

For those unfamiliar with the life cycle of the malaria parasite, perhaps the following may be helpful. Transmission of malaria occurs through the female Anopheline mosquito that ingests the parasite – when blood feeding on an **infected** human. This is then injected into an **uninfected** human during its next blood meal.

Mosquitoes breed by laying their eggs in water which eggs hatch into larvae. These larvae lay parallel to the water surface eventually changing into pupae from which the adult emerges.

EDUCATION – THE OVERLOOKED VITAL AND ESSENTIAL INGREDIENT IN MALARIA ELIMINATION.

WITHOUT EDUCATION, ELIMINATION IS UNLIKELY.

This article was written for anyone seriously involved with practical malaria elimination **in the field**. It considers the often overlooked critical contribution of Education to the elimination of malaria begun in Palestine 90 years ago.

And also it considers what is meant by ‘Education’.

100 years ago, Palestine was drenched in malaria. It was either uninhabitable in many areas or thinly populated. The disease had decimated the population to the point that Mark Twain in 1867 wrote on his visit to Palestine

‘A desolation is here that not even imagination can grace with the pomp of life and action. We never saw a human being on the whole route’.

And the British Mandate had noted *‘...the experts of 1918 ... (prophesied) that the future of this country (Palestine) might be considered to be almost hopeless from the malarial standpoint.....’*

But a little more than 90 years ago, Palestine became the first place in the world where a successful national malaria-eradication campaign began. And by 1967, despite violent social disturbances in the 1920s, 1930s and 1940s, the area was declared free of the disease.

Dr Kligler, a microbiologist and public health scientist, and architect of this, the successful malaria-elimination (anti-larval) campaign, was a Zionist, a Jewish nationalist, who had come in 1920 to settle in Palestine. He was not just a visitor.

Kligler commented that he came to Palestine *“... with a view to coming to grips with the malaria situation.unless something was done to check the ravages of malaria, the reconstruction of Palestine would be a costly if not altogether an impossible effort.”*

BASIC ATTITUDE TO MALARIA ELIMINATION

Just before coming to Palestine, Kligler had written about malaria elimination. *“..... The campaign may be directed against adult mosquitoes in houses etc, against the larvae in the ponds and swamps.*

But the only ready effective method is to destroy the (mosquito) breeding places. It should be borne in mind, however, that these measures (eg screening of houses, fumigating barns, etc) are only supplementary to the main attack against the breeding places."

So it can now be understood why, in 1925, the Malaria Commission of the League of Nations, having been alerted to Kligler's anti-larval campaign, and having inspected his work in Palestine, reported on the successful operations in this way -

"But here (in Palestine) we were shown very complete anti-larval measures Their anti-malarial value had to be judged not in the first place by malarial statistics but by the fact that no actual or potential breeding places were in existence"

-and this was precisely what Kligler had been attempting to achieve.

It is important to appreciate from the outset that malaria control involved many questions requiring investigation for each mosquito breeding site. It is often overlooked that the mosquito will travel probably no further than 2-4 kms from its breeding site, and Kligler wrote in 1930 *"We have come to realise that malaria is eminently a local problem, and that a successful attack is possible only after a careful study of the local conditions combined with systematic experiments with the method or methods most likely to give the desired results."* The methods used to control by Dr Kligler were based on sound principles eg draining swamps, clearing overgrown canals or diverting springs and wadis, and while not novel in practice, perhaps the degree of implementation and of attention to detail of such methods was unique in a number of ways.

(An important point. In 1922, Dr Kligler agreed with the Br. Mandate "...only by placing all antimalarial work under the control of an organised Government Dept. that country-wide success can be obtained in dealing with a disease like malaria ", rather than each independent organisation conducting its own projects.)

Kligler was blunt and spoke as he saw it. He was very careful and thorough, and only came to conclusions once he had checked data to support such conclusions. Therefore, in 1925, only three years after Kligler began his anti-malaria campaign, he must have felt extremely confident to be able to write *"The future is plain sailing.malaria will assume its place among the insignificant diseases of Palestine."* Also in 1925, the Malaria Commission of the League of Nations, after inspecting his work in Palestine, were unanimous in their praise and were very impressed. They wrote that the works and methods seen by them *"destroyed pessimism, raised hopes"* and those involved in this work were *"... benefactors not only to the Palestinian population but to the world as a whole."*

SIGNIFICANCE OF EDUCATION TO MALARIA ELIMINATION.

But it was Education's significance in relation to malaria elimination that Dr Kligler repeatedly stressed again and again. He wrote in 1930 **'the educational aspect of the work was certainly as important, if not more so, as any other.'**

I fear that there may be a tendency with many of those involved in malaria elimination to either pay lip-service to, or patronise Dr Kligler's reference to education, and without fully understanding its significance or its role in the eventual elimination of the disease.

Kligler's term 'Education' in this context included the active co-operation of the inhabitants (but only after they understood fully the significance and value of the elimination work). This co-operation ensured thorough and continuous and systematic control including maintenance of anti-larval measures, and whereby the wadis and canals were gradually put in condition and kept so at very little cost.

And it was this that was at the heart of Kligler's continual repetitive emphasis on education. His energies were directed towards ensuring that the drainage and water diversion projects would be maintained and the wadis and drainage canals would be kept from becoming overgrown, because he knew that otherwise the destruction of the mosquito breeding sites would have been only temporary, the exercise would have been pointless and of little value, and malaria would return.

It may be helpful and clearer to also read an extract from a paper written by Kligler in 1923 on the topic of Education:

*"An important element in these demonstrations was the educational propaganda carried on along with the work. The demonstration started with a popular illustrated lecture on malaria, its causes, prevalence and modes of prevention. Two pamphlets on malaria, one illustrated, were printed and distributed freely among the inhabitants. During the examination the doctor spoke to each individual explaining the purpose and import of the work. Throughout the year the malaria inspector would visit various delinquent families and impress them with the dangers resulting from their carelessness. A special Health Day was set aside on which lectures on malaria and other infectious diseases were given to the school children. After the lecture the children made an inspection tour of the (settlement) in company of the teacher and the malaria inspector, in the course of which the latter pointed out breeding places and demonstrated methods of control. **In brief, every opportunity was taken to keep the issue alive.** For the first time, malaria assumed the importance of a real and preventable disease which should be eradicated."*

Kligler strove to keep the whole question of observation and maintenance of the anti-malaria works alive, and thereby ensure such observations and maintenance were undertaken as a matter of natural regular routine by the whole population.

And in 1930, in his text book on malaria, Kligler wrote *"The fourth important step in the effective organisation of a control area (of a breeding place) was the constant supervision. The work of the inspector, as well as that of the physician, had to be checked at frequent intervals, particularly during the early stages. **This also had an educational value because it kept the question alive ..."***

The British Mandate in 1941 wrote "Thus public co-operation was an essential and early feature (of the campaign of malaria-elimination in Palestine). In rural areas, headmen, both Arab and Jewish, were soon with little persuasion turning out squads of villagers and settlers to clear and drain small wadis ...in the vicinity of their homes, a procedure which was rapidly developed into an annual seasonal occurrence on the cessation of the spring rains, to a set plan. "

Education was also necessary to fight an acceptance of malaria, a fatalism or a sense of inevitability of the disease. "It has to be remembered that a considerable section of the population tends to ignore malaria in areas in which it is common". In 1925, the Malaria Commission of the League of Nations reported "In the beginning of the work, many difficulties were encountered, but by patient instruction and demonstration, most of them were gradually overcome and at present the people, whether urban or rural, Arab or Jew, are ready and willing to carry out requirements of the Medical Officers of Health both in respect of their private premises and on communal lands."

To further appreciate how essential Kligler viewed this cooperation, the possibility was discussed in December 1920 of seeking funds from Baron Rothschild in France specifically for anti-malaria propaganda when there was hardly funding to maintain the health services generally. In January 1921, when Kligler was setting out his budget for his first demonstration in Palestine of his elimination methods, he allowed for an amount of \$19,500 to include hospital maintenance, doctors, nurses, drugs and laboratory use. Of that amount he earmarked \$2,500 (almost 13%) for education, including exhibits, pamphlets, travelling expenses etc for lecturers.

And to further illustrate how significant Kligler considered the co-operation of everyone, he wrote in February 1921 just before commencing this first demonstration of his elimination methods "The work will be initiated with an illustrated public lecture; printed illustrated pamphlets on malaria will be distributed, and if possible posters and exhibits will be prepared. In this way general **and individual** education will be an integral part of the campaign."

SUSTAINING COOPERATION – WOULD IT WITHER OR FADE AWAY?

But was this co-operation sustainable? Evidently, the President of the League of Nations Malaria Commission didn't think so, he didn't think the cooperation could last or be sustained, and even wrote to discourage such elimination. It is surprising to read that notwithstanding the unanimous lavish praise by the Malaria Commission experts after their inspection in 1925 of the Palestine works, the Malaria Commission President (who incidentally had not been with the others to inspect Palestine) wrote in November 1927:-

*"... the sole purpose of the campaign against malaria, as far as the Commission is concerned, is to reduce the incidence and severity of the disease. Measures designed to accomplish more than that (**particularly measures aiming at eradication**) are not a wise proposition (A number of states) had undertaken an energetic campaign against malaria. The disease yielded to the measures which were taken, but re-appeared with added virulence as soon as these measures were somewhat relaxed. This is a very serious result which brings in its train disillusion and discouragement."*

The Malaria Commission President had obviously misjudged how effective and strong was Kligler's education and resulting cooperation.

How intense was the education? At what level or degree of education did Kligler have to aim?

It will now be extremely useful and helpful to demonstrate how strongly rooted this public-cooperation became. This cooperation had to withstand (1) the monotony and tedium of ensuring the anti-malaria works and wadis remained well maintained, even when malaria appeared to have

been beaten, and also (2) in times of social unrest, the intimidation and threatened violence against the population (both Arab and Jew) when the population was seen to be cooperating.

Kligler realised that unless he had the cooperation of the population to maintain the anti-malaria works already carried out, his efforts would have been wasted and futile. He had to take the situation as he found it, and in his quest to educate and secure cooperation, Kligler knew from the outset that he had to deal with elements in the population who potentially were very hostile.

Kligler showed through his practical demonstrations that malaria-elimination was for the common good, and that this was only possible and sustainable with the full cooperation of the population as a whole. He also had to teach to keep malaria-elimination alive and that even when the disease appeared beaten, it was still essential for the population to maintain the works.

Possibly the extreme violence that Kligler found before he began his work helped to ensure he pitched the intensity of the education even higher – he knew unless he convinced every one of the need to cooperate, his goal of sustained malaria-elimination would have been in tatters.

- In April 1920, there had been a massacre of Orthodox Jews by Arabs in Jerusalem. In May 1921, soon after Kligler had arrived in Palestine, there was further violence, and a British Government Commission of Inquiry had reported on "racial strife, begun by Arabs" had taken place, describing a small Arab town near the disturbance as "... almost exclusively Moslem; there are a few Christians, **but Jews are not tolerated..**" (Report of Commission of Inquiry of Palestine Disturbances in May 1921)

Notwithstanding this, and against this backdrop, Kligler, a Jew, still sought to enlist the whole population, both Arab and Jew, in his attempt at obtaining cooperation to defeat malaria. Kligler realised that without such cooperation, the disease would never be eliminated.

Despite the extreme violence that had taken place in 1920 and May 1921, in late 1921, Dr Kligler began in earnest his anti-malaria campaign including its emphasis on education of the population. And by 1926, the British Government felt able to reduce the forces available for maintaining order to a very low strength because according to a Palestine Royal Commission **"For some time past, Palestine has been the most peaceful country of any in the Middle East"!!**

So from late 1921 until August 1929 (8 years), these were years of peace.

But in August 1929, a massacre of Jews by Arabs took place in various towns in Palestine. There followed further violence and disturbances during the 1930s and which began to be directed not only against the Jews but also against the British authorities. Even staff engaged in anti-malaria work became a target for Arab violence. The hatred by the Grand Mufti, the head of the Arabs in Palestine, towards the Jews and also subsequently towards the British, and his incitement to violence were such that the authorities attempted to arrest him, he fled and eventually spent the duration of WW2 in Nazi Germany assisting the Nazi war effort.

And yet despite the incitement and resulting troubles and violence, during the 1930s, each year, the British Health Department in Palestine repeatedly praised the cooperation that existed, and in 1941, the Health Department reviewed the position:

“As the general scheme has gradually advanced in scope, so the community self-help which has been stressed already as a particular feature of the antimalarial scheme here has come more and more to the fore. In rural areas, all headmen and villagers and settlers, must cooperate in the cleaning and channelling of the more important streams and other water holding places adjacent to their dwellings, under skilled government supervision. This is now a seasonal procedure after the April rains.such co-operation was willingly, and even enthusiastically, given. For as the health of villagers and settlers improved from year to year, as dunnum after dunnum of waste land was gradually added to the use of farmers and shepherds, so did this co-operation steadily increase in volume and energy. That no actual and serious damaging effect on the community as a whole has resulted from these troubles (*disturbances*) is a matter for satisfaction: a result due, without doubt, to the system of observation, and wide and detailed control of the disease, now practised in all the most populous and important sections of the country.”

Hopefully it can now be appreciated and understood just how essential and important Kligler treated education in relation to malaria elimination. Kligler’s method of malaria elimination worked, and accordingly, his views must still be taken seriously. At all costs, the anti-malaria works that had taken place, together with the system of observation, had to be kept and maintained at all times. And no matter what difficulties or obstacles presented themselves which prevented or discouraged that cooperation and maintenance, then the constant education had to be increased, or its level raised to whatever level was necessary, to eventually overcome all obstacles and thereby achieve that vital cooperation.

Since 1967 when Israel was declared free of the disease, monitoring and vigilance against potential breeding sites continue to this day, and for the time being, Israel remains free from malaria, except for a small number of imported cases.

Cooperation is the key to successful malaria elimination.