either appropriate or slightly above that expected for the haemoglobin level. This increased 2,3-DPG results in an increase in $P_{O_2}$, which in most cases is less than would be expected because of a decrease in MCHC. Thus, it would seem from this study that the 2,3-DPG-mediated adaptive decrease in the oxygen affinity of the blood is compromised in megaloblastic anaemia by the concomitant low MCHC found in the megaloblastic cells.

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The Clinical and Histological Features of South West African Cutaneous Leishmaniasis

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SUMMARY

The clinical and histological features of 18 cases of dermal leishmaniasis encountered in South West Africa are described and discussed. The anatomical distribution of the leishmanial lesions differs from that encountered elsewhere in Africa, but the histopathological changes follow a pattern similar to that of Oriental sore in other parts of the world.


Leishmaniasis occurs in the systemic (kala azar) or dermal form in many African countries. The extent and distribution of either form of the disease in the southernmost part of Africa are uncertain and ill defined. Since 1970, when the first case of leishmaniasis was described in South West Africa, a further 17 cases have been diagnosed and the patients treated. The South West African cutaneous form is nearing full elucidation, and extensive epidemiological and entomological projects have been instituted to achieve this end. As in Ethiopia, hyraxes (Procavia capensis or dassies) play a prominent role as reservoir hosts for the disease. Man intruding upon a hyrax-sandfly-hyrax transmission cycle of dermal leishmaniasis in South West Africa probably never participates as a reservoir host by transmitting the disease.

In South West Africa hyraxes inhabit the whole of the escarpment area, a large central area of the country extending as far north as Grootfontein and as far east as Aranos and Leonardville. In the south hyraxes are encountered up to the border of South West Africa and the Republic of South Africa.

A sandfly, Phlebotomus rossi, living in close association with hyraxes in rock shelters, has been identified as a probable vector of cutaneous leishmaniasis in South West Africa. Cultures from human leishmania lesions, nosetips of Procavia capensis, and P. rossi have all yielded vigorous growths of promastigotes in biphasic modified Novy-Nicolle-McNeal (NNN) medium. Sandflies apparently shun hairy body surfaces and as a result hyraxes are bitten on their hairless, vascular nosetips. Identification of Leishmania strains isolated from humans, hyraxes and sandflies in widely distant regions of South West Africa is currently under way at the Liverpool School of Tropical Medicine. In this article the clinical and histological features of 18 patients with leishmaniasis, from whom tissues were examined histologically, are presented.

HISTORIES AND CLINICAL FINDINGS

All patients presented with chronic non-healing skin sores (Fig. 1). The lesions differed considerably in size, ranging
from 0.5 to 3 cm in diameter. The majority of patients could not specifically recall being bitten by an insect to account for lesions, but, in the case of some patients, questioning revealed possible exposure to sandfly bites in likely localities. In almost every case, however, the patient could at some time or another have been exposed to sandfly bites near a hyrax habitat, as many parts of South West Africa could be considered 'hyrax country'.
The macrophage pole, corresponding to lepromatous leprosy, macrophage cytoplasm is vacuolated and filled with parasites (Fig. 3).

Fig. 3. High-power view showing macrophages filled with leishmanial parasites.

The tuberculoid form, at the opposite pole of the range of skin changes, shows no or very occasional parasites. Areas of some lesions in the intermediate part of the spectrum are typical for the macrophage form, while simultaneously showing a typical tuberculoid picture devoid of parasites in other parts of the lesions. The finding of extreme polar forms in the intermediate skin changes is not unusual in Oriental sore and is usually accompanied by varying degrees of lymphocytic infiltration denoting varying degrees of cell-mediated immunity. Superficially, sections of skin in some cases of leishmaniasis, especially in the late stages of healing, may show such nonspecific changes as are encountered in old insect bites of the skin. Parasites may be absent or very scanty in number and could readily be missed unless looked for. Tuberculoid (lupoid) lesions with few or no parasites may also be mistaken for other conditions of similar histological appearance. The change from macrophages to epithelioid cells with corresponding severe diminution of the parasite load signifies an increase in immunity, as in leprosy, in what Ridley calls a 'reversal reaction'.

Epidermal changes show atrophy or hyperkeratosis, with features of parakeratosis, acanthosis, and even pseudoepitheliomatous hyperplasia in some (Fig. 5). Ulceration is commonly seen, and parasites in groups of macrophages may often be found lying adjacent to epidermal tissue at or near the edge of the ulcer. In well-cut sections, stained with haematoxylin and eosin, high-power magnification of the parasites may demonstrate the nucleus and prominent kinetoplast clearly. The microscopical picture of cutaneous leishmaniasis may appear to be nonspecific, and therefore the identification of parasites, if present, will often require prolonged searching. Giemsa staining has not offered any great additional diagnostic advantage when parasites in the lesions were few in number.

Fig. 5. Histological section showing marked dermal inflammatory infiltration with pseudo-epitheliomatous epidermal changes.

Histological sections of the nosetips of some hyraxes from which cultures of Leishmania were carried out, showed changes in subepidermal tissues comparable to those seen in human skin lesions. In our experience ulceration was not a feature of leishmanial lesions in nosetips of hyraxes and the changes were confined to the dermis.

DISCUSSION

Over a period of 6 years dermal leishmaniasis has been established in 18 patients from South West Africa. Clinical features of the disease, although not diagnostic, should, when encountered, suggest the condition. Leishmaniasis is not a public health problem of any consequence in the territory as yet, and it is possible that it never will be, because of the fact that man in South West Africa, unlike his fellows in Ethiopia, seldom comes into contact with vectors at night when these sandflies venture forth from their hyrax habitats. It is probable that Black people, who mostly sleep inside homes where woodsmoke may repel insects, are less likely than White people to acquire cutaneous leishmaniasis. Whites are inclined to sleep on stoops or with their bedroom windows wide open during
hot summer nights and may consequently be bitten on any exposed part of the body. The absence in our series of cases of face bites could be accounted for either by the peculiar biting habits of \textit{P. rossi} or by the fact that soaps and cosmetics used on the face act as repellents for sandflies. There is an apparent association of exposure of some of our patients with leishmaniasis to hyrax and \textit{P. rossi}. The majority of patients came from 'hyrax country' in South West Africa, and, as can be expected, evidence of exposure to bites was more common in such areas. One such patient lives on the slope of a mountain harbouring hyrax and \textit{P. rossi} in the cliff shelters directly above his home. Another patient often camped at night near dassie shelters when out hunting. In quite a number of patients a history of picnicking, camping, or living near hyrax colonies could be established. To date, an as yet incomplete study has not revealed any other definite sandfly vectors or reservoirs such as wild rodents. There are areas in the Republic of South Africa, such as the north-western Cape, with similar geographical and climatic conditions as southern South West Africa, where leishmaniasis could possibly appear in future. \textit{P. rossi} has been found in a few hyrax locations in the northern Transvaal.\footnote{The majority of patients came from 'hyrax country' in South West Africa, and, as can be expected, evidence of exposure to bites was more common in such areas.}

The histological picture in South West African cutaneous leishmaniasis is similar to that of Oriental sore seen in other parts of the world. The disseminated form of the cutaneous disease has not yet occurred in the territory. In some tissue sections of skin parasites are so few that they could easily be missed, resulting in a wrong or indefinite diagnosis. In South West Africa, granulomatous tuberculous skin reactions are, in addition to leishmaniasis, also often seen in tuberculosis, leprosy and mycotic infections. Oriental sore type of cutaneous leishmaniasis heals in the normal course of events, and one suspects that a number of patients in some communities exposed to infection heal spontaneously without the disease having been diagnosed. A chronic sore which does not heal, in areas where the disease is known to occur, should arouse suspicion of leishmaniasis. Although the condition does not seriously affect the health of the individual, there was nevertheless a steady number of patients requiring medical attention over a period of 6 years. It is not possible at present to make any forecast of a possible future increase or decline in the incidence of leishmaniasis seen annually in South West Africa. The important question arises, however, whether the more serious visceral leishmaniasis (kala azar) would, if introduced from outside into South West Africa, give rise to human cases as occurred in explosive epidemics in Kenya after World War II.\footnote{Another possible vector, \textit{P. grovei},\textsuperscript{16} with an extensive distribution throughout southern Africa, including South West Africa, has been found in termite hills and burrows of ground squirrels (\textit{Xerus inauris}) and the meercat (\textit{Suricata suricatta}). Investigations into the possible role of other small animals as reservoir hosts in the transmission of leishmaniasis are, together with serological and skin hypersensitivity tests, some of the important research pursuits which could contribute in future to a complete understanding of the disease as it occurs in South West Africa.}

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