The human hookworm is the cause of a disease commonly called ancylostomiasis or necatoriasis according to the genus concerned. The disease has been variously designated uncinariasis, Egyptian chlorosis, tropical chlorosis, miner's, brickmaker's or tunnel anaemia, dirt-eating disease, miner's cachexia, mal d'estomac, mal de coeur, cachexie africaine, anémie des pays chauds, amarillo, etc.

It is characterized by an insidious onset, progressive anaemia, physical and mental debility, cardiac, digestive and nervous incompetence. It is caused by infection with certain intestinal nematode worms. The infection is contracted from the soil and is therefore common among agricultural workers and soil labourers. It is capable of cure upon removal of the causative organism from the alimentary canal but may be fatal in advanced cachectic cases.

Although the causative organisms were first discovered more than a century ago, the disease itself was known from time immemorial. Then, during the time of the 18th dynasty of the ancient Egyptian Empire, a medical papyrus was written. It fell into the hands of Ebers, who in 1873 translated it into German. In that papyrus a disease known as AAA or UHA was described as causing heart weakness, palpitations, stabbing cardiac pain, intestinal haemorrhage, flatulence, constipation, oedema in the legs, a heavily pressing weight in the body, and spasms. Definite connexion between this disease and the occurrence of intestinal worms in the same individual is made. Scheuthauer (1881) and Joachim (1890) infer from this description that the AAA disease is caused by the worms now known as Ancylostoma and that it is Ancylostoma which the ancient Egyptians were evacuating from the bowels on prescribing a remedy for a patient "who has in his abdomen worms which are produced by the AAA disease." Although
this view is opposed by V. Oefele (1901 and 1902) who is of the opinion that there is a deficiency in the translation of the papyrus and a misunderstanding of the text, there is no reason to believe that entocec of many kinds, especially intestinal helminths, were not common among ancient Egyptians as they are common now; and that the ancient Egyptians did not observe some of these intestinal helminths. One is inclined to believe that the ancient Egyptians were in a position to observe taenia, ascasis or enterobius. These are helminths known to pass spontaneously in the stools. Especially the first two mentioned are large enough and enterobius, though small, but so active as to draw the attention to their occurrence. Hookworms on the other hand, though visible with the naked eye are, however, not large enough to draw the attention of the superficial observer, nor are they known to have the habit of passing spontaneously in the stool, and if they do, they are either dead or too macerated and sluggish to be noticed. It is therefore highly improbable, as Looss (1905) has pointed out, that it was hookworms which came under the observation of the ancient Egyptians as "abdominal worms". Therefore, V. Oefele may be right in refusing to accept the view that these symptoms were caused by ancylostoma worms, but he is not entitled to deny the occurrence of these characteristic and common symptoms which might, however, be due to other causes. The direct reference to "abdominal worms" produced by the AAA disease, must, in my opinion, by all means be interpreted as a definite proof of the helminthic origin of that disease. To this is added the now known fact that these symptoms more readily occur as a result of infection with hookworms rather than with any other intestinal helminth.

Now that the occurrence of the disease in ancient Egypt and most probably also of the parasite is fairly established, the question arises whether the disease was indigenous to the locality or whether it had been introduced.

In modern times the earliest report of anaemia as ascribed to hookworms came from Brazil in 1640 and from the West Indies and Guiana at the beginning of the 18th century. According to Sandwith (1905) it was noted in Europe among the miners of Anzim in 1802 and the first reference to the disease in modern Egypt was by Henont in 1633. There existed a "cachexie aqueuse" which was very common among the peasants and soldiers and which after lasting years had been nearly always fatal. He described some of the post-mortem appearances. As a method of treatment leeches were ridiculously applied to the abdomen of people dying from anaemia. No mention however, was made by him of the venomous nature of the condition.

Five years later, actually in 1836, Dubini in Italy observed the occurrence of nematodes in the gut of 20% of the post-mortem he made. In 1843, Dubini made his historical publication on the parasite which appeared under the name: Ancylostoma duodenale, an apparent misprint for Ancylostoma duodenale. This was later rectified by a competent authority.
The second reference to the parasite came from Egypt by Pruner (1816) who was the first to observe it in this country. He found it not infrequently in the Nile valley but failed to describe its pathology. Yet, he connected the parasite with people suffering from cachexy, dropsy and scrofulosis. The credit is due to Bilharz (1853) and Grissinger (1854) who were the first to establish the relation between Ankylostoma duodenale and "Egyptian chlorosis", a disease, sometimes very severe, then endemic among about 25% of the Egyptians. Two years later, Grissinger referred to this relation more precisely.

In spite of this discovery, important for this country in particular, the attention of medical circles in Egypt and abroad was not particularly aroused. However, Wucherer (1866) discovered the hookworm in individuals suffering from tropical chlorosis in Brazil. Grassi and Parona (1878) were able to demonstrate the eggs of hookworms in the stools of anaemic brickworkers in Italy, a very important advance in our knowledge of hookworm infection, being the specific method of diagnosis of the infection. In 1880 Perroncito, investigating the very fatal epidemic of anaemia in the St. Gotthard mines, came also to the conclusion that it was due to infection with Dubini's ankylostoma duodenale. He used the ethereal extract of male form as a vermifuge and Bozziolo (1881) used thymol, both successfully in the specific treatment of hookworm infection.

The greatest advance in our knowledge of the morphology, biology, life cycle and mode of infection was made by Looss in 1898. When he visited Alexandria in 1894, he found a rich field of helminthological problems and decided to settle in Cairo in order to investigate the two most prevalent diseases in the country, namely bilharziasis and ankylostomiasis. His achievement in discovering the life-history of the hookworms, besides his other extensive contributions to Egyptian helminthology more than sixty years ago, have not yet been surpassed. Meanwhile, evidence of the occurrence of hookworm disease in America was accumulating. Hirsch (1884) was among the first to report the existence of hookworm disease among the southern negroes of the USA. He came to this conclusion after a study of the earlier reports on the habit of dirt-eating, practiced by negroes and poor whites and the disease symptoms associated with it, formerly attributed to malnutrition. In 1901, Smith obtained worms expelled by a patient in Southern Mexico, where an epidemic of anaemia, emaciation and dropsy prevailed. He recognized them as hookworms probably identical with Uncinaria stenocephala (Railliet 1884) of dogs. These worms were re-examined by Stiles who recognized them as new to science and designated them in 1902 as Uncinaria americana. Later, he selected for them a new genus, Necator, and the worms were reclassified as:

*Necator americanus* (Stiles 1902) Stiles 1906.
Following Stiles' report, Harris (1903) attributed the widespread anaemia in Southern USA to hookworm rather than malaria as was generally thought at that time.

In other parts of the American continent, reports incriminating hookworms as the cause of disease were forthcoming. Thus, there are the reports of Ashford (1900) and (1903), Ashford and Igaravides (1906) in Porto Rico besides the above mentioned report from Brazil. This is added to the significant finding by Schaeffer (1901) of hookworm eggs in eight medical students from the Southern US and the assertion of Harris and Stiles (1903) that most of the cases of anaemia in that region were due to ancylostomiasis, the most common and most debilitating disease of the South.

The third human hookworm to be discovered was Ancylostoma braziliense by de Faria, 1910, who reported it from Brazil as being found in cats and dogs. It was also reported under the name Ancylostoma ceylanicum by Looss, 1911, from a civet cat from Ceylon. The first report for man was made by Lane (1913) from Bengal and later by Kerr and Leiper who found it, although only in small numbers, in 10% of the Siamese, who were usually at the same time more heavily infected with A. duodenale. This species seems to be a natural parasite of dogs, cats and foxes and may be regarded as the tropical and otherwise the southern representative of Ancylostoma caninum (Evelain 1859) of the carnivora in the Northern Hemisphere. Its occurrence in man is apparently only circumstantial, being specifically inappropriate (at least partially).

Thus far, only three human hookworms and not all the hookworms had been discovered. Then records at hand show up to the year 1945, a good number of genora (about sixteen) and species (about thirty) of the family Ancylostomidae. The last fifteen years must have added more to these figures and it seems worthwhile to compile an up-to-date list of genora and species of this important family with their hosts.

The discovery of these three species of hookworm and of the evil they did to mankind, stimulated workers in isolated attempts to try to ameliorate their sufferings. Among the earliest pioneers in this field in Egypt, is Dr. Sandith, senior physician and professor of medicine at Kasr El Ainy hospital and School of Medicine, Cairo (1883-1904). For more than twenty years he had been intensively engaged in the study of medical problems in Egypt. Among other subjects, he tried to learn all that had been published by his German predecessors about ancylostoma and ancylostomiasis. Thanks to his attempts, thousands of patients were successfully treated at that time in the various hospitals of Egypt, using Bozzolo’s specific method of treatment.
Of course, this was only a beginning. But the question was more seriously handled in USA from 1909. The Rockefeller Sanitary Commission found that more than two million people in the Southern USA were infected and suffering from the disease. It was estimated upon extensive enquiry that hookworm disease prevailed in a belt of territory encircling the earth and extending about thirty degrees both north and south of the equator and inhabited by about one billion people. Infection in some people was as high as 90%. The Commission recognized the great menace brought about by this insidious illness which robbed the people of their vitality, stunted their physical and mental development, rendered them sleepy, disinterested, dull, stupid and lazy. The people could hardly be trusted to bring any work spontaneously to a satisfactory end. The resulting, long-standing economic deficiency added to the bodily suffering of the people. When about half a million persons in the Southern US were treated (from 1909-1913) there was a noticeable improvement in the living conditions among their communities together with the awakening of an intelligent public interest in hygiene and sanitation.

The activities of the Rockefeller Sanitary Commission was continued by the International Health Commission established in 1913 in the USA. This commission extended its work of hookworm eradication to other countries, especially Egypt.

The direction of the campaign in Egypt was entrusted by the Government to Mac Callan, then director of the very famous and successful mobile ophthalmic hospitals in Egypt. At that time, there was already a camp hospital near Cairo, administered by a consultative committee of some British physicians in the service of the Egyptian Government, namely, Ferguson, Todd, Day and Hastings under the chairmanship of the famous German biologist, Looss. A preliminary survey was made in two provinces, Sharkiah in the North, and Assuit in the South, under the supervision of Stiven and Kennedy, two British physicians, to whom all the work of training the Egyptian physicians for laboratory work was entrusted. The incidence of infection in each of the two provinces was shown to be 56% and 45.7% respectively of 20,000 male persons, not being hospital cases. These constituted the first authentic figures on the incidence of infection in Egypt. (N.B. with the present advanced technique in diagnosis these figures should be higher by about 25%).

Hardly had the treatment activities begun, when the first world war broke out. All the ankylostoma hospitals were closed early in 1915, personnel and equipment used for war hospitals and the campaign indefinitely suspended.

After the war, Day revived the interest in combating the disease and a new consultative committee, again of important British physicians in the service of the Government, was formed in 1919. In view of the discovery by Christopherson
at Khartoum in 1918 of tarter emetic for the specific treatment of bilharziasis, it was thought advisable to include the treatment of that disease in the activities of the committee, which laid down lines of action, namely, treatment, survey, propaganda, water and soil pollution and research. A limited number of hospital annexes was established in lower Egypt only. By the end of 1923, only about 50,000 stools had been examined for hookworm eggs. Out of these hospital cases 77% were found positive and during the same period about 100,000 attendances for treatment had been made, the average case having to attend three to four times. At the recommendation of the committee a research section was established and entrusted to Khalil, who carried out extensive survey work throughout the country as a prelude for a general campaign against these two diseases, ancylostomiasis and bilharziasis. Thanks to his zeal and perseverance a large number of competent Egyptian workers, including physicians, engineers and social workers are now directing a national campaign against these two scourges of mankind in Egypt. Their activities are being extended to other endemic diseases prevalent in the country.

In the meantime, other workers on the subject used to publish their reports dealing with the epidemiology, diagnosis, pathology and control, both in Egypt and abroad. Particularly Scott (1937) made a detailed survey of the distribution of the infection in Egypt and showed that over most of the country about half of the rural populations are infected and that the incidence in some villages was as high as 90%.

When one thinks that since 1926, when ancylostoma and bilharziasis hospitals were being established in various parts of the country both North and South, when at least a yearly average of one million free doses of anthelmintic drug against intestinal worms were being administered in these hospitals, one can imagine the magnitude of the benefit rendered to the populace of this country alone as a result of the work done and published by pioneers on this subject. Because of the efforts of these workers and the humanitarian nature of the International Health Committee of the Rockefeller Foundation, the countries suffering from the ravages of this and allied diseases, have a deep sense of gratitude.

Only those who lived through the two periods, namely, the pre- and the post treatment periods, can have an idea of the amount of good done to humanity, by combating ancylostomiasis. People in this country are now certainly different from what they were only forty years ago, both mentally and physically and their economic status has improved markedly. In other parts of the world, namely, in the Southern USA the result of the campaign was more prompt and conclusive.
due to favourable circumstances. It is only hoped that the campaign in Egypt and elsewhere against these diseases will continue unabated until complete eradication is achieved.

Those who have and who are still contributing to that cause must always be remembered with gratitude and respect. It is hoped that the meeting of exports on the subject planned by the Regional Office for the Eastern Mediterranean of the WHO will put on its agenda a plan for the commemoration of these pioneers.