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A Diseases Caused by Protozoa

I

*Sleeping sickness of man – Trypanosomiasis of animals*¹

Africa

Trypanosoma gambiense was discovered only at the beginning of the twentieth century, the clinical symptoms of sleeping sickness, however, were known in endemic regions of West Africa for hundreds of years before the discovery of the causative agent. The fatal trypanosomal disease of horses and cattle as well as that known as *mbori* in dromedaries at Timbuktu were likewise known for a very long time. This is supported by numerous indications.

A very early description of what was evidently sleeping sickness was given by two Arabic authors. One is the celebrated historian IBN KHALDŪN, who died in Cairo in A.D. 1406, and who wrote a comprehensive history of North Africa (note 1). The second is SHIHĀB AL-DĪN AḤMAD AL-QALQASHANDĪ, an Egyptian official, who died in Cairo in 1418 (note 2). As AL-QALQASHANDĪ was a younger contemporary of IBN KHALDŪN and lived with him in Cairo for nearly 20 years, he may have taken his narrative from IBN KHALDŪN's famous historical work (note 3).

The case in question concerns Mari Djata (Jatah), sultan of Mali (Melle) in the Western Sudan. The respective paragraph was translated from IBN KHALDŪN's Arabic into French by Baron DE SLANE (1st ed. 1863, 2nd ed. 1927) and into German by BECKER 1910. His translation was retranslated into English by MEYERHOF 1941. This retranslation corresponds in every respect with the French translation of Baron DE SLANE and runs as follows:

“He (the sultan) was overtaken by the sleeping sickness, which is a disease that frequently befalls the inhabitants of these countries and particularly their chieftains. The sufferer is attacked repeatedly and at any time by profound sleep, so that it is hardly possible to awake him but for a short time only. It is harmful to

¹ This chapter is based on an article by R. HOEPPLI and CHR. LUCASSE in J. trop. Med. Hyg. vol. 67, 1964, pp. 60–68. The author wishes to thank Dr. A. J. Duggan, Co-editor of the Journal, for his kind permission to reprint parts of the former article.

the sufferer, and his disease continues until he dies. He (the judge) said: His (the king's) disease remained in his constitution for two years until he died in the year 775 (A.D. 1373/74)." AL-QALQASHANDĪ repeated IBN KHALDŪN's narrative in nearly the same words, he calls the sultan Mari Jazah (Lion Prince) and sleeping sickness *illat al-nawm*.

From the remark that the disease frequently befalls the inhabitants of these countries, one may draw the conclusion that it was a disease which had existed in this region for some time and was well-known regarding its symptoms.

IBN KHALDŪN and AL-QALQASHANDĪ are according to our present knowledge the only two early Arabic authors who refer doubtless to sleeping sickness (note 4). It is possible and even likely that a future intensive search in the early Arabic literature will provide more references to sleeping sickness. Such an investigation may advance our knowledge of the existence of sleeping sickness in early centuries, which so far have yielded no information.

We have not found a reference to sleeping sickness during the 360 years following Mari Djata's death (note 5).

JOHN ATKINS, a British naval surgeon who had visited the Guinea coast in 1721, gave in his book *The Navy Surgeon* (1st ed. 1734, 2nd ed. 1742) the first brief but definite report on the clinical symptoms of sleeping sickness. He writes:

"The sleepy Distemper (common among the Negroes) gives no other previous notice than a Want of Appetite two or three Days before; their Sleeps are sound and Sense of Feeling very little; for pulling, drubbing or whipping, will scarce stir up sense and Power enough to move; and the Moment you cease beating, the Smart is forgot, and down they fall again into a State of Insensibility; driveling constantly from the Mouth, as in deep Salivation; breath slowly, but not unequally, nor snort."

"Young People are more subject to it than the Old; and the Judgement generally pronounced is Death, the Prognostick seldom failing. If now and then one of them recovers, he certainly loses the little Reason he had, and turns Idiot."

"The Cure is attempted by whatever rouzes the Spirits, bleeding in the Jugular, quick Purges, Sternutories, Vesicatories, Acu-Puncture, Seton, Fontanels, and sudden Plunges into the sea; the latter is most effectual when the Distemper is new, and the Patient is yet not driveling at Mouth and Nose."

THOMAS MASTERMAN WINTERBOTTOM in 1803 furnished a more detailed account of sleeping sickness as observed in Sierra Leone and on the Gulf of Benin. He drew attention to the enlargement of the posterior cervical glands, subsequently called 'Winterbottom's

sign'. This swelling of the neckglands had been already known to the slave dealers as an indication of sleeping sickness which always ended with death. They therefore refused to buy slaves with enlarged neckglands. WINTERBOTTOM states:

"The Africans are very subject to a species of lethargy, which they are much afraid of, as it proves fatal in every instance. The Timmanees call it *márree* or *'nluoi*, and the Bulloms *Nagónlôe*, or *Kadeera*: it is called by the Soosoos, *Kee Kóllee Kondee* or sleepy sickness, and by the Mandingos, *Seenoyúncaree*, a word of similar import."

"This disease is very frequent in the Foola country, and it is said to be much more common in the interior parts of the country than upon the sea coast. Children are very rarely, or never affected with this complaint, nor is it more common among slaves than among free people, though it is asserted that the slaves from Benin are very subject to it. At the commencement of the disease, the patient has commonly a ravenous appetite, eating twice the quantity of food he was accustomed to take when in health and becoming very fat. When the disease has continued some time, the appetite declines and the patient gradually wastes away."

"Squinting occurs sometimes, though very seldom in this disease and in some rare instances the patient is carried off in convulsions. Small glandular tumors are sometimes observed in the neck a little before the commencement of the complaint, though probably depending rather upon accidented circumstances than upon the disease itself. Slave traders, however, appear to consider these tumors as a symptom indicating a disposition to lethargy, and they either never buy such slaves, or get quit of them as soon as they observe any such appearances. The disposition to sleep is so strong, as scarcely to leave a sufficient respite for the taking of food; even the repeated application of a whip, a remedy which has been frequently used, is hardly sufficient to keep the poor wretch awake. The repeated application of blisters and of setons has been employed by European surgeons without avail, as the disease under every mode of treatment, usually proves fatal within three or four months. The natives are totally at a loss to what cause the complaint ought to be attributed; sweating is the only means they make use of, or from which they hope for any success: this is never tried but in incipient cases, for when the disease has been of any continuance they think it in vain to make the attempt."

"The root of a grass, called by the Soosoos *Kallee*, and the dried leaves of a plant, called in Soosoo *Fingka*, are boiled for some time in water in an iron pot; when this is removed from the fire, the patient is seated over it, and is covered over with cotton cloths, a

process which never fails to excite a copious perspiration. This mode of cure is repeated two or three times a day and is persisted in for a considerable length of time, until the disease be carried off, or appears to be gaining ground. No internal medicines are given in the complaint" (note 6).

Among later physicians who paid special attention to sleeping sickness were R. CLARKE, 1840, 1842, 1860; W. F. DANIELL, 1849 (note 7); GORE, 1875, and a number of French physicians, mostly naval surgeons, some of whom reported cases of sleeping sickness from the French Antilles. Among them were: MOREAU DE JONNÈS, 1808; NICOLAS, 1861; DANGAIX, 1861; CHASSANIOL, 1865; SANTELLI, 1868; GRIFFON DU BELLAY, 1864; GUÉRIN, 1869; CORRE, 1876, 1877; BORIUS, 1882; ABLART, 1883.

Names for Sleeping Sickness used by Africans

African names sometimes indicate characteristic clinical symptoms. They may also express certain beliefs regarding the assumed cause and nature of the disease. From the many names for sleeping sickness used by different tribes in various areas only seven have been selected as they seemed of some interest. The great majority of African names have the same meaning as the English 'Sleeping sickness'².

Kemborn 'nut' – Kissi, Northern Liberia, Sierra Leone (WINTERBOTTOM, 1803). Enlarged lymph glands.

Kpatsungi, *Kpatsun* – neck; *gi* meaning small, also child. *Kpatsungi* therefore: little ones of the neck. – Nupe, Niger valley, Nigeria. The Nupe disease term, *Kpatsungi*, may mean sleeping sickness, but includes all diseases in which the presence of enlarged cervical glands is noticed (MCLETCHIE & DUGGAN, 1954).

Konje-Kira, 'ball sickness' (enlarged lymph glands) – Vai, Western Liberia (STRONG, 1930).

Moryor, 'swollen body' – Kissi, Northern Liberia, Sierra Leone (pers. comm., 1962) refers to patients who during the very early stage eat excessively and in consequence become temporarily fat.

Yeesegebei, 'water disease' – Kpelle, Sheansue clan in Gbanga district, Central Province, Liberia (pers. comm. 1962). Suspicion of a connection between the disease and water.

² See also the previous quotation from WINTERBOTTOM's publication.

Dudduru, name used for sleeping sickness, an alternative meaning of which is a 'river or stream with shady banks', indicating some suspicion of the whereabouts of infection. – Inhabitants of riverside areas in the Lake Chad Basin (DUGGAN, 1962).

Fukufenkor, name for sleeping sickness; originally the name of a wide open country pot as is used for the treatment of sleeping sickness. – Kissi and Loma in Western Province, Liberia (pers. comm. 1962).

Names for Sleeping Sickness used by Foreign Physicians

a) English authors

ATKINS, 1734; sleepy distemper; WINTERBOTTOM, 1803; lethargus, negro lethargy; CLARKE, 1840, 1842, 1860; lethargus, sleepy dropsy, narcotic dropsy, sleepy sickness.

b) French authors

Maladie de Gorée, maladie de Neaning (both places had a very bad reputation regarding sleeping sickness), somnolence, lethargie, narcotisme des Nègres, hypnose, hypnosie. A name frequently used by French authors was *Névalane*, an African name, originally used by the Wolof north of the Gambia river. A corresponding name is *Dadane*, applied by the Serer, south of Cajor (CORRE, 1877).

Symptoms

In endemic areas people were familiar with the symptoms and the course of sleeping sickness. In the Eket district in south-east Nigeria the inhabitants differentiated two stages of sleeping sickness (MACFIE, SCOTT & GALLAGHER, 1914). In the first stage there is an enlargement of lymph glands, it is called *insip itong*, the second is the somnolent stage, *odono idap*. The rash over the body was known (MACFIE, SCOTT & GALLAGHER, 1914).

If the enlarged glands are not removed, the patient gradually becomes somnolent and ultimately succumbs. Many tribes held similar views. It was known that the incubation period might be very long, therefore in Gorée a person was not regarded safe before he had been absent from an endemic area for seven years (CORRE, 1877).

Various early assumed Causes

Many different causes were considered because the real cause remained unknown until the beginning of the twentieth century.

Most of the assumed causes need not be discussed, they include: sexual intercourse in day-time; eating bad food; poisoning by a plant; magic influence; sleeping sickness being a primordial disease, the germs of which are in every man and woman. This opinion was held by the Nupe on Jebba Island, Nigeria; standing and working in stagnant cold water, the Sheansue clan in the Gbanga district of Liberia called sleeping sickness *Yeesegebei* or 'water disease'.

Many West African tribes, e.g. the inhabitants of Rio-Nunez, the Mandingos (Malinke) and the Loma regarded enlarged cervical glands as connected with the cause of sleeping sickness.

"Enlarged cervical glands or kernels are called *Kwea weagi* by the Loma. They say: If they get to the stomach, the patient dies. If not cut out they make him sleepy' (HARLEY, 1941, p. 45; SCHWAB & HARLEY, 1947).

An 'impaired condition of the brain' was suspected as cause of sleeping sickness by DANIELL, 1849 (note 7).

Here may be mentioned the suspicion temporarily held by MANSON that *Acanthocheilonema perstans* might have some relation with sleeping sickness. The adult filaria was discovered by DANIELS in 1898 in Demararan aborigines in British Guiana. It was first described by MANSON, who had already in 1891 identified in London the microfilariae in the blood of two negroes from the Congo, one of whom died of sleeping sickness. Later he found again the same microfilariae in the blood of negroes from Old Calabar and the Congo and also in blood films from British Guiana. It became evident that *A. perstans* had no relationship with sleeping sickness as in British Guiana where this filaria is common, there is no sleeping sickness while on the other hand among the Kavicondo on the north eastern shore of Victoria Nyanza, where sleeping sickness was frequent, *A. perstans* does not exist.

Sleeping Sickness attributed to the Bite of Tsetse Flies

Before dealing with this question, it may be stated that by some tribes, for example the Peuls in former French Guinea, tsetse flies are only exceptionally incriminated (RISTORCELLI, 1939).

On the other hand, a connection between tsetse flies and sleeping sickness was long recognized or at least suspected in certain parts of West Africa (e.g. in the Lake Chad Basin). MACFIE, SCOTT

& GALLAGHER, 1914, reported that in Ikotobo in Southern Nigeria some Africans attributed sleeping sickness to the bite of a fly known as *nsung idap*, or sleeping fly. This fly is commonly known in towns of the Eket district as *ung obio*, or town fly, and has been identified as the tsetse fly.

In 1945 a physician who had studied sleeping sickness in the Gambia, stated that the Mandingo (Malinke) were so well acquainted with the disease that they not only realized that it was carried by tsetse flies, but were able to distinguish between species of tsetse. *Glossina palpalis* was known to be dangerous to man, while *G. morsitans* was regarded as innocuous. Such detailed knowledge suggests that sleeping sickness has existed in the Gambia for many centuries (A. J. DUGGAN, pers. comm.).

The inhabitants of the Lake Chad Basin realized the need to protect themselves against the bite of tsetse flies (DUGGAN, 1962).

Tsetse Flies and Diseases of Horses and Cattle

A connection between a fatal disease of horses and cattle and tsetse flies was widely recognized for centuries. DUGGAN, 1962, refers to Mahmud ben Zergun, who in 1592, while fighting along the Niger north of Jebba, had to report to the Sultan of Morocco that his horses had been killed by tsetse flies so that he was compelled to return to Timbuktu.

In East Africa tsetse flies likewise apparently influenced military operations. Francisco Barreto, who in November 1571 led a strong Portuguese expedition up the Zambesi valley to occupy the Manica goldfield, lost his horses and camels at Sena. Suspecting that the local Arabs had poisoned a well, he had all Arabs and Swahili of the Arab settlement at Sena killed (see H. H. JOHNSTON, 1899; COUPLAND, 1961, p. 50; DUFFY, 1962, p. 84).

Finally D. Bruce in 1895 demonstrated that nagana is due to trypanosomes transmitted to domestic animals by tsetse flies. Wild game serves as reservoir host. The result of this investigation contributed considerably to the subsequent successful work on human sleeping sickness.

Prevention

The Fulani of Northern Nigeria knew that there exists a relation between tsetse flies and a fatal disease of horses and therefore kept away from the Niger and Benue valleys (DUGGAN, 1962).

There are indications that such a relation was not only recognized in West Africa. LIVINGSTONE, 1857, p. 527, reported that

while travelling along the ancient bed of the Zambesi, they moved only at night when passing a tsetse-infected area.

LIVINGSTONE, while fully realizing the great danger of tsetse flies for domestic animals, believed that they were perfectly harmless to man (note 8).

He was shown a root at Moyara which when pounded and sprinkled over the oxen was believed to cause the flies to make off without sucking blood. Another method of protection consisted in mixing dropping of animals, human milk and some medicines together and rubbing the animals with the mixture before they passed through a tsetse district.

According to AUSTEN, 1903, several writers have referred to the feeding of tsetse flies by Africans to their animals in order to protect them.

MAUCH (1874) used this prophylactic treatment in the case of one dog. Although the animal had to pass through a tsetse district, it did not become sick. This experiment is, however, without value, as there was no means of knowing whether the dog, while passing through the danger zone, had, in fact, been bitten by infected flies.

Treatment by Africans³

Based on their experience, Africans in regions where sleeping sickness was endemic, knew that the disease was nearly always fatal. Therefore in many instances no treatment was given and the patient was abandoned. If treatment was attempted, it was applied to early cases only. Purgation, inducing strong perspiration and washing with infusions and decoctions of leaves, roots and bark were used by many tribes. Ointments of herbal origin and pastes made of triturated roots were applied to the neck. In certain areas vesicatories were used. Multiple incisions in the region of the neck glands were widely practised, for example in the Benue valley of Nigeria. In the Central Congo, among the Basakata, multiple incisions were made all over the body to remove larger amounts of blood, which was supposed to contain a pathogenic principle introduced by a ghost.

Excision of the cervical glands, exceptionally also of glands in axilla and groin, was widely practised among different tribes. There was a widespread belief in the preventive and curative value of the excision of the neck glands.

Besides excision, cauterization of the neck glands was also practised.

³ For an excellent general discussion of treatment in Primitive Medicine, see SIGERIST, 1951.

Non rational treatment using special kinds of medicines, amulets and fetish need only be mentioned (see plate I).

Treatment by Foreign Physicians

There existed the general opinion that sleeping sickness did not respond to any treatment and always terminated fatally.

Among the therapeutic methods which have been – unsuccessfully – tried were: Bleeding, purgation, vesicatories, acupuncture, sudden plunges into the sea (ATKINS, 1742); various stimulants, strychnine, coffee, quinine sulphate (NICOLAS, 1861). CORRE, 1877, used in addition cauterization, moxibustion, potassium iodide, mercury ointment, cold-water treatment. He undertook special studies regarding the climate, the geological formation and the flora and fauna of the endemic areas of sleeping sickness. These studies, although valuable in themselves, gave him no indication as to the cause of the disease.

*America*⁴

Negro slaves carried sleeping sickness to the West Indies and South America. They were all cases in the early stages which had not been recognized before shipment. As mentioned before, the slave dealers knew that enlarged cervical glands were a sign of the disease which always proved fatal and they refused to buy negroes with swollen neck glands.

In the Antilles one noticed that the creoles and the white immigrants were never attacked, only 'bozal' negroes who had themselves been shipped from West Africa. Negro children, if born in the Antilles, never got sleeping sickness, not even if one or two of their parents had suffered and died of the disease. It was also observed that sleeping sickness in some cases became evident only many months after the arrival of the negro at the West Indies.

Several French authors reported their observations of sleeping sickness in the Antilles. MOREAU DE JONNÈS saw cases among the slaves in 1808, DANGAIX in 1861. NICOLAS, 1861, found in nine months 5 cases among 1,200 negroes. In his opinion one out of hundred deaths among negroes on the voyage from the Congo to the Antilles was due to sleeping sickness. In his Paris thesis 1869, GUÉRIN of Martinique reported 148 cases among negro slaves imported from the Congo during 12 years.

⁴ Stanley's Emin Pasha Relief expedition in 1888 probably introduced sleeping sickness into Uganda and the region of the great lakes, resulting in very great epidemics.

GORE noticed cases of sleeping sickness among negro soldiers in the Bahamas and Ribeiro in Brazil among negro labourers (teste SCOTT, 1943).

We therefore realize that the slave trade carried cases of sleeping sickness from Africa to the Western Hemisphere but the infection could not spread because there were no suitable vectors.

Notes

1. Abu Zaid 'Abd al-Rahman ibn Khaldūn, born in Tunis at the end of May 1332, died in Cairo 16th March, 1406. The Arabic text is found in Ibn Khaldūn's Kitāb al'ibar (Bulaq edition, 1284 A.H.) vol. VI, p. 201, teste MEYERHOF, 1941.

2. His reference to sleeping sickness was pointed out by Prince Omar Tusun (Tussim) in the Egyptian Gazette, number of 5th December, 1931, Cairo, and in Sudan Notes and Records, vol. XIV.

3. Al-Qalqashandī's chronicle *Ṣubḥ al-a'sha* was printed in Cairo in 14 volumes in 1915 (see MEYERHOF, 1941).

4. Ibn 'Abd al Hadjala (1325–1375), an Algerian, made a pilgrimage to Mecca and subsequently went to Damascus and Cairo where he became Safi of a monastery. In 1362 he wrote on plague and according to L. BRANDL (1966) also on sleeping sickness. The present writer was, however, unable to trace this publication.

5. We cannot agree with W. R. BETT, 1959, that Aleixo de Abreu, 1623, in his description of 'mal de Loanda' refers to sleeping sickness.

6. In Liberia one of the early reported victims of sleeping sickness was Doala Bukere, the inventor of the Vai alphabet (JOHNSTON, 1906, vol. II, p. 1114; STRONG, 1930, vol. I, p. 497; STRONG, 1945, vol. I, p. 166).

7. "The Ebo's from an hereditary predisposition of melancholy and despondency, are affected with the malady which Dr. Winterbottom has termed lethargus, or sleepy sickness, a disease that possibly originates from an impaired condition of the cerebral apparatus and which has been thought to be one of the sequences of the deranged organic functions of the skin" (W. F. DANIELL, 1849).

8. "A few remarks on the tsetse, or *Glossina morsitans*, may here be appropriate.

Its peculiar buzz when once heard can never be forgotten by the traveller whose means of locomotion are domestic animals; for it is well known that the bite of this poisonous insect is certain death to the ox, horse and dog. In this journey, though we were not aware of any great number having at any time lighted on our cattle, we lost forty-three fine oxen by its bite" (pp. 80 and 81).

"A most remarkable feature in the bite of the tsetse is its perfect harmlessness in man and wild animals and even calves so long as they continue to suck the cows. We never experienced the slightest injury from them ourselves, personally, although we lived two months in their *habitat*, which was in this case as sharply defined as in many others, for the south bank of the Chobe was infested by them, and the northern bank, where our cattle were placed, only fifty yards distant, contained not a single specimen" (p. 81).

"The mule, ass and goat enjoy the same immunity from the tsetse as man and the game. — Our children were frequently bitten, yet suffered no harm; and we saw around us numbers of zebras, buffaloes, pigs, pallahs and other antelopes feeding quietly in the very habitat of the tsetse, yet as undisturbed by its bite as oxen are when they first receive the fatal poison" (p. 82) (LIVINGSTONE, 1857).

LIVINGSTONE's book shows on the title page a picture of the tsetse fly. Other pictures of it are found in the first edition on page 571: the fly in natural size, enlarged and the proboscis, drawn by I. E. Gray of the British Museum from specimens obtained by Livingstone.

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II

Cutaneous leishmaniasis

Africa

Oriental sore was known for centuries under various names to the local population in endemic areas.

ELGOOD, 1934, based on the works of Persian and Arabic medical writers, came to the conclusion that the so-called 'Balkh' sore was Oriental sore, and was probably brought to Baghdad by the conquering Mongols in 1258. The early writers assumed that it was transmitted by mosquitoes.

Oriental sore or *Aleppo boil* was described since the second half of the eighteenth century. RUSSEL (1756) and several later physicians found it endemic in Aleppo and described it under the name *Aleppo boil* (STRONG, 1945).

It exists in endemic regions in different parts of Africa: On the mediterranean coast from Morocco, Tunis to Lower Egypt, in the Sudan, in Abyssinia, Uganda, Mozambique, on the Gulf of Guinea and in the Congo. When in the first half of the nineteenth century the French established their rule in North Africa, French physicians, especially naval surgeons, became familiar with the infection.

It is known that the population in some endemic areas inoculated their children with material from oriental sore on parts of the body which are normally covered by clothing. They knew that an infection gives as a rule a lasting immunity, and by their inoculation they prevented a possible infection at a later age on the face, neck or on the arms which would heal with a disfiguring scar.

James Homer Wright in 1903 gave the first complete description of the parasite *Leishmania tropica*. He obtained his mate-

rial from the Oriental sore of an Armenian child which apparently had acquired the infection in its home country two or three months before departure for America and had been admitted to the Massachusetts General Hospital in Boston (note 1).

Wright's case showed, as might be expected, that a patient with Oriental sore can carry the infection to different parts of the world. The question whether the infection will spread depends on the presence of a *Phlebotomus* species suitable to serve as vector.

America

There are no records of a transmission of Oriental sore by negro slaves from Africa to the New World. In view of the large number of African slaves who entered the West Indies and the American continent during about 350 years of the slave trade, it is reasonable to assume that occasionally Oriental sore was carried by an infected slave to the Western Hemisphere. Such an introduction, however, had no visible result. In Central and South America there existed already cutaneous leishmaniasis caused by a parasite *Leishmania brasiliensis*, Vianna, 1911, which is morphologically undistinguishable from *Leishmania tropica*¹. The clinical picture of American cutaneous leishmaniasis is, however, different from that of Oriental sore in the Old World. Generally speaking, the American infection is more severe and destructive and in a certain percentage in South America, especially in Brazil and Peru, involves the mucosa of the mouth, the pharynx and the nose, causing extensive destructions. A form which as a rule only affects the external ear is the 'disease of the Chicleros' occurring chiefly in Yucatán but also in other parts of Mexico. It resembles more closely Oriental sore of the Old World, as also in this form of infection a part of the external ear is usually destroyed.

American leishmaniasis has been recorded from Mexico southwards to the northern part of Argentina with especially numerous cases in Peru and Brazil. Autochthonous cases have so far not been found in Uruguay and Chile (MARTÍNEZ DURÁN, 1964, fig. 14).

Among the people of the different South American countries the infection has nowadays different names, only a few may be mentioned: Brazil: botón de Bahia, ulcera de Baurú, boubá – Dutch Guiana: bosch-yaws – British Guiana: forest yaws – French Guiana: pian bois – Columbia: marranas, puercas – Ecuador: sarna brava – Peru: espundia, uta – Mexico: ulcera de los chicleros.

¹ Recent studies of immunity in American leishmaniasis indicated the existence of different strains of *Leishmania* in the Western Hemisphere which have been given different names.

The term 'uta' is a comparatively modern word which does not occur in the old Queshua and Aymara dictionaries and which was applied to chronic ulcerations of different aetiology, corresponding to the Spanish term 'llaga'. Nowadays it is used, especially by physicians in Peru, for muco-cutaneous leishmaniasis occurring in the high valleys of the Andes, whereas 'espundia' refers to a clinically somewhat different form of muco-cutaneous leishmaniasis, found in the tropical forest at a low altitude (note 2). The Queshua called cutaneous leishmaniasis of the Andes (nowadays 'uta') 'anti-onccoy' (disease of the Andes).

It is of special interest that the Spanish botanist HIPÓLITO RUIZ, who visited Peru from 1777–1788, pointing out the frequent destruction of the nose and the upper lip, stated: 'Los naturales atribuyen el origen del mal a la picadura de un pequeñísimo y casi imperceptible insecto, llamado uta.' – The natives attribute the origin of the disease to the bite of a very small and almost imperceptible insect called *uta*. (Quoted from LUIS A. LEÓN, 1957, p. 31).

The native population evidently held the correct view regarding the transmission of the disease and called the very minute insects (sandflies) 'uta', a term which was later applied to the disease.

Vásquez de Espinosa who wrote his 'Compendio y Descripción de las Indias Occidentales' at the beginning of the seventeenth century likewise mentions among the great number of troublesome insects some very minute ones.

According to LUIS A. LEÓN (1957) the history of American leishmaniasis may be divided into four periods: 1. The pre-Columbian period; 2. the period of the Spanish historians, naturalists, physicians and travellers from the discovery of the New World to about 1885; 3. the period from 1885 to 1909 during which time American leishmaniasis was regarded as identical with Oriental sore of the Old World and 4. the period from 1909 until our days when American leishmaniasis was recognized as an independent disease. First period. It has been mentioned already that the Queshua called the 'disease of the Andes' 'Anti-onccoy' and that the word 'uta' is not found in the old Queshua and Aymara dictionaries. Its radical, however, occurs in these two ancient languages with the meaning *corrosive* or *to gnaw* or *to eat up*. It corresponds to the Spanish *llaga* (teste D'HARCOURT, 1939, p. 94).

Apart from linguistic indications we have a documentation in pre-Columbian pottery, which shows that cutaneous leishmaniasis evidently existed long before the coming of the Spaniards.

Ancient Peruvian Mochica pottery has left in the form of anthropomorphic vessels which date mostly from the pre-Inca period, many representations of pre-Columbian pathology. Some of these

vessels show what may be lesions of the mouth and the nose caused by leishmaniasis or blastomycosis (plate IV). There are figures which possibly represent cases of *Verruga peruviana*. A number of the vessels with facial lesions are according to the modern view, examples of changes due to intentional, possibly punitive mutilations, some vessels may represent normal desiccated heads of mummies (note 3). The comparatively rare occurrence of Mochica vases showing changes which may be attributed to leishmaniasis may be explained by the fact that the people who produced the vessels lived near the coast where leishmaniasis was less frequent. Second period. Soon after the Conquest, Spanish historians mentioned in their works ulcerations and destruction of nose and mouth of the Indians in the high Andean valleys and of Spaniards who entered these regions. FERNÁNDEZ DE OVIEDO (1535) speaks of 'llagas rebeldes'. PEDRO PIZARRO (1571) describes the 'disease of the Andes', which occurs among the inhabitants of the hot humid valleys on the eastern side of the Cordilleras where the Indians cultivate coca. He states that the Indians are decimated by a disease which destroys the nose and affects the nasal cavities. It resembles St. Anthony's Fire and gradually causes the death of the patient. Natives of these valleys are similarly attacked as newcomers (note 4).

FRAY RODRIGO DE LOAYSA (1586) deplored the Indians who in order to be able to pay the excessive taxes imposed by the Spaniards went for work to the regions where coca was cultivated. There they got the disease so that out of ten only five returned and these in a most miserable physical condition (teste D'HARCOURT, 1939). He calls the disease 'ande-ongo' (from the Indian name 'anti-onccoy'). It destroys the nose and 'worms' develop and multiply in the nasal cavities (note 5). SANTILLAN (1572) compared the disease of the coca growing Indians to cancer.

For additional details and literature, see COBO, 1890-1895; D'HARCOURT, 1939; GARCILASO DE LA VEGA, 1943; LAS CASAS, 1927; LASTRES, 1951; LAVORERIA, 1902; PALMA, 1908.

Third period (about 1885-1909). American leishmaniasis was identified with Oriental sore. This opinion was already held by Bravo in 1852. In Brazil A. Cerqueira (1885) expressed this view which was shared by numerous subsequent investigators (teste LUIS A. LEÓN).

Fourth period (from 1909 to the present time). Leishmanias were found by CARINI and PARANHOS in 1909 in 'ulcera de Baurú' in Brazil and later in the various forms of leishmaniasis in South- and Central America and in Mexico. G. Vianna in 1911 created the

species *Leishmania brasiliensis* and postulated its specificity in causing American leishmaniasis.

As the present publication deals only with early documentation and transmission, the reader interested in the more recent work on leishmaniasis is referred to P. WEISS, 1943, and LUIS A. LEÓN, 1957. He will find in these two publications numerous bibliographic references.

The fact that American cutaneous leishmaniasis with destruction in various degree of nose and mouth involving the mucosa existed already long before the coming of the Spaniards and their slaves is of considerable medical interest. The American destructive cutaneous leishmaniasis evidently did not develop from an introduced comparatively mild Oriental sore, carried from the Old World, but existed long before such an introduction might have taken place.

Notes

1. Leishmanias were probably first seen by Cunningham in 1885, later by Firth in 1891 and by Borowsky, a Russian military surgeon in Tashkent in 1898.

2. In 'uta' the ulcerative skin lesions may invade the mucosa by direct extension. In 'espundia' the ulcerations of the mucosa usually have no direct contact with the primary skin lesions, and appear often after the skin lesions have healed.

American cutaneous leishmaniasis shows different clinical pictures in different parts of the continent. In Mexico, Central America and in French Guiana *L. brasiliensis* invades the mucosa comparatively seldom. In some hot humid regions, as in parts of Brazil, involvement of the mucosa is frequent. SHATTUCK (1938) pointed out the correlation in the degree of severity of *L. brasiliensis* infection and different parts of South- and Central America and Mexico.

3. The Peruvian anthropomorphic vessels 'huacos' with facial lesions attracted the attention of anthropologists, pathologists and physicians since the middle of the last decade of the nineteenth century. At first leprosy, lues and lupus were chiefly regarded as cause of the facial changes. This opinion was gradually discarded in favour of uta and blastomycosis. Intentional punitive mutilation seemed also a possible explanation.

HOLLÄNDER (1912) expressed the opinion that some of the vessels with supposed signs of a destructive disease such as uta merely were representations of heads of desiccated mummies. He pointed out that in such mummies as found in the dry climate of Peru the lips retract so that the teeth are visible to a great extent. The nose

shrinks and may even give the impression of having been cut off during life. HOLLÄNDER believed that these huacos formed a parallel to the antique European drinking cups with reliefs of skeletons such as found in Pergamon and Boscoreale. They served the purpose of stimulating the guests to drink according to 'carpe diem'. A few Peruvian vessels have on the top a sitting blind musician without nose and lips, playing a tamburine. A reliefband or paintings encircle the vessel showing skeletons and dead people without nose and lips dancing and playing instruments.

A rather unusual explanation of the face destructions was given according to H. DIETSCHY (1938, p. 2016) by R. N. Salaman, who had made special studies on the history of the potato. He came to the conclusion that the changes of the face in the Peruvian vessels were intentional ritual mutilations in connection with the potato cult. According to Salaman, the mutilations were carried out so that the head without nose and lips somewhat resembled a potato and was regarded as representing the potato-demon, called papamama by the Queshua. In this connection it may be mentioned that Peruvian pottery shows specimens of a large potato with two human noseless faces (father and mother) and several small faces with their pointed noses just emerging from the potato (the children).

Leaving apart the various mentioned explanations, it may be stated that a certain number of the Peruvian huacos with lesions of the face represent in the present writer's opinion destructions caused by leishmaniasis (uta).

4. More recent investigators such as PALMA, 1908, and TAMAYO, 1908, found that in endemic regions the native population has a certain immunity against uta. According to these authors, usually children there get this disease which heals spontaneously leaving only some scars. TAMAYO assumes the existence of a hereditary immunity.

5. FRAY RODRIGO DE LOAYSA in 1586 states: 'Los que entran en los Andes que les da un mal en las narices a manera de mal de San Antón, que no tiene cura, aunque hay algunos remedios para entretenerla, al fin se les vuelve y les mata' (copied from P. WEISS, 1943, p. 320).

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III

*Malaria**Africa*

Malaria, on account of the characteristic periodical recurrence of the fever attacks and the enlargement of the spleen, must have been recognized in very early times and differentiated from numerous other diseases accompanied by fever. We find descriptions of what must have been malaria in early medical texts of various ancient civilizations, for example in Mesopotamia, India, China, Greece, and Rome.

Plasmodium infection existed in prehistoric times long before the coming of man. Mosquitoes found in translucent amber and petrified mosquitoes from the Isle of Wight include *Culex*, *Aedes*, and *Mansonia*. As RUSSELL, 1955, points out, it is very likely that malaria-transmitting *Anophelini* which morphologically represent a more primitive stem, likewise existed. The earliest human infections probably occurred in Africa. Certain chimpanzees in Central Africa are naturally infected with a plasmodium which seems identical with *P. malariae* of man. The quartan parasite is probably the oldest plasmodium in the scale of evolution and was possibly the earliest to infect man.

Mosquitoes and malaria: Herodotus, c. 500–424 B.C., states that the Egyptian fishermen used to sleep with their nets arranged around their beds, so that mosquitoes could not reach them (note 1)¹.

A connection between mosquitoes and disease was assumed by various Arabic authors, for example by al-Harith ibn Kalada, a physician of Mohammed (GEMAYEL, 1932).

In Somaliland, the Somalis have the same word *Kaneo* for both mosquito and malaria. In the middle of the nineteenth century, RICHARD BURTON (1856) landed on the coast of British Somaliland and went up into Abyssinia. In several of his accounts he mentions the belief of the native population that malaria is transmitted by the bite of mosquitoes. Negroes in the Usambara mountains called malaria *Mbu*, the name for mosquito, as they believed that malaria came from the bite of mosquitoes when they went to the lowlands (teste Robert Koch, see RUSSELL, 1955, p. 40). In some parts of East Africa, the local Bantu equivalent of the Kiswahili word *Mbu*,

¹ Regarding beliefs in a connection between mosquitoes and malaria held in different countries and statements by various authors, see RUSSELL, 1955, chapter 3.

mosquito, is similarly used for both mosquito and malaria which is known as the mosquito sickness².

It is very likely that malaria existed in Ancient Egypt, although it may not have been very important for the population as a whole. Enlarged spleens, possibly due to malaria, have been found in mummies about three thousand years old (teste RUSSELL, 1955). Enlarged spleens with fever are mentioned in the Papyrus Ebers (EBBELL, 1937) but there is no clear description of malaria in the papyri which so far have been translated.

In 1892 W. GROFF discussed the inscription of a prayer to different months of the year in the temple of Denderah. This prayer mentions the periodical action of the evil spirit *Aat* represented by the goddess Sekhmet and the calamity following regularly the inundation of the Nile. GROFF drew the conclusion that it was malaria which nowadays is prevalent annually in September and October after the inundations.

Prof. Ch. Kuentz, Ancien Directeur de l'Institut français d'Archéologie orientale in Cairo, with whom the present author discussed the question of the existence of malaria in ancient Egypt, drew his attention on two similar inscriptions in the temple of Denderah and the temple of Edfu (note 2). The inscriptions represent a long prayer to the New Year; each stanza begins with an invocation to the New Year that it may be favourable. In the temple of Denderah the stanza in question says: "O Year . . . keep the goddess Hathor free from all misfortune, from all calamity, from all bad air." In the temple of Edfu the wording is the same, except that the prayer is in favour of the local god Horus, identified with Pharaoh, and that the sequence of the words is different: "from all misfortune, from all bad air, from all calamity" (note 3).

The expression 'bad air', although vague, reminds of 'mal-aria' and might be interpreted as suggesting the specific disease 'malaria'³.

Regarding this point, the present writer consulted also Prof. W. Westendorf, Director of the Seminar für Aegyptologie at the University of Munich⁴. In his answer Prof. Westendorf expressed his opinion as follows:

The wording *t3w nb dw* "all bad air" or "every kind of noxious breath" does not allow the assumption of a specific disease. In the

² The writer wishes to express his thanks to Dr. J. R. Audy, Director of the George Williams Hooper Foundation, University of California, for the information about the views of negroes regarding a connection between mosquitoes and malaria.

³ Concerning the name 'malaria', see RUSSELL, 1955, pp. 17-23.

⁴ Now at Göttingen.

old Egyptian medicine this wording is so widely used, also in other connections, that one has to regard it as a figurative expression to indicate causing a disease in an indirect way as if a malevolent God breathed on human beings.

Also nb "every, every kind of" indicates that it is a collective notion which in the text of PAPHOS EDWIN SMITH and the closely related Denderah and Edfu texts might be translated as epidemic or pestilence. There is the only certainty that this pestilence appears in connection with the Nile inundation. It may be malaria but just as well typhoid fever or some other disease. It is absolutely certain that the expression in Denderah and Edfu is identical with that in PAPHOS EDWIN SMITH in as far as the incantations against epidemics are concerned.

From these discussions one may conclude that malaria was possibly one of the diseases to which the prayer refers; the expression is, however, too frequently used and too vague to diagnose malaria with a certain probability⁵.

When Europeans started the African slave trade, malaria was known to exist widespread in Africa. The Guinea coast gradually got the reputation of being so unhealthy that Europeans could hardly live there. Examples of the high death-rate are found in Hakluyt's *Voyages* and later ones have recently been published by GELFAND (1965) in his *Rivers of Death*. He showed that the loss of lives chiefly due to malaria but to some extent also caused by dysentery was extremely high (see Part Three: Diseases and mortality of Europeans on the Guinea coast at the time of the slave trade). Reports on malaria in the Dongola region in the first half of the nineteenth century have been collected and published by D. J. LEWIS (1948).

America

Malaria existed widespread in Europe, especially in Italy, Spain and Portugal⁶. It is therefore certain that the conquering Spaniards carried malaria to the West Indies and the American mainland. In a much higher degree, however, malaria was transmitted by the ever increasing number of negro slaves as most of them were probably infected.

⁵ The author is greatly indebted to Prof. Ch. Kuentz for having drawn his attention to the inscriptions, and to Prof. W. Westendorf for his detailed information.

⁶ In the second half of the 15th century so many negroes were brought to Portugal that the malaria which they introduced depopulated portions of the Tagus valley. (R. LINTON, 1955; E. H. HUDSON, 1964.)

In this connection the question arises: Did malaria exist in America before the arrival of Columbus, or was it for the first time introduced during the Conquest?

JARCHO (1964) has examined this question carefully and critically and comes to the conclusion based on the paleontological, archeological, linguistic, historical, epidemiological and clinical evidence discussed by him, that there is no convincing documentation that malaria existed in any part of the Western Hemisphere before the arrival of Columbus. His personal opinion is that the presence of malaria in pre-Columbian America is improbable but not impossible.

ASHBURN (1947) had come to similar conclusions. He found no real evidence that malaria existed in any part of America before the Conquest. As the disease was common and well recognized in Europe, it would, according to ASHBURN, certainly have been mentioned by the early Spanish chroniclers if the Spaniards had observed it after their landings. In later works dealing with the New World it was frequently mentioned.

For one or two generations after the first arrival of the Spaniards, there are no reports of diseases which might be regarded as malaria, not even from localities which later acquired the reputation of being highly malarious. Examples are the Isthmus of Panama, Honduras and the Mexican coast near Veracruz. Cortés and his troops remained there from March to August 1519 before starting for the conquest of Mexico. Neither Cortés in his letters to Charles V nor BERNAL DIAZ DEL CASTILLO nor GÓMARA in their descriptions of the Conquest mention diseases among the troops which could be regarded as malaria. Guayaquil, which later got a very bad reputation of being highly malarious, was a health resort before and during the first time of the Conquest. HERRERA stated that many sick people went there to recover their health. The coastal area near Veracruz, which later became very unhealthy on account of malaria, was thickly populated when the Spaniards arrived.

BUSTAMANTE, 1967, points out that the various flourishing pre-hispanic civilizations, especially those of the Olmecs and Mayas, could not have developed in highly malarious regions.

The question whether man may have brought malaria with him from Asia to America across the Siberian Alaskan connection has been discussed and rejected by BOYD, 1941, JARCHO, 1964, DUNN, 1965, and others. Conditions in north-eastern Siberia and north-western North America during and after the Pleistocene did not allow malaria transmission.

The Vikings, who without doubt reached the coast of north-

eastern America about five hundred years before Columbus (INGSTAD, 1964⁷), arrived at regions north of any *Anopheles* mosquito population which could have transmitted malaria. If one admits that perhaps a few people from islands of the central Pacific reached the American continent in subtropical and tropical zones, one has to consider that these islands have been without *Anopheles* which might have served as vectors and have probably always been free from malaria (RUSSELL et al., 1963). Pre-Columbian contacts of the New World with the Old across the Pacific Ocean were discussed by CLARKE, 1961; MASON, 1961; MACGOWAN and HESTER, 1962; MCNEILL, 1963.

BRUCE-CHWATT, 1965, on the other hand, regards it as probable (though not proved) that malaria existed in the Americas before the Spanish conquest and that sea-going people may have brought it to the New World long before the voyage of Columbus.

In this connection one has to consider the possibility of its introduction into small areas by negroes who reached the Western Hemisphere before Columbus, either by shipwreck or by bringing merchandise as slaves of Arabic traders. A number of investigators have dealt with this question.

In examining the results of their studies one gets the impression that negroes came to the American shores long before Columbus and settled there in a few small communities. Even if some of the reports are vague and contradictory in details, there remain other statements which evidently record simple facts. As the question of the arrival of negroes from Africa in the Western Hemisphere before Columbus is of special importance regarding the possible existence of malaria in America before Columbus, we have dealt with these reports in some detail in note 4.

One is justified in assuming that among the negroes who may have arrived from Africa before Columbus there were some who carried malaria parasites in their blood, and as in all likelihood *Anopheles*, which might serve as vector existed in America, it is probable in the present author's opinion that malaria existed before Columbus in America in a few small areas with isolated communities which had no connection with the indigenous Indians with whom they were, as for example in Darien, constantly at war.

It should be added that in recent years simian malaria attracted special interest. The accidental infection in 1960 of four research workers with *P. cynomolgi bastianelli* from *Macaca mulatta* following bites of infected *Anopheles freeborni* produced symptoms of *vivax* malaria (EYLES, COATNEY, and GETZ, 1960).

⁷ See also: *The Vinland Map and the Tartar Relation* by R. A. Skelton, Th. E. Marston and G. D. Painter. Yale University Press, New Haven and London, 1965.

Of interest are also the results of recent experimental work by EYLES, COATNEY & GETZ, 1960, and BEYE et al., 1961, who were able to transmit *Plasmodium cynomolgi bastianelli* from rhesus monkeys to man by the bite of heavily infected mosquitoes (*A. quadrimaculatus* and *A. freeborni*) and the work of COATNEY, 1963, who succeeded in transmitting *P. cynomolgi* from man to man.

DUNN, 1965, who made special studies of the malaria parasites of neotropical primates, came to the conclusion that indigenous human populations and cebid monkeys must originally have got malaria parasites from Europe and Africa. Based on the result of his studies he assumes that malaria was introduced into the Western Hemisphere after 1492.

COCKBURN, 1963, and BRUCE-CHWATT, 1965, likewise discussed the relationship between simian and human malaria in connection with the problem of eradication.

Modorra

A disease which was introduced by the Spaniards into America early in the sixteenth century and caused many deaths among the Spaniards was known as modorra. Its symptoms were fever, apathy, loss of consciousness and coma. The best descriptions are those by DIAZ DEL CASTILLO and LÓPEZ DE GÓMARA dealing with the last illness and the death of Luis Ponce de León, who had been sent out from Spain to succeed Cortés. From the descriptions it is difficult to make a definite diagnosis, and modorra is here only mentioned, as some authors assumed that it was a cerebral form of malaria. From the various symptoms, which need not be discussed here, one may draw the conclusion that modorra was not malaria but possibly epidemic cerebrospinal meningitis (STICKER, 1922).

Blackwater fever – Schwarzwasserfieber

Blackwater fever in the modern sense of the word, connected with attacks of malaria or a prolonged malaria infection, was only recognized as late as in the second half of the nineteenth century. Before that time blackwater fever was apparently often confused with other diseases accompanied by fever and dark urine.

Between 1850–1860 French naval surgeons described blackwater fever from Madagascar. At about the same time it was observed in Greece. In North America it was first described in 1859 from Louisiana and subsequently from several other Southern States. It is common in Central America and the West Indies, also

in the northern part of South America. It is, however, of greatest importance in tropical Africa.

Blackwater fever is rare in Negroes. It affects particularly Caucasians who lived for long periods in the tropics where malignant tertian is widespread; it is also found among Arabs, Hindus and Chinese.

There is no connection between the slave trade and the occurrence of blackwater fever in America.

Notes

1. HERODOTUS. "Gnats are abundant; this is how the Egyptians protect themselves against them; those who dwell higher up than the marshy country are well served by the towers whither they ascend to sleep, for the winds prevent the gnats from flying aloft; those living about the marshes have a different device instead of the towers. Every man of them has a net, with which he catches fish by day, and for the nights sets it round the bed where he rests, then creeps under it and so sleeps. If he sleeps wrapped in a garment or cloth, the gnats bite through it; but through the net, they do not even try at all to bite." Book 2. 95. Loeb Classical Library, 1946.

2. The Horus temple of Edfu was built between 237–57 B.C. The temple of Denderah was built at the time of Augustus and was dedicated to the goddess Hathor.

3. The inscription in the temple of Denderah is found in: A. MARIETTE, *Le temple de Dendérah*, Paris 1873. Tome IV, planche 30 c, 4.

The second inscription is found in: E. CHASSINAT, *Le temple d'Edfou*, Cairo 1931 (Institut français d'archéologie), Tome VI, p. 96, 1. 58.

4. Among investigators who dealt with the question of the presence of negroes in pre-Columbian America are the following: AHMAD ZAKĪ PASHA, 1920; COMAS, 1956; DONNELLY, 1950; HERRERA, 1944; IBN FAḌL ALLĀH AL-'UMARĪ, 1927; JEFFREYS, 1953; LAS CASAS, 1951; LÓPEZ de GÓMARA, 1941; PEDRO MÁRTIR DE ANGLERIA, 1944; QUATREFAGES, 1887, 1889; SCHEDL, 1957; STEWART, 1939; WEITZBERG, 1922; WIENER, 1920–22.

QUATREFAGES (1887)⁸, according to DONNELLY (1950, p. 137), reported that "Black populations have been found in America in

⁸ JEAN LOUIS ARMAND DE QUATREFAGES DE BRÉAU (1810–1892), *Introduction à l'étude de Races Humaines* (Paris, 1887).

very small numbers only, as isolated tribes in the midst of very different populations. Such are the Charruas of Brazil, the Black Carribees of Saint Vincent, in the Gulf of Mexico; the Jamassi of Florida, . . . such, again, is the tribe that Balboa saw some representatives of in his passage of the Isthmus of Darien in 1513 . . . they were true Negroes."

JEFFREYS, 1953, p. 210, points out that between the islands of the Atlantic coast of Africa and the Americas lies the region of the calm equatorial seas of the Doldrums. Such seas are in their calmness most suitable for vessels driven by oars and the heavy rainfall ensures a water supply. The Arabs used maps, astrolabes and a primitive kind of compass. They knew the Canaries and the Azores⁹ before the first Europeans landed there¹⁰.

Regarding Columbus, JEFFREYS, 1953, p. 211, states: "From the Journal of his third voyage, JANE translates 'certain chief men of that island of Santiago came to see him and they told him that to the southwest of the island of Huego, which is one of the Cape Verde Islands and which is twelve leagues from them, an island was visible . . . and that there had been found canoes which set out from the coast of Guinea and steered to the west with merchandise'."

Further JANE writes (quoted from JEFFREYS, 1953, p. 211): "... and that he (Columbus) thought of testing the truth of that which the Indians of Espaniola (Haiti) said that there had come to this island from the direction of the south and the south-east black people and that they had the points of their spears made of a metal which they call 'guanin', of which he had sent some to the sovereigns that an assay might be made, from which it was found that of thirty-two parts, eighteen were gold and six silver and eight copper" (see also HERRERA, vol. I, p. 325, Asunción del Paraguay, 1944). The present author does not know of any statement that Columbus carried out the planned investigation regarding the alleged arrival of black people in Espaniola previous to his own landing.

There exist reports by three early Spanish chroniclers about Vasco Nuñez de Balboa's finding negroes on his march across the Isthmus of Darien, when he was on his way to discover the Pacific.

PEDRO MÁRTIR DE ANGLERIA¹¹ states in his *Decada Tercera*,

⁹ The Canaries and the Azores were inhabited by stone-age populations and Carthaginian coins of the fourth century B.C. have been found on one of the islands of the Azores. (BIBBY, 1962.)

¹⁰ LI HUI-LIN, 1960, provided evidence of transatlantic travel by Arab mariners from the study of Chinese geographical documents of the twelfth century.

¹¹ PIETRO MARTIRE DE ANGLERIA belonged to an ancient family of Arona in the north of Italy. In 1487 he went to Spain where he remained to the end of his life. He died in 1525 at the age of seventy.

libro I, Capitulo 2, p. 200, 1944: "Encontraron alli' esclavos negros de una región que dista de Cuarecua solo dos dias, en la cual no se criian más que negros, y estos feroces y sobremanera crueles. Pien-san que en otro tiempo pasaron de la Etiopia negros a robar y que naufragando, se establecieron en aquellas montañas. Los de Cuare-cua tienen odios intestinos con esos negros, y se esclavizan mutua-mente o se matan."

FRANCISCO LÓPEZ DE GÓMARA, 1941, tells the same story but with the slight difference of stating that Balboa received some black slaves from the Cacique.

The third early chronicler who refers to the negroes, whom Balboa met in Darien, is BARTOLOMÉ DE LAS CASAS. He also gives a different report by stating that Balboa fought a battle with the black people whose chief was Quarequa, who perished in the fight.

Neither HERRERA nor OVIEDO referring to Balboa's expedition mention the episode with the negroes.

A very curious story is told by IBN FADL ALLĀH AL-'UMARĪ in his famous *Masālik al-absār fi mamālik al-amsār* (1927). He reports that Mansa Musa, sultan of Mali (Melle) made in 1324 a pilgrimage to Mecca with a great number of attendants and great riches, especially gold which he spent so lavishly that the price of gold in Cairo dropped for several years. His pilgrimage was long remembered. When reaching Cairo, Mansa Musa stopped there for a while, and was invited by the governor of Cairo Ibn 'Amir Hadjib. The governor asked the sultan how he had reached his high position and Mansa Musa gave the following explanation: His predecessor wished to know whether there was land in the West of the (Atlantic) ocean. He therefore fitted out 400 boats, 200 to transport his men and 200 to carry gold, water and food, sufficient for a long journey. After a long time only one boat returned. The captain told the sultan that his boat had been the last one and that all preceding boats had been swallowed by a very strong current in the midst of the ocean. He had therefore returned. The sultan did not believe this story and fitted out a still larger fleet with more men and he personally took part in this expedition after he had delegated his royal power for the time of his absence to Mansa Musa. Nothing was ever heard of these boats and the men. When after a very long time the sultan had not returned, Mansa Musa became officially the new ruler. This story was nearly literally copied by AL-QALQASHANDĪ in his chronicle.

IBN FADL ALLĀH AL-'UMARĪ heard the story from the governor Ibn 'Amir Hadjib directly, or through the governor's son, the emir 'Amir Hasan 'Alī. In 1920, AḤMAD ZAKĪ PASHA translated the story of 'Umari into French and published it in the *Bulletin de l'Institut*

d'Egypte (tome 2, pp. 57–59, 1920). It was again translated by GAUDEFROY-DEMEMBYNES in the Bibliothèque des Géographes Arabes, tome II, Paris 1927. This last translation was used by the present writer¹².

It is unlikely that Mansa Musa's story as recorded by 'Umari is a pure invention; it is obviously possible that the expedition got lost at sea, there is, however, a possibility that some of the boats reached the Western Hemisphere and that the negroes settled somewhere in tropical America. There are certain indications of relations between Negroes and Indians in Central America and Mexico.

However, the statement by WIENER, 1922, that a colossal stone head of a negro had been found in the region of Tuxtla is apparently based on a misconception. A number of colossal basalt heads, some with a flat nose and thick lips, were found in the region of Tres Zapotes and San Lorenzo (Veracruz) and La Venta (Tabasco). These heads – one at San Lorenzo has a height of more than nine feet – belong to the Olmec culture and do not represent negroes. Up to 1955 ten typical colossal heads were known (STIRLING, 1940, 1943, 1955).

Cowrie shells, *Cypraea moneta*, which came from the Eastern seas, were brought by the Arabs to Africa. They were widely used as currency on the Guinea coast. Cowrie shells have been found in the Roden Mounds, Marshall County, Alabama (JEFFREYS, 1953, p. 213). The Roden Mounds were constructed before their builders had any contact with white people.

Non-barking dogs were found by Columbus on his first voyage when he went ashore on Cuba. JEFFREYS, 1953, justly asks: Is it a coincidence that the dogs of negro Africa likewise do not bark?

Another indication of a relation between negroes and Central American Indians is given by the distribution of four food crops; as pointed out by JEFFREYS, 1953, Yam, Taro, Manihot, and Maize. The first two are not indigenous to America, the other two are. All were long cultivated in Africa before Columbus sailed for America (see also JEFFREYS, 1953a, Pre-Columbian maize in Africa).

Lastly it should be mentioned that T. D. STEWART, 1939, described (pre-Columbian?) negro skeletal remains from Barbados, British West Indies.

¹² This rather fantastic story unfortunately does not indicate the place on the African West coast wherefrom the expedition started.

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IV

Amoebic dysentery

General statements

Dysentery has drawn the attention of physicians and laymen from early times.

During the first half of the nineteenth century the old theory still prevailed that dysentery was but one of the symptoms of malaria.

Although dysentery was known in Europe from antiquity, its existence in the tropics drew general attention only from the eighteenth century on, on account of the very high death rate which it caused among the Europeans and to some extent among the native population.

A series of interesting studies were published from the West Indies where England had obtained colonies. There were always many cases among the soldiers, sailors and the negro slaves.

In India likewise a number of British physicians paid special attention to dysentery; BALLINGALL, 1818, based on his experience with European troops in India, differentiated the two distinct clinical types of dysentery, now known as the amoebic and bacillary form.

In the second half of the 19th century, LAMBL's finding in Prague, 1859, of living *amoebae* in the stool of a child with diarrhoea and, most important, the discovery by LOESCH, 1875, in St. Petersburg of *amoebae* in a case of chronic dysentery and his experimental transmission of the infection to four dogs started a series of scientific investigations which placed the knowledge of amoebic dysentery on a solid base.

SHIGA, 1898, discovered and isolated in Japan the dysentery bacillus of the epidemic form.

Among the various remedies employed in cases of dysentery ipecacuanha played an important rôle. This drug is the root of *Cephaelis ipecacuanha*, a native plant of Brazil. The first statement

of 'ipecaya' as a remedy for the 'bloody flux' was made by a Portuguese priest, it was published by SAMUEL PURCHAS in 1625 (note 1). The 'dysentery root' was used by the Indians. PISO, 1648, referred to it and described the plant¹.

Africa

In Africa we find dysentery mentioned as one of the greatest dangers to health already in the earliest reports by traders, travelers and sea-captains. Dysentery existed evidently widespread in Africa from ancient times. This is proved by the fact that the natives were not only familiar with it, but had developed quite elaborate systems of treatment which, although rather different from European methods, were in many cases quite efficient (CLARKE, 1860).

J. BARBOT, 1732, in his description of the coasts of South Guinea states: "The Bloody-flux is also common, and sweeps away multitudes of the Blacks after they have lost all their blood. They fancy this distemper is given by witches and sorcerers called here *Sovah-Monou*. The Quojas Negroes affirm, they never knew of the bloody-flux till it was brought from Sierra Leona in the year 1626, eight months after the Dutch admiral Laun had left that place."

The 'bloody flux' caused the death of many Europeans and made more invalids. Among well-known victims were Clapperton and David Livingstone.

There are no early publications from Africa which like some in the West Indies and India distinguished between the two forms, bacillary and amoebic dysentery. It is certain that both were present and that the epidemic outbreaks among negro slaves in the barracoons on the African coast and on the slave ships were bacillary dysentery.

In Egypt KARTULIS, 1885, found *amoebae* in the stool of 500 patients suffering from dysentery and also in the wall of liver abscesses. KRUSE and PASQUALE, likewise in Egypt, proved in 1893 experimentally the existence of two species of *amoebae*, one harmless (*E. coli*), the other one pathogenic (*E. histolytica*) producing amoebic dysentery.

America

WINTERBOTTOM, 1803, and BRYSON, 1847, described the horrors of dysentery among the slaves. Out of 700 slaves shipped from

¹ For more details regarding the early history of dysentery the reader is referred to Sir PHILIP MANSON-BAHR, *The Dysenteric Disorders*, second edition, 1944, chapter III.

Sierra Leone to Barbados, only 380 lived to reach their destination (WINTERBOTTOM).

BRYSON, Director General of the Naval Medical Service, who passed nine years mostly in ships on the African West Coast, writes in his *Report on the Climate and Principal Diseases of the African Station*: "The diseases from which negro slaves suffer most severely on board of the vessels destined for their transportation, are dysentery, fever, small-pox, ophthalmia, and diarrhoea; the first two are by far the more generally destructive and it not unfrequently happens that they acquire such virulence, as to carry off a fourth or even a third of the whole cargo in the short period of a few weeks" (note 2).

Amoebic dysentery exists nowadays all over Africa with North Africa and especially the equatorial parts showing a much higher incidence. Negro slaves who were mostly taken from the tropical zone of West Africa, will have carried their amoebic infection to the Western Hemisphere together with the more spectacular bacillary infection.

Similarly as in the case of malaria the question arises: did amoebic dysentery exist in America before the arrival of the negro slaves? It is hardly possible to give a definite answer. It seems that in Central- and South America, the infection, although widespread nowadays, is nevertheless apparently more frequent in certain areas and therefore somewhat more localized than in Africa.

Some of the places where formerly slaves disembarked are nowadays heavily infected, which might be interpreted as an indication that the infection was originally introduced by African slaves. However, in the absence of extensive examinations regarding amoebic infection in places to which slaves were shipped in large numbers over long periods and comparative examinations of regions which had formerly few slaves, one has to defer judgement as to whether amoebic dysentery existed in America before the coming of the Spaniards. In any case it is certain that negro slaves carried the infection to the Western Hemisphere.

Notes

1. "For the Bloudy Fluxe. Igpecaya or Pigaya is profitable for the bloudie Fluxe; the stalke is a quarter long, and the roots of another or more, it has onely foure or five leaves, it smelleth much wheresoever it is, but the smell is strong and terrible, this roote beaten and put in water all night at the deaw, and in the morning if this water with the same roote beaten and strained be drunke,

onely the water it causeth presently to purge in such short, that the laske ceaseth altogether." (From PURCHAS Hakluytus posthumus; or Purchas his Pilgrimes, 1625, copied from MANSON-BAHR, 1944, p. 23.)

2. "There is perhaps not any condition in which human nature may be viewed in a more revolting aspect than that of a crowded slave vessel with dysentery on board. Of all the horrors attending the middle passage with the exception perhaps of small-pox, it is the worst. The effluvium which issues from her decks, or rather prisons, is peculiar and sickening by any conception, and is generally perceptible at a great distance to leeward" (BRYSON, 1847).

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