

examined for 10 days running. Only if the last of these tests gave negative results did we consider the drug to be effective in preventing relapses.

As far as therapeutic action was concerned, penicillin, administered in regular doses, proved to be more satisfactory than either streptomycin or arsenobenzene; over the long term, however, all three drugs were discovered to be almost powerless to prevent relapses. Chloramphenicol had an immediate and complete therapeutic effect, but its spirochaetal action was insufficient to prevent relapses. In the tetracycline group, the effect of Acromycin on infections produced by the two strains of *T. persicum* was very different; its use does not therefore guarantee recovery in every case. On the other hand, Aureomycin and Terramycin gave first-class results in both respects, and, despite their high cost, may be considered as the drugs *par excellence* for Jordanian tick-borne relapsing fever.

Leprosy and Yaws: Points of Contact *

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Although the causative agents of yaws and leprosy are entirely distinct, the two diseases have a number of points of contact as regards clinical appearances, epidemiology, and control. These similarities are interesting and may occasionally be of importance. The matter has received very little notice in the past, but has recently forced itself upon the attention of workers in Eastern Nigeria, where during the past 20 years massive yaws infection in a dense rural population has been accompanied by an outbreak of leprosy of unusual magnitude. Since the two diseases have flourished side by side, there have been unusual opportunities for observing similarities both in their epidemiology and, what is more important, in their clinical appearances. In an investigation of control methods, lessons have been learned which are of common importance to workers in the prevention of both diseases.

Usually the differential diagnosis of yaws and leprosy presents little difficulty. The typical case of either disease is not likely to be confused with that of the other, and even with only simple laboratory facilities mistakes should not be made. The two diseases may, however, be present in the same patient, and in the course of survey work, especially where yaws treatment has been inadequate and leprosy is common, a variety of skin manifestations may be encountered in which the one disease can simulate the other very closely. Such lesions are usually localized and are often atypical.

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In yaws they are found most commonly among cases of minor recurrent skin lesions, and in leprosy, while all the main types of the disease may on occasion be implicated, they are found most commonly in the wide group of cases which are intermediate between the lepromatous and tuberculoid forms. Bacteriological examination for *Mycobacterium leprae* is often of no assistance in such circumstances, and though a therapeutic test will settle the matter, there is satisfaction in establishing the diagnosis on clinical grounds where, as is often the case, this is possible. It is proposed here to indicate those clinical types of the two diseases in which confusion is possible, and briefly to discuss their differentiation from the standpoint of the leprosy worker.

Confusion with leprosy lesions. The leonine facies and generalized thickening and nodulation of the skin of advanced nodular *lepromatous leprosy* could scarcely be confused with the manifestations of any other disease. To many, they present the only picture associated with this type of leprosy, a misapprehension shared only too often by the patients themselves, who frequently delay in consulting a doctor until the disease is unmistakable. In the early stages it is exceedingly easy for the subtle changes in the skin to pass unnoticed. Patients in a somewhat later stage, when definite signs of macular or diffuse lepromatous leprosy are present, have sometimes been given long courses of treatment for seborrhoea or syphilis, their true infection having passed unrecognized. It is in this type of leprosy that a positive Kahn reaction has occasionally been observed.

Confusion with yaws is most likely to arise when lepromatous leprosy has reached the macular stage, to which reference will later be made, and also when the changes associated with diffuse lepromatous infiltration are not sufficient to be obvious but are surmounted by isolated groups of small nodules. Such individual nodules may closely resemble the isolated hyperkeratotic papules sometimes seen in yaws, especially as they are frequently found about the knees and elbows (see Fig. 1). Yaws lesions in these sites have been illustrated by Hackett^a and Muir.^b

In differentiating between the two diseases, in the first place it is most unlikely that these signs would be the only visible manifestations of infection. Other stigmata of yaws would be expected, and in leprosy it would be most

^a Hackett, C. J. (1946) *Trans. roy. Soc. trop. Med. Hyg.*, 40, 206

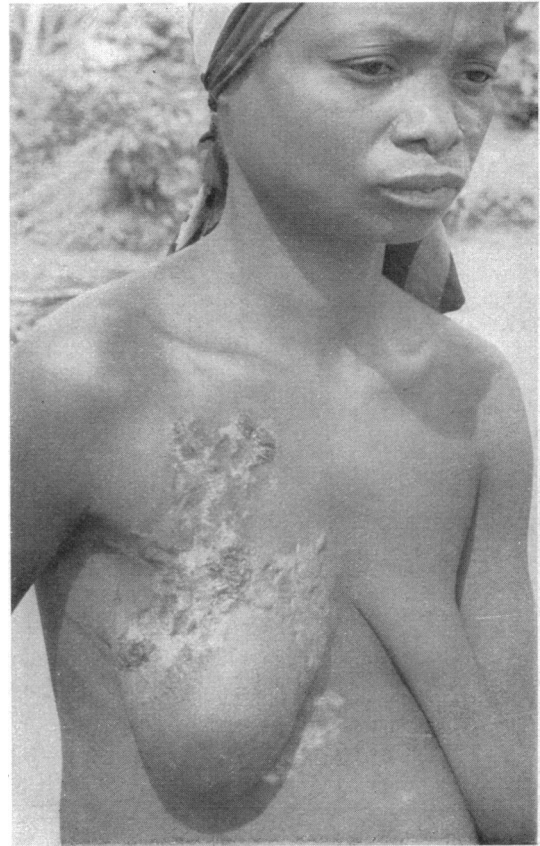
^b Muir, E. (1948) *Manual of leprosy*, Edinburgh, p. 93

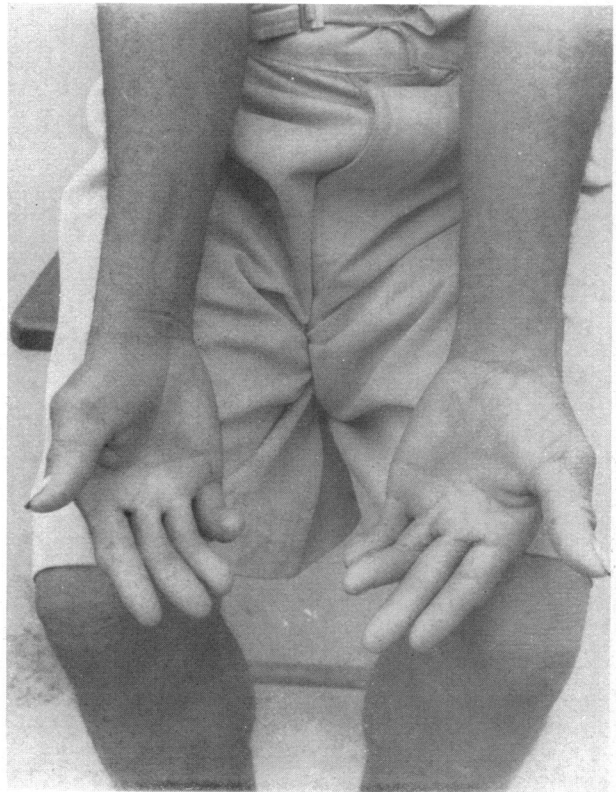
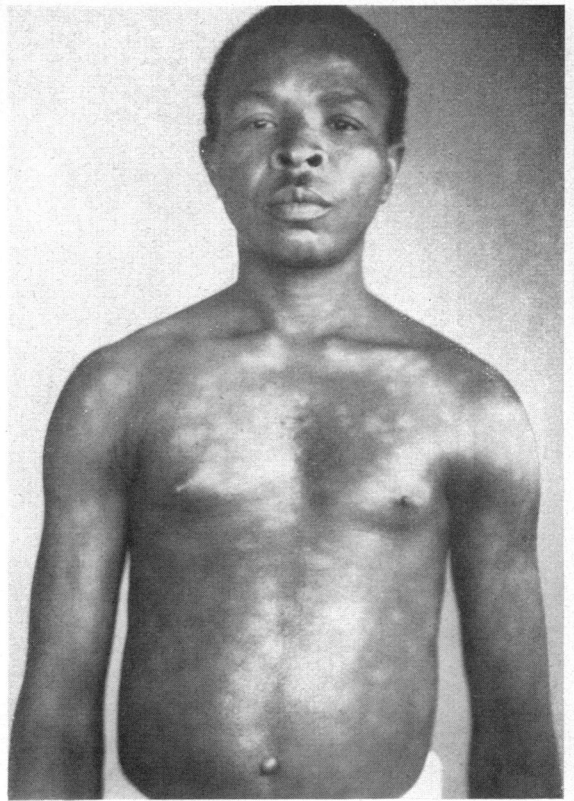
Fig. 1. Isolated nodules on the knee, bearing a superficial resemblance to the hyperkeratotic papules of yaws, in a case of leprosy

Fig. 2. Circinate framboeside, very closely resembling minor tuberculoid leprosy

Fig. 3. Papular framboeside, the lesions of which resemble one variety of minor tuberculoid leprosy

Fig. 4. Lupoid yaws lesion with scarring and formation of keloid; a similar appearance may result from the application by patients of caustics to isolated leprosy macules





unusual if nodulation of the ears were absent and the feet offered no evidence of nerve involvement. Secondly, in leprosy lesions of this severity the Kahn reaction would be expected to be negative. Thirdly, and by far the most important, in the leprosy patient *M. leprae* would readily be found in the nodules and elsewhere. However, a word of caution is necessary. To leprosy workers the technique of bacteriological examination for *M. leprae* is a commonplace, but we have not infrequently found mistakes in diagnosis that have arisen through faulty technique. It should be remembered that *M. leprae* occur in the corium and not on the surface of the skin; moreover, although these organisms are acid fast they are not as resistant to decoloration by acid as are tubercle bacilli, so that a weak solution containing 5%, not 25%, sulfuric acid should be used.

In contrast to lepromatous leprosy, another stable type of the disease—*tuberculoid leprosy*—is associated with an active immune response on the part of the host to *M. leprae*. The signs are well-localized lesions in the skin with various degrees of elevation, in which *M. leprae* are scarce or undetectable by ordinary methods. There is usually an associated neuritis of varying severity.

It is not likely that the distinctive plaques and circinate lesions of major tuberculoid leprosy would be attributed to yaws, though they are frequently confused with the manifestations of psoriasis and syphilis. In the same way, confusion is equally unlikely to arise with the milder minor tuberculoid leprosy, when the lesions have their typical circinate appearance (see, however, Fig. 2, 5).

In its earliest stages tuberculoid leprosy may appear as a small group of papules, not unlike an isolated small papular framboeside. If untreated, such a lesion often takes a very chronic course with periods of extension followed by resolution, until finally it may appear as isolated papules surrounding a pale, macular, perhaps slightly desquamated, area. The resemblance to a papular framboeside may thus be very close indeed (see Fig. 3). Illustrations of both diseases have been given by Smith.^c

In differentiating between the two diseases it should be noted that in leprosy lesions of this type there will be, almost invariably, signs of nerve involvement. Dryness as a result of anidrosis may persist even when a macule has by all appearances resolved. Loss of the sensation of light touch in the lesion will also probably be found. Since the African skin is highly sensitive to touch this test is a very delicate one. Signs of nerve involvement

^c Smith, E. C. (1932) *An atlas of skin diseases in the tropics*, London, figs. 40, 218, 226

Fig. 5. Same patient as Fig. 2: stigmata of yaws are apparent apart from the skin eruption

Fig. 6. Leprosy of indeterminate type—a form of the disease which may be closely simulated by macular framboeside

Fig. 7. Macular framboeside, similar in appearance to leprosy of indeterminate type

Fig. 8. Hyperkeratosis of the palms in yaws, with bilateral contracture of the fifth fingers resembling the early stages of a lesion of the ulnar nerves as seen in leprosy

may also be found elsewhere in the body, either on the dorsum of the foot or on the ulnar side of the hands in the form of thickened nerves or anaesthesia. Finally, the leprosy lesion never has the ashy-grey appearance sometimes seen in the desquamative framboeside.

Irregular spread following spontaneous resolution in minor tuberculoid leprosy lesions may lead to macules of serpiginous type. Such lesions, particularly when caustics have been applied in misplaced attempts at local treatment, may resemble a lupoid framboeside. Keloid scars and ulceration are often present as a result of such treatment and it is sometimes not easy to differentiate the points of activity persisting in such lesions from late yaws lesions (see Fig. 4). Scarring may seriously interfere with sensory testing. A yaws lesion of this type has been illustrated by Hill, Kodijat & Sardadi.^d

The most difficult and fascinating problems in distinguishing leprosy from yaws arise in the important group of *indeterminate lesions* which link one main form to the other, rather than in relation to typical lepromatous or tuberculoid leprosy. These lesions are difficult to diagnose, for they lack the characteristics of the polar lepromatous and tuberculoid types and appear as a wide variety of flat or almost flat macules, in which *M. leprae* are scarce or absent in routine tests; the localization and tendency to spontaneous healing of tuberculoid leprosy are also lacking. Nerve involvement is variable, but never marked in the lesions. Every gradation of change may be encountered, from atypical tuberculoid on the one hand to early leproma on the other. The importance of this group lies in its instability. It is frequently the first indication of leprous infection, and has a definite tendency to progress into the lepromatous form. With such a variety of appearances it is not surprising that the macules of yaws should sometimes be simulated.

Confusion with yaws lesions. Among the various types of macular framboeside described by Hill, Kodijat & Sardadi^d three may closely resemble leprosy. They are the erythematous framboeside, hypo-pigmented macules denoting the sites of healed framboesiomata, and multiple circular macules which are themselves a variety of framboeside. Two other conditions worthy of comment are gangosa and lesions of the hands.

Erythematous framboeside is described by Hill and his collaborators as "erythematous areas denoting the sites of healing or recently healed lesions", and may be simulated by early leprosy lesions, especially of lepromatous or incipient lepromatous type. If erythema of this type were encountered in a new patient during a leprosy survey, a bacteriological examination would be clearly indicated.

The transient hypopigmented areas produced during the *healing of yaws lesions* can almost exactly simulate one type of indeterminate leprosy, in which the usual slight erythema of the dry and slightly scaly lesions is lacking. In leprosy the lesions are persistent and likely to multiply in the absence of treatment; signs of nerve involvement, which might be slight in

^d Hill, K. R., Kodijat, R. & Sardadi, M. (1951) *Atlas of framboesia. A nomenclature and clinical study of the skin lesions*, Geneva (World Health Organization: Monograph Series, No. 5), figs. 13, 20, 27

the lesions themselves, are probable, particularly in the distribution of the ulnar and peroneal nerves. The yaws lesion has been illustrated by Smith.^e

The *macular framboeside* is encountered most frequently as multiple small hypopigmented macules especially on the forearms and legs and usually involving both sides of the body simultaneously. This symmetry of distribution is also seen in leprosy, and the individual yaws macules may very closely simulate those of indeterminate leprosy (see Fig. 6, 7). Their differentiation is important, for such leprosy lesions often progress into lepromata.

Since *M. leprae* would probably not be found, the diagnosis largely depends on the demonstration of nerve involvement, and with care this is often possible. When a mixed nerve is involved in leprosy, loss of function commonly proceeds in the following sequence: (a) anaesthesia of autonomic fibres, (b) loss of thermal sensation, (c) insensitivity to light touch, and (d) insensitivity to pain. The intense cellular reaction in a nerve in tuberculoid leprosy may suffice to interfere with the function of all types of fibrè, but in the slighter response which displays itself as indeterminate macules, while the sensation of pain and light touch may be retained, autonomic and thermal functions may be involved. This is not surprising and is in accord with the anatomy of peripheral nerves. Thus, leprosy macules which resemble macular yaws lesions may show some impairment of the sweat glands as well as of thermal sensation, sensitivity to cold being lost before that to heat. The demonstration of these sequelae is a simple and a valuable means of detecting such cases. It is in these types of cases that, in the absence of all distinctive features, a therapeutic test is necessary to settle the matter.

In lepromatous leprosy involvement of the nose is usual, most frequently with infiltration and ulceration of the mucous membrane of the nasal septum. Extension and secondary infection may involve the nasal cartilages and lead ultimately to the sunken nose with which leprosy is commonly associated. The bone is only rarely involved, and then not sufficiently to aggravate the deformity.

A *healed gangosa* is indistinguishable from this condition; in fact it was in relation to leprosy that some of the early studies of gangosa were made.

Several points of similarity arise between leprosy and yaws in the *involvement of the hands*. The leucoderma of the hands which is common in yaws is never seen in leprosy, but in lepromatous leprosy involvement of the fingers may sometimes present the thickened ichthyotic appearance on the back of the hands which is frequent in yaws. Leprosy does not cause hyperkeratosis of the palms, but a tuberculoid macule involving the palm may produce a pitted appearance very similar to that caused by yaws, especially in major tuberculoid leprosy. Mild degrees of contracture of the fourth and fifth fingers resulting from the extension of the hyperkeratosis of yaws to those fingers may bear a close superficial resemblance to early *main en griffe* resulting from the ulnar nerve involvement in leprosy (see Fig. 8).

^e Smith, E. C. (1932) *An atlas of skin diseases in the tropics*, London, figs. 40, 218, 226

Epidemiological aspects. Whatever points of contact may exist between the clinical appearances of yaws and leprosy, it is in their epidemiology that resemblances are closest. Both are chronic diseases spread by contagion, probably most commonly by direct contact between abraded skin surfaces. Both are primarily diseases of rural communities, flourishing where low standards of living and hygiene produce overcrowding and encourage parasites which abrade the skin. Both decline with the introduction of clothing. Children are more susceptible than adults, and in many places males are more susceptible than females. Conjugal infection is uncommon and congenital infection is unknown. Leprosy is most prevalent in tropical climates and shows some seasonal variation, though its association with moisture is not as pronounced as is that of yaws. These and other points of contact should stimulate the interest in both diseases of those working among them.

L'échinococcose en Yougoslavie

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L'échinococcose est très répandue dans certaines régions de la Yougoslavie. Il faut rappeler que la maladie chez l'homme est en relation étroite avec l'infestation des chiens et du bétail domestique. Sans chiens ténifères, il n'y aurait pas d'échinococcose, ni humaine, ni animale. Or, en Yougoslavie, les chiens sont très nombreux et, dans 15 localités différentes, le taux moyen de chiens parasités s'élève à 16%. Il faut attribuer cette infestation animale au fait que le paysan yougoslave a l'habitude, au moment de l'abattage du petit bétail pour les besoins domestiques, de donner en nourriture aux chiens présents les viscères infestés, ne voyant là aucun danger pour lui-même ou pour le chien. D'autre part, il arrive que même dans les abattoirs des villages la destruction des viscères infestés ne soit pas totale ou que le contrôle soit insuffisant. Enfin, cas plus rare, les chiens des bergers ou les chiens errants dévorent du bétail crevé qui n'a pas été enterré.

D'après une statistique effectuée dans un très grand nombre de cantons et de villes, plus de cinq millions de bêtes sont atteintes d'échinococcose.

Il n'est donc pas étonnant que la morbidité par échinococcose soit très élevée dans les régions rurales où souvent le paysan cohabite avec le bétail et où les conditions d'hygiène sont souvent défectueuses.

L'échinococcose est une maladie chronique débutant par une longue période asymptomatique. Le paysan, dont la culture sanitaire est encore peu développée, n'en comprend pas la gravité. Les premiers troubles qu'elle occasionne sont supportables, et les malades sont peu enclins à accepter l'hospitalisation. Pour toutes ces raisons, le diagnostic n'en est pas aisé et il est souvent accidentel.