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# OPERATIONAL PROGRAMS IN DEVELOPING COUNTRIES[1]

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## INTRODUCTION

The well documented resurgence of malaria and yellow fever, the spread of dengue and its associated acute syndromes, clearly show the progressive failure of vector control programs in developing countries. In the final analysis the occurrence of an epidemic in a country said to be conducting a vector control program is proof of that program's failure (Giglioli 1979a).

In spite of repeated resolutions by politically orientated international assemblies, there are few success stories, the most notable being Singapore, and lately Cuba (PAHO 1982), but many failures, each one attesting to the payment of lip service to the doctrine of eradication at the international level, and the national practice of inadequate abatement measures.

This dangerous state of affairs at the national level is increased by the international organizations imposing changes in strategy and target nomenclature (often wrapped in trendy slogans), when more success might be achieved by giving realistic scientific and technical leadership, and by stressing the fundamental needs of organized integrated vector control after ensuring that the country has a genuine need and the intention of supporting the collaborative effort. So far, we have progressed from the concept of world-wide eradication in 1955, through basic polyvalent health services to "Health for all by 2000"—in 27 short years. Having failed to control the major tropical diseases during the last quarter of a century, how are we to achieve Utopia in 22 years?

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Since the mid-1960's the vector control organizations which gave the heady successes of the 50's have been dismantled in many countries, and revamped from their simple vertical structure to an impractical horizontal service structure in order to comply with the needs of integrated health services. Whilst this may be a marvelous concept in a developed technical country, the fact remains that educational levels and social customs in the Third World are not such as to allow the rapid retraining of personnel required by horizontal restructuring; as a result even the much publicized integrated health services of Cuba failed to prevent or control two massive dengue epidemics in 1977 and mid-1981. This was eventually rectified by an intensive, highly organized *Aedes aegypti* eradication program, based on a clear-cut philosophy of control (Giglioli 1979a) backed by complete Government support and the will to win (PAHO 1982).

Failure in vector control programs has been attributed to many factors: physiological and behavioristic resistance in the vector; resistance to chemotherapeutics in the parasite; lack of knowledge of the vector's biology; lack of leadership, trained personnel, funds and appropriate technology; changing government priorities, political instability, and public apathy, to name but a few. Perhaps it would be fairer to say the main cause is an inability to learn from the past experience of both successful campaigns (e.g. Soper et al. 1943, Giglioli 1948, Logan et al., 1953) and the published analyses of our failures (e.g., Malaria Symposium 1972, Reeves 1972, National Academy of Sciences 1976, PAHO 1979, Yekutiel 1980) in order to arrive at a basic model of the philosophy or rationale of successful, organized vector control.

## SUCCESS OR FAILURE: THE CHOICE IS OURS

Our failures can be classified into two major categories; biological and human.

Biological failures are mainly due to evolutionary changes in the vector and/or parasite, in response to the pressures caused by control methods. This category of failure has been the subject of many publications and I do not intend to address myself to it herein save than to indicate that these difficulties are inherent in any control program, in spite of the best laid plans and their tactical implementation. Their solution and the strategies employed to delay their effects in the field are part and parcel of our academic and operational research efforts. I accept that biological failures are an occupational hazard of vector control to be resolved within the scientific community and advocate that research should continue to receive the fullest support of both national governments and international organizations.

In contrast, failures due to the human element are man-made, and thus reversible, if the will to win exists in the society at large.

This is the category which I regard as our major reason for failure: it includes such deficiencies as weak aid agreements, undefined policies and targets, poor and unsupported leadership, lack of organization, motivation, incentive and appropriate technologies; usually caused by politics, petty nationalism, nepotism, parochialism, bureaucracy and a mid-century mania for egalitarianism and liberalism which have led to the breakdown of a disciplined society to the point that the work ethos has become a disease "Workaholism" and elitism based on excellence and enterprise, a denial of human rights.

Against this background of late 20th Century mediocrity let us now turn to specifics, bearing in mind that vector ecology goes beyond the scientific disciplines to include the human parameters that bring success or failure to world-wide control programs.

## INTERNATIONAL AID, WHAT WENT WRONG?

"Tout le monde est pays" a fact well

known to the Big Six communicable diseases in this shrinking world. In the creative euphoria following World War II the challenge of world health was enthusiastically accepted by the United Nations, their specialized agencies and the developed nations. A flood of aid flowed between them and Third World countries, especially after Mr. Macmillan's "Winds of Change" sounded the deathknell for colonialism. And yet, sad to relate, history has shown that the high tide of vector control ebbed in the late 1950's in many newly independent countries, in spite of increasing technical and financial aid. Notable exceptions were few and usually in authoritarian states with strong central governments.

Deference for the ultra-sensitive sovereignties and budding nationalism of newly created Third World countries led to weak and unrealistic agreements between the donors and the recipient countries, in spite of the highly technical nature of the programs in question, often using new methodologies on a scale rarely seen before.

Programs using multinational staff were created without due thought for their detailed organization and the careful definition of the roles, responsibility and command structure between international and national staff. International technicians, denied executive powers, were frequently mismatched with untrained or non-existent national counterparts, or contracted expatriates acting as such. Staff discipline and in-country expenses for recurrent needs were left to the discretion of the national administrator. In many cases isolated projects were ignored by the senior local authorities, thus losing face and cooperation vis à vis tribal authorities; hampered for months by delays in local supplies and furthermore they often failed to receive effective backing from their Regional Headquarters who were often unwilling or incapable of implementing weak, unspecific agreements.

In this scenario I have seen competent and motivated international technicians slowly flounder in frustrated isolation and sink into apathy, petty intrigue, disloyalty and even alcoholism. Stronger personalities often maintained their sanity by engaging in studies totally unrelated to their mission.

Projects were frequently funded from multilateral sources, with each contributor setting different criteria for continued support. This often led to the campaign deviating from its strategic plan to one of fiscal expediency to insure next year's funding. The most insidious criterion was the one requiring a yearly "protected head count," which led to vector control spreading like a spider's web across a country, along its main vehicular roads, rather than consolidating an ever-expanding area to provide defence in depth.

It is incredible that situations such as these come to pass in the wake of the highly successful and well documented eradication programs in Brazil and Sardinia. In both cases a private organization, the Rockefeller Foundation, aided countries of long established sovereignties and independence, only after its leadership of the campaign was recognized and defined by a Presidential and a Royal proclamation. I refer, of course, to Decree N 1042 Article 4 of the 11th January 1939 proclaimed by President Gertulio Vargas of Brazil (Soper et al. 1943) and the ERLAAS decree, Article 4 of 12th April 1946, proclaimed by Umberto di Savoia, King of Italy, (Logan et al. 1953). In both cases the Rockefeller Foundation and its appointed representatives were given the executive *fiat* and defined autonomy to organize, implement and control all aspects of the campaign under their appointed supreme commander.

This was the key to success, on the one hand the affected country recognised its need, admitted its limitations and inability to cope with the problem and willingly yielded leadership and control to a respected foreign organisation. On the other hand the organization recognizing its single responsibility to the host en-

sured the best of leadership and placed its full support and vast experience at the country's disposal. This resulted in an organized, efficient and effective campaign against the vector, and the high standards of professionalism, trained and motivated a generation of national vector control workers. Please note that we failed to learn from these examples and thus failed to apply this highly successful no nonsense formula to post-war agreements.

Following the re-evaluation of the strategy of global eradication in the late 60's, and the consequent withdrawal from this policy, expatriate technicians were progressively removed from the field projects and centralized in research and training units, scattered in the Third World. Their staff also acted as advisors together with short-term consultants.

In practice, this gave expatriate staff a greater degree of freedom and allowed for higher productivity, as it removed them from administrative responsibilities with the host country; their research and recommendations being left for the country to implement or reject, without obligation. While this approach has yielded excellent research which has greatly improved the methodologies and tactics of vector control, it has failed to train or motivate national leaders and teach the need for organization as a prerequisite for effective vector control.

Teaching seminars tailored for professional management often stress methodology rather than organization and those aimed at middle management seem not to recognise that in many small countries, this lower level of management may be entrusted with the whole program. The result is often inflexibility through ignorance; as indicated by a Chief Public Health Inspector in charge of vector control in a small island, who proclaimed that a Swingfog was superior to a Leco fogger because only the former had been demonstrated at a course he had attended, thus the Swingfog had been "officially endorsed" by the International Organization.

By and large research and training units have fulfilled their mission, though anomalies exist under the guise of "regional communications." I refer to such situations as an *Aedes aegypti* unit located in the pleasant climate of the "altipiano" above the distribution of the species, or a covey of international aid specialists located on a pleasant, trouble-free tropical island rather than on its more problematic neighbors.

A stopover in major hotels of many Third World capitals soon discloses that we live in the era of consultants—who frequently outnumber travelling salesmen. Whilst this subject was dealt with by another speaker in this seminar, it is pertinent to note that understandably the consultant's stock is falling in developing countries, except where his mission is that of an assessor on whose judgment depends the release of further funds. In this sense the World Bank's use of consultants is more realistic and productive than that of other aid organizations as they periodically assess projects to ensure that work progress is realistic and in keeping with loan agreements. Failures to comply may lead to restrictions on the release of allocated funds.

Lastly, I would like to comment on the shortcomings of the policy of proportional representation or country quotas, used in staffing U.N. agencies. While this policy is in keeping with the spirit of the United Nations charter, it is self-defeating in practice. On one hand it tends to deprive the developing countries of their professional manpower (the very resource we are trying to create), while on the other hand by not recruiting on merit alone on an open market, the standards of the organizations may be lowered, when by definition they should be setting a standard of excellence for the developing countries to emulate.

## THE DEVELOPING COUNTRIES, WHAT IS WRONG?

Any campaign aimed against an insect scourge requires the same approach as a

military operation and should be based on the same parameters—namely organization, leadership, intelligence, tactics and logistics (Giglioli 1979b).

This philosophy was amply demonstrated in Cuba in the wake of a severe epidemic of dengue (type II) with 258 deaths from dengue haemorrhagic fever and dengue shock syndrome in the summer of 1981. The Cuban Government confirmed its resolution to eradicate *Aedes aegypti* by declaring a national emergency. Between August and October 1981 the premise index was reduced from 35% to 0.03% by a massive campaign using airsprays, 215 vehicular misters, 3,961 ULV knapsack sprayers, 4,407 pressure pumps, 307 vehicles and 13,000–15,000 temporary staff drawn from the Civil Defence (PAHO 1982).

The Republic of Singapore using more moderate means, but with equal resolution and organization, took the long-term approach and effected control by communal effort. The *Aedes* index was reduced from 19% in 1966 to 2% in 1972 by using continuing public education to gain the active cooperation of the populace, whose efforts were checked by small, well-trained cadres of inspectors, backed by a fair but rigidly enforced law: "The Destruction of Disease-bearing Insects Act, 1968" (Chan et al. 1973). This Act allows for a caution to be served on the household of a "breeder," a fourteen day period of grace followed by scaled fines for repeated offences. Efficient judicial action where public education has failed has led to effective source reduction. The *Aedes* inspectors act as assessors of public cooperation and by these means clear one zone at a time with increases of seasonal and geographic vigilance dictated by research results. A succinct overview of this remarkable program by public cooperation, operated by the Ministry of the Environment rather than the Ministry of Health, is given by Farid (1981) and should be compulsory reading for all vector control directors.

The two approaches are different, but their success dependent on the same parameters which could be emulated in any developing countries.

The fact that they are not, clearly demonstrates a lack of resolve at the highest levels of government and a failure to recognize the need for successful vector control.

Half-hearted measures are counterproductive to the creation of an environment where leaders will flourish, especially where they have to be field oriented (Gabaldon 1972). A suit and tie, rather than a bush jacket have become the status symbols of successful leadership, with quantity rather than quality typifying field staff. Organization, maps, statistics and graphical digests of data to keep management and staff informed are usually unknown in these countries: supervision is slack at all levels, and field rather than laboratory identifications of field collections the norm.

Management is traditionally a physician, (Giglioli 1979b) untrained in vector control, who delegates his duties to an even less trained Public Health Inspector: the rare entomologist is relegated to an inadequate laboratory to study taxonomy and do minor research. For this reason vector control entomology is an infertile profession in the developing world when compared to its agricultural counterpart. The agricultural entomologist is usually available, reasonably equipped and more knowledgeable of modern techniques and the latest insecticides, which often reach the agricultural ministries of these countries long before they gain EPA certification in the USA.

At the other end of the spectrum, unequipped inspectors and spraymen wander around the countryside, with little rhyme or reason, and even less supervision—this is frequently impossible due to a lack of, or a failure or an inability to use existing maps.

In emergencies more affluent countries have resorted to airsprays by contracting the local crop spraying companies. Unsupervised by vector control entomologists and flown by agricultural pilots not versed in mosquito control,

adulticidal sprays are applied at the wrong time of the day, with too coarse a spectrum delivered as a placement rather than a drift spray, at the pilot's discretion, without ground control. Little wonder that airsprays are often thought to be expensive and ineffective!

Since an understanding of organization seems central to the problem of ineffective vector control, in the developing countries, Figure 1 gives a typical organogram on which the rationale of vector control can be overlaid.

## ORGANIZATION OF VECTOR CONTROL

The Table of Organization (Fig. 1) stresses the sequence of events, chain of command, pathways of communication inside and outside the vector control organization giving both the administration and operational aspects. Though all individual elements should be represented within the organization, its size, staff etc., will depend on the size of the country, bearing in mind that a mobility and quality rather than quantity are the aims of an efficient organization.

The salient points that arise from the Table of Organization are as follow:

1. The Organization should be planned at the Ministerial level with the full consultation of other interested parties and Ministries: after its creation a statutory advisory board should be created from the key departments to prevent self-generated problems; e.g. a successful agricultural irrigation scheme extended anopheline breeding grounds in spring, attracted infected migrant labor and so returned malaria to an eradicated area; this could have been avoided by early and comprehensive planning with full interministerial consultation.
2. Technology appropriate to the country, its vector biology, labor pool etc., must be selected *ab principio* and changed when operational changes dictate so.
3. The campaign should be planned and costed before presentation to the government, this includes estimates for capital and recurrent costs. The presentation should clearly show that even if the campaign is successful, maintenance is forever, and its cost will not cease after a given time. This erroneous impression is often provided by the theoretical diagram showing the phases of malaria eradication and epidemiological status. Declining incidence should not be related to declining expenditure with cessation in the maintenance phase.
4. The organization should be given its mandate by the highest government council (e.g. Cabinet) and its creation proclaimed by an executive decree stating its aims, leadership, responsibilities, funding and the country's resolve to back the campaign.
5. Administrative pathways between the Ministry of Finance or other key departments in government should be direct, in order to facilitate indents and payment under strict audit; they should not pass through a bureaucratic labyrinth; e.g., in one case the public hospital estimates the budget of the vector control organization, indents its orders, disburses its monies, and clears and delivers its orders from overseas. Under this system delays of six months or more are not unusual.
6. A code should be formulated between the unions, the organization and the Ministry of Labor, giving the organization the right to hire and fire staff, acting within the agreed code of labor relations.
7. The director and his senior staff should be selected on merit and experience, trained, and assured of long-term employment. If leadership is not entrusted to an en-

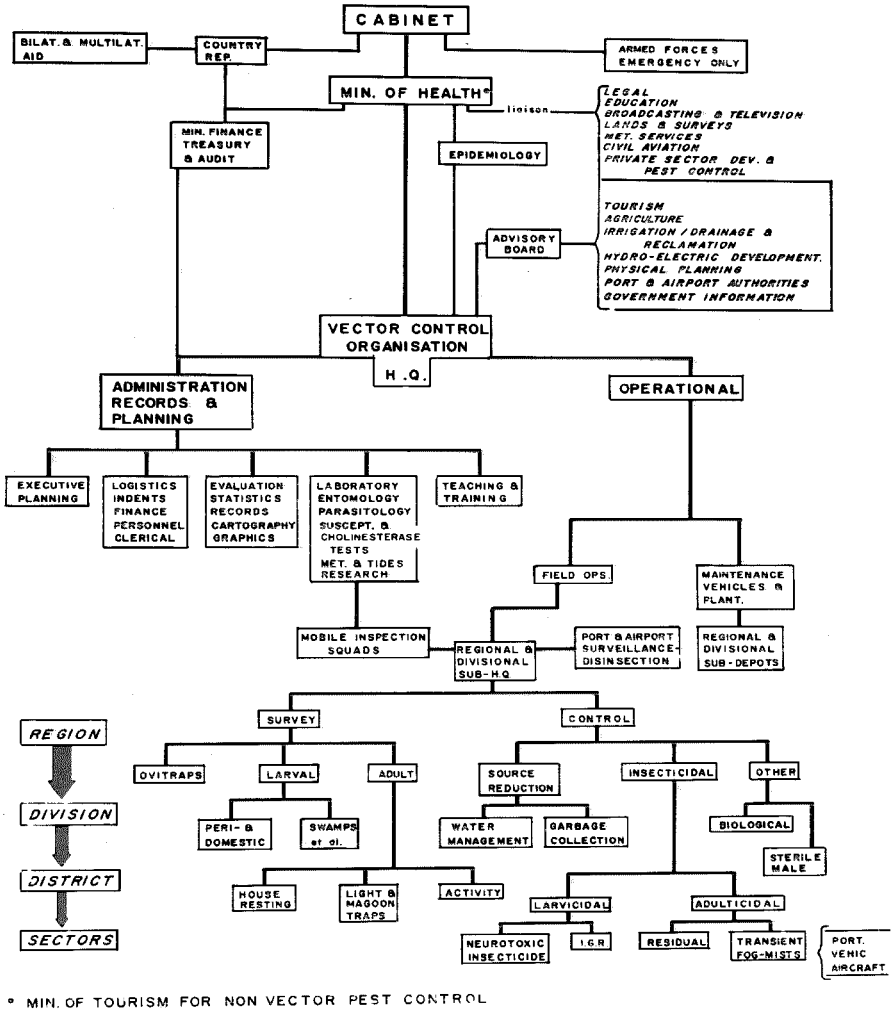


Fig. 1. Table of Organization for vector control.

tomologist, one should be employed as a Deputy Director, and kept in the mainstream of both planning and operations.

8. Staff should be kept to a minimum, well-trained and equipped; discipline and elitism should be fostered. The population at large can be co-opted through public information (particularly through television) and used as shown by the examples of Cuba and Singapore.
9. Field staff should be supported by a strong administrative section, laboratory, statistical, and maintenance section, to allow a measure of self-sufficiency; this avoids repetition of the incident where ovitraps, examined by untrained field inspectors were always reported as negative, until it was noted that they were examined whilst still wet and the glare reflected by the meniscus hid the underlying eggs.
10. Logistics should ensure reliable and cheap supplies by dealing directly with the manufacturer, wherever possible; by gaining their confidence through quick payments, supplies can be obtained quickly. An adequate stockpile for meeting emergencies should be insured and maintained throughout the campaign. Many a campaign has ground to a halt (even in the attack phase) for a lack of insecticides, losing momentum and purpose at its most critical time.
11. Accurate maps and the graphic representation of analyzed data are the basis of planning and daily execution of the campaign, it is not for nothing that all malaria textbooks provide a chapter on basic map-making and Soper and Logan figured their cartographic sections.
12. The collection of data and the analysis is for in-country education and not just for the tedious filling of required forms such as PAHO 601.
13. Inspection and treatment are done by the lowest paid, least motivated staff in the organization; mobile teams operated from Headquarters should make constant random inspections and checks at all operational levels.
14. The attack phase should only be launched when the organization has reached a state of full preparedness, the objective should be a quick knock-out of the vector. Consolidation and maintenance are often more difficult and demanding on organization and discipline and more important than the attack phase. Winning a battle is easier than maintaining peace.

In conclusion, some of you may feel that I have been hypercritical of international and national aid organizations. If so, this was not my intention, which was to expose some of the more human elements of vector control failures and by so doing aid in their solution. On the other hand, many of you may accuse me of predicating what is common knowledge to members of this Association; to this I would plead guilty. What I have suggested is common practice in any Mosquito Abatement District, but as yet has not been exported to the Third World.

I would thus commend to you that: "So likewise ye, except ye utter by the tongue words easy to be understood, how shall it be known what is spoken? for ye shall speak into the air." (1 Corinthians, 14:9).

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# MOSQUITO SPECIES INHABITING RICEFIELDS IN FIVE RICE GROWING REGIONS OF ARKANSAS

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ABSTRACT. Mosquito larvae of 5 species were identified in 5 riceland regions of Arkansas. *Psorophora columbiae, Anopheles quadrimaculatus* and *Culex erraticus* were the 3 most commonly found and were present in all regions sampled. *Aedes vexans* was present only in the E region. *Uranotaenia sapphirina* was found in 3 regions. No significant difference in species occurrence was found among areas. Only one significant correlation of a mosquito species with changes in environmental factors was found: *An. quadrimaculatus* with water depth fluctuation.

Ricefield habitats provide breeding sites for the dark ricefield mosquito, *Psorophora columbiae* (Dyar and Knab), the malaria mosquito, *Anopheles quadrimaculatus* (Say), and several other species. Arkansas is one of the leading rice producing states in the US with ca. 6,000,000 ha in rice production. Most of these rice growing regions are in the eastern half of the state, although some acreage exists in central Arkansas counties bordering the Arkansas river, and some acreage is found in the southwestern counties.

Mosquitoes inhabiting ricefields have been identified as pests of cattle, causing weight gain reduction (Steelman et al. 1972, 1973, 1976, 1977). *Psorophora columbiae* has been shown capable of transmitting Venezuelan equine encephalitis (VEE) and cattle anaplasmosis (Sudia et al. 1971). In addition *Ps. columbiae* have a population peak from mid-June to mid-July (Coombes et al. 1977) which can be an extreme nuisance to farmers and residents near ricefields in Arkansas. *Anopheles quadrimaculatus* could pose a serious health threat if malaria were ever reintroduced in the area.

Studies of larval mosquito distribution

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