntary for the term of his incumbency, which covers the major part of the period from which we drew our statistics.

An influence which would tend to increase the computed "net number of lepers at large" would be the substitution of the true death rate of lepers at large for the death rate which we have employed. We have assumed that the lepers at large would die off as rapidly as they do at the leper settlement. We choose this figure as the best obtainable approximation, although it is probable that it is too high. The inmates of the leper settlement are of all ages and a great majority of them are well advanced in the disease, while the majority of the lepers at large, as shown by the ages at apprehension, are between 15 and 30 years of age and are, of course, not so far advanced in the disease. To offset this qualifying element we must allow for the better hygienic conditions in the leper settlement.

Under the conditions which have prevailed in the last five years we would be inclined to increase the estimated number of lepers at large per thousand of the native population, and would expect to find, with a perfect technique for diagnosis, that about one in every hundred Hawaiians was a leper.

We feel that from statistical data we might reasonably expect to find a moderate number of incipient cases of leprosy by a thorough examination of a number of Hawaiians. If the nose is the site of a

diagnosable initial lesion, such as is seen in later stages of the disease, it should thus be possible to discover cases of leprosy in individuals who were unaware of the infection.

In making our examination we attempted to answer the following questions:

1. Will the systematic examination of the nasal septum and the nasal secretions reveal cases of leprosy which would pass undetected by other methods of examination?

2. When an early case of leprosy is under observation, can it be said that the case could have been detected by the examination of the nasal septum and the nasal secretions alone?

REVIEW OF LITERATURE.[a]

1. *The frequency of leprous lesions in the nose.*—Much of the literature upon the general subject of the nose in leprosy is particularly concerned with the results of the bacteriological examinations of the nasal secretions of lepers. While we consider that much of this data is of doubtful value in establishing the nose as the site of the initial lesion of the disease, owing to the fact that the cases examined were inmates of leper asylums, and therefore cases of considerable duration, yet it certainly does establish, with great certainty, the fact that a great majority of lepers, at some time in the disease, have lepra bacilli in their nasal secretion. For the moment we are only concerned with establishing the point that the nose is a common site of a lesion containing the specific bacilli of the disease and that these bacilli can be demonstrated by appropriate examinations.

The importance of the nose in leprosy was brought into prominence by the work of Sticker, '97, who made sweeping statements as to the importance of the nose in leprosy at the First International Lepra Conference in 1897.[b] That part of his work which emphasizes the frequency of nasal lesions in the disease and the high percentage of lepers who bear the specific bacilli in their nasal secretion, may be said to be perfectly convincing. Besides Sticker, '97, Jeanselme and Laurens, '97; Gerber, '01; Werner, '02; and Theroux, '03, have shown the frequency of the finding of the bacilli of leprosy in the nasal secretion and the importance of the nose as a site of leprous lesions.

---

[a] Owing to the fact that the library of the leprosy investigation station is not completed, much of the literature bearing upon the subject of this article could only be seen in abstract. In the brief bibliography appended to this article the papers that were read in abstract are indicated by the word "Abstract" in brackets at the end of the bibliographical reference. All other papers were seen in the original form of publication.

[b] The priority of Sticker in this matter has been contested by Beck, '99, and Goldschmidt, '99.

A large number of case reports upon lepers mention the finding of the bacilli in the nasal secretion: Matagne, '04; Theroux, '03; Fraenkl, '97; English, '96, etc.

Hollmann [a] finds that a very large percentage of the cases of leprosy examined by him at the territorial leper settlement on the island of Molokai, Territory of Hawaii, show evidence of leprous lesions, past or present, in the nose, and contributes an ingenious explanation of the origin of the nasal lesions.

2. *The frequency of leprous lesions in the nose in the early stages of the disease.*—Sticker cites the case of a 5-year old child of leprous parents seen by him in India. In this case he observed an ulcer on the right side of the nasal septum which contained lepra bacilli and was the only lesion of the disease present in the case.

Plumert, 1903, mentions the finding of lepra bacilli in the nasal secretions of persons in intimate family contact with advanced cases of leprosy. The individuals in question showed no other evidence of the disease. We find no record of an examination of the nasal septa of these cases. He suggests the possibility that the bacilli owed their presence to mechanical reasons and were not necessarily evidence of a leprous infection of the individuals.

Falkao, 1906, observed epistaxis associated with small ulcers on the nasal septa of descendants of lepers. The lepra bacilli were found in the crusts from these ulcers. He also often found perforation of the nasal septum as the only symptom of leprosy and preceding all other manifestations of the disease. In 17 out of 22 descendants of lepers he found not only a rhinitis but small ulcers of the septum which contained the specific bacillus. The patients showed no other signs of the disease. Two of them later developed tubercular leprosy. The others showed no further signs of the disease after seven years. It is to be noted that two cases which subsequently became lepers did not present bacilli in the ulcers at the first examination.

The results of Sticker, Plumert, and Falkao would indicate that the nose is frequently the site, in the earliest stages of the disease, of a lesion discharging lepra bacilli.

MATERIAL.

The material on which our paper is based consists in the findings in the examination of the nasal septa and the nasal secretions of inmates of seven public institutions in the Territory of Hawaii. In addition to these, patients were examined who presented themselves for treatment at the Free Dispensary and at the Marine-Hospital out-patient clinic, in Honolulu.

---

[a] Personal communication and advance sheets of an unpublished article.

TABLE II.

Institution.	Hawaiian.[a]	Other nationalities.
Boys' Industrial Home	97	34
Girls' Reform School	40	9
Lahainaluna School	91	10
Leahi Home	8	29
Territorial prison	18	70
Home for Nonleprous Boys of Leprous Parents	34	.....
Kapiolani Home for Nonleprous Girls of Leprous Parents	53	4
Free Dispensary	49	128
Marine-Hospital clinic	2	6
Kalihi receiving station for lepers	9	1

[a] Throughout this paper the term "Hawaiian" is used to designate persons of the Hawaiian race, whether or not of pure stock.

Summary:

Hawaiians	401
All other nationalities	291
Total	692

TECHNIQUE OF EXAMINATION.

Three methods of examination were employed. In some instances all methods were used, in others, one or more.

I. *Bacteriological examination of smears from the nasal secretion.*—Both sides of the septum and the bottom of the anterior cavity of the nose were carefully swabbed with a bit of sterile cotton wool twisted about the end of a sterile iron wire. The infected cotton was then used to make one or more smears on glass slides. New slides were used for each observation. The smears were fixed by heat and stained as follows:

1. Carbo-fuchsin, steaming, one minute.
2. Wash in water.
3. Flood with a 3 per cent solution of nitric acid in 70 per cent alcohol, ten to twenty seconds.
4. Wash in water.
5. Counterstain with Loffler's alkaline methylene blue, dry, and examine with oil immersion.

II. *Inspection of nasal septum.*—Whenever possible the case was examined in direct sunlight, the alæ nasi being dilated with a special speculum. In this way a clear view of the mucous membrane of the septum could be obtained. When sunlight was not available the usual head mirror or an electric speculum was employed.

III. *Scraping from suspected septa.*—Whenever, in the course of the inspection of the septum, anything resembling an ulcer or a thickening of the mucous membrane over the septum was observed the suspicious area was scraped with the point and edge of a rigid, spear-pointed, sterile platinum needle. The material obtained was used to make smears on slides which were examined by the same method as the smears of the nasal secretion.

The routine work of the laboratory furnished frequent opportunities to verify the staining technique upon material known to contain lepra bacilli.

In this connection it should be mentioned that the whole question of the diagnosis of leprosy by the demonstration of the bacillus lepræ in the tissues of the discharges of the patient must rest for the present upon the judgment of the examiner. In making the examinations upon which this article is based, the criteria used for the identification of the specific organism were: Morphology, staining reaction, including the tint of the bacilli, as well as its acid fastness, and the arrangement of the bacilli in relation to each other and to cells or cell remains. It must be recognized that if the lepra bacillus has a nonacid-fast phase in its life history our present methods of diagnosis for the disease are faulty. This must be borne in mind in interpreting the data underlying this article.

DETAILED STATEMENT OF EXAMINATIONS.

1. Boys' Industrial Home, Waealae, Oahu.

September 23, 1908, all the inmates of the home were examined. The procedure was as follows: Each boy was seen by both of us, one making an inspection of and a smear from the surface of the septum and the nasal secretion, and the other making a careful speculum examination of the septum and anterior part of the nasal cavity. The smears were later examined for acid-fast bacilli.

The inmates of the home were boys from various parts of the Territory who had been committed for truancy or for other minor offenses. They ranged in age from 10 to 19 years, the average age being about 15. They were drawn from the stratum of society in which leprosy is most prevalent, and the majority were of the race most often infected with the disease in this Territory.

The number of boys and their nationality were as follows:

Table III.—*Boys' Industrial Home.*

Hawaiian	97
All other nationalities	33
Total	130

In the course of the examination two boys were set aside for further study. The details of these cases were as follows:

No. 87. M. K——. Japanese; born in Hawaii; age, 16.

Nasal examination.—Mucous membrane on both sides of the septum is of an opaque white color, slightly thickened, and with a slightly irregular surface. Bleeds easily. Nasal cavity anæsthetized with

cocaine-adrenalin solution and mucous membrane on both sides of septum scraped. Four smears made.

Physical examination.—Careful inspection of the skin surface and palpation of the accessible nerve trunks yielded no signs of leprosy.

Microscopic examination.—No acid-fast bacilli found in smears from nasal secretion, or in smears from scraping of mucous membrane of septum.

No. 8. P. A——. Hawaiian; born on the island of Maui; age, 18.

Nasal examination.—This boy was passed over in the first examination, as no abnormality was detected in his nose. He was recalled for further investigation, as the superintendent stated he had complained of numbness of the right forearm and hand.

Physical examination.—Well-developed and well-nourished Hawaiian boy. Nasal septum appears entirely normal. Accessible nerve trunks normal on palpation. On the skin of the back of the trunk and buttocks are seen a number of white areas from 3 to 6 cm. in extent. The skin is not thickened over these areas, and the only abnormality detected is the lack of pigmentation. On the rim of the left ear, just where the helix runs into the lobule, a firm nodule 3 mm. in diameter is detected. The nodule is so small and so deep seated that it would escape any but a most careful examination. The skin over the nodule cleaned and the nodule incised. Smears made from the expressed juice of the nodule. No other evidence of leprosy could be discovered.

Microscopic examination.—Smears from the nasal secretion and from the scraping of nasal mucous membrane over the septum showed no acid-fast bacilli. Smears from the juice of the nodule on the ear showed very large numbers of typical lepra bacilli.

SECOND EXAMINATION.

October 13, twenty days later.

Nasal examination.—Careful inspection of the nasal septum showed no evidence of a pathological process. Smears were taken from the surface of septum and from the secretion of posterior part of nasal cavity.

Physical examination.—On the rim of the left ear the nodule previously observed is found to be slightly increased in size. Above and posterior to the first nodule are two barely palpable nodules not over 2 mm. in extent, which were not present at the first examination. The first nodule observed excised with a border of 2 mm. of apparently normal skin, the dissection being carried down to the cartilage. Specimen put in alcohol. Patient given 1½ grams of potassium iodide and a second, equal, dose given eight hours later. (Leredde et Pautier, '03.)

Microscopic examination.—Smears from nasal secretion showed no acid-fast bacilli. Sections of the nodule excised from ear presented the typical picture of a leproma. The *Bacillus lepræ* were present in large numbers.

THIRD EXAMINATION.

October 14, one day later. Smears made from the nasal secretion, which had been slightly increased in amount by the administration of the potassium iodide.

Microscopic examination.—Four smears of the nasal secretion, taken after the exhibition of potassium iodide, were subjected to a prolonged search. A single acid-fast bacillus, having the morphology of the *Bacillus lepra*, was found.

The case was reported to the territorial board of health and was transferred to the Kalihi receiving station and officially declared a leper after an examination by the territorial bacteriologist.

FOURTH EXAMINATION.

January 5, 1909. Examination of nasal septum. Inspection showed no pathological change. Smears made from surface of the septum and nasal secretion.

Physical examination.—A nodule, 5 mm. in diameter, has appeared in the lobe of the right ear since the last examination.

Microscopic examination.—No acid-fast bacilli found in the smear from nasal secretion.

History of case.—By comparison of the dates of his first symptom and his stay in the school we find that the infection must have taken place in the school, or else, if the infection was received in his family life, he has had an incubation period of at least five and a half years. It is of interest to note that two cases of rather advanced leprosy were discovered and removed from the school five months before the patient was seen by us. The case presents a number of interesting points, which will not be brought out at this time, as we are only concerned for the present in establishing the fact that it was an incipient case, and one which would not have been detected by nasal examination alone. This is in accord with the results of Gerber, 1901, and Darier, 1902.

Summary of the examination of the inmates of the Boys' Industrial Home.—The routine inspection of the septa and the microscopic examinations for the presence of acid-fast bacilli in the nasal secretion of the boys were negative. In one case, an incipient case of leprosy, repeated examinations of the nasal septum failed to reveal any lesion, and smears from the nasal secretion and from scrapings of the mucous membrane of the septum failed to show acid-fast bacilli, except in one instance, when, after the exhibition of a large dose of potassium iodide, a single suspicious bacillus was found.

2. Girls' Reform School, Honolulu, Oahu.

October 28, 1908. All the inmates of the school were examined, the same technique being employed as in the case of the Boys' Industrial Home. The inmates of the school were girls who had been committed by the courts for various minor offenses, such as truancy. They came from all parts of the territory, and, as in the case of the boys' home, were drawn from the part of the community in which leprosy was most common. Three years ago (1905) a case of leprosy was removed from the school. The average age of the inmates was about 13 years. The number of the girls and their nationality were as follows:

Table IV.—*Girls' Reform School.*

Hawaiian	40
All other nationalities	9
Total	49

In the course of the examination three cases were set aside for more thorough study.

No. 42. Hawaiian; age, 15. Born in the territorial leper settlement of leprous parents. Septum appears perfectly normal, and the smear from the nasal secretion contains no acid-fast bacilli. No signs of leprosy observed.

No. 63. Hawaiian; age, 10. Small, deep ulcer on left side, at the junction of the fleshy tip of the nose with the cartilaginous septum. The ulcer is covered with a dry, yellow crust, which, on removal, reveals a small drop of creamy-yellow pus. Smear made from material obtained by swabbing the ulcer with a sterile cotton swab till it bleeds freely. Smears from general nasal secretion and from ulcer contain no acid-fast bacilli.

No. 78. Hawaiian; age, 13. On the left side of the septum, 0.5 cm. from the junction of the bony and cartilaginous septum, is a stellate scar, grey-white in color. The center of the area is a bleeding point. The bleeding area was rubbed with a sterile cotton swab till it bled freely, and the material so obtained used to make smears. Microscopic examination of the smear from the general nasal secretion and from the bleeding point showed no acid-fast bacilli.

Summary of examination of the inmates of the Girls' Reform School.—The microscopic examination of the smears from the nasal secretions of the girls failed to show acid-fast bacilli. One of the cases was born of leprous parents in the territorial leper settlement, but showed no evidence of a pathological condition in the nose. Two pathological septa showed no acid-fast bacilli in smears taken from an ulcer and from a bleeding point, respectively. None of the inmates showed physical signs suggestive of leprous infection.

3. Lahainaluna School for Boys, Lahaina, Maui.

November 28, 1908. An examination of the nasal septum was made by one of us (W. R. B.) of the boys in the school. Each septum was inspected through a speculum, and a smear was made from the nasal secretion and the surface of the septum of each case. In addition to this, each pathological septum was scraped with a rigid, sterile, platinum needle, and additional smears made from the material so obtained.

The pupils of the school were drawn largely from the more prosperous part of the native population of the Territory. From epidemiological data, however, they might be expected to yield occasional cases of incipient leprosy on account of the predominance among them of the Hawaiian race. The boys ranged from 15 to 21 years of age. The number and nationality of the pupils examined were as follows:

Table V.—*Lahainaluna School.*

Hawaiian	91
All other nationalities	10
Total	101

In the course of the examination four cases were set aside for more extended study. The notes on these cases were as follows:

No. 13. Hawaiian; age, 18. Crusts of dried secretion on septum. The mucous membrane of the septum bleeds readily on the removal of these crusts. There is a small loss of substance where the skin reflected over the septum meets the mucous membrane. History of habit of picking the nose. Smears made from mucous membrane of septum beneath the crusts. No acid-fast bacilli found on microscopic examination.

No. 58. Hawaiian; age, 16. On left side of septum are adherent crusts of dried secretion. On removing these a small ulcer, not over 2 mm. in extent and 1 mm. deep is found upon the cartilaginous portion of the septum. Smears made from scrapings from the site of the ulcer. No acid-fast bacilli found on microscopic examination.

No. 73. Hawaiian; age, 17. Patient gives history of epistaxis. No ulcer found on septum. Smears made from scrapings from surface of septum. No acid-fast bacilli found on microscopic examination.

No. 90. Hawaiian; age, 16. On the left side of the septum is a dark-brown crust 3 mm. in extent. On removing the crust a shallow ulcer is found beneath. Smears made from scrapings from the site of the ulcer. No acid-fast bacilli found on microscopic examination.

Summary of results of examination of the pupils in the Lahainaluna School for Boys.—The microscopic examination of smears from

the nasal secretion of the boys failed to show acid-fast bacilli. In four cases suspicious lesions, or the history of the case, led to the examination of smears from scrapings of the septum. These additional smears were also without demonstrable acid-fast bacilli.

4. Leahi Home.

The noses of all the patients were examined. Smears were made from the nasal secretion in each case, and the visible mucous membrane of the nose was inspected with the aid of a special speculum and an electric head lamp. The patients in the home were indigent individuals, suffering from a variety of chronic diseases. The patients were partly of native birth and were all of the stratum of society in which leprosy is most common in the Territory. A case of leprosy was removed from the home two years ago (1906). The number of the patients and their nationality were as follows:

Table VI.—*Leahi Home.*

Hawaiian	8
All other nationalities	29
Total	37

In the course of the examination three cases were found with more or less complete perforation and absorption of the bony portion of the nasal septum. In one of these cases there was a clear history of syphilis. In the other two cases syphilis was suspected. There was no evidence of recent ulceration. None of the other cases presented any suspicious lesions of the septum. In making the microscopic examination of the smears from the nasal secretions one was found which contained acid-fast bacilli. The notes on this case are as follows:

No. 244. American; male, age 50. Clinical diagnosis, asthma.

Microscopic examination.—Scattered acid-bacilli present. As a rule the bacilli are single, but sometimes small clumps of six or more individuals are found. The bacilli are shorter and plumper than the typical lepra bacilli.

Eighteen days later a second examination was made of this case. Mucous membrane of septum appears normal. Collected specimens of sputum, made smears from nasal secretion, and inoculated four dog-blood serum tubes (Mallory & Wright hard serum) from the nasal secretion. Inoculated small amount of sterile plain bouillon with nasal secretion. Two of cultures incubated at 34° and two at 37° C. Two guinea pigs inoculated intraperitoneally with the suspension of nasal secretion in plain bouillon. Sputum put on ice for one week and then mixed with small amount of plain buillon and injected intraperitoneally into two guinea pigs.

Results of examination of smears: A single acid-fast bacilli found in four smears. The organism is short and thick, not resembling morphologically either the tubercle bacillus or the lepra bacillus.

No acid-fast bacilli could be demonstrated in the sputum or nasal secretion of this case by means of cultures or the inoculation of guinea pigs. Inasmuch as the acid-fast bacilli found in the nasal secretion did not agree, morphologically, with the lepra bacillus we concluded that the bacilli found belonged to the large group of saprophytic acid-fast bacilli. The case is only important as showing how confusion might arise in the examination of smears from nasal secretions by persons not thoroughly familiar with the morphology of the lepra bacillus.

Summary of examination of patients in the Leahi Home.—No suspicious lesions were found on the nasal septa. Acid-fast bacilli were found in one case in the nasal secretion, which upon further study were judged to be neither lepra bacilli nor tubercle bacilli.

5. Territorial Prison.

One of us (W. L. M.) has been in charge of the medical work of the territorial prison for five years. During the last five years one case of leprosy has been discovered among the prisoners. It will be noticed that there are relatively few Hawaiians among the prisoners. This is particularly noticeable among the felons. There are relatively more Hawaiians found among those imprisoned for minor offenses. Various methods of examination were used. In some cases a microscopic examination was made of the nasal secretion. At another time the prisoners were examined by one of us (W. R. B.) for lesions of the septum, and those showing any suspicious condition of the nose were subjected to further study. The medical supervision of the prisoners is so thorough we feel it is highly improbable that any case of leprosy that could be diagnosed by inspection existed among them during the course of our investigations. It is not to be expected that marked cases of leprosy would reach the institution, as the prisoners who are taken to the police station are carefully scanned for evidence of the disease. In the last five years five cases of leprosy have been detected in this way. For this reason we regarded the prisoners as particularly valuable material for the purpose of our investigations, as none but incipient cases were to be expected among them.

The number and the nationality of the prisoners examined were as follows:

Table VII.—*Prisoners in the territorial prison.*

Hawaiians	18
All other nationalities	70
Total	88

None of the prisoners showed acid-fast bacilli in their nasal secretion, or clinical evidence of leprosy.

In one case, a Japanese, a perforation of the nasal septum was found. Repeated examination of the smears from the nasal septum and of scrapings from the borders of the perforation, both before and after the exhibition of large doses of potassium iodide, failed to show lepra bacilli.

6. Home for Nonleprous Boys of Leprous Parents.

Honolulu, December 20, 1908. The noses and throats of all the inmates were inspected, and a smear was made from the nasal secretion of each case. In certain instances a scraping from suspicious areas on the septum was made in addition to the smear from the general nasal secretion. Up to within the last six months it has been the custom to allow the male children born in the territorial leper settlement to remain with their parents. When arrangements had been made to care for the male offspring of the lepers, all the boys born in the settlement were examined by the resident physicians, and 34 individuals, ranging in age from 18 months to 19 years, were declared clean and were sent to Honolulu. These boys had not only been born of leprous parents, but had been exposed to the disease through living with their leprous parents for the duration of their life less six months. The number and nationalities of the boys examined were as follows:

Table VIII.—*Home for Nonleprous Boys of Leprous Parents.*

Hawaiian	34
All other nationalities	0
Total	34

The boys were suffering from an epidemic of "cold," which may explain the acute conditions observed. The lesions seen in the throats and noses differed in no way from those encountered in a nonleprous clinic, and are designated by the same terms. Where any suspicion of a specific leprous process was aroused a careful bacteriological examination was made in addition to the usual examination of the nasal secretion. The following table epitomizes the findings in the boys of acute and chronic lesions which were regarded as nonleprous in character.

Table IX.—*Acute and chronic lesions of the throat and nose in thirty-four male children of leprous parents.*

Throat:	
Acute pharyngitis	10
Acute tonsilitis	6
Chronic adenoids	2
Chronic pharyngitis	8
Normal	8

Nose:

Acute catarrhal rhinitis	6
Chronic atrophic rhinitis	5
Normal	20
Suspicious	2

Three cases deserve more complete presentation.

No. 3. Una A——. Hawaiian; age, 8. Throat shows acute pharyngitis.

Nasal examination.—A depression or fold 3 mm. in extent is seen on the left side of the cartilaginous septum just anterior to its junction with the bony septum. On the right side of the cartilaginous septum, at about its center, is an adherent crust. On removing the crust the mucous membrane beneath is seen to be smooth. Smears made from material obtained by scraping the mucous membrane of the septum beneath the adherent crust.

Microscopic examination.—No acid-fast bacilli found in any of the smears.

Physical examination.—On the chin, extending to the left from the middle line, is an area 3 by 4 cm. in extent, in which pigment is more or less lacking. The area has a peculiar purplish-white color. No thickening of the skin could be made out, and there is no sensory disturbance.

No. 33. David K——. Hawaiian; age, 2 years. Throat shows an acute pharyngitis of moderate severity. Nose appears normal.

Microscopic examination.—An occasional large, short, thick, acid-fast bacillus is found in the smear from the nasal secretion. At a second examination, made twenty-four days later, four smears from the nasal secretion were examined without finding any acid-fast bacilli. The organisms observed at the first examination were much larger than any form of the lepra bacillus that has been described. We conclude that the organism in question was a temporary inhabitant of the nose and not significant for our purpose (c. f. Case 244, Leahi Home).

No. 34. Joe M——. Hawaiian; age, 18 months. Throat shows tonsilitis. Nose shows no evidence of pathologic process. No acid-fast bacilli found in microscopic examination.

Physical examination.—Many depigmented areas ranging from 1 to 4 cm. in extent present on the legs, thighs, and buttocks. The border of these areas show hyperpigmentation. At a second examination one of the areas above described, on the buttock, was found covered with brownish crusts. The nose showed a slight catarrhal discharge, but no lesion could be made out on the visible mucous membrane. Microscopic examination of smears from the nasal secretion showed no bacilli resembling the *Bacillus lepræ.*

There was a clear history of extensive infection with scabies, which yielded readily to treatment. The microscopic examination of the smears from the nasal secretions of the other boys showed no acid-fast bacilli.

Summary of the results of the examination of the inmates of the Home for Nonleprous Boys of Leprous Parents.—The examination of the nose and the nasal secretion of 34 children of leprous parents yielded no evidence of leprous disease of the nose. Over 58 per cent (20) of the boys showed no lesions on the septum nasi. Seventeen per cent of the cases (6) showed an acute inflammatory condition of the nasal mucous membrane. Fourteen per cent of the boys (5) showed a chronic inflammatory condition of the mucous membrane of the nose. There was nothing about the acute and chronic lesions observed to differentiate them from those found in the examination of persons born of nonlepers.

7. Kapiolani Home, Honolulu.

The inmates of this home are the female children of leprous parents from the territorial leper settlement. The children are taken from their parents at birth and are brought up in a clean nursery in the leper settlement till they are 1 year old, when they are transferred to the Kapiolani Home in Honolulu. A small percentage of the children develop leprosy.

February 11, 1909. A careful examination was made by one of us (W. L. M.) of the nasal septum of each child in the home. A smear was also prepared from the nasal secretion. The children ranged in age from 1 to 18 years. The number and nationality of the girls examined were as follows:

Table X.—*Kapiolani Home for Nonleprous Girls of Leprous Parents.*

Hawaiian	53
All other nationalities	4
Total	57

The result of the clinical examinations can be tabulated as follows:

Table XI.—*Acute and chronic lesions in the noses in forty-nine children born of leprous parents.*

Nose:	
Normal	43
Acute rhinitis	4
Chronic rhinitis	2
Total	49

No evidence of ulceration, past or present, was found on the septa of these 49 children, and no acid-fast bacilli were found in the smears from the nasal secretions of these cases.

The 8 children remaining presented various suspicious clinical signs, which led to a more thorough examination. The notes on these cases are as follows:

No. 6. A——. Hawaiian; age, 9 years. Found leucodermic patches on cheeks; mucous membrane of nasal septum appears normal. No acid-fast bacilli found in smear from nasal secretion.

No. 46. M. N——. Hawaiian; age, 14 years. Small nodule near lobule of left ear, not over 5 mm. in extent. Similar nodule at site of Darwinian tubercle on right ear. Nodules on both ears incised and smears made from tissue. Mucous membrane of nasal septum appears normal. Smears from nodules in ears show no bacilli of any sort; two smears examined from each ear. Smears from nasal secretion show no acid-fast bacilli.

No. 49. C——. Hawaiian; age, 15 years. Scars of old ulcers on the soles of both feet, most prominent over the ball of the foot and the heel, showing as hyper-pigmented areas ½ to 1½ cm. in diameter. The sister in charge states that great difficulty was experienced in healing the ulcers. Mucous membrane of nasal septum appears normal. Smears from nasal secretion show no acid-fast bacilli.

No. 52. J——. Hawaiian; age, 16 years. Indolent ulceration on sole of right foot 1.2 cm. in diameter, situated at the base of the second toe, partly on the plantar surface. The sister in charge states that there have been a number of similar ulcers on the same foot, which have healed, leaving scars. Mucous membrane of nasal septum bedecked with yellowish crusts; the mucous membrane bleeds easily. Smears from the nasal secretion and from the discharge of the plantar ulcer show no acid-fast bacilli.

No. 54. A. H——. Hawaiian; age, 5 years.

Physical examination.—Right forearm presents multiple dusky red macules from 2 to 3 mm. in diameter, slightly elevated, with a shiny surface, and scattered irregularly over the area of distribution of the ulnar nerve and extending down upon the palm, where they coalesce to form a dusky red patch, occupying, roughly, one-half of the palmar surface and extending over on the side of the hand. The little finger is semiflexed, can not be completely extended, is dusky red in color, as is also the ulnar side of the palmar aspect of the third finger; some mobility of the finger, but not complete. On the dorsal aspect of the hand is an indolent ulcer about 8 mm. in diameter, with an elevated, shiny border, deep pink to red, with a denuded slightly depressed granular center, dusky red flush of the terminal phalanges of the third and little fingers. The right ulnar nerve is slightly thickened; the mucous membrane of the nasal septum appears normal. Smears from the nasal secretion show no acid-fast bacilli.

Nos. 55 and 56. O—— and M——. Hawaiians; age, 5 and 4 years, respectively. These children were examined and officially declared lepers fifteen months ago. The disease is evidenced in each by typical macule formation, and lepra bacilli have been found in the skin lesions.

The nasal mucous membrane appears normal in both children, and no acid-fast bacilli are found in the nasal secretion.

No. 57. N——. Hawaiian; age, 14 years. Has been examined and officially declared a leper. The right cheek presents a leucodermatous area, and lepra bacilli have been found in a snipping from the lobule of the right ear. The mucous membrane of the nasal septum appears normal. On microscopic examination of smears from the nasal secretion, a single, large mononeclear cell is found which contains in its protoplasm three typical lepra bacilli. A prolonged search failed to reveal any other lepra bacilli in the preparation.

Summary of results of nasal examinations of inmates of Kapiolani Home.—Among the 57 children examined there were 3 who had been diagnosed as lepers. Two of these failed to show anything suspicious upon nasal examination, while one showed a small group of lepra bacilli in a cell in the nasal secretion, although no lesion was made out on inspection of the nasal mucous membrane. Five of the 54 children remaining were suspected of being lepers. The results of the nasal examination were negative in these cases, both clinically and bacteriologically. The remaining 49 children showed neither evidence of leprous lesions nor acid-fast bacilli in the nasal secretions. Two cases of chronic rhinitis and four cases of acute rhinitis were found. The results of the examinations differed in no respect from similar examinations of children of clean parents.

No. 8. Free Dispensary, Honolulu.

During certain periods all patients presenting themselves for treatment at the clinic were subjected to some nasal examination. The patients were suffering from the usual minor ailments found in dispensary cases. They were from the stratum of society in which leprosy is prevalent in the Territory. The number and nationality of the patients examined and the procedure used were as follows:

Table XII.—*Free Dispensary.*

Examination by inspection of the nasal septum:	
Hawaiians	17
All other nationalities	48
Total	65
Bacteriological examination of nasal secretion:	
Hawaiian	29
All other nationalities	78
Total	107

In the inspection of the nasal septa no suspicious pathological conditions were found. In the bacteriological examination of the nasal secretions one case of clinically certain phthisis showed acid-fast bacilli in the smear. The case did not come under observation again, but the subsequent history was that of a rapidly fatal pulmonary tuberculosis with frequent profuse hemorrhages. Although it was not possible to make a thorough study of the case, we feel justified in regarding it as not leprous in character.

In two instances the conditions warrant the detailed presentation of the case, as follows:

1. H. M——. Portuguese; age, 11 years; born in Hawaii. This boy was suspected of being a leper by the physician in charge of school inspections. He was brought to the dispensary for an official examination. The case was clinically one of tubercular leprosy in a moderately early stage. Smears of the nasal secretion taken at the time of the official examination showed no acid-fast bacilli. The bacilli of leprosy were easily demonstrated in a bit of tissue excised from the skin. The two brothers of the leper were examined at the same time, and one of them was regarded as a suspect. Unfortunately the two brothers were concealed by the parents, and no further studies could be made of their cases. Smears taken from their nasal secretion at the time of the first examination showed no acid-fast bacilli. The boy who was officially declared a leper was seen by one of us (W. R. B.) on two occasions at the Kalihi receiving station. Each time a careful inspection of the septum failed to reveal any pathological condition, and smears from the nasal secretion were negative. The final examination of the nose was made five weeks after the official examination.

2. H. B——. Hawaiian; age, 25 years; female. The septum shows much thickening of the mucous membrane over the cartilaginous portion of the right side. The mucous membrane is rough and of an opaque white color. Smears made from material obtained by a vigorous swabbing of the right side of the septum with a sterile cotton swab. No physical examination was made.

Microscopic examination.—Two smears examined. A moderate number of slender, not beaded, acid-fast bacilli are present. The bacilli are often curved. Three typical bacillary heaps are found. The bacilli agree with the *Bacillus lepræ* in morphology, arrangement, and staining reaction.

This case passed from observation for a time, as it was not considered expedient to apprehend her as a leper suspect for political reasons.

Summary of the results of examinations of patients at the Free Dispensary, Honolulu.—Among the 46 Hawaiians examined, 1 case

of leprosy was detected. One case of leprosy was found free from specific nasal lesions and without acid-fast bacilli in the nose.

No. 9. Out-patient clinic, Marine-Hospital Service, Honolulu.

A certain number of the patients applying for treatment were examined for acid-fast bacilli in the nasal secretion. The patients were sailors on the vessels in the interisland trade and on American ships plying between Hawaii and mainland and foreign ports. The number and nationality of those examined was as follows:

Table XIII.—*Marine-Hospital clinic, Honolulu.*

Hawaiian	3
All other nationalities	6
Total	9

Acid-fast bacilli were not found in any of the cases. One patient thought himself to be suffering from leprosy, but turned out to be a case of syphilis.

No. 10. Kalihi Receiving Station for Lepers.

In this institution cases of leprosy from all parts of the Territory are retained till the diagnosis is officially established. In certain cases lepers are kept in the station for some time if undergoing treatment, or if their cases are being reviewed by the courts. Ten patients were in the station at the time of the examination, January 5, 1909. One of us (W. R. B.) made a speculum inspection of the nose of each case and prepared a smear from the nasal secretion. The number and nationalities of the cases were as follows:

Table XIV.—*Kalihi Receiving Station for Lepers.*

Hawaiian	8
All other nationalities	2
Total	10

DETAIL NOTES OF EXAMINATION.

1. C——. Hawaiian; age, 30 years; male. Advanced case of tubercular leprosy. Under treatment with nastine for eleven months.

Nasal examination.—Marked deviation of septum to left side. The mucous membrane on both sides of the cartilaginous portion of the septum is thickened and of an opaque white color. On the right side is a shallow, open ulceration, 5 mm. in extent. There is some bleeding after swabbing the site of the ulcer. Microscopic examination of the smear from the nasal secretion shows large numbers of typical lepra bacilli.

2. P. A——. Hawaiian; age, 18 years; male. This case was described under the examination of the Boys' Industrial Home.

It is pertinent in this place to repeat that a careful inspection of the septum and the examination of the smears from the nasal secretion, at this time, did not yield any evidence that the boy was a leper. The diagnosis had been established in other ways. (See p. 10.)

3. L. A——. Hawaiian; age, 11 years; male. Advanced case of tubercular leprosy. Under treatment with nastine for eleven months.

Nasal examination.—The mucous membrane on both sides of the cartilaginous portion of the septum is thickened and of an opaque white color. No definite ulcer can be made out, but there is some oozing of blood on the right side. Microscopic examination of smears from the nasal secretion show many typical groups of lepra bacilli.

4. H. M——. Portuguese; age, 11 years; male. Moderately early case of tubercular leprosy. This case has been described under the heading of Case 1, Free Dispensary. In this connection it is to be noted that inspection of the septum nasi and the examination of smears from the nasal secretion would not have yielded data for a diagnosis of leprosy.

5. V. H——. Hawaiian; age, 21 years; male. A pronounced case of tubercular leprosy. The patient has been under the nastine treatment for eight months.

Nasal examination.—The mucous membrane covering the cartilaginous portion of the septum, on both sides, is thickened and of an opaque white color. On each side there is an open ulcer 3 by 5 mm. in extent. Microscopic examination of the smears from the surface of the septum show many typical bacillary heaps of lepra bacilli.

6. W——. Hawaiian; age, 14 years; male. Marked case of tubercular leprosy.

Nasal examination.—Thickening and opacity of the mucous membrane on both sides of the cartilaginous portion of the septum with open ulcers. Microscopic examination of smears from the surface of the septum show a few typical bacillary heaps of lepra bacilli.

7. N. L——. Hawaiian; age, 10 years. A marked case of tubercular leprosy. Patient has not been treated.

Nasal examination.—On the right side of the cartilaginous portion of the septum the mucous membrane is thickened and opaque. On the left side the whole visible portion of the septum is the site of an open ulcer, the base of which is more or less rough, suggesting involvement of the cartilage. Microscopic examination of smears from the septum show enormous numbers of typical lepra bacilli. The smear is richer in bacilli than any preparation we have seen from the lesions of the disease.

8. C——. Hawaiian; age, 21 years; female. Marked case of tubercular leprosy.

Nasal examination.—On the right side of the cartilaginous septum the mucous membrane is white in color and thickened and opaque. On the left side is an ulcer 1 cm. wide, which extends the whole height of the septum. Microscopic examination of the smears from the surface of the septum show large numbers of typical bacillary heaps of lepra bacilli.

9. F. S——. Portuguese; age, 31 years. A case of mixed leprosy, the nerve type predominating, of many years duration. The case has had treatment in Japan and is now under nastine treatment. Three months ago lepra bacilli were demonstrated in a bit of tissue snipped from the lobe of the ear at the site of a resolved tubercle.

Nasal examination.—On both sides of the septum the mucous membrane shows small islands of chronic atrophic rhinitis. Elsewhere the mucous membrane appears smooth and glistening. On the right side of the septum is a slightly depressed area, 3 by 5 mm. in extent, in which the underlying tissue has a brownish color. This is assumed to be a healed ulcer. Microscopic examination of the smears from the nasal secretion shows no acid-fast bacilli. Three months ago smears from scrapings of the surface of the left side of the septum showed no acid-fast bacilli.

10. K——. Hawaiian; age, 22 years. Male. Moderately severe case of tubercular leprosy.

Nasal examination.—On both sides of the septum are small islands of chronic atrophic rhinitis. No definite ulcer seen. Microscopic examination of smears from the surface of the septum shows moderate numbers of acid-fast bacilli, showing the morphology and arrangement characteristic of *Bacillus leprœ.*

Summary of nasal examinations of patients at the Kalihi receiving station for lepers.—Seven out of 10 cases of leprosy showed lepra bacilli in the smears from the nasal secretion. The bacilli were not found in 2 early cases, and in 1 late case which had improved under treatment. In 6 of the cases, in which the bacilli were found, an open ulcer was seen on the cartilaginous portion of the septum. In 2 cases in which the bacilli were present no ulcer was found, but the mucous membrane was affected. In 8 of the 10 cases examined there was some lesion of the mucous membrane of the septum, the 2 exceptions being early cases of the disease.

GENERAL SUMMARY.

TABLE XV.—*Results of nasal examinations for detecting lepers.*

Nationality.	Inmates of institutions.	Living at large.	Total.	Lepers detected.	Lepers not detected.
Hawaiian	356	51	407	1	
Other races	141	134	275	.....	.....

TABLE XVI.—*Results of nasal examination in detecting disease by the nasal examination in known lepers.*

Number of lepers examined	14
Cases recognizable by nasal examination	9
Cases not recognizable by such examination	5

DISCUSSION.

A review of the literature on leprosy since the publication of Sticker's work upon the nasal origin of lepræ would lead one to suppose that the discovery of lepers in the early stage of the disease would be a comparatively easy matter. In a number of publications statistics are given as to the frequency of lepra bacilli in the nasal secretions and of the occurrence of specific lesions on the mucous membrane of the upper air passages of lepers. In going over this literature we were struck by the fact that practically all of the examinations on which this work was based were made upon lepers in whom the disease had made considerable progress. We felt dissatisfied with this data and determined to reopen the subject with examinations made upon persons who were not known to be lepers, but among whom we might reasonably expect to find a considerable number of cases of the disease as yet unrecognized by the patients or their associates. Supplemental to this examination of nonlepers, we took advantage of every opportunity to examine early cases of the disease to see if there was evidence of a primary nasal lesion on the nasal septum. It should be borne in mind that in this investigation we make a sharp distinction between the nose as a site of a diagnosable initial lesion and the nase as a point of exit for the bacilli from the patient to the outside world. That part of the work of Sticker and others which deals with the latter point we feel to be most convincing.

Value of the nasal examination in detecting incipient cases of leprosy.

When we examine critically the material which we used for our examinations, we have to recognize that certain influences would tend to reduce the number of lepers found in the course of our examinations.

In the first place, about six-sevenths of the individuals examined were inmates of schools or institutions which were under fairly close medical supervision. For this reason it was not to be expected that many pronounced cases of lepra would be found among them. This would not militate against the finding of cases whose only symptom of the disease was an ulcer on the septum, however, for so far as we are aware the systematic examination of the nose has not been a part of the general routine examination of inmates of institutions in the Territory.

In the second place, the individuals who came under our observation in such places as the Free Dispensary had undergone a species of self-selection. The Hawaiians have a very clear idea of what external signs and symptoms subject an individual to the suspicion of being a leper, and it is highly improbable that anyone with outward signs suggesting leprosy would present themselves at the Free Dispensary for treatment, well knowing that they would be subjected to an official examination if they did so. But just as in the case of inmates of the institutions examined, when an ulcer on the septum would be passed over undiscovered by an ordinary medical examination, so in the patients of the Free Dispensary the presence of such a lesion would not prevent the individual from coming to get treatment for some other ailment, as no suspicion would exist in their minds that they were subject to the leprous affection.

When we weigh all these facts we feel it is fair to say that for the purpose of determining if the nasal septum is the site of a diagnosable lesion in the incipient stages of leprosy in any considerable number of the individuals attacked, we can base tentative conclusions on the results of the examination of these 407 Hawaiians. We would have expected from what we know, both statistically and otherwise, of the prevalence of leprosy among the Hawaiian inhabitants of the Territory, to have found a larger number of cases of leprosy than we did, if the examination of the nasal septum was at all a reliable method of detecting the disease in its incipient stages.

We are confirmed in our doubts of the efficiency of the nasal examination for the detection of incipient cases of leprosy by the results of our examinations of known cases of leprosy. We have examined in all 14 lepers, 5 of whom could be classed as in the incipient stage of the disease. The 9 cases remaining were all of considerable duration, with the possible exception of Case 2, Free Dispensary. In this instance it was not possible to obtain a history or to make a physical examination, so we have to class her with the cases of leprosy having similar nasal lesions.

An examination of the notes on the 5 cases of leprosy which we class as incipient, shows that 4 of them could not have been detected by an inspection of the nasal septum and a bacteriological examination of the nasal secretion.[a] The remaining case[b] showed no microscopic lesion upon the septum, but during the bacteriological examination of the nasal secretion a single large mononuclear cell was found which contained three unmistakable lepra bacilli in its protoplasm. This would be slender evidence on which to make a diagnosis, but if it

[a] Case 8, Boys' Industrial Home; Case 1, Free Dispensary; Cases 55 and 56, Kapiolani Home.

[b] Case 55, Kapiolani Home.

occurred in the course of routine examination of nasal secretions it would be enough to determine further study of the case.

We feel that from these cases we are justified in doubting the value of the nasal examinations for the detection of incipient cases of leprosy, for, on the one hand, it failed to reveal as many cases as would be expected, and when incipient cases were found, by other methods of diagnosis, the nasal examination in four out of five instances was negative.[a]

On the other hand, we found lesions of the nasal septum and the presence of lepra bacilli in the nasal secretion to be the rule in cases of leprosy of considerable duration,[b] except in one case[c] of mixed leprosy, which showed a scar of an ulcer of the septum, but neither active nasal lesions nor bacilli in the nasal secretion.

Prevalence of incipient cases of leprosy, with nasal lesions, in the community.

In a number of cases the condition of the mucous membrane of the septum determined a careful examination which in all but one case was negative. We incline to the belief that many of the lesions seen in the nose of lepers are nonspecific in character, and have no diagnostic value. For example, the prevalence of chronic atrophic rhinitis in lepers is without significance if the condition is common in the general population. We feel that this is the explanation of the existence of chronic atrophic rhinitis in the children of lepers examined by us.

One conclusion can be drawn from our results which is of some public-health importance. It is evident that no considerable number of individuals in institutions in Hawaii have, as the sole evidence of the disease, lesions in the nose which are discharging lepra bacilli. On the other hand, we are inclined to lay great emphasis upon the

---

[a] As a corollary to this we must state that so far as our limited experience goes we have not evidence to present in support of the dictum of Sticker that the nose is the site, in a great majority of the cases of leprosy, of the initial lesion of the disease. This conclusion is in accord with the results of Thompson, 1908; Macdonald, 1903; Theroux, 1903; and Kolle, 1899. We do not take issue with those who emphasize the importance of the nose as a site of leprous lesions, and who draw from that fact conclusions as to the prophylaxis of the disease. (Gerber, 1901; Schaffer, 1897; Jeanselne, 1897). We feel that the nasal lesions in leprosy are of the utmost importance in this respect, but we do not consider that the presence of a lesion on the nasal septum of advanced cases of leprosy has necessarily any significance in determining the site of the initial lesion of the disease, unless it can be shown that a lesion occurs there before other signs of the disease are demonstrable elsewhere.

[b] Cases 1, 3, 5, 6, 7, 8, and 10, Kalihi Receiving Station, and Case 2, Free Dispensary.

[c] Case 9, Kalihi Receiving Station.

finding, among the patients of the Free Dispensary, of a case which had a considerable number of lepra bacilli in the nasal secretion (Case 2, Free Dispensary). We regard this case as of particular importance, because she had come to the dispensary a number of times and had therefore been under the passing notice of a physician who was familiar with leprosy and always on the lookout for cases of the disease. We regard such a case as a most dangerous one from a public-health standpoint, and feel that the labor of examining smears from fifty odd nasal secretions was well repaid by the discovery of this case. While we are not willing to recommend the wholesale examination of nasal secretions as a certain method of detecting incipient cases of leprosy, we do feel that in clinics frequented by races who have a high incidence of leprous infection, it would be advisable to make the inspection of the nasal septum a part of the routine examination of all cases applying for treatment. It is not practicable to strip and make a complete physical examination of every individual who comes to such a clinic, but if every septum were inspected, and all those showing any suspicious condition examined bacteriologically, it might be possible to detect cases of leprosy which would otherwise escape notice. That the diagnosis could be established in other ways would not signify in this instance, for our contention is that in the cursory inspection accorded the majority of the cases coming to a dispensary clinic the disease would not be suspected. By following the plan of nasal examination, supplemented by the bacteriological investigation of suspected cases, one could be tolerably certain that the most dangerous types of the disease were not being overlooked and allowed to wander at large in the community.

CONCLUSIONS.

I. The routine examination of the nasal septum and the nasal secretions of individuals of a race with a high incidence of leprous infection did not reveal as many cases of leprosy as would be expected from statistical data, had the method been an efficient one for establishing a diagnosis of the disease in the incipient stage.

II. The examination of the nasal septum and the nasal secretions is not of dominant value in confirming a diagnosis of leprosy in the early stages of the disease.

III. The conditions found in the noses of nonleprous children of leprous parents do not differ in important respects from those found in the descendants of nonlepers.

IV. When it is not practicable to make a complete physical examination of all individuals of a class suspected of leprosy, the examination of the nasal septum and the bacteriological examination of the nasal secretions will prove of value by permitting the recog-

nition of the most dangerous type of the disease, and is therefore worth while even if it does not reveal all cases of the disease in those who come under observation.

LITERATURE.

Beck, M., 99. Ueber die diagnostische Bedeutung des Koch'schen Tuberkulins. Deutsch. Med. Woch., 1899, No. 9, s. 137. (Abstract.)

Darier, J., 02. Sur la prophylaxie familiale de le lèpre. (2 Note.) Bull. de la Soc. franc. de Dermat et de Syph. 13 Annee, p. 2–3, 9 janv. (Abstract.)

English, W. T., 96. Lepra. Medical News, 1906, Nov. 11. (Abstract.)

Fraenkel, E., 97. Demonstration von Leprabacillen aus Nasenschleim. Münchener med. Wchsch., 1907, No. 41, s. 1153. (Abstract.)

Falcao, Z., 06. La Rhinite Lepreuse. Presse Med., 1906, p. 280.

Goldschmidt, J., 99. Der Nasale Ursprung der Lepra. Berichtigung. Deutsch. Med. Woch., 1899, No. 12, s. 200. (Abstract.)

Gerber, P. H., 01. Beitrage zur kentniss der lepra der Oberen Luftwege und der Verbreitung der Leprabacillen. Arch. f. Laryngol. Bd. 12 H. 1, p. 98, Sonderabdruck. (Abstract.)

Jeanselme, E., 97. La Lepre. Presse Med., 1897, No. 85. (Abstract.)

Jeanselme, E., et Laurens, 97. Des localisations de la lèpre, la gorge, et la larynx. Berlin Internat. Lepra Conf. Bd. 1, Abth. 2, S. 18. (Abstract.)

Kolle, 99. La lésion initiale de la lèpre. Deutsch. med. Wochenschr., 1899, p. 39. (Abstract.)

Leredde et Pautrier, 03. Le diagnostic de la lèpre et du lupus tuberculeux du nez par l'examen bactériologique du mucus nasal, après ingestion d'iodène de potassium. Rev. prat. du mal. cutan., syph. et vénér. T. 2, p. 85–90, 1 mars. (Abstract.)

Macdonald, J. T., 03. A diagnostic examination of one hundred and fifty cases of leprosy. Jour. Am. Med. Asso., 1903, June 6.

Plumert, A., 03. Sporadische Fälle von Lepra im Bereiche der österreichisched-ungarischen Monarchie. Arch. f. Dermat. u. Syph. Bd. 67, H. 3.

Schaffer, J., 97. Ueber die Verbreitung der Leprabacillen von den oberen Leftwegen aus. Arch. f. Dermat. u. Syph. (Abstract.)

Sticker, G., 99. Untersuchungen über die Lepra. Arb. a. d. kaiseri. Gesundh.-Amte. Bd. 16, Anlage. (Abstract.)

Sticker, G., 97. Thesen über die Pathogenese der Lepra. Internat. Lepra Conf. Berlin 1897. Bd. 1, Abth. 1, p. 99.

Sticker, G., 97. Mittheilungen über Lepra nach Erfahrungen in Indien und Aegypten. Münch. med. Wochen., 1897, No. 39, 40. (Abstract.)

Théroux, 03. Lésions ainhiques dans un cas de lèpre authentique. Ann. d'hyg. et de méd. colon. T. 6, pp. 562–563. Oct.–Dec. (Abstract.)

Théroux, 03. Contribution à l'etude de la contagion et de la pathologie de la lèpre. Ann. d'hyg. et de méd. colon. T. 6, pp. 564–582. Oct.–Dec. (Abstract.)

Thompson, J. A. 08. Notes on Leprosy. Lepra. Vol. 7, p. 211.

Werner, 02. Untersuchungen über Lepra an Kranken der Leproserie in Bagamoyo. Arch. f. Schiffs- u. Tropenhyg. Bd. 6, No. 2, S. 49. (Abstract.)

○