REPORT ON THE PRESENT CONDITION OF ISMAILIA AS REGARDS MALARIAL FEVER.

By Colonel Sir David Bruce, C.B., F.R.S.

On returning from Uganda via the Nile in February, 1910, I visited Ismailia to inspect the work of malaria prevention which has been in progress in that town since 1902. On arriving at Cairo from Khartoum, arrangements were made to proceed to Ismailia on February 18th, 1910, every assistance and facility being given by the Suez Canal Company for that purpose. Ismailia station was reached on the date mentioned at 2 p.m., Prince d'Arenberg, the President of the Company, several of the Directors, including M.M. Sharme, Tillier and Doyen, and others, being present.

During the afternoon an inspection of the town and its environs was made under the guidance of Dr. Cambiouliu, and embarking with him in a motor launch across Lake Timsah to a hill situated about a mile to the west of the town, we reached the new reservoir for the filtered water; from here a good view of Ismailia, its suburbs, and Lake Timsah, could be obtained. The township is located on the northern edge of this lake, through which the Suez Canal passes. It is one of the Bitter Lakes which existed in the Isthmus of Suez before the Maritime Canal was cut, and it formerly contained much salt until the sea-water of the Mediterranean and the Red Sea was run into it, and the Suez Canal dredged through it. Viewed from the hill, the lake appeared circular, about five miles in diameter, and bordered by desert on all sides, except for the town itself, which is richly planted with gardens and trees, and is immediately surrounded by much cultivation. The town is in an oasis standing on the shore of the lake, and then beyond again is desert so far as the eye could reach.

Ismailia is a town of villas built among gardens. To the west there is a native location containing many huts built on the edge of the desert. Further to the westward again the Sweet Water Canal can be seen winding its way from the direction of Cairo, 100 miles distant. As this canal, which conveys fresh water from the Nile to Ismailia; Port Said and Suez, nears Lake Timsah it breaks up into several branches, which form a small delta as they discharge into the sea-water of the lake. One of these branches can be seen passing to the southward towards Suez, another running north to Port Said, while a third passes through the town of Ismailia itself,
and ultimately flows into Lake Timsah to the east of the European quarters. This Sweet Water Canal was the cause of the fever which decimated the place for twenty years after the opening of the Suez Canal itself. From the hill could be seen the delta of this Fresh Water Canal, passing in several streams round its base, and to be noted were the trees and vegetation wherever the water escaped into the surrounding desert. Before the anti-malarial campaign was instituted, this water, which is laden with a rich silt from the Nile, formed pools and puddles, and even shallow marshes around all of its ramifications, and in and near the town of Ismailia itself; it was in these that the Anopheline mosquitoes used to breed. Now the puddles have all been filled up, and the banks of this canal strengthened, so as to prevent oozing through its walls leading to the formation of puddles, &c. The shallow marshes have been drained or filled up, and in the town a system of irrigation instituted, so that no stagnant water is allowed to remain for a period long enough to allow mosquitoes to breed.

With a view of inspecting this system of irrigation more closely a descent of the hill was made to return to the pier at Ismailia, crossing the lake again in the boat. The Sweet Water Canal as it passes through Ismailia is about twenty metres broad and two deep. It has a very sluggish stream, and the water is muddy as it is in the Nile. It is full of fish, which keep the canal itself free from mosquito larvae. This canal was originally a small irrigation stream which served the native villages between Ismailia and the towns nearer Cairo. After the Suez Canal construction had begun this stream was deepened so as to obtain more water for the workmen employed. After the Araby Pasha Rebellion in 1882, it was again deepened to allow the passage of shallow-draught boats between Cairo and the Suez Canal; they were to carry cargo to and from the ships. The result was that much water infiltrated through the banks of the recently dredged stream, and the surrounding desert being wholly sandy and free from impermeable strata, it appeared in the hollows of the neighbourhood, forming the marshes which gave rise to the fever. It was at first intended to make Ismailia the chief port of the Suez Canal, but the appearance of malaria frustrated the intention, for almost everyone in the town was attacked, and nearly 2,000 cases occurred annually; Port Said has since taken its place as the principal port of the Suez Canal. The level of the water in Fresh Water Canal is higher than that of Lake Timsah, and it contains two locks as it passes through the town. This allows boats to be raised up to the necessary height.
Condition of Ismailia as regards Malarial Fever

for towing to Cairo, and prevents sea-water finding its way into the canal from the lake. The gardens are situated below the level of the water in this canal, and they are irrigated from it. The Nile water is permitted to flow down into them through sluices. Then a series of irrigation channels or runnels feeds all parts of the town and the neighbouring cultivations. At each bend of these irrigation channels a syphon is interposed, so that the flow of the water can be regulated or even stopped if necessary. The keys of the various sluices are kept by the engineers of the Suez Canal Company, who allow water to flow through each gate for a certain number of days only in each week. During that time the gardens and cultivations are thoroughly irrigated. Then the sluice gates are closed and the water in the runnels beyond is allowed to dry. In this way the formation of puddles containing stagnant water is prevented for more than two or three days at a time. Mosquitoes require at least twelve days for their larval metamorphoses, and they must remain in water during this period. But at Ismailia, under this system of irrigation, no water is stagnant for more than three days at a time, and in consequence the mosquito larvae cannot reach maturity before the water dries up, and they are killed in the drying.

The Public Gardens were then visited under the guidance of Dr. Cambiouliu, and the sites of the filled-up marshes noted. One large marsh to the east of the town has been levelled up and converted into the park called the Bois de Boulogne. The golf links now cover a large swamp which was formerly the cause of much malaria. Through these filled-in marshes the water runs in shallow streams, in which its course is controlled by syphons and sluice gates. The channels themselves, when they permanently contain water, are stocked with fish. To the west of the town the same thing has been done. Here below and beyond the native quarter the cultivations are irrigated in the same way as in the gardens. The natives are not allowed to harbour stagnant water for more than two or three days on their allotments. Further to the south-west, in the delta of the Sweet Water Canal, there still exist some undrained swamps, and Anophelines may still be found there during the summer and autumn months. This has necessitated the undertaking of drainage for these distant marshes also, as when the wind veers to the south-west in the early autumn, an occasional mosquito finds its way into the town. They are never in sufficient numbers to do any harm, for south-west winds are not common, and no malaria exists to infect the mosquitoes,
but as it is imperative to absolutely prevent any danger of malaria reappearing this expensive work has been undertaken. These swamps are being treated as the others, namely, by filling in and reclaiming, and by controlling the passage of the water through them. The object aimed at, being, as at Ismailia itself, to prevent stagnant water.

In the town itself there is a population of ten thousand, and it is well laid out with broad streets and avenues. The villas of the employees of the Company are well built, with open verandahs and good gardens. With the exception of the new residence of Prince d'Arenberg, the houses are of two stories generally. But as the Company owns or has control over all the land around Ismailia measures are being taken to regulate buildings. In the native quarter the small huts are placed more closely together. Each house or hut has a cesspool in which Culecine mosquitoes were in the habit of breeding. These have now been dealt with by oiling weekly with petroleum. For this purpose, a gang of men under a European foreman visits every house and hut once a week, when the cesspools are oiled, dirty water emptied, mosquito larvae searched for, and insanitary conditions dealt with when found. This mosquito brigade has now been working regularly since 1902, and with great success; mosquito nets are dispensed with at the Residence, which is in the centre of the town. In the European quarter a drain has been recently laid down to receive the overflow water from the cesspools, and it discharges into the lake below the town; but the work and weekly visit of the brigade continues as before. This costs annually about £400, of which half is spent in oil and half on the men's salaries. The brigade, which was seen at work, consists of three natives and a Greek foreman. They have a barrel on wheels containing about 40 gallons of mixed crude and refined petroleum. This is taken from house to house, the whole town being mapped out into six areas corresponding to the days of the week. One man enters each house, and having oiled the cesspool, he examines the compound for stagnant water, such as buckets, broken bottles, tins, &c., and then asking if there are any mosquitoes in the house, he proceeds to the next villa or hut appointed to him. Some footmarks made by camels near the Sweet Water Canal bank which had formed puddles were noted; these had been recently oiled. Some holes made by stakes driven into the ground by natives to mark an allotment had also been recently oiled. These observations serve to show that the work must continue perpetually and persever-
Condition of Ismailia as regards Malarial Fever

ingly or mosquitoes will return. There are many fountains at Ismailia. Some of them have been allowed to dry up; some are now stocked with gold fish; the remainder are emptied completely every week.

The result of these measures has been the abolition of all species of mosquitoes from Ismailia. It was learned that the President of the Company, with some of his Directors, reside there for several weeks every year, and that they are never worried by mosquitoes and that fever is unknown. The work must always be continued, however, and it costs annually, including the permanent drainage of the marshes, about £1,000. This represents an annual tax of less than two francs per head per year, which the Company gladly pays, regarding it as a great economy over the expenses which were caused to them by malaria. Information was forthcoming to show that all the inhabitants of the town used to be afflicted; men could not work, families were always ill, and children died. Facilities to witness the change that has now taken place were given by attending a discourse given by M. Tillier on his travels in Central Africa. It took place at the Club before a crowded audience consisting of officials and employees of the Company. They did not look ill; on the contrary they looked very well.

The last visit was to the hospital. It is placed on a hill overlooking the Suez Canal, about a mile to the east of Ismailia. It is divided into two buildings, one for Europeans and one for natives. Dr. Cambioulieu exhibited the malaria returns since the year 1877. In the hospital there were treated 300 cases of tertian and malignant malaria that year. During 1885, after the deepening of the Fresh Water Canal, the number rose to 2,000, and the annual incidence continued, with an average of 1,800, until the measures against mosquitoes were instituted by the advice of Major Ronald Ross, in the year 1902; then the result was almost immediate, for in the following year only 214 cases occurred. In 1904, there were only 90 cases; in 1905, 37 cases; and in 1906, the town was free from the disease, and has continued free ever since. In 1902 the taking of quinine was made compulsory among the employees and workmen of the Company, and a dispensary was opened in the town where it could be obtained gratis. This was continued for three years, but now the necessity for it has disappeared. At the present time very little quinine is distributed, except to the villagers who live miles above the town on the banks of the Sweet Water Canal. But in Ismailia itself the demand for quinine is very small, and there is no need now for its compulsory
distribution. In the fever days, the dispensary dealt with large numbers of malaria cases, but records of these are not very trustworthy, as only the admissions to hospital and the cases treated in the wards had the diagnosis confirmed by blood examinations. That there were many deaths due to malaria is beyond question, but death-registration in Egypt is carried out very imperfectly and is left largely to natives. Many persons die apparently without certification or examination before death, so that death-rate returns in Egypt are not trustworthy. But it appears that almost everyone at Ismailia was infected with malaria, and work was at one time at a standstill. Now the doctors treat an occasional case of typhoid or Malta fever (there are several infected goats at Port Said), but malaria has been abolished.

One fact, however, impressed itself. The Suez Canal Company is all-powerful at Ismailia. The inhabitants, with the exception of a few natives and minor Government officials, are employees of the Company and are paid by it. Therefore, any regulations made by the Directors can readily be enforced. The disabilities of the Capitulations under which the remainder of Egypt suffers do not affect Ismailia. There is absolute authority. Then the Company is a rich one; it has the necessary funds. With these two factors almost any sanitary reform may be carried out. And with them malaria has been exterminated at Ismailia. Nature has assisted these factors by supplying a rainless climate. The town being isolated in the desert has been easier to free from mosquitoes than many others would be, for surrounding irrigation and cultivation would have rendered the task a greater one. One can well understand tropical rains making malaria prevention a more expensive matter, for the drainage would then have to be more extensive, and the work of the mosquito brigade much increased. However, the fact remains that the work done at Ismailia has been thorough and malaria has been abolished.