

REVISITING MALARIA: MOVING FROM CONTROL TO SUSTAINABLE ELIMINATION

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MALARIA: “THERE IS NO SUCH THING AS PARTIAL SUCCESS. IT IS EITHER GLORIOUS SUCCESS OR DISMAL FAILURE”

BART GJ KNOLS, PHD MBA

The above statement, by the legendary Dr. Fred L. Soper, reflects in just sixteen words the fragility of recent gains in reducing malaria across Africa with insecticide-treated bednets and indoor residual spraying. On the assumption that the figures in the annual World Malaria Report of the World Health Organization are correct, Africa has seen a dramatic reduction in child mortality and malarial disease incidence over the last decade. Massive increase in funding since the turn of the millennium has enabled African governments, through the relentless efforts of thousands of public health professionals, to dramatically increase coverage with these interventions and deliver a severe blow to malaria. But in Soper’s words this is still only a ‘partial success’. The question that begs to be answered then is: Are we heading for glorious success or dismal failure?

Since 2007, the global community has set malaria eradication as its goal, i.e. the complete and penultimate disappearance of malaria from the face of the planet. A goal that was set once before in history when, led by the World Health Organization (WHO), between 1955 and 1969, a similar attempt was undertaken. Although many today consider this campaign a failure, which in the strict sense is true of course, it is largely forgotten that more than 800 million people in over 100 countries can now go to bed each night without the fear of contracting malaria. In other words, although eradication was a dismal failure, many countries witnessed glorious success – their malaria disappeared and it never became endemic thereafter.

These tremendous successes in Europe, the USA, Russia, Australia, Taiwan, Israel and the Caribbean, did not include Africa. Africa was largely excluded from the Global Malaria Eradication campaign and the strong focus on indoor residual spraying in most countries did not yield promising results when tried there. Both the Pare-Taveta scheme in Tanzania and the Garki project in Nigeria gave disappointing long-term results that negated the hope for successes similar to those witnessed elsewhere. Interestingly, it was the same Dr. Soper who had led successful campaigns to eliminate malaria vectors in Brazil and Egypt who argued for the almost exclusive use of indoor residual spraying, which contrasts strongly with his previous successes that were based on an integrated package of interventions targeting both adult and larval stages of mosquitoes.

By the early 1970s the WHO had abandoned its campaign, the most powerful insecticide DDT had been banned for use in the USA and Europe, which strongly affected its use in Africa, and large-scale successes came to a grinding halt. ‘Control’ or ‘management’ of malaria became the adopted policy – a policy to reach partial success. Partial successes which, it cannot be ignored, have saved countless lives. But also partial successes that often resulted in dismal failure when donor funds ran out. The resurgence of malaria in Zanzibar following



Bart GJ Knols

two attempts to eliminate malaria on the island, show what I call the ‘trampoline effect’: Donor funds come in, interventions are rolled out, malaria goes down, donor funding stops, malaria returns. Worse, sustained use of biocides against both parasites (drugs) and mosquitoes (insecticides) inevitably and always resulted in resistance. In other words: Trying to maintain partial success always results in guaranteed failure.

Although it is now widely acknowledged that the current interventions are insufficient to reach elimination, the way forward is often seen as ‘adding new tools to the toolbox’. The hunt for a potent vaccine has been ongoing since the 1950s, and it is beyond doubt that such a vaccine would be of tremendous value. Yet it is persistently overlooked that malaria elimination in more than 100 countries was achieved *without* a vaccine. Moreover, adding a vaccine to the toolbox is not a sure recipe for success.

Sadly, with the coming available of large sums of research money through organisations like the Bill & Melinda Gates Foundation, the hunt for new magic bullets has intensified. At the expense of interest for old and proven strategies of which we know one thing for sure: they worked in numerous countries. And were prime examples of what today is considered ‘integrated vector management’ (IVM) which, ironically, is hardly practiced anywhere in the tropics.

If anything, we owe it to those who succeeded in eliminating malaria from many countries to understand the underpinning factors for success of their campaigns. And better still, to see how these experiences can be of use during our second Global Malaria Eradication era. In Mandate Palestine, Kligler insisted on sound epidemiological surveillance and mapping of the vector and the environment to inform anti-malaria strategies. His public health approach included collaboration

with the Department of Health for public education and disease treatment and with the Malaria Survey Section engineers to advise on swamp drainage programs and field surveys. The boldness with which elimination was undertaken, based on knowledge of the biology of the vector that was a fraction of what we know today, should serve as an example of how public health was practiced successfully in the past.

In the acknowledgements of their book, *'Anopheles gambiae in Brazil: 1930-1940'*, Wilson and Soper write *'A special note of recognition is due to those persons who were responsible for approving the program and budgets [...], at a time when there was very little concrete evidence of the possibility of species eradication'*. This intriguing paragraph shows that high-risk projects like the elimination of this mosquito from 54.000 km² of Brazil did not proceed without hefty debate and lobbying. The key point is that it was done and that it succeeded. This contrasts sharply with the world we live in today, where arguments to attempt (vector) elimination (on whatever small scale) are merely met with scepticism and disbelief, based largely on the hope that molecular biology will provide what we need and delivery of nets is the way forward. Worse, all this is still supported by policy that 'partial success' is a good enough start.

Virtually every country that succeeded in malaria elimination moved beyond the house (nets and indoor spraying) to end the menace. Larval control and environmental modification (or larval source management as it is called today) were the cornerstone of elimination programmes. It is only today that this approach is slowly re-gaining interest. The use of large squadrons of larval control personnel (reaching thousands in Brazil and Egypt) gives us a template of what larval control means in an elimination framework. A template that today we can augment with a vast amount of scientific knowledge accumulated over the last six decades, besides modern tools such as satellite imagery, geographical information systems, global positioning systems, mobile telephones, computers, and a vastly improved infrastructural network and capacity in many parts of Africa. Should we not attempt, therefore, to go for glorious success in Africa?

The question of where and how elimination of malaria (vec-



tors) could be attempted today was addressed by experts from around the world in the Jerusalem meeting titled 'Malaria in Africa: Moving from control to sustainable elimination', which took place between 8-12 December 2013. In the same manner as the 1950s debates, when the target of control or elimination for Africa was debated intensely, strong and opinionated views were tabled during this meeting. Fortunately, given that we have seen what 'partial success' has given us over the past four decades, the majority of participants was or became convinced that malaria is not a disease that one can tackle with 'partial success'. In this report you will read more about the deliberations as well as suggested plans on how malaria may be eliminated in parts of Africa. It is my hope that those in key positions in funding organisations will take note of these views and perhaps become convinced that an uncompromising attack on malaria somewhere in Africa is worth a try – it is the only road towards glorious success.

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Bart Knols, Major Dhillon, Abdullah Ali. Photo by Serge Christiaans

MALARIA: BACK TO THE FUTURE

SANFORD F. KUVIN, MD

Last year in Africa more than half a million children were killed by a ruthless and indiscriminate enemy. Yet most people are unaware of this epic tragedy, or the fact that it happens again and again, every year, despite our proven ability to stop it.

The deadly enemy I refer to is malaria. In 2012, it infected 219 million people, and killed 660,000, in 98 countries. This is a human tragedy – particularly because this mosquito-borne parasite targets the most innocent among us. Most malaria victims are children.

This global plague kills one-third the number of people who die from HIV. Yet when it comes to newspaper headlines and government grants, malaria receives nowhere near a third of the attention. If we are to finally rid the world of this avoidable scourge, the same attention and resources that made a profound difference in the fight against HIV/AIDS must be employed against malaria.

Despite significant progress in the fight against malaria, this deadly form of germ warfare continues. In 1955, the World Health Organization submitted a proposal to eliminate malaria and smallpox within 3 years. Yet while smallpox elimination was a resounding success, malaria eradication was a dismal failure. The mosquitoes that carry the malaria parasite know no borders, and regional unrest and wars create new openings for malaria to advance.

It is telling that all three Nobel Prizes in the area of malaria were awarded in the early 1900's. Our ability to stop malaria was demonstrated in British Mandate Palestine, which was decimated in the 1920's until the Jewish population applied a zero-tolerance policy and techniques to eliminate the mosquitoes that carry the malaria parasite. Within two decades malaria had been largely controlled and Israel was declared malaria-free. Since then, the world's progress has been less than stellar.

In 1962, while working at the U.S. National Institutes of Health, I infected prisoner volunteers by mosquito bite with a form of monkey malaria, which led to my discovering the first reliable antibody test for malaria. Since this was the first antibody test for any parasitic infection, I wrote in subsequent publications that a vaccine could not be far behind. Yet here we are 50 years later, with no effective vaccine that can be routinely used for mass malaria elimination, and no new Nobel Prize on the horizon.

Sadly, until recently there have been few significant advances in malaria eradication and control, despite advances in the use of insecticide-treated bed nets, water drainage and treatment of mosquito-breeding areas, the use of new drugs, and early trials of vaccines and advances in molecular biology.

But new hope may be at hand. A recent international conference at the Hebrew University of Jerusalem looked into the time-tested techniques that people such as Professor Israel



Sanford F Kuvin

Kligler employed in the 1920's to save the population of British Mandate Palestine. On International Malaria Day the conference organizers released *The Jerusalem Declaration* on malaria, based on the insights of research scientists, field workers and historians from as far afield as Africa, Australia, Europe and the USA.

The declaration endorses an approach I call "Back to the Future," which advocates "reviving the historical strategies as an addition to existing integrated approaches" in order to "save more lives by making malaria elimination cost-effective, realistic and durable."

These efforts include rigorous larval source management; elimination efforts guided by detailed epidemiological monitoring of parasite prevalence and mosquito and climate data; African specialists taking ownership of malaria elimination efforts tailored to their specific situations; and pilot elimination projects in appropriate African settings to demonstrate the advantages of classical integrated approaches.

Along with these efforts, we must continue the kind of innovative scientific research exemplified by Hebrew University scientists like Professor Yosef Schlein, who uses toxic sugar bait to control mosquitoes, and Professor Ron Dzikovski, who discovered how the malaria parasite hides from the immune system by expressing one gene while hiding the other 59.

But the sad truth is that on their own, anti-malaria techniques, both old and new, will never be enough. As the global campaign against HIV has shown, real progress cannot be made without political advocacy and determined action. This requires leadership from the U.S. Congress, the U.S. Agency for International Development, the European Union, the Bill and Melinda Gates Foundation, the Global Fund to Fight AIDS, Tuberculosis and Malaria, and other major fund giving bodies.

HIV/AIDS activism made a huge impact in the fight against AIDS. That same financial and political activism must be employed against malaria which has killed so many millions — mainly children.

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CONFERENCE REPORT

MAUREEN MALOWANY, PHD

LEARNING FROM SUCCESS

Over the past 60 years, conferences on malaria have increased from maybe one per decade to multiple conferences annually. The 1950 Kampala Malaria Conference set the parameters for the 1955 Global Malaria Eradication Programme,¹ followed about 40 years later, in 1992 and 1996, with the meetings in Dakar and Amsterdam that galvanised WHO and international support to eradicate malaria. Roll Back Malaria, the Global Fund, the Gates Foundation and other major international donors took us to the 21st century goal of malaria elimination.

The Jerusalem Conference, held December 9-12, 2013 and designed as a workshop, brought together an international gathering of malariologists from 10 countries, to look back not on our failures, but to learn from past successes.² Drawing upon lessons learned from the success of malaria elimination in 20th century Mandate Palestine/Israel, field workers, entomologists, laboratory researchers, doctors and historians met over three days to revisit the integrated strategies for malaria elimination developed over 100 years ago, to reassess contemporary tools and to design a practical, deliverable malaria elimination program for two African settings: Pemba Island, Tanzania and Gabon. The medical entomologists drove the agenda, linking the past, present and future, to focus on what they do best – vector control for malaria eradication and elimination.

WHY JERUSALEM?

Professor Israel Kligler arrived in Mandate Palestine in 1921, to a land and people dying from malaria.³ Malarious areas impeded settlement and agriculture and the land needed to be reclaimed for human populations. And so it was! Working from Jerusalem with his team of health professionals and scientists, he developed and delivered an integrated program to eliminate malaria from Mandate Palestine/Israel. His strategies addressed people, the parasite and the mosquito: community education, public health (including hygiene, malaria prophylaxis and treatment), epidemiological surveillance and mosquito breeding control.⁴ Kligler built a platform of collaboration with the Department of Health, the Malaria Survey Section and his own Malaria Research Unit. He insisted on sound evidence as the basis for anti-malaria control and elimination programs. Working with entomologists, engineers,

nurses, doctors, teachers and community leaders, Kligler's teams successfully mapped, surveyed, controlled, educated and treated the population of Mandate Palestine. The collective efforts reduced malaria prevalence by 50% in the first year of coordinated anti-malaria work from 5.7% to 2.9%. By 1925, the average monthly prevalence rate was 0.8%.⁵

The visit of the Malaria Commission of the League of Nations in 1925, and the eminent malariologist from The Netherlands, Dr. N.H. Swellengrebel in particular, praised the Kligler model as one that could be applied to malarious areas in other parts of the world.⁶

CONFERENCE PROGRAM⁷

The following is a summary of the presentations and discussions which took place during the formal opening of the Conference and the workshop sessions which followed. Conference material is available online through www.malariaworld.org and, where appropriate, specific links will be cited.⁸

We were very grateful for the presence and contributions of Dr. Rob Dixon, Deputy Head of Mission, British Embassy in Israel and Dr. Gabriel E. Alexander, Jewish National Fund/Keren Keyemeth LeIsrael. Professor Kligler's grandson, Dani Kligler, also in attendance, was presented with a plaque honouring his grandfather's contributions to medicine, public health and malaria eradication in Mandate Palestine and to Israel. This plaque has been placed in The Sanford F. Kuvin Center for the Study of Infectious and Tropical Diseases, Faculty of Medicine, Hebrew University-Hadassah.

The Conference opened with a focus on Prof. Israel Kligler, his vision and his work to eradicate malaria in Mandate Palestine. Drawing upon the primary source documents found in multiple archives in Israel and England, League of Nations reports and Kligler's publications, Anton Alexander elaborated on the challenges of malaria eradication facing local populations, immigrants and government health systems. Kligler arrived in Mandate Palestine in 1921 and by 1922 had initiated a malaria eradication campaign. Kligler's campaign was based on three pillars of epidemiological surveillance (including systematic examination and reporting as evidence for detection and treatment of the entire population); community education on malaria prevention, anti-mosquito measures, hygiene and reporting; and larval eradication, including anti-malarial engineering work and drainage schemes.

1 MJ Dobson, M Malowany, RW Snow. Malaria control in East Africa: the Kampala Conference and the Pare-Taveta Scheme: a meeting of common and high ground. *Parasitologia* 2000;42: 149-166.

2 List of Participants, p.18

3 Zalman Greenberg and Anton Alexander, Israel Jacob Kligler: The Story of a "Little Big Man". A Giant in the Field of Public Health in Palestine, *Korot* 2011-2012; 21:175-206.

4 Palestine. Department of Health. *A Review of the Control of Malaria in Palestine (1918-1941)*, Jerusalem: Government Printing Press. (All primary documents relating to Kligler held in the private collection of Dr. Zalman Greenberg, Jerusalem.) See also the extensive discussion of the Review in Norman White, *Tropical Diseases Bulletin*, September 1942: 39, 592-4.

5 Kligler, Israel. *Epidemiology and control of malaria in Palestine* (Chicago: University of Chicago Press, 1930), ix.

6 League of Nations. Health Organisation. Malaria Commission. *Reports on the Tour of Investigation in Palestine in 1925*. C.H./Malaria/52, Geneva, September 1925. (Greenberg collection).

7 Audio-video recordings of all presentations delivered on Sunday, 8 December can be accessed at: <https://medicine.ekmd.huji.ac.il/schools/publichealth/En/research/malariya2013/Pages/Movies.aspx>

8 <http://www.malariaworld.org/blog/week-its-world-malaria-day-read-jerusalem-declaration-sustainable-malaria-elimination-africa>



Malaria Commission, League of Nations, Tour of Palestine 1925. Zionist Archives, Jerusalem.

As stated above, Kligler recognized the importance of involving government, local community authorities and all segments of the population in his campaigns in order to achieve success. Jerusalem's Health Week Exhibitions of the 1920s included an 'Anti-Malaria Section' with '...illustrated lectures on malaria, its causes, prevalence and modes of prevention; by illustrated pamphlets; and by personal interviews and visits to delinquent families by local malaria inspectors. Palestine had its own Health Day with lectures, visits to breeding places and demonstrations of methods of control.'⁹

For historical photos of this period, texts of archival reports and commentary on the contexts and delivery of the Kligler malaria eradication campaign, please see the two booklets prepared by Anton Alexander.¹⁰

The Malaria Commission of the League of Nations, established in 1923, recommended the Kligler model to other malarious areas of the world. In his reports, Kligler noted the successful strategies already employed in Italy during this period.

9 I. Kligler, *The Fight Against Malaria*; 1925 quoted in Alexander, *Elimination of Malaria* booklet available at www.malariaworld.org/blog/israel-jacob-kligler-story-little-big-man, p. 11

10 Anton Alexander, "Elimination of Malaria in Palestine 90 years ago. What didn't General Allenby and early Jewish pioneers do..."; Anton Alexander, "Elimination of Malaria in Palestine 90 years ago. What didn't General Allenby and the early Jewish pioneers do... that Dr Kligler did", available at www.malariaworld.org/blog/israel-jacob-kligler-story-little-big-man"

One of the members of the Malaria Commission, Dr. and Col. Sydney Price James (1870-1946), with extensive experience in India and well-aware of the disappointments of the Mian Mir anti-malaria campaign there, stood firmly behind an aggressive larval control program as the foundation for malaria eradication. James' 1929 Report to the British Colonial Office following the 1926 malaria epidemic in the Kenya Highlands, reaffirmed the Kligler model with its foundation on community education, health (what James termed 'social development'), anti-mosquito brigades (first recommended by Ronald Ross in the early 1900s) and water drainage.¹¹

Dr. Jan Peter Verhave, author of the biography of the afore-mentioned Dutch malariologist, Nicolaas H. Swellengrebel (1998-1970),¹² extended the international context to include anti-malarial research and practice in The Netherlands. The importance of scientific evidence and knowledge of local epidemiology was the key message of Dr. José A. Nájera drawing upon his extensive experience working with the World Health Organization. Their contributions to the post-Conference debate on the importance of larval control/eradication/elimination programs are noted later in this Report.

11 Dobson, *et al.*, *op.cit.*; S.R. Christophers, *Obituary Notices of Fellows of the Royal Society*, Sydney Price James, 1870-1946, 1947: 5:15; 507-23 at <http://www.jstor.org/stable/769098> accessed 30/09.2013.

12 Jan Peter Verhave, *The Moses of Malaria. Nicolaas H. Swellengrebel (1885-1970) Abroad and At Home*. 2011. Rotterdam: Erasmus Publishing.

Malaria eradication and the work of Fred Soper were never far from the forefront of discussion throughout the Conference. Many participants thought the work of Kligler and Soper were similar in their focus, energy, drive and success and could provide lessons for contemporary programs. The first presentation on Soper's campaigns was delivered by Dr. Bart Knols.¹³ As one of the Rockefeller Foundation's dynamic, confident and sometimes belligerent field officers, Soper brooked little opposition to his work in Brazil and Egypt. The debate on Soper's work and lessons learned can be found in the later pages of this Report and more extensively in the literature cited below.¹⁴

WORKSHOP SESSIONS

For the next 2.5 days, participants shifted into workshop mode with small group sessions, presentations to the entire group and general debates/discussions. We were joined by Israeli scientists and researchers at various times including those members of the Israel Society for Parasitology, Protozoology & Tropical Diseases whose annual meeting was held during the time of the conference to facilitate knowledge sharing and exchange.

The goals for the workshop sessions were to design a malaria elimination program for two settings in sub-Saharan Africa: Pemba Island, Tanzania and the country of Gabon, West Africa. Background material included examinations of Soper's earlier campaign and detailed reports on the contemporary situation for Zanzibar and Pemba. Although malaria is under-researched for Gabon relative to other sub-Saharan African countries, two recent publications on malaria prevalence and incidence were brought to the table, together with the WHO World Malaria Report 2013.¹⁵ Dr. Abdullah Ali, Manager, Zanzibar Malaria Elimination Program, presented on the successes and challenges of the Zanzibar plan. Other presentations were given by participants on past experiences with malaria eradication in other African settings and current vector control/elimination strategies and insecticides.¹⁶ The group broke into two working groups – one for Pemba Island and the other for Gabon. The discussions for Gabon were held in French.

PEMBA ISLAND

With regard to malaria eradication, there was intense debate

13 Knols' presentation available at <http://www.malariaworld.org/blog/conference-opening-program-sponsors> See also: GF Killeen, Fillinger, U., I. Kiche., L.C., Gouagna, BG Knols, Eradication of *Anopheles gambiae* from Brazil: lessons for malaria control in Africa? *Lancet Infect Dis* 2002 Oct;2(10):618-27.

14 Socrates Litsios. Fred L. Soper's Ignored Criticism of WHO's Approach to Malaria Eradication. *Parassitologia* 2000 42: 167-172.; Socrates Litsios, René J. Dubos and Fred L. Soper: Their Contrasting Views on Vector and Disease Eradication. *Perspectives in Biology and Medicine* Autumn. 1997: 138-149. To watch Soper and his team work in the field see: <http://www.malariaworld.org/blogs/j20-jerusalem-conf>

15 Julia N. Goesch, et al., Socio-economic status is inversely related to bed net used in Gabon, *Malaria Journal* 2008, 7:60; <http://www.malariajournal.com/content/7/1/60>; Denise P. Mawlili-Mboumba, et al., Increase in malaria prevalence and age of at risk population in different areas of Gabon, *Malaria Journal* 2013, 12:3; <http://www.malariajournal.com/content/12/1/3>; http://www.who.int/malaria/publications/country-profiles/profile_gab_en.pdf; <http://www.map.ox.ac.uk/explore/countries/gab/>

16 Powerpoint presentations available at www.malariaworld.org

over definitions of terms such as eradication, species eradication, participants' experiences with malaria control and eradication programs, tools, strategies and methodologies. In short, every stage of designing an elimination program was under intense scrutiny. Some felt the goal itself was unattainable; others that the cost-benefit was not clear; others that the epidemiological evidence was incomplete and others were frustrated with those not willing to move forward with the evidence available. The malaria burden on Pemba has been recorded as 1.4% in 2007.¹⁷ While fishermen provide a reservoir for malaria, the number of cases does not warrant mass prophylaxis. Most agreed that a targeted larval source management to elimination program would reduce the malaria burden on Pemba to zero. Using a grid, in the style of Soper's environmental strategies employed in Brazil, together with the recommended insecticide (e.g. *Bacillus thuringiensis serovar israelensis* (Bti)), elimination would be achievable. While this was the majority view, the Pemba Island working group could not come to a consensus. In the end, with one opposition and one abstention, the group did agree to draw up a concluding statement on the importance of larval programs for malaria elimination. The group planned to meet with the National Malaria Elimination Program leaders after the conference to advance an elimination program utilizing larval elimination strategies.

GABON

Designing a malaria elimination program for Gabon proved premature. We were very grateful to have Dr. Abdou Razack Safiou, Directeur du programme national contre le paludisme, Ministère de la santé du Gabon, present for the Conference. Dr. Safiou raised a number of challenges with respect to malaria elimination in Gabon. He stated that Gabon is seen as a wealthy country by international donors and organisations. While it is true that Gabon has natural resources, the benefit is not reflected in education and health for Gabon's citizens. Children who live in the city and visit families in rural villages during vacation often die of malaria.

We approached malaria elimination in Gabon on a setting by setting basis – i.e. considering the mining areas as 'biological islands of man-made malaria' for which malaria prevention and elimination programs could be designed. Sanitary zones could be designed around the premises of the mining stations or 'plants'. The first step would be to conduct a baseline epidemiological survey as there are not sufficient data available to inform a program or intervention. Financing malaria control and elimination could be attempted on two fronts. The companies could be challenged to meet their corporate social responsibility for workers, families and surrounding communities. Another suggestion was to propose a Global Business Coalition which could encourage corporate competition and collaboration. Dr. Safiou proposed that the centennial day of Dr. Albert Schweitzer ('our doctor' in Gabon) established in 2013, become an annual marker for national pride and Presi-

17 Thomas Jaenisch, et al., Malaria incidence and prevalence on Pemba Island before the onset of the successful control intervention on the Zanzibar Archipelago, *Malaria Journal* 2010, 9:32 accessed at <http://www.malariajournal.com/content/9/1/32>; Zanzibar Malaria Control Program. Malaria Elimination in Zanzibar, October 2009 available at <http://www.soperstrategies.com/countries/pemba/tanzania-library/files/EliminationZanzibar.pdf>

dential financial support for a malaria campaign.

The Conference concluded with a working session on Wednesday night into Thursday morning, the 12-13 December, to produce a document that would recall the work of Kligler and Soper on larval eradication to be applied to the contemporary challenge of malaria elimination.

A selection of issues raised during the post-Conference discussions, including those which disagreed with the Declaration, are presented on the pages that follow in a Talmudic style which places commentary and discussion around a central text, in this instance, the contentious phrases drawn from The Jerusalem Declaration.

THE JERUSALEM DECLARATION

Reminiscent of the debates of the 1950 Kampala Conference, the Jerusalem Conference generated heated discussions that resulted in consensus or in accepted disagreements over complex issues of control, eradication and elimination.

The Jerusalem Declaration, p. 12, reflects the debates and discussions that continued vigorously via email well after the closing of the Conference. Although unable to reach a 100% consensus, the Declaration was accepted by 90% of participants.

Snow – 35 cm in total, the heaviest on record – fell in Jerusalem starting on the 12th December paralysing the city, leaving Jerusalem participants home-bound and forcing international participants to leave early. As a result, we were unable to have a closing session to discuss and debate the draft document of The Jerusalem Declaration. However, intense and thoughtful debates continued through e-mail correspondence.

In conclusion, we thank those participants who joined us for the Conference, regret the absence of others invited but unable to attend, and leave open the discussion, debates and challenges to all on the website: www.malariaworld.org

A printed copy of this Report is available upon request from maureenm@ekmd.huji.ac.il

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On behalf of the Organising and Scientific Committees:

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Dr. Bart Knols; Prof. Yehuda Neumark;
Prof. Dan Spira; Prof. Eli Schwarz

PRESS LINKS

- *The Times of Israel*: <http://www.timesofisrael.com/remembering-the-man-who-battled-israels-mos...>
- *Israel 21c*: <http://israel21c.org/health/world-malaria-experts-look-to-israels-past-f...>
- *The Jerusalem Post*: <http://www.jpost.com/Health-and-Science/Bed-nets-wont-wipe-out-a-deadly-...>
- The Hebrew University of Jerusalem: <https://medicine.ekmd.huji.ac.il/schools/publichealth/En/research/malari...>



THE JERUSALEM DECLARATION

Almost a century after Dr. Israel Kligler initiated a malaria elimination campaign in Mandate Palestine, the undersigned met in Jerusalem to honour his exemplary approach that consisted of an integrated attack on malaria that ultimately led to its disappearance.

In many ways, the disease burden of malaria in Africa today resembles that of Palestine when Kligler first arrived. His success – a toolbox that included larval mosquito control, swamp drainage, quinine prophylaxis and treatment, community education - played a major role in making the Holy Land habitable and productive.

The value of this historical approach was seen again in the successes of Dr. Fred Soper of the Rockefeller Foundation. Between 1938-1940, Dr. Soper succeeded in the elimination of an imported but established African malaria mosquito population from its entire distribution over 54,000 km² in Brazil. He achieved further success with the elimination of malaria from Egypt during WWII. Today, children are needlessly dying of malaria in fourteen African nations that are smaller than the area cleared of African mosquitoes by Soper in Brazil.

It is noteworthy that the success of these historical strategies, which consisted of the destruction of malaria mosquito breeding grounds, land reclamation, and housing improvement, occurred before the current strategies based on bednets, residual spraying, synthetic quinine derivatives and artemisinin-based therapies became mainstream.

Contemporary strategies are making inroads toward malaria elimination but are hampered mainly due to insecticide and drug resistance. It is absolutely imperative that we revive the historical strategies as an addition to existing integrated approaches. When augmented with exciting contemporary digital technologies that were absent in the Kligler and Soper days, we can save more lives by making malaria elimination cost-effective and realistic.

We cannot lose the gains of malaria control over the last decade. Worse, in the absence of dramatic successes in the fight against malaria in the near future, it is likely that donor fatigue will result in a situation comparable to that of forty years ago when malaria control and eradication was no longer of interest.

Therefore, we, the undersigned of this declaration, a unique gathering of concerned malaria specialists from around the world, urgently recommend that:

1. Larval source management, i.e. the rigorous, systematic and uncompromised control of aquatic stages of malaria mosquitoes in breeding sites as well as the modification thereof, be added to current strategies. No country that eliminated malaria succeeded in doing so without larval source management.
2. Elimination efforts be guided by detailed epidemiological monitoring of parasite prevalence in representative and comparable sentinel human populations as well as mosquito and climate data.
3. The growing cadre of African specialists, now working in strengthened economies, lead in taking ownership of and responsibility for malaria elimination efforts tailored to their specific eco-epidemiological situations.
4. Pilot elimination projects be undertaken in appropriate settings of Africa, several of which were identified by us, to demonstrate the advantages of classical integrated approaches.

Signed this 12th Day of December 2013:

Dr. Safiou Abdou Razack, Gabon
Mr. Anton Alexander, UK
Capt. Serge Christiaans, The Netherlands
Dr. Major Dhillon, USA
Dr. Zalman Greenberg, Israel
Prof. Charles Greenblatt, Israel
Dr. R. L. Jacobson, Israel
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STATEMENTS IN THE JERUSALEM DECLARATION THAT AROUSED DEBATE

Unlike the situation in Africa...“the report of the Malaria Commission said the Palestine situation was quite exceptionally favourable to the success of antilarval operations. (JN)

Kligler explained that the initial campaign against malaria, begun in 1922, was carried out along these main lines:

1. Detection and treatment of carriers.
2. An anti-mosquito campaign aimed principally at the larvae.

And also, in particular.....

3. EDUCATION (AA)

“In many ways, the disease burden of malaria in Africa today resembles that of Palestine when Kligler first arrived”

Anyone who has spent any length of time working on malaria control in Africa or any other country knows that we have a very limited set of options we can deploy against malaria. (MLT)

.... The Commission would greatly profit by its visit to Palestine, and the world would surely benefit by what they had seen there,

through the medium of the League of Nations. League of Nations, 1925 from www.kligler1930.com (ZG and AA)

STATEMENTS IN THE JERUSALEM DECLARATION THAT AROUSED DEBATE

Collection of data regarding the prevalence of the disease, types and breeding places of the mosquitoes concerned went hand in hand with the education of the public in regard to controlling the disease, and the value of this education was probably as important as the immediately practical results obtained.

Kligler demonstrated through the Haifa Malaria Research Unit that drainage of the swamps alone would have little effect on the malaria, because some mosquitoes can breed in little, out-of-the-way unsuspected places, which even the most elaborate system of drainage would not have reached. Kligler pointed out that at least half of the malaria cases could be ascribed simply to human carelessness and neglect. (ZG and AA)

I strongly object to the reduction of Kligler's success to the use of a toolbox while it was due:

“His (Kligler’s) success – a toolbox that included larval mosquito control, swamp drainage, quinine prophylaxis and treatment, community education - played a major role in making the Holy Land habitable and productive”

- To his careful and detailed study of the epidemiology of malaria in Palestine, as evidenced by his paper on rural malaria of 1924 and his book of 1930 and the appreciation by the LoN Malaria Commission
- To the favourable epidemiological conditions of Mandate Palestine, including that the majority of rural malaria was man-made, as as recognised by the Malaria Commission team. (JN)

STATEMENTS IN THE JERUSALEM DECLARATION THAT AROUSED DEBATE

My main concern is that an uncritical promotion of so called “Soper’s strategies”, would lead some countries to engage in setting up armies of operational forces, without developing/strengthening their epidemiological services, which would have allowed them to understand their problem areas (hotspots), and design appropriate targeted interventions.

I cannot accept linking Soper’s unscientific campaign to Kligler’s scientific approach:

- Soper grossly exaggerated the importance of *A. gambiae* in the very serious epidemic of 1938-9, claiming that the population of the area had not had any previous malaria experience, while there were records of serious periodical (ca. 10 years cycles) epidemics going on for several decades
- He disregarded the epidemiology of malaria, dealing only with the elimination of *A. gambiae*, pretending that it was the essential factor, and the data presented in his book are pitifully inadequate to judge the epidemiological long term impact of his campaign.
- Soper grossly exaggerated the risk of *A. gambiae* invasion to the whole continent in order to impress politicians about the value of his campaign.
- While Kligler’s approach to the study and the subsequent design of malaria control is highly recommended, Soper cavalier assumption that a problem can be reduced to a single factor and concentrate only in the operational aspects, is absurd, as is the assumption that current African malaria problems resemble those of Mandate Palestine.” (JN)

What is significant about Dr. Soper’s work is not only that he managed to eradicate *A. gambiae* from an area the size of Togo, West Africa, but that he completed his work in 18 months and with approximately six million US Dollars in today’s currency. Fred Soper understood the grave threat nature can pose to humanity, and he demonstrated what can be achieved when humanity uses thought and action to boldly fight back.” (ML)

“The value of this (Kligler’s) historical approach was seen again in the successes of Dr. Fred Soper of the Rockefeller Foundation”

STATEMENTS IN THE JERUSALEM DECLARATION THAT AROUSED DEBATE

Comments like “Any money we dedicate to vector control is less money we can put on nets,” made during last year’s meeting of the Vector Control Working Group in Geneva are counterproductive and miss the point of integrated vector control. Besides, this has been the basis for malaria control during the past decade and we still have half the world’s population at risk and around a million annual deaths to malaria (ML)

“No country that eliminated malaria succeeded in doing so without larval source management”

Not true: in the Netherlands, larval source management was too costly, and was abandoned when in-house spraying was found to be effective in the late 1930s (JPV)

Sledge - a political scientist from the University of Texas at Austin, states that drainage works in the southern USA were the key factor in eliminating malaria from the US in the 1930’s. (WB)

The essential thing is to have a thorough knowledge of the type of breeding places and the habits of the local mosquitoes, and apply the appropriate method to the particular local set of conditions. Just as it is difficult to generalize about methods of control for a given country, so it is dangerous to assume that any one method of mosquito control is suitable under all conditions. (Kligler, 1930 as reported in AA, ftn, 10)

“Elimination efforts be guided by detailed epidemiological monitoring”

I insist on adding clinical coverage, plus the addition of a subline, stating that during the period of additional larval source management, and until elimination, the children have to be covered by extra protective measures. (JPV)

STATEMENTS IN THE JERUSALEM DECLARATION THAT AROUSED DEBATE

Integrated control is presently NOT neglected. The plea of the declaration is to add back larval source management to the toolbox. (JPV)

I think it is highly desirable to call for the recovery and/or strengthening of the scientific and technical capacities of malaria control programs in the often neglected fields of Entomology and Malaria Engineering, but this should not lead to a conflict for power by demanding a radical change in policies. Instead, it is necessary to strengthen epidemiological surveillance and to study the entomological and ecological determinants of malaria hotspots to design appropriate ways of treating them rather than merely intensifying the same interventions that had locally failed in the first place. (JN)

“Pilot elimination projects be undertaken in appropriate settings of Africa, several of which were identified by us, to demonstrate the incredible advantages of classical integrated approaches.”

What I don't want to see is a reliance on mosquito nets as the main and sometimes only method against the vector. Comments like “Any money we dedicate to vector control is less money we can put on nets,” made during last year's meeting of the Vector Control Working Group in Geneva are counterproductive and miss the point of integrated vector control. Besides, this has been the basis for malaria control during the past decade and we still have half the world's population at risk and around a million annual deaths to malaria. (ML)





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REVISITING MALARIA:
MOVING FROM CONTROL TO SUSTAINABLE ELIMINATION

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