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A STUDY OF DISEASES OF AUSTRALIAN NATIVES IN THE NORTHERN TERRITORY.

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DURING the occupation of the Northern Territory by the army a native hospital was built in the vicinity of an Australian general hospital and staffed by the hospital medical officers, sisters and orderlies. The native hospital, having accommodation for 65 patients, consisted of an administrative hut, four huts equipped as wards and a patients' mess hut. It was situated on the banks of the Katherine River. The patients came from all parts of the northern districts of the territory and from Bathurst and Melville Islands.

The intention of this article is to describe and review the diseases met with at the hospital during the period from September, 1943, to October, 1944. It includes also an account of medical conditions found amongst natives in the surrounding settlements which were visited on occasions by medical officers. Visits were made to Elsey, Roper Valley, Roper Bar, Roper River Mission (which lies on the southern border of Arnhem Land), Monteginnie, Mooloolloo, Victoria River Downs, Timber Creek, Coolebah and Willeroo, and at each of these stations a medical survey of the natives was carried out.

Approximately 400 patients, mostly full-blooded aborigines, were treated at the hospital during the period, and about 250 were examined at the settlements. The surgical conditions will not be considered here as they form a separate study. The ophthalmic conditions are being described elsewhere by the ophthalmologist, who made an extensive and detailed survey. It may be mentioned that a large majority of natives were found to be suffering from trachoma in one form or another, from the mild early infections to the most severe and complicated conditions with gross destruction and distortion of the eyelids and globe, and with deterioration and loss of vision.

The medical conditions fall naturally into two groups. The first group comprises those diseases which are usually found amongst the natives and rarely amongst white populations—namely, yaws, ankylostomiasis, *granuloma venereum* and leprosy. These diseases are endemic and ubiquitous amongst natives in the territory, and only in exceptional circumstances do the white people contract yaws or leprosy. No cases of *granuloma venereum* were seen in the white community.

The second group comprises those conditions which are commonly found amongst white and native populations, such as malaria, acute infectious diseases, acute respiratory diseases, pulmonary tuberculosis, cardiovascular and renal diseases, anæmias, nervous and mental disorders, gonorrhœa, non-specific venereal infections and other miscellaneous conditions.

Yaws.

The first major problem that confronts a medical officer in the Northern Territory concerns the prevalence of spirochætal infections amongst the natives. A routine Kline precipitation test of the blood was performed when the patients were admitted to hospital. During the period under consideration 193 tests produced a positive result—that is, in 48% of all admissions. Thirty of these subjects who reacted to the test had lesions which were regarded as typical of yaws in an early, intermediate or late stage, and 51 had lesions which resembled yaws but could not be described as typical. In these 81 cases (20% of all admissions) the diagnosis of yaws was made. It may be reasonably assumed that the majority of the remaining 113 reactors to the Kline test (with the exclusion of the occasional positive result which may have been caused by malaria or leprosy) had had a previous spirochætal infection. The question then arises, is *Treponema pertenue* the offending organism in all these cases?

Early, intermediate and late manifestations of yaws were recognized. It was usually impossible to elicit from natives

a clear account of their past or present illnesses, and they seemed to have no conception of the measurement of time. Histories, therefore, were useless, and reliance had to be placed solely on direct observation. Therefore it was not often possible to identify the stage of the lesions in relation to the time of onset of the disease, nor was it feasible to classify lesions rigidly as primary, secondary or tertiary.

A male patient had a granulomatous ulcer on the knee and spirochætes were seen under darkground illumination in scrapings from the ulcer. The Kline test of the blood at first produced a negative result, but a week later the result was positive. The lesion was regarded as a primary ulcer and it healed after a few intravenous injections of "Novarsenobillon".

A young female adult examined at Moolooloo Station had a similar lesion on the forearm. The solitary ulcer was about half an inch in diameter, raised, with an irregular granular surface. It was regarded as a primary lesion and treated by an intramuscular injection of "Acetylarsan".

This type of lesion was rarely found.

A female child, aged about five years, was admitted to hospital with several pale, granulomatous lesions typical of early yaws. On the upper lip there was a raised, fungating mass with overhanging margins extending along the surface of the mucous membrane where the upper and lower lips met. The mass extended a little to the buccal mucous membrane. At the left angle of the mouth the granuloma expanded on to the cheek and the lower lip, leaving a deep ulceration. In the left axilla on the chest wall were two granulomata about one inch in diameter, circular and raised above the surface. In the right axilla were two or three similar but smaller lesions. In the groin and on the perineum were a few round, yellowish, fungating granulomata. Under dark-ground illumination numerous spirochætes were seen in smears taken from the lesions. The Kline test of the blood produced a strongly positive result. The only treatment in this case was penicillin (800,000 units) given parenterally in three-hourly injections. The lesions began to shrink immediately and were almost healed after three days; after six days they had completely healed, only purplish stains without induration being left in the groin and axillæ, and no visible trace at all being left on the lips.

Another female patient, aged about eight years, had a similar but more extensive granulomatous lesion covering most of the perineum. The inguinal glands were enlarged. Also she had a discharging granuloma inside the right nostril, which was ulcerating the nasal septum and the skin margin of the nose. There was also a deep ulcer on the inner surface of the right little finger. The surface of the ulcer was granular and the margins were well defined. The finger nails of the right hand were thickened, pitted and partially destroyed. The left hand was unaffected. On the left foot was another deep ulceration between the hallux and the second toe extending to the dorsal and plantar surfaces. The surface of the ulcer was granular and the skin surrounding it on the ball of the foot was undermined for an inch or more, an area of depigmentation being exposed. The skin of the anterior surface of the legs was roughened but not ulcerated. Spirochætes were found under dark-ground illumination from a granuloma on the thigh. The Kline test produced a positive result. Again penicillin (600,000 units) was given parenterally, with improvement in a short time; in six days the lesions were completely healed, pale, raised, smooth areas covered with epithelium being left.

The rapid response of these early lesions of yaws to treatment with penicillin is proved. Further investigations are required to determine the adequate and optimum dose and to compare the relative advantages of organic arsenical preparations and penicillin.

Skin lesions that were less typical than those described above were more often seen. Some were lesions that had become secondarily infected, others were retrogressing granulomata. Raised papules, varying in size, with a flat surface, some pale, others hyperpigmented, were observed on the hands, forearms, elbows, ankles, knees and buttocks. The papules sometimes became infected and pustular or were covered with a yellowish crust. After removal of the crusts an ulcerated, granular surface was exposed. This type of lesion was seen more often on the buttocks.

This secondary infection by pyogenic organisms complicated the picture, making the diagnosis difficult. Especially in young children impetiginous sores were frequently confused with yaws. Thirty patients suffering from impetigo, all non-reactors to the Kline test, were treated. The distinguishing characteristics were the pustular crusts covering smooth, shallow ulcers, mainly on the hands, feet and buttocks and occasionally on the face and scalp. The treatment usually consisted of local applications of white precipitate ointment.

Another common skin condition which was confused with yaws was scabies. In the natives the numerous small burrows of sarcoptes quickly became infected, and large pustules were produced. Unless careful search was made for parasites or ova the scabietic origin of these lesions was overlooked. They responded well to treatment with sulphur ointment.

Chronic skin conditions were frequently seen, which were considered to be late manifestations of treponema infections or healed early and intermediate lesions. Scars were difficult or impossible to identify because of the lack of a reliable history. Most natives said that their scars were due to fire (which was not doubted) or to some accidental cause. A scar at the corner of the mouth with a smooth, raised surface and radiating bands looked typical of a healed yaws lesion,[1] but its owner maintained that it was a burn from smoking a pipe. This same native had longitudinal grooves on the finger nails with considerable irregular thickening and some excoriation. The skin on the palms was desquamating and partially depigmented. The skin on the back of the hands was dry, thickened, redundant and scaly. On the forearms the skin was thickened and scaly. Also, there were patches of ichthyotic skin on the dorsum of the feet, on the front of the calves and on the thighs. In addition he had anterior bowing of both tibiæ. The Kline test produced a strongly positive result. The skin condition was regarded as a late manifestation of yaws and there was much improvement in texture of the skin after a few intravenous injections of "Novarsenobillon".

In other cases the skin of the forearms, elbows, knees and abdomen was roughened. The surface felt like rough sandpaper. Sometimes numerous small black papules were present, sometimes large hyperpigmented papules. Localized or more general desquamation was commonly seen. The skin of the soles of the feet was thickened and fissured. Over the lower third of the tibia and over the wrists the skin and subcutaneous tissues were thickened and deeply pitted. These pitted scars seemed to go down to the bone, which was often affected with chronic osteitis beneath the affected skin. These scars had the appearance of healed sinuses or of deep ulcers. Sometimes a little discharge exuded from them. The condition was regarded as a late manifestation of yaws, although absolute proof of the spirochætal origin of the lesions was lacking. All these patients reacted to the Kline test.

Several cases of gangosa were seen; in all the Kline test produced a reaction. In the young female patient described above, an early granulomatous lesion was attached to the nasal septum just inside the nostril, and the surrounding nasal mucous membrane and skin of the nostril were ulcerated. In another female there was a large granulating area of ulceration on the upper lip extending into the nose; where excoriation of the mucous membrane and commencing destruction of the cartilage of the nasal septum were obvious. In other cases the destruction of the nasal septum led to collapse of the bridge of the nose. Advanced stages were most disfiguring, with loss of the nose leaving only an aperture. An X-ray film of one of these patients revealed complete absence of the nasal septum, loss of the turbinate bones and sclerosis of the medial wall of the maxillary antrum. This patient had other extensive bony lesions which will be described later. Intravenous injections of "Novarsenobillon" effected resolution of lesions in the active stages.

Such cases have been described in medical literature as syphilitic.[2] This is not surprising when one considers the destructive type of lesion, with positive response to the Kline test, caused by a spirochæte which is morphologically indistinguishable from *Treponema pallidum*.[3]

Bony lesions that were regarded as being caused by yaws were frequently seen, and sixteen cases of "boomerang legs" with anterior bowing of the tibiæ, usually at the

middle third, were recorded. These natives came from different parts of the territory, including the islands. Both tibiæ were usually affected. Kline tests were performed in eleven cases, and in ten positive results were obtained. The youngest patient was a boy, aged about six years, at Willeroo Station, who had tenderness of his legs when walking and bowing of both tibiæ.

X-ray photographs of several patients were taken. They showed the bowing of the tibiæ with dense sclerosis of the cortex in the curved region and a narrowing of the medullary cavity from encroachment by the cortical sclerosis. In some cases the cortical sclerosis was localized, with isolated dense patches projecting into the medullary cavity. In earlier stages localized patches of osteoporosis in the cortex occurred. This lacunar formation seemed to precede the sclerosis. The bony wall of the nutrient artery was usually well defined and thickened, and a bony spicule had formed and projected into the medullary cavity. This condition is described by Hackett.[4]

A different type of bone lesion was seen in a few cases.

A middle-aged male half-caste had considerable thickening of both clavicles and of the shafts of the long bones of the legs and forearms. There were hard, tender, localized swellings on the bones. X-ray photographs revealed pronounced changes in the bones of the forearms and in the tibiæ and fibulæ, and irregular patches of osteoporosis and periosteal reaction with new bone formation. In places widening of the bone and thickening of the cortex with some areas of rarefaction were present. In the frontal bones areas of rarefaction were seen. The Kline test produced a positive result.

A middle-aged lubra had a somewhat similar condition. She had a mild degree of anterior bowing of the tibiæ and patches of rarefaction throughout the shaft, with considerable intervening cortical sclerosis, and also a periosteal reaction with new bone formation. A similar appearance was seen in the X-ray photographs of the fibulæ. The lower ends of both radii were thickened from periosteal overgrowth, and there was a rarefied area in the distal end of the right ulna. The skin over the right wrist and over the shins was thickened, pitted and scarred. The Kline test produced a positive reaction. In addition, this patient had fluid in the knee joints, in the ankle joints and in the left elbow joint. A secondary anæmia was present, and the hæmoglobin value was 50%.

This condition of multiple arthritis in this patient would have been regarded as a manifestation of yaws, had it not been observed that she had a mitral valvular lesion with systolic and diastolic apical murmurs and a cardiac shadow of mitral disease configuration. The condition was typical of rheumatic heart disease.

The association of yaws and acute rheumatism was seen in another patient, who also had boomerang legs, a bony swelling of the lower end of the fibula and rheumatic heart disease affecting the aortic and mitral valves. The significance of this association is not clear.

In a few other cases joint lesions were observed in patients who had other bony lesions. A patient suffering from gangosa had extensive osteitis and periostitis of the radius and obliteration of the wrist joint with ankylosis, and also evidence of osteoarthritic changes in the ankle joint. Another patient had late skin manifestations and arthritic changes in the interphalangeal joints of the left hand. The distal ends of the proximal phalanges were atrophied, and the interphalangeal joints were obliterated. Another patient had osteoporosis and enlargement of the proximal phalanges with arthritic changes of the interphalangeal joints. In these cases the metacarpophalangeal joints were unaffected, and in this respect the condition differed from rheumatoid arthritis. Chronic bursitis was found in three cases; in one there was a large prepatellar bursa which had a partially calcified capsule; another patient had an olecranon bursa, and the third had cystic swellings, which contained calcified nodules, attached to the outer side of the ankle joints.

Two other interesting conditions will be described at this point, as they were both probably due to spirochætal infections.

A blind native baby was brought from Roper Bar to hospital suffering from a condition diagnosed by the ophthalmologist as interstitial keratitis, with yellowish-grey opacies in both corneæ. There was an ulcer at the angle of the mouth. An X-ray examination of the skull showed an increase in size of the anterior fontanelle. The Kline test produced a strongly positive reaction.

If a similar condition was found in a white baby, a diagnosis of congenital syphilis would undoubtedly be made.

The other patient was a female, aged about twenty years, who was examined at Coolebah Station. She was completely blind and had bilateral optic atrophy. She was ataxic, and flaccidity of the muscles of the lower limbs was present, and the knee jerks and ankle jerks were absent. The Kline test produced a positive result. The condition resembled closely *tabes dorsalis*, but she could not be brought to hospital for further investigation.

The question then arose whether these conditions were due to *Treponema pallidum* or *Treponema pertenue*. No other lesions suggestive of syphilis were seen amongst the natives; but an aneurysm of the aorta, specific aortitis, *tabes dorsalis* and other specific tertiary lesions were seen amongst the white population.

Gangosa, and the bone lesions described above, so closely resemble syphilis as to be almost indistinguishable from it. The responses to blood tests are the same, and the *Treponema pallidum* and the *Treponema pertenue* are morphologically identical. The important difference between the two diseases, if they are separate entities,[6] is that one predominantly affects the native population and the other the white population. The difference in the mode of living is probably one of the important ætiological factors.

Ankylostomiasis.

Hookworm infestation was the next most frequently found condition; 12% of natives admitted to hospital were proved to be infested, and it is probable that many more were not discovered. As a rule no symptoms directly attributable to the parasite were seen, but the ova were found on routine examination of the stools. The affected natives came from all regions; this fact indicates the widespread dissemination of the condition throughout the native settlements. The treatment given was a vermifuge consisting of tetrachlorethylene (3·0 cubic centimetres) and oil of chenopodium (1·0 cubic centimetre) suspended in magnesium sulphate solution.

Three female patients who came from Bathurst Island had a profound secondary anæmia due to ankylostomiasis. The most severe case will be described in detail to illustrate the course and prognosis of this condition.

The patient was a child, aged about ten years, not ill-nourished, but with œdema of the legs up to the knees and a protuberant abdomen which contained free fluid. The temperature on her admission to hospital was 102° F., the pulse rate was 120 per minute and the respirations numbered 30 per minute. The palpebral conjunctiva and the buccal mucous membranes were pale, and most noticeable was the whiteness of the tongue. The apex beat was visible and palpable in the fifth left intercostal space in the mid-axillary line, and loud systolic and diastolic murmurs were heard at all areas. The percussion note at the base of each lung was impaired and crepitations were heard there. The abdomen was distended and the liver was enlarged. The spleen was not palpable. An X-ray photograph of the chest showed a greatly enlarged heart shadow, the configuration indicating a general enlargement. Mottled opacities due to bronchopneumonia were present in the right lung field. The first blood examination gave the following information: the hæmoglobin value was 15%, the erythrocytes numbered 990,000 per cubic millimetre, and the colour index was 0·75. Numerous ova of *Ankylostoma duodenale* were found in the stools. The Kline test failed to produce a reaction. Treatment was commenced with a blood transfusion of 300 cubic centimetres and a course of sulphapyridine (14 grammes) to combat the pulmonary infection. The child was delirious for the first two days and said that she could see snakes. Her condition rapidly improved in a few days, the elevated temperature gradually subsided, the physical signs in the lungs disappeared and the œdema of the legs and ascites disappeared. She was then given a liberal diet rich in vitamins, and iron. The hæmoglobin value rose steadily at the rate of 10% per week. She was given a vermifuge when it was above 40%. In the fifth week of treatment the hæmoglobin value was estimated at

80% and the erythrocytes numbered 4,200,000 per cubic millimetre; a normocytic, normochromic anæmia was present. There was an absolute eosinophilia of 14% of 7,000 leucocytes per cubic millimetre.

By the tenth week the hæmoglobin value had reached 100% and the erythrocytes numbered 5,000,000 per cubic millimetre. The apex beat was palpable in the mid-clavicular line, and only a faint systolic apical murmur was audible. An X-ray photograph of the chest showed the heart shadow to be normal. The liver margin was just palpable below the costal margin. She had gained in weight and was apparently a healthy child on her discharge from hospital.

The other two patients also had profound anæmia, enlargement of the heart and enlargement of the liver; their response to similar treatment was the same, and they were discharged from hospital in good health.

These cases illustrate the rapid response to treatment of this profound anæmia and the return to normal of the enlarged heart and the enlarged liver. Other factors may be concerned in the production of this type of anæmia, but that question will not be discussed here. The need for the treatment, and prevention if possible, of ankylostomiasis amongst the natives is obvious.

Granuloma Venereum.

Twenty patients suffering from *granuloma venereum* were admitted to the native hospital, an equal number of males and females. The lesions consisted of red granulating ulcerations on the external genitalia and perineum. In the males the granulations were usually on the fold of the prepuce and on the glans. In some cases separate lesions were present in the groins, but they always had the same characteristic appearance. The margin of the granulations was raised above the surface of the healthy skin and there was a clear-cut line of demarcation. The surface was sometimes covered by a mucopurulent exudate due to a secondary infection. The raised edge had an appearance not unlike an epithelioma. Healing occurred in the centre of a lesion, thickened, smooth epidermis being left, while the active edge continued to advance. The healed surface was at first depigmented and later became pigmented. The involved prepuce became thickened and fibrous. The inguinal glands were sometimes enlarged. Donovan bodies[6] were not found on microscopic examination. Various organisms including spirilla and fusiform bacilli were found, but they were all considered to be secondary infectors. In advanced cases there was considerable ulceration with destruction of the deeper tissues. In females the perineum and recto-vaginal septum were partially destroyed by the ulceration.

The treatment given was the excision of as much as possible of the diseased area and intravenous injections of a 2% solution of sodium antimony tartrate twice a week in increasing doses from 1·5 cubic centimetres to 6·0 cubic centimetres. Healing of the ulcers occurred slowly, scars being left, and the patients were usually discharged from hospital without active lesions after two or three months' treatment.

The ætiology of this well-defined clinical entity is obscure. Its response to antimony injections suggests a protozoal infection. The clinical picture was quite distinct from that of *lymphogranuloma inguinale*. No examples of this disease were seen amongst the natives.

Leprosy.

Twelve natives suffering from leprosy were found, four with nerve leprosy and eight with the nodular type. Lepra bacilli were found in the skin or in the post-nasal space in all the cases. These natives came from widely separated regions of the Northern Territory—from Roper Bar, Roper River Mission, Timber Creek, Willeroo, Coolebah and stations along the north-south road.

In the nodular form a great change in the facial appearance occurred. The skin and the subcutaneous tissues over the eyebrows and on the forehead were thickened and irregularly fissured. The loose skin below the eyes was swollen and nodules were felt on other parts of the face and on the lobes of the ears, which were hypertrophied. The creases on the face were deep and the lips were thick. The surface of the skin was smooth and shiny and had a waxy texture. Subcutaneous nodules were felt on the forearms, on the backs of the hands, on the legs and on the dorsum of each foot. The nipples were sometimes hypertrophied.

In these cases numerous acid-fast bacilli were found on bacteriological examination of the skin. Also, acid-fast bacilli were sometimes found in post-nasal swabs. The diagnosis of this type presented no difficulty.

On the other hand, in some cases nerve leprosy was not easily distinguished from other peripheral nerve lesions which were frequently seen.

A female child, aged about ten years, had a right ulnar paralysis, wasting of the small muscles of the hand and excoriation of the tip of the forefinger said to have been caused by a burn. The results of sensory tests were difficult to evaluate. The ulnar nerve on the right side felt uniformly thickened above the elbow. Acid-fast bacilli were found in post-nasal smears.

This evidence was not considered sufficient to confirm a diagnosis of leprosy.

By contrast, another female patient, aged about eleven years, had a similar ulnar paralysis on the right side, wasting of the small muscles of the right hand and a fusiform enlargement on a greatly thickened ulnar nerve. Acid-fast bacilli were found in post-nasal smears. A search for lepra bacilli was made by inserting a hypodermic needle into the swelling on the ulnar nerve, but they were not discovered.

This patient was regarded as suffering from leprosy.

Another female native, aged about forty years, had bilateral foot-drop, bilateral ulnar paralysis, a fusiform swelling on the left external popliteal nerve and palpable ulnar nerves above the elbow; but no acid-fast bacilli could be found. Further investigations were necessary to confirm a diagnosis of leprosy.

Several other male and female natives were seen who had ulnar palsies without an obvious increase in the thickness of the ulnar nerve trunks, and from whom no acid-fast bacilli were recovered. A custom of both the males and females to fight with heavy yam sticks, causing fractures of the humerus or the ulna or a nerve injury, was the probable explanation of some of these palsies.

The treatment of leprosy was not commenced at the hospital; but patients with confirmed and probable lesions were transferred to the Channell Island Leprosarium.

Comment.

Of the four diseases included in this group, leprosy, ankylostomiasis and yaws were occasionally found amongst the white population. The second group to be discussed includes those diseases which are commonly found amongst both the white and the native populations.

Acute Infectious Diseases.

Apart from respiratory infections, the only acute infectious disease occurring as an epidemic was mumps. Twenty-four cases were recorded; in some of them the condition was contracted in neighbouring settlements and in others in hospital. The parotitis was bilateral or unilateral and the disease ran a mild course, subsiding in a few days without ill effect. One case of orchitis occurred.

Acute Respiratory Infections.

Sixty-five cases (16% of admissions to hospital) of acute respiratory infections were recorded and classified as follows: six cases of upper respiratory tract infection, 27 cases of acute bronchitis, eight cases of bronchopneumonia and 24 cases of pneumonia. In the cases of bronchitis an initial fever occurred with a cough and physical signs of râles and rhonchi. Five patients were radiologically examined and the films showed no abnormality except for a slight increase in the basal lung markings. In one case a calcified, healed, tuberculous lesion was seen behind the second and third ribs. All the patients recovered in several days.

The cases of bronchopneumonia and pneumonia presented the usual clinical features—fever, dyspnœa, cough, expectoration, pain in the chest and physical signs of pulmonary consolidation with rales and crepitations. The bases of the lungs were usually involved and occasionally the mid-zone or the apical region. Treatment with sulphapyridine was effective in many cases.

During a period just before the wet season, a number of severely ill patients were admitted to hospital, and six of these died. Post-mortem examination revealed massive pneumonia in the stage of grey hepatization in three cases, localized empyema with basal pulmonary consolidation in one case, and fulminating bronchopneumonia and pulmonary œdema in one case. The remainder of the patients recovered in a few weeks and were discharged from hospital. The high mortality rate of six deaths in 32 cases of pneumonia and bronchopneumonia was not explained; but it seemed that a particularly virulent type of infection, perhaps a virus infection, was active in the area during the period just before the wet season.

During the year under consideration there were twelve cases of *otitis media* with perforation of the tympanic membrane and aural discharge. A few cases of paranasal sinusitis and four cases of acute follicular tonsillitis occurred. These cases ran a normal course.

Pulmonary Tuberculosis.

Twenty-one patients (5% of those admitted to hospital) were found to be suffering from pulmonary tuberculosis. X-ray examination of the chest and bacteriological examination of the sputum were performed whenever the condition was suspected. It is of interest to compare the figures for non-tuberculous respiratory infections with those for tuberculous infections—16% and 5% of all admissions respectively.

In the cases of pulmonary tuberculosis various types of lesions were present. Pleurisy with effusion, subclavicular areas of soft infiltration, bilateral consolidation of bronchopneumonic distribution, generalized pulmonary fibrosis, fibrosis with the formation of a cavity at one or other apex, usually just below the clavicle, pleural thickening and irregularity of the dome of the diaphragm, calcification at the hilum of the lungs and thickening of the anterior lobar septum were the features recognized radiologically.

In two cases enlarged cervical glands were excised and histologically proved to be tuberculous. Hæmoptysis occurred rarely. Six of the 21 patients died in hospital, including one with acute miliary tuberculosis. Other complications found were tuberculous adenitis, spinal tuberculosis and meningitis. The fate of the remaining patients with active lesions was not known, as they were transferred to Tennant's Creek hospital.

It is evident that pulmonary tuberculosis is not uncommon amongst the natives, and that the course of the disease is similar to the course in white people. The frequency of the chronic lesions of fibrosis and calcification suggests that the natives have some innate power of resistance to the disease. The problem of the control of pulmonary tuberculosis amongst the natives is not so hopeless as has sometimes been taught.

Acute Rheumatism.

Five natives were seen who had signs of acute rheumatism.

A female patient, aged about twenty-six years, was admitted to hospital with swollen ankle joints and a swollen right knee joint. The temperature was elevated, and on the third day the left knee joint was involved. There was no sign of cardiac involvement. Salicylates were given, the pyrexia subsided in a few days and all symptoms were gone in ten days.

Another female patient, aged about twenty years, had tachycardia, an enlarged heart with a loud systolic apical murmur transmitted to the axilla and an accentuated second pulmonary sound. She had previously had swelling of the joints. Two other patients had signs of mitral valvular disease and another had aortic and mitral valvular disease. The blood of this last patient reacted to the Kline test, and a swelling of the lower end of the fibula was present. The association of yaws and rheumatism has been referred to previously.

Chorea with almost continuous involuntary, irregular movements of the shoulders, trunk and limbs, more severe on the right side, occurred in a pregnant woman, aged about seventeen years. The temperature rose to 103° F., the pulse rate was 140 per minute and the respirations numbered 30 per minute. A male infant weighing two and a half pounds was born, and after the confinement physical signs of bronchopneumonia were detected. The choreiform spasms continued, and after a few days she died. Autopsy revealed pneumonia in the stage of grey hepatization and early empyema. No abnormality was detected in the brain or the heart.

Meningitis.

There was one typical example of cerebro-spinal meningitis associated with severe headache, vomiting, neck rigidity and increased pressure of cerebro-spinal fluid; the fluid contained many polymorphonuclear cells and both extracellular and intracellular Gram-negative diplococci. The patient was treated with sulphapyridine, receiving 64 grammes in five days, and recovery was complete.

An infant, aged about five months, was brought by aeroplane from Roper River Mission. She was comatose, the anterior fontanelle was distended, the left eyelid was drooping, the pupils were unequal and the hands and arms were in clonic spasm. The patient died soon after her admission to hospital, and autopsy revealed a thick layer of pus over the cerebrum and at the base of the brain. Pneumococci were found on bacteriological examination.

An extraordinary case occurred of internal hydrocephalus due to plastic arachnoiditis of the roof of the fourth ventricle associated with granular ependymitis of the lateral ventricles. The histological picture was characterized by proliferative infiltration of the arachnoid, the chorioid and the ependyma with round cells, polymorphonuclear cells, epithelioid cells, plasma cells and giant cells. In some places throughout the infiltration were found spaces containing yeast bodies. This was probably an example of infection by *Torula histolytica*.

Malaria.

Twenty patients were found to be infected by *Plasmodium vivax*. Some of these had no fever at all, but the malarial parasites were discovered on routine examination of blood slides. Others had typical attacks of fever. They all responded to quinine, "Atebrin" and "Plasmoquine" therapy. The natives seemed to have a high resistance against malarial infection. Two children, aged about three or four years, had very enlarged spleens and an associated anæmia with a hæmoglobin value of 50% and an erythrocyte count of 2,600,000 cells per cubic millimetre. Benign tertian parasites were found in the blood. After treatment with quinine and iron both were discharged in good health, with a normal blood picture.

The Dysenteries.

Only four cases of bacillary dysentery were detected. These were all Flexner infections and the patients quickly recovered. There were two cases of amœbic dysentery; the patients responded to treatment with emetine injections, emetine-bismuth-iodide by mouth, and "Yatren" (2%) given *per rectum*.

Venereal Diseases.

Besides the cases of *granuloma venereum* which have already been described, eleven patients were proved to be suffering from gonorrhœa. In addition, there were three cases of epididymo-orchitis, five cases of non-specific urethritis and seven cases of non-specific cervicitis. Many other male and female patients were examined "on suspicion". The results of treatment with sulphonamide drugs and more recently with penicillin were satisfactory.

No other specific venereal disease was identified. The absence of the primary and secondary clinical manifestations of syphilis was remarkable. This supports the theory that a widespread infection by *Treponema pertenue* immunizes the population against syphilis.[7]

The Anæmias.

The secondary anæmias of hookworm, malaria and yaws have already been mentioned.

One female patient developed a macrocytic anæmia after a confinement. The erythrocytes numbered 2,000,000 per cubic millimetre, the colour index was 1·2, and macrocytes and nucleated red cells were seen in the film. A reticulocyte response occurred after a short period on a diet rich in vitamins, and the hæmoglobin value on her discharge from hospital was 92%.

A male patient had a profound microcytic anæmia with a hæmoglobin value of 16%. He died before investigations were completed, and at the autopsy tuberculous lymphadenitis of the mediastinum was found.

Hyperpiesis.

An old man of indeterminate age had a systolic blood pressure of 210 millimetres of mercury, a diastolic pressure of 120 millimetres, an enlarged heart and congestive heart failure. An elderly female had a systolic blood pressure of 225 millimetres of mercury and a diastolic pressure of 125 millimetres. She died of a hemiplegia. Senile arteriosclerosis was observed, but the age at which it commenced could not be determined.

Nervous and Mental Disorders.

There were two cases of true epilepsy without apparent mental disorder.

Another male patient was admitted to hospital in a state of catatonic stupor. His temperature was subnormal, his pulse and respiration rates were slow, the deep reflexes were absent. He could be roused, but he was disinterested in his surroundings and quickly lapsed into stupor. On the night of a corroboree he recovered sufficiently to take a vigorous part in the festival, after which he "went walkabout".

One or two patients were apparently mentally deficient, but mental tests to estimate the degree of deficiency were not devised.

Conclusion.

This review of the diseases that have been observed during the period of a year amongst the natives in the Northern Territory may serve to emphasize the need for the continuation of adequately equipped native hospitals and the establishment of mobile medical units for the outlying settlements.

To prevent and control disease is a primary and obvious way of preventing the decline of a native race of people who are invaluable to Australia.

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DYSENTERY IN THE NORTHERN TERRITORY.

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THE following notes embody our experience in the care and management of 114 patients suffering from bacillary dysentery at an Australian general hospital in the Northern Territory. Bacillary dysentery is endemic throughout the Northern Territory, although it is usually seen in but moderately severe forms. Any relaxation in the standard of hygiene in camps is commonly associated with a sharp outbreak of diarrhœa in the area.

Shortly before the commencement of these observations sulphaguanidine became available to be used in the treatment of all dysentery patients admitted to the hospital. Since this was so for the first time in our experience, the purpose of this survey was to obtain information as to what immediate cure rate could be expected from the use of this drug. Unfortunately the necessity to return men to duty as soon as possible and the large area over which units were scattered prevented any observation of patients over long periods.

It was also hoped that it might be possible to arrive at certain criteria of cure suitable for application when laboratory facilities are not available, similar to those used in the saline therapy era as described by Hone, Keogh and Andrew.(1)

Clinical Material.

The patients consisted of members of the forces or of the Allied Works Council stationed in the Northern Territory. The diagnosis in all cases was established by the isolation of *Bacterium dysenteriæ* from the stools, and by typing by slide agglutination.

In all, 101 patients suffering from acute bacillary dysentery and 13 patients regarded as symptomless carriers were investigated. The types of organisms recovered and the number of cases in which they were found are shown in Table I.

TABLE I.

Type of Infection.	*Bacterium Dysenteriæ*				
	Flexner.	Boyd.	Sonne.	Schmitz.	Total.
Acutely ill patients	100	1	—	—	101
Carriers	5	4	3	1	13
Total.. ..	105	5	3	1	114

As will be noted, the Flexner type of dysentery bacillus was the causal organism in by far the majority of cases. All the patients from whom other types were recovered were members of one unit in which a large number of cases of dysentery had occurred when the unit was stationed in Western Australia some twelve months previously. Thus it would appear that bacillary dysentery in the Northern Territory is essentially due to *Bacterium dysenteriæ* Flexner. This is in accord with the infrequency in which severe cases of dysentery were encountered; only in rare instances did patients pass more than twenty stools in the first twenty-four hours after their admission to hospital. In all other aspects the symptoms did not differ from those usually described.

Treatment.

Sulphaguanidine.

Acutely Ill Patients.—The dosage of sulphaguanidine given was based on that recommended by Fairley and Boyd,(2) but for convenience in administration an arbitrary standard dose of 3·5 grammes was adopted in all cases. This amount of the powdered drug, as supplied, was made up as a suspension in one ounce of water. All patients were given an initial dose of seven grammes of the drug and thereafter 3·5 grammes at intervals of four hours until the number of stools in twenty-four hours was less than five. At this stage the standard dose was given every eight hours until the patient had passed his usual daily number of normal stools for two successive days. Failure of the bowels to act on any one day was not considered normal, and treatment was continued until the above condition was fulfilled. When this stage was reached the administration of the drug was stopped, provided that