

DDT AND MALARIA VECTOR CONTROL

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As a result of the Intergovernmental Negotiations on an international, legally binding Convention for the reduction and elimination on Persistent Organic Pollutants, the discussion has been rekindled on the use of DDT for malaria vector control, and more generally, on the question how to make vector control strategies more sustainable. This paper looks at some old and some new thinking on malaria vector control, it looks at the impact of DDT on our thinking and it presents the basic elements of a WHO Action Plan to mainstream the malaria professionals and programme managers in the POPs negotiations.

Controversies over how best to deal with the problem of malaria date back to the discovery of the *Plasmodium* parasites that cause the disease and of the fact that it is transmitted by the female mosquitoes belonging to the genus *Anopheles* when these take repeated bloodmeals. Questions of how malaria control fits into the overall development picture and whether the balance of the control approach should be tilted towards medical approaches or towards vector control were common in the 1920s and 1930s.

Consensus on a strategy was reached at the Intergovernmental Conference of Far Eastern Countries on Rural Hygiene held in Bandoeng (now: Bandung) in 1937 under the auspices of the League of Nations. It is interesting to note how the Bandoeng declarations compare to the current headings in the Roll Back Malaria initiative:

The Bandoeng declarations include:

- *malaria is a health and social problem; it must be attacked simultaneously from both these angles.*
- *malaria in badly affected areas forms a considerable barrier to the development of other welfare activities and oftentimes must be checked before other types of work become possible.*
- *the opening of public health work in rural areas can often be used as the entering wedge for the development of a broader programme embracing education, sociology, engineering and agriculture.*
- *Since malaria is a focal disease in any country –absent in some rural areas, lightly prevalent in others and moderately or heavily endemic elsewhere- the structure of and programme for rural health organization, including health units and health centre, should not be stereotyped but flexible. In those areas where malaria is the outstanding social and health problem, the resources of the health administration, specially augmented where necessary, should be directed chiefly to malaria control, even if this should entail the restriction of other public health activities, until malaria is no longer of major importance.*

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There were also observations made concerning the need to expand the knowledge base on the effectiveness of naturalistic measures which may be interwoven ..with agriculture, pisciculture and animal husbandry, and in line with the economic realities of the rural areas of the world...

Currently, the Roll Back Malaria Initiative, which was launched in October 1998 by WHO, UNDP, World Bank and UNICEF at the instigation of WHO's new Director General, Dr Gro Harlem Brundtland, is gathering momentum. RBM is based on the following principles:

- The malaria burden is a challenge to human development, and a significant cause of poverty and suffering
- The present response is characterized by fragmented efforts and a lack of synergy among "development partners"
- The present response favours the parasite and mosquito vector, not the people at risk
- The primary focus of the response must be with people at risk (not just with the parasite and the mosquito)
- If people know more then they are in a better position to make beneficial choices
- Choices are influenced by knowledge, understanding, resources and services, opportunities to act and a supportive environment.

The advent of DDT in the 1940s and its extensive use in the malaria eradication campaign of the 1950s and 60s has everything to do with the fact that we are now returning to concepts that have been dormant for about 60 years. So, what is the balance of DDT's impact in retrospect? On the positive side, DDT's contribution to humanity includes, *inter alia*:

- millions of human lives were saved by the residual house spraying campaigns with DDT and, subsequently, with second generation residual insecticides when DDT resistance occurred.
- malaria, usually of the unstable type, was eradicated from substantial areas in the temperate and sub-tropical zones and from some small island states in the tropics.
- the malaria eradication campaign brought health services to the community level in many countries (and into remote rural areas often for the first time !) and provided a form of employment and livelihood for tens of thousands of people.
- reliance on DDT and other residual pesticides triggered new research into behavioural aspects and genetics of vectors, particularly in relation to insecticide resistance.

On the negative side of the balance, the following aspects feature:

- the concept emanating from the Bandoeng Conference, of a flexible malaria control programme geared to generating local solutions to local problems, underwent a paradigm shift to a monolithic, vertical programme relying on blanket application of a single intervention in a virtually military operation.
- traditional multidisciplinary and intersectoral support for malaria vector control operations was replaced by strictly health sector confined operations; malaria disappeared from the rural development agenda.
- research on the ecology and biology of vectors came to a virtual standstill.
- commercial vested interests started to dominate decision making on malaria control strategies.

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- and, unbeknownst to those promoting DDT at the time, the build up of an environmental load of this persistent organic pollutant started, although it should be stressed that the proportion of DDT used for public health purposes has been minor compared to the amounts applied in the agriculture sector, even taking into consideration its banning for agricultural use in the 1970s.

In 1999, the global population estimated at risk of malaria infection is estimated at 2 billion, with an estimated 100 million episodes of malaria each year and an estimated 860,000 deaths each year. The distribution of the burden of disease and mortality shows that 90% occurs in sub-Saharan Africa, 9% in Asia and 1 % in Central and South America. War zones and areas undergoing major ecological/demographic change because of land and water resources development have become hotspots for malaria. As unplanned urbanization continues to create large peri-urban areas lacking the necessary basic services, malaria is also on the rise in the urban setting. The POPs negotiations and the renewed discussions on the role of DDT, and of pesticides in general, in malaria control, offers opportunities to make a paradigm shift in vector control, towards truly integrated vector management. The process of putting together an integrated package of interventions requires:

- Evidence-based decision-making criteria to arrive at the most cost-effective mix of vector management methods
- Identification and monitoring of critical environmental determinants of transmission risks
- Indicators for clear thresholds with acceptable safety margins to switch to chemical control, which assumes a fall-back position
- That the concept of subsidiarity prevails in decision-making over resources allocation for operational needs

GIS (and possibly RS) will be important tools in the analysis of the epidemiological and ecological situation as it develops over time and space. It is, on the other hand, hard to conceive the application of Integrated Pest Management principles from agriculture (which are based on food-web models) in Integrated Vector Management.

Criteria for effective IVM include:

- Genuine community involvement that focuses on the operational aspects of scientifically developed IVM methods and approaches
- A solid evidence base for techniques, methods and their synergies in an integrated approach
- A robust cost-effectiveness component
- Sustainability

Resilience of vector control measures is crucial in relation to their cost-effectiveness. Capital intensive methods of environmental modification (usually of an infra-structural nature) are often economically at a disadvantage compared to on-going services with recurrent costs. In periods of social instability, however, when there is a breakdown in services, the value of resilience of such modifications has come clearly to expression.

In the context of natural resources **development projects** (land and water resources development, mining, logging, infrastructure development and urbanization, malaria takes a prominent place among the health impacts, because of its ecological links through the mosquito vector. Health Impact Assessment (HIA) is an essential element in development planning. It should be carried out in the context of EIA and use local expertise and knowledge. In first instance, HIA should

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lead to changes in the design and operations of the project, to reduce health risks; in addition, strengthening of health services may be appropriate so they can meet the requirements of a new epidemiological situation. Maintenance needs of development projects (e.g. of irrigation schemes) should be realistically estimated so that transmission risk reduction can be sustained. In the project budget, a substantial allocation should be made for preventive (design change) measures, with, in addition and where necessary, an allocation for the strengthening of health services.

In order to mainstream malaria programme managers into the national dialogue on the POPs negotiations, WHO has prepared an Action Plan for the implementation of World Health Assembly Resolution 50.13, with special reference to the gradual phasing out of DDT use for public health purposes.

The framework of the WHO Plan of Action focuses on five items:

- The needs of WHO Member States
 - How to improve compliance with WHO recommendations
 - How to take cost analysis factors into account in the decision making
 - How to decrease reliance on pesticides through an integrated vector management approach
 - How to meet needs in terms of human, institutional and other resources, to make the transition required under the POPs Convention
- Safe management of DDT stockpiles
 - How to take into account existing environmental conventions (Basel Convention on the Transportation of Dangerous Goods, and the Rotterdam Convention on Prior Informed Consent)
 - How to make reliable inventories of obsolete stockpiles of public health pesticides
 - How to link up with FAO's programme for the destruction of obsolete pesticides
- Institutional research network
 - How to establish an IVM strategy based on an ecosystems approach
 - Options for a financial mechanism in the POPs Convention in support of research on alternatives
 - How to create a stronger and more effective research network
- Monitoring
 - POPs residues in food and water
 - Human exposure monitoring
 - Monitoring of the phase out process and its impact on malaria
- Advocacy
 - How to bring ministries of health into the INC debate at the national level
 - How to strengthen the capacity of MOHs to make the transition to IVM

Early outputs of this Action Plan will still be introduced into the negotiations. Medium- and long-term outputs will ensure a continuation of WHO's and the health sector's involvement in the POPs Convention procedures.