The scrolls discovered in the ruins of the city of Kahun record the presence in the Nile Valley of urinary schistosomiasis in its most widely known clinical manifestation, haematuria, under the Xlith dynasty, around 1900 B.C. Calcified Schistosoma haematobium eggs have also been found in two mummies dating from the XXth dynasty (1250-1000 B.C.). But it was not until 1851 that Theodor BILHARZ, whose name was to remain associated with the disease, identified the parasite causing urinary schistosomiasis at the Qasr el Ayni hospital in Cairo. In 1915, LEIPER identified the snail intermediate hosts.

At the present time, both S. mansoni and S. haematobium infections are found in the Nile Delta. In Upper Egypt, only urinary schistosomiasis has been reported. The estimates of the total number of people infected range from 6.9 million (DEWOLFE-MILLER) to 20 million (AYAD), which means that Egypt is one of the most highly endemic areas in the world (42).

I. POPULATION DISTRIBUTION OF S. HAEMATOBUM INFECTION

In 1937, SCOTT published the first complete study of the distribution of schistosomiasis in the Valley (Upper Egypt) and the Delta (Lower Egypt) of the Nile (1). His estimates were based on a field survey of 40,000 people which he himself conducted, and also on the statistics of the "mobile hospitals" of the Endemic Diseases Section of the Ministry of Public Health (which covered nearly 2 million people). He suggested that the average prevalence rate of S. haematobium infection was 48% (which correlated with available hospital data). Of the population of 15,230,000 of Egypt at that time, 6,330,000 would thus have been infected with S. haematobium. In Lower Egypt, mean provincial prevalence rates showed that S. haematobium infection was present in more than half or as much as two-thirds of the population examined: 52% at Gharbiya, 53% at Beheira (Buheira), 61% at Qalyubiya, 63% at Minufiya (Shibin El Kom), 86% at Sharqiya. In the Valley itself, the variations were enormous: 93% at Fayum, 82% at Beni Suef, 54% at Giza, 45% at Minya (Minieh) in the Middle Valley, with very much lower rates for the Upper Valley (22% at Assiut, 13% at Aswan, 4% at Qena and 3% at Sohag). Below Cairo (El Qahirah), the prevalence was between 25% (El Ghafraria) and 26% (Sursok) in the eastern part of the Delta; in the western part, prevalence ranged from 36% (Aurin) to 79% (Kom Abu El Eida); between the two main branches of the Nile there was 28% infection at Shalma, near the Mediterr-

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Above Beni Suef, prevalences of S. haematobium over 30% are very rarely found: one locality in the Governorate of Minya (33.2% at Beni Amer), two localities in the Governorate of Assuit (30.4% at El Mansha Kobra and 47.3% at Seresna). The prevalence was 42.8% in the village of El Awawna, not far from Ilnhassa, near the Bahr Yusef tributary.

In the Nile valley proper, the epidemiological distribution of urinary schistosomiasis has changed more since 1955. In 1952, mean prevalence rates between 11% and 24% have been recorded both at Giza near the Delta, at Minya (14.7%) and Assuit (11.1%), in the Middle Valley, and at Sohag (14.9%), in the Upper Valley at Aswan. In the first two localities, a prevalence rate of 12.3% was found, which was approximately half the rate reported in 1955 (23%) and in 1965 (27%), while prevalence fell sharply between 1965 and 1979 in the regions of Beni Suef and Fayoum: from 41.4% to 13.3% in the former, and from 48.4% to 12% in the latter case.

In the Fayoum depression, the sector of Tamiya had a high prevalence of S. haematobium (the prevalence was 53.5% in El Fayoum, 47.3% in Beni Amer, and 47.3% at Seresna). The prevalence was 42.8% in the village of El Awawna, not far from Ilnhassa, near the Bahr Yusef tributary.

A survey carried out in June 1980 revealed variable but often high prevalence (from 17% to 75%) among the fishermen frequenting this very vast area. Before 1978, when the Egyptian Ministry of Public Health updated SCOTT's surveys in 1975, the same villages were thus investigated after an interval of 20 years. More than 120,000 people were examined. A downward trend in the national prevalence rate of S. haematobium infection emerged from this work (38% in 1955 as compared with 48% in 1937). This decline in prevalence was substantial both in the Middle Valley, in the provinces of Fayoum and Beni Suef, and in the Delta around Qalyubia (a fall of over 50% of the cases of Schistosoma haematobium and slightly in Minya, Assuit, Sharqiya, Beheira, and especially Dakka iya and Gharbiya. On the other hand, however, the prevalence had increased from 13% to 23% in the Aswan region, and, most surprisingly, from 4.2% in 1937 to 42% in 1955, in the Upper Nile Valley. In 1972, DAZO & BILES (111) found a mean prevalence of 38.1% for the Upper Valley. In the Aswan sector, the prevalence was 32.4%.

In 1979, a third schistosomiasis survey covering all of Egypt was carried out under the auspices of the Ministry of Health. In the western part of the Delta, there was a continued decline in prevalence. Less than 5% of the population examined in the Governorate of Alexandria were infected, an arrearage more than 20% in that of Beheira. The prevalence was less than 10% in one-third of the communities investigated; another third had prevalences between 10% and 20% only in Assiut and Monufia. In the west of Upper Egypt, (Assiut and Zateen, 89.9%). In the central part of the Delta, the prevalence also showed a downward trend: 17.3% in the Governorate of Kafr El Sheikh, 49.7% in Kafr El Sheikh, 69.7% and 60.3% in El Bakaouros and Qosha (district of Qalseen) respectively, 54.5% in Zagazig, 30.9% in Qalseen (district of Zafra) and 100% at Amroos (El Shohada and Manshat Soltan (Monufia). In the eastern part of the Delta, the prevalence continued to decline substantially, falling between 1965 and 1979 from 38.5% to 17.3% in the Governorate of Qalyubiyia, from 51% to 17% in that of Sharqiya and from 41.9% to 16% in Daqqakilia. In Damietta, at the mouth of the eastern branch of the Nile, the prevalence was already very low, widespread infection was found in the prevalences rates between localities. The highest preca-

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II. — POPULATION DISTRIBUTION OF S. MANSONI INFECTION

In 1937, SCOTT estimated that 3,200,000 people were infected with S. mansoni in Egypt (1). The endemic area at that time was confined to the Nile Delta. In the province of Beheira, infection rates ranged between 43% (Kaf Kharif) and 80% (Lagana). Between the two provinces, prevalence varied between 37% (Lagana) and 90% (Kotama El Ghaba) in the province of Gharbia; further south, however, in the administrative district of Minufiya, rates were below 20%. N. S. rates ranged between 5% (Fisha Bana) and 57% (Godayda) on the basis of the survey; and from 2.9% (Mit Abu Khalid) to 68% (Fariskur) when the data from the health services were also taken into account (1). The survey carried out by SCOTT thus revealed an important focus to the north of Cairo; it confirmed the data from the health services, with slightly higher figures. At provincial level, more than half the population of Beheira (54%), more than one-third of the population of Gharbia - Kafr El Sheikh (38%) and Daqqaqiyaa (38%), more than a quarter of that of Sharqiya (27%) and Qalyubiyaa (26%), and, lastly, 4% of that of Minufiya were infected with S. mansoni. In 1937, therefore, as many people were affected by intestinal as by urinary schistosomiasis, and the presence of Beheira (western part of the Nile Delta); prevalence remained lower in other cases, particularly in Qalyubiyya and Sharqiya (50% lower infection) and especially in Minufiya (10 times lower), in the southeast part of the Delta area.

In 1955, only one person in three (and no longer one in two) was infected with S. mansoni in the province of Beheira (31%). The prevalence had fallen to 17% in the province of Gharbia, 25.5% in Kafr El Sheikh, 5% in Daqqaqiyaa, 5% in Sharqiya, 3% in Qalyubiyaa and 1% in Minufiya. However, if one moves to the north of Cairo, in the first time in the province of Giza (prevalence 3%), at the country level, this gave an overall rate of 9% (as compared with 38% in 1937).

In 1965, the downward trend of the disease continued in the Governorate of Beheira (20%), and again in 1972 in Kafr El Sheikh (13.3%). But in 1979, in the Governorate of Beheira, the prevalence of S. mansoni was 29.8%, and in the Governorate of Kafr El Sheikh, it had risen to 22.5%. S. mansoni had also reached the south of Alexandria where the prevalence was 57.5% in the sector of ibis.

In 1979 in the Governorates of Gharbia and Daqqaqiyaa, 12.4% and 9.7% of the inhabitants were infected with S. mansoni, as compared with 5% and 10.5% respectively in 1965. At Damietta, there is a sharper increase: 18.5% infection in 1965, 28.8% in 1979. Over 25% of the prevalence rates thus moved from 5% (1965) to 1.8% (1979) in Qalyubiyaa, from 5% (1955) to 2.7% (1965 and 1979) in Sharqiya, and practically no further infection was found in the administrative district of Minufiya.

The pattern of prevalence is not uniform within the governorates. The highest prevalence was reported at El Zateen (97%) in the district of Abou Hamus, in the centre of Beheira governorate; at El Salamiya (81.1%) and at Shabas Amir (79.8%) in the districts of Fowa and Galeen, on the banks of the western branch of the Nile (Kafr El Sheikh); at Kom Morzoo (65.9%) in Damietta, at El Kowa (63.4%) in the southern Governorate of Beheira, at Mit El Kordi near Talkha (50.9%), in the district of Daqqaqiyaa.

In the Delta, when both forms of schistosomiasis coexisted in the same population, the prevalence of the urinary form was higher than that of the intestinal form. This pattern is now changing in the south and east of the Nile Delta. In the north-west of the Delta the prevalence of S. mansoni exceeds that of S. haematobium in three-quarters of the villages and two-thirds of the districts of the Governorate of Beheira, and in the majority of those of Kafr El Sheikh. In the north-west of the Delta, only one district (Sid Salem) reported no cases of intestinal schistosomiasis. In all other places, the prevalence of S. mansoni was over 30% in half the villages surveyed in Beheira and in two-thirds of those in Kafr El Sheikh.

Above the Delta, there are a few localities with a low prevalence of S. mansoni infection in the vicinity of Gizi (Bani Magdooli, 7%; Kom Bera, 1.7%; Bortos, 0.7%), and 80 km south of El Aiat (Zawiet El Abou Swailim, 0.5%).

II. — RÉPARTITION DES POPULATIONS INFESTÉES PAR S. MANSONI

En 1937, SCOTT évaluait à 3 200 000 le nombre de personnes atteintes par S. mansoni en Égypte (1). L’âge d’endémie se limitait au seul delta du Nil. Dans la province de Beheira, les taux d’infestation étaient compris entre 43% (Kafr Kharif) et 80% (Lagana). Entre les deux bras du Nil, les zones infestées varient entre 37% (Lagana) et 90% (Kotama El Ghaba) pour ce qui est de la province de Gharbia ; elles sont par contre inférieures à 20% plus au sud, dans la circonscription de Minufiya. Aucune infestation à S. mansoni n’est rapportée à El Helwasi et Shamandali, sur les bords de la branche orientale du Nil. A l’est de cette voie d’eau, l’infestation est croissante au fur et à mesure qu’on s’avance vers la mer Méditerranée ; dans la province de Daqqaqiyaa, les prévalences sont comprises entre 5% (Fisha Bana) et 57% (Godayda) si on se réfère à l’enquête directe, entre 2.5% (Mit Abu Khalid) et 68% (Fariskur) si on prend en compte les données des services de santé. Ces données reflètent un problème d’endémie important à la sortie nord du Caire ; dans la plaine deltaïque, elle confirme, en les surévaluant légèrement, les données des services de santé. A l’échelle provinciale, l’infestation occasionnée par S. mansoni intéressait plus de la moitié de la population de Beheira (54%), plus du tiers de celle de Gharbia - Kafr El Sheikh (39%) et de Daqqaqiyaa (36%), plus du quart de celle de Sharqiya (27%) et de Qalyubiyaa (26%), enfin 4% de celle de Minufiya. Ainsi, en 1937, la schistosomiasis intestinale affectait-elle autant de monde que la forme urinaire dans la province de Beheira (partie occidentale du delta du Nil) ; sa prévalence a ensuite varié dans les autres cas, particulièrement à Qalyubiyaa et à Sharqiya (infestation inférieure à moitié) et surtout à Minufiya (infestation fixe depuis moindres), dans le sud-est de la zone deltaïque.

En 1955, S. mansoni n’intéresse plus qu’un habitant sur trois (et non plus un sur deux) dans la province de Beheira (31%). Le taux moyen de prévalence tombe à 17% pour la province de Gharbia, 25.5% pour Kafr El Sheikh, 9% pour Daqqaqiyaa, 5% pour Sharqiya, 3% pour Qalyubiyaa et 1% pour Minufiya. Ainsi, l’infestation se fait son apparition dans la province de Giza (prévalence de 3%). A l’échelle du pays, cela détermine un taux général de 9% (contre 38% en 1937).

En 1965, le processus de réduction de l’endémie se poursuit dans le gouvernorat de Beheira (prévalence de 20%), ainsi qu’en 1972 pour Kafr El Sheikh (13.3%). Mais en 1979, on assiste à l’évolution inverse dans le gouvernorat de Beheira où le taux moyen d’infestation pour S. mansoni s’élève à près de 25% et dans le gouvernorat de Kafr El Sheikh, il passe à 22.5%. L’infestation gagne Alexandria (57.5% dans le secteur d’ibis).

Les gouvernorats de Chrewabia et de Daqqaqiyaa ont en 1979 12.4% et 9.7% de leurs habitants infestés par S. mansoni, contre respectivement 5% et 10.5% en 1965. A Damietta, la progression est forte : 18.5% de personnes infectées en 1965, 28.8% en 1979. A l’opposé, dans le gouvernorat de Minufiya. Ainsi, en 1937, la schistosomiasis intestinale affectait-elle autant de monde que la forme urinaire dans la province de Beheira (partie occidentale du delta du Nil) ; sa prévalence n’a ensuite varié dans les autres cas, particulièrement à Qalyubiyaa et à Sharqiya, et surtout à Minufiya, ainsi que dans la zone deltaïque.
Les deux tiers occidentaux du territoire égyptien s’inscrivent dans le désert libyque, vaste espace tabulaires de plaine de plateaux de grès, de massifs éruptifs et de dépressions sableuses dont le fond est souvent occupé par des lagunes d’eau saumâtre ou salée. À l’est du Nil, s’étend le désert arabique composé d’une série de plateaux d’altitude modérée de l’ordre de 2 187 m (Shaby El Banat). Cette bande et son prolongement au Sinaï sont formés de roches éruptives et métamorphiques fortement désséchées. Ces déserts sont profondément enfoncés dans une vallée du Nil, vaste couloir de 1 500 km de long, de 10 à 25 km de large, dominé par les plateaux désertiques de 100 à 300 m d’altitude, et sur lequel se greffe la dépression du Fayum (2 000 km²), grâce à un impotent débouché, le Bahr Yusef.

IV. HUMAN ECOSYSTEM IN EGYPTIAN SHERMOTTAMASIS

La population de l’Egypte a passé de 4 millions d’habitants vers 1800 à 44,67 millions en 1982. Le pays étant en constante croissance, compte plus de 100 hab./km² dans les villes et de 1 hab./km² dans les campagnes. Le nombre de 1 000 hab./km² dans la vallée et le delta, Biophalmária alexandrina, l’hôte intermédiaire de S. mansoni a une écologie plus sensible aux forts écarts de température ; le mollusque ne reçoit pas une des modifications saisonnières. De ce fait, il n’est présent que dans le delta et depuis peu dans quelques lieux de la moyenne vallée. D’un autre côté, bien adapté aux eaux à écoulement lent, Biophalmária alexandrina semble trouver un cadre de vie privilégié dans les recoins d’eau stagnante ou dans la vallée de l’Egypte en raison de l’expansion des eaux souterraines, de l’énorme débauche de l’évaporation et du manque d’exposition aux sources d’eau salée ou saumâtres.
ral canals were dug in order to set up a permanent irrigation system which would permit the large-scale cultivation of rice and cotton, while wheat, barley and legumes remained the staple crops in the valley. Permanently irrigated areas increased in the twentieth century, making it possible to cultivate several crops in succession in an annual cycle: winter crops requiring less water (wheat, fodder) followed by summer crops requiring more water (maize, cotton). The increase in the number of water supply canals and drainage canals, as well as the improvement and physicochemical stability of surface water collections seem to have been very conducive to the spread of *Bipolaris alexandra* and thus of intestinal schistosomiasis, first of all in the Delta, and more recently in certain localities in the Middle Valley. There may even be an important increase in the intestinal form, while at the same time, the urinary form appears to be less prevalent among the rural population. This situation has been reported on several occasions in the Delta (24:36). It would seem that *Bipolaris alexandra* is increasing more significantly than *Bulinus truncatus* for reasons that are uncertain.

The Nile dams have been raised in order to create still more permanently irrigated agricultural areas: the first Aswan dam was raised twice (1907 and 1929), the Isna dam in 1933, the Nag Hammadi dam in 1945. In 1958, in a basin area of 972,000 feddans given over to rice (409,535 hectares), 114,000 feddans were under continuous irrigation (47,982 ha), while seasonal flooding no longer played a minor role.

Since much of the Nile waters remained unused, particularly during the "flood", while agricultural needs were constantly increasing, the building of a large reservoir in Upper Egypt was first contemplated. It would have been an unhealthy and thus devastating flood, while the reservoir, because of its very size, would not be completely filled for several centuries. The Upper Aswan Dam or Sadd El Ali Dam, was therefore built between 1956 and 1968. Its completion reduced the surface of the reservoir lake, Lake Nasser (partly in the Sudan), 500 km long and 5,000 km² in area. The direct results have been the doubling of the areas devoted to rice and cotton crops, and increased yields of maize, the staple bread crop among the peasants. Unfortunately, the Upper Aswan Dam also holds back almost all the alluvial vegetables which come down from the Ethiopian mountains, almost completely eliminating the small deposits which have enriched the river valley, dangerously increasing the river’s potential for erosion, leading to the salinization of the lagoons around the Delta and, above all, producing modifications in the aquatic flora and fauna. Without the suspended matter, the waters became clear, aquatic plants grew more vigorously, and thus became more propitious to the spread of the snail intermediate hosts. The changes may have altered the ecology of the snail intermediate hosts and partially explain the increase in urinary schistosomiasis transmission due to the rise in *S. mansoni* infection rates in the Delta. The linking of the Nile area and the Suez Canal zone by irrigation canals may have contributed to the increase of both forms of schistosomiasis in the region of Ismailia. On the other hand, *Bulinus truncatus*, and with it *S. haematobium*, is gradually spreading around Lake Nasser.

In 1981, it was reported that the prevalence of *S. haematobium* infection on the plain of Kom Ombo, below Aswan (where the Nubians who had to leave their villages when Lake Nasser was filled with water were resettled) is around 25%, while at the edge of the desert in the same valley sector, it is less than 5% (41).

Prevalence rates are also related to the conditions of water supply points. In localities where water sources are piped from deep wells the prevalence is low, while the highest prevalence rates correspond to the localities where water is pumped by rudimentary manual machinery. Mollusciciding has a significant role in effects on schisto-

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