

Pan American Health Organization

PAHO/ACMR 10/S2.4

TENTH MEETING OF THE
ADVISORY COMMITTEE ON MEDICAL RESEARCH

Washington, D.C.

14-18 June 1971

ASPECTS OF HUMAN BEHAVIOR
INTERFERING WITH VECTOR CONTROL

PAN AMERICAN HEALTH ORGANIZATION
Pan American Sanitary Bureau, Regional Office of the

WORLD HEALTH ORGANIZATION

Washington, D.C.

Symposium, June 15, 1971

VECTOR CONTROL AND THE RECRUDESCENCE OF VECTOR-BORNE DISEASES

ASPECTS OF HUMAN BEHAVIOR INTERFERING WITH VECTOR CONTROL

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ASPECTS OF HUMAN BEHAVIOR INTERFERING WITH VECTOR CONTROL

There are many ways, some well-known, by which human behavior encourages infectious and other diseases, as witnessed by the expression "man-made malaria". Some of these also interfere with programs of vector control or eradication, but they have been dealt with elsewhere (e.g. PMSAC 1956; Rosicky and Heyberger 1965; Audy 1965, 1970) and, except for one section, will largely be ignored in the present paper, which is concerned with the anthropology and sociology of human errors as they relate to control or eradication of vector-borne diseases. It is becoming increasingly recognized that this problem is a general one. Thus, examples of behavior directly relevant to our present topic can be found in activities that have nothing to do with vector control. Also, there is an increasing recognition that the help of anthropologists and sociologists is necessary in order to succeed with programs involving the public -- the anthropologist Benjamin Paul (1955) has collected case studies of public reactions to health programs that are all indirectly relevant to vector control although none of the 16 studies relates to vector-borne diseases. Papers on cross-cultural approaches edited by Lynch (1969) and on psychological factors in poverty by Allen (1970) and a review of attitudes by Lambo (1970) are helpful. Margaret Read (1966) has gathered much material necessary for improving all types of health programs.

The human elements broadly concerning us are failures of communication; conflict between political and scientific, or personal and public concern; stupidity (a stupid act may have its origin in many sources ranging from cupidity to jealousy, arrogance to fear); and ignorance (which is not the same as stupidity and may or may not be culpable). Since it is difficult to exemplify in detail without causing offense or embarrassment, I propose to start by drawing some lessons from the time when plague first came to San Francisco's Chinatown, as described by Haas (1959).

Plague in Chinatown, San Francisco, 1900-1904^{*}

On Monday morning, March 25, 1900, Chick Gin died in a cellar in San Francisco's Chinatown. His was the first case of bubonic plague to be recognized in North America. While laboratory confirmation of the diagnosis by culture was progressing, police isolated Chinatown and a house-to-house search for more victims began. On Wednesday, newspapers started an attack on health department officials that was to continue for years. Eleven weeks later, four plague deaths had been confirmed, mortality among Chinese had apparently halved -- presumably because bodies were being smuggled away -- offers of plague vaccine had been refused, a third house-to-house search had been started, and the strict quarantine laws of 1890 had been "applied". Judge

^{*}This and the next section, and a few parts of the remaining text, are adapted from the manuscript of a book in preparation on Manmade Maladies.

William W. Morrow, under pressure from a Chinese organization called the Six Companies, declared the quarantine illegal. He blocked an effort to move 7,000 Chinese to nearby Angel Island in the Bay, and ordered the sanitary cordon out of Chinatown. Serious harrassment of Dr. Kinyoun*, the chief quarantine officer, began. He reported attempts to bribe him and threats to run down his official launches. Judge Morrow cited him for contempt and set a date for trial, because a Chinese filed an affidavit that Kinyoun had prevented him from leaving San Francisco in defiance of the Judge's injunction. The Judge had already said in court "If it were within the province of this court to determine this issue, I think . . . I should be compelled to hold that plague did not exist and has not existed in San Francisco." He had listened to physicians practicing in Chinatown.**

By October, confirmed plague deaths had reached 19. Accusations were circulated that corpses were being deliberately inoculated with plague. In June Governor Henry T. Gage had denied the existence of a plague epidemic, and in January 1901, he declared to the legislature that Kinyoun was incompetent and also ignorant about plague. He hinted that the laboratory animals used in diagnosis had been accidentally infected by laboratory cultures. "Governor Gage Pleads for Economy and Denounces the Plague Fakers," said a leading newspaper. When a federal Scientific Commission was appointed to study this situation, the Governor immediately complained to the President of the United States. He later tried to stop their work. The President of the University of California was induced to countermand the medical school's offer of a laboratory for the Commission. The State Board obstructed the City Board of Health. Harrassment took every form: raids on Chinatown, for arrests in connection with alleged slave traffic in Chinese girls, were timed so as to make it easy to associate the raids with visits of sanitary officials. As late as January 1903 stubborn Governor Gage in his last message to the legislature denied the presence of plague (one of his diagnoses of the trouble in Chinatown was "syphilitic septicemia," whatever that is) and castigated Kinyoun and the press for publishing false epidemic predictions. Nothing really constructive was done until the new governor, George Pardee, M.D., took over some three years after the first diagnosis. The last reported case of plague, four years after the first, brought the total to 120, but there must have been many more.

*Dr. Joseph J. Kinyoun had formerly been director of the Hygiene Laboratory in Washington, D.C., that ultimately became the National Institutes of Health.

**Judge Morrow did not share Kinyoun's opinion that some of those physicians "are nothing more nor less than vampires, who engage in the work simply for the living that is in it, and will do anything to curry favor with their patients." We have some such with us now in every country.

In spite of the many deaths that could have been avoided, Chinatown was lucky, because plague is capable of much more disastrous epidemics than this. At that time there was no specific treatment and the mortality was high. The culpable harassment by officials from Governor to Judge to local physicians could have resulted in a frightful slaughter if conditions had been right for a brisk epidemic. It is however true that predictions of a large epidemic would have been ill-informed and needlessly alarming to the public. The way in which such news is reported in the newspapers is extremely important. Not only must reporters be competent and integrious, but good relations must be maintained with them by the health authorities.

Cholera in England, 1831-1832

Although cholera is not a vector-borne disease, what happened when cholera came to Sunderland, England, in 1831 (Longmate 1966) is so instructively similar to the above episode that it is worth selecting some items. Unlike Chinatown, which had no warning, England had known for 13 years of an epidemic of the mysterious and deadly "Asiatic cholera" which started in India in 1817 and had been relentlessly spreading westward ever since. As hysterical anticipation and fear grew, it was rumored that the disease didn't exist at all and, variously, that the English were poisoning the Indians, the rich the poor, governments their subjects, or foreign doctors the helpless populations. Not until late 1830, when most of Continental Europe was affected, did the English government act -- and then it merely quarantined Russian trading ships and ordered a British medical man to Moscow to study the disease.

A few people almost certainly died of cholera in Sunderland during the summer of 1831, including one child whose mother asked the surgeon "What makes the child so black?". The diagnoses were missed, probably as much through fear of unpopularity and scorn as through ignorance, even though ignorance was profound and summer diarrheas were common in those unsanitary times. Dr. James Kell, an army surgeon, was the only doctor in Sunderland who had seen an epidemic of cholera -- indeed he had handled one in Mauritius with apparent great success.

The first official case was diagnosed in late October, and within a week the doctors could no longer ignore the presence of cholera. At an emergency meeting, every doctor raised his hand to show he agreed that the "Continental cholera" had arrived. London was notified. An "expert", Dr. Daun, and a naval sloop were sent. On November 7 the national government quarantined Sunderland, requiring that both British and foreign ships be held 3 weeks. The merchants and ship owners formed a powerful anti-cholera party -- in opposition not to the spreading disease, but to its recognition. The people of Sunderland then solemnly declared that there was no cholera there after all. The Marquis of Londonderry, member of the House of Lords in Parliament with a financial interest in Sunderland's coal trade, wrote to a leading London newspaper that the alarm was false. At a public meeting on November 12, most of the doctors who had so recently raised their hands recanted and supported a formal resolution

"that the town is now in a more healthy state than it has usually been in at the present season of the year; and that . . . as to the nature of the disorder which had created unnecessarily so great an excitement in the public mind, the same is not the Indian Cholera, nor of foreign origin." Those who had reported cholera were castigated. One doctor after another rose to declare that there was no cholera. It then became impracticable for authorities to insist either that doctors take precautions (such as they were) or that they report cases. Dr. Kell, Dr. Clanny (who had a strong interest in the causation of diseases through "distemperature" of the atmosphere and slept with his bedroom door open in winter), and other pro-cholera doctors boycotted that meeting but met with some waverers the next day, when 27 doctors signed a compromise public statement that something that wasn't cholera (but was so like it as to be indistinguishable!) had arisen locally, apparently from "atmospherical intemperature," "acting in most cases upon persons weakened by want of wholesome food and clothing." By increasing the desperate plight of the latter, the statement claimed, the quarantine only encouraged the disease! This whole statement, and especially the last proclamation, is a splendidly sickening example of how human self-interest will have its subconscious way.

Patients were very unwilling to go to the hospital, because of the distressingly long journey and the fear of postmortem dissection. Word got around that the doctors were so hungry for anatomical dissection that they were doing antemortem autopsies. Such rumors commonly arise to support people who do not want to do what they should do. Although it was reported that thirty homes in one street could muster only two blankets, an appeal for blankets and other needed things produced an unrealistically small response. More coffins were provided than blankets; a blanket only allays suffering of others but a coffin helps to allay one's own fear of contamination by the dead. There were fears that donated blankets might be exchanged by the poor for food or ale. One parish conspicuously marked its loaned blankets and asked pawnbrokers not to accept them. The well-off often assume that the poor will abuse charity, a notion that helps to rationalize withholding it. It also happens to be true that the poor, very reasonably and very humanly, are hurt by some kinds of charity because it so often is motivated not by love and compassion but by some need to patronize, to relieve guilt, secure income-tax benefits, advance one's status among peers, and so on, even though there may at times also be a truly generous impulse. Better a loaf given with love than a banquet with duplicity.

Between October 23, 1831, and January 2, 1832, when the epidemic in Sunderland petered out, there were 418 cases of cholera, 215 fatal. Those who had worked hardest to recognize and face the epidemic in its early stages only incurred the displeasure of the community, and many of the doctors had been suborned by a "knot of mercantile speculators." Charles Greville, Clerk of the Privy Council in London, reported on November 22, "The conduct of the people of Sunderland on this occasion is more suitable to the barbarism of the interior of Africa than to a town in a civilised country." While agreeing with Greville's sentiment,

I object to his choice of comparison: slums in industrializing England were much more barbaric and unwholesome than African villages, which in the natural course of events are usually models of neat layout and decent living.

Groups of people involved

It is necessary to consider the interactions and relations between the distinct groups of people involved in vector control and other health programs. (a) Those who are only politically involved. (b) Those who plan and make decisions but are remote from the individuals directly affected, i.e. the senior government administrators who are involved in political aspects but do not necessarily operate politically. (c) Those scientist-administrators who organize and direct the control or eradication program. (d) Experts, such as malariologists with local experience as well as visiting experts without such experience. (e) Those who carry out practical measures in the field and come in contact with the people, comprising inspectors as well as spray-teams. (f) Those who are to be protected by the program, e.g. those at malarial risk. (g) Those, if any, who are affected by the measures as distinct from the protective effects of the program. Planning a program requires ensuring that communication between these groups is adequate..

Those in (a) and (b) may push (c) and (d) too hastily. Those in (e) may not be adequately trained. There may be conflict between local and foreign experts in (d), especially when the visiting expert is overconfident or dogmatic (see comments below on bureaucracies). Those in (e) often antagonize those in (f) and (g), evoking obstruction and withdrawal of cooperation. There is a tendency for those in groups (a) to (d) to belong to what an outstanding sociologist, Pitirim Sorokin (1956), calls a "Mutual Back-Patting Insurance Company" of colleagues.

Problems at the political level

The two stories about plague and cholera will immediately remind all of us of examples of similar kinds of attitudes and behavior during our own work with vector-borne diseases. It will also be obvious (a) that it is impracticable and perhaps unjust to deal as frankly with more recent happenings of like sort, and (b) that it is impossible to deal meaningfully with human nature by means of a few examples and some quick precise conclusions. Human nature demands much more examination. And lessons must be felt in the heart, not only learned in the head, when dealing with fellow men.

Governor Gage, and in a relatively minor way but perhaps more selfishly the Marquis of Londonderry, were obviously directly influenced by vested interests. But such influences are not always blatantly selfish, because the human mind is so extraordinarily clever at rationalization and contriving situations that protect it from what it does not want to know. Advisors are usually selected who can be

relied upon not to distress the man in charge; but this selection may seem at the time to be "natural" and "reasonable". The personality of a high-ranking officer decides by direct and indirect means how he will be approached and what he will or will not be told. The Japanese 15th Army that advanced so dramatically over the Indo-Burma border in early 1944 was in the charge of Lieut.-General Renya Mutaguchi whom a Japanese description showed to be a man of "strong personality" -- doubtless meaning he always got his own way -- with such a violent temper that his subordinates were liable to keep unpleasant facts from him for fear of incurring his wrath. As a result, he was not always aware of the true situation (Evans and Brett-James 1962:57). In many ways, officials in power deliberately or unthinkingly set up filters that distort or block information they should have. When this is combined with remoteness from scientists and the peasantry and other working people, who may belong to a different subculture such as Oscar Lewis' "subculture of poverty," then the wisest decisions may often not be made on practical matters at these high levels. In addition, there are always vested interests connected with elections or the threat of a revolution. Szent-Gyorgyi (1970) has noted how politicians must always be thinking about the next election, while statesmen think about the next generation. For this and other reasons, political decisions may be especially blundering when concerned with long-term projects. Also, decisions at this level may be precipitated by some chance personal involvement rather than by the force of reason: for example, Gordon Smith and Wells (1955) have reviewed a splendid vigorous campaign to eradicate rabies from Malaya, but not the least stir was made in this direction until rabies appeared in the capital (and, the story is told, only after a rabid dog invaded the compound of the governor's house -- although I cannot confirm this, it is a valid illustration of the point I wish to make). In a recent announcement of an expensive campaign against cancer, President Nixon assured the nation that he had a personal interest in ensuring a vigorous attack because his aunt had died of cancer. Although this campaign is most surely needed, and although his purpose was doubtless only to show that he had had personal contact with the suffering caused by cancer, many would suppose that this personal experience had given him a spur that could not have been applied by a mere advisor.

What of Judge Morrow? The evidence could mean that he was indeed corruptible, that he had reason to fear the Six Companies enough to do what they suggested. He might have had an undying distrust of medical people. His medical opinion in court was as incompetent and ridiculous as that of the Governor's before the legislature. Perhaps we should simply say that corruption becomes more enormous and more of a temptation the higher up the ladder people are, a situation that puts at disadvantage the many honest and integrious people in high office.

The denial or attempted concealment of plague, as of cholera, had its origin in vested interests as well as in concern for undue public unrest and fear, and for the economic effects of strong control measures. The danger is that the latter and more legitimate concerns may be used to rationalize behavior dictated solely by personal vested interests. We are familiar with the fact that while every nation wishes to know what diseases and epidemics may be occurring in neighboring countries, none

wishes to advertize an epidemic within its own borders. There are several mechanisms which allow silence to be rationalized although there must be cases where positive knowledge is deliberately suppressed. One rationalization is to insist on absolute proof, for example by recovery and sure identification of yellow fever virus from a sample of patients. It is always possible to raise doubts in a cautious scientist: serological evidence in the presumption of many previous arbovirus infections, the infallibility of microscopic appearances in a liver biopsy, the possible confusion of other infections occurring simultaneously, may all be questioned: the onus of proof demanded of the expert will often appear to him as excessive (W. Downs*). A similar attitude may be taken toward evidence of the emergence of DDT-resistance, say in Aedes aegypti on an island, in which the evidence is rejected as spurious -- compare the decision (or accusation) that the isolation of plague bacilli from Chick Gin was really a laboratory cross-infection.

To turn from negative to positive responses at the political level, the main dangers are the overriding of scientific caution and advice, welcoming outside advice and data to avoid local pilot studies, blindness to the breadth of problems, ignoring long-term aspects, and the silencing of experts whose advice opposes politician decisions or demands revision of decisions already made. Pilot studies are politically unpopular: they slow down the action. Reports and published data from other countries are readily accepted as a basis for planning although local species and conditions often make those findings inapplicable -- there is no substitute for local know-how. An example of ignoring the breadth of a problem is that of the Aedes aegypti eradication program in southern U.S.A.: one criticism of this program among many is the ignoring of the nationwide need for mosquito control -- there are other disease-carrying mosquitoes -- which has been eclipsed by the limited objectives of the program although a more carefully planned and probably not much more expensive program would have given more acceptable protection and, furthermore, would probably have had a better chance of being sustained after federal funds were withdrawn (R. F. Peters)*. Another example is very familiar: the narrowing of views to sole dependence on the magic of insecticides, so that the former techniques of environmental and naturalistic control, and the infrastructure of experienced people, often together with entire drainage schemes and control measures, are ignored and starved of funds. "Off with the old and on with the new" is often bad policy. Similarly, lack of breadth of vision has allowed

*Names in parentheses refer to personal communications from those whose help is acknowledged at the end of this paper.

**As Rene Dubos has quoted in a familiar but wry joke in Man Adapting (1965), DDT has got rid of more malariologists than mosquitoes. Now we have reason to be worried about this.

many countries to ignore the effects of modern agricultural insecticides and herbicides on other organisms such as vectors and their predators and parasites (H. Groot).

Organs of the United Nations, such as the World Health Organization, become political organizations when they advise governments at the highest levels and when they espouse large-scale movements such as eradication programs. Once started, a program such as malaria eradication takes on the characters and inexorable momentum of a political (or religious) movement. Representation to high levels of government has often been made far over the heads of malariologists who may have many misgivings about local problems and the long-term economic aspects -- the time when the country will be expected to maintain at its own expense. Local experts are usually in no position to argue with an authority from Geneva who has already been welcomed by the Ministry of Health. Some have certainly been unjustifiably cowed by WHO pundits in spite of their essential detailed local knowledge (D. Clyde). This makes a bad start to any program.

Problems at the administrative and executive level

Insofar as the senior administrative and executive officers cannot entirely escape political considerations, the preceding comments also apply here. Gabaldon (1969) discusses a number of relevant examples. Perhaps the greatest problems at the administrative level are not having enough time to think about all aspects, knowing whose advice to heed, listening too much to visiting advisors, basing priorities on political or short-sighted bases so that they change too frequently, putting matters completely out of mind once machinery has been started, not considering long-term or even short-term side-effects of actions, neglecting small but unmistakable signs of impending trouble, and somehow silencing all those who tend to complain or make demands. Not all these will be exemplified here.

Even the simplest measures may lead to unfortunate results because actions have not been thought through. A State agricultural statute in California requires that all dairy cattle manure must be at least 50ft from the milking area and 100ft from a milk processing structure. This measure, concerned only with possibilities of direct contamination, results in the piling up of manure at the stipulated distance, leading to heavy fly breeding and much more general contamination, whereas spread manure is trampled and breeds relatively few flies (R. Peters).

Gabaldon (loc. cit.) has not only drawn attention to inaccessible malaria, inaccessible "due to cultural patterns or to the state of mind of the affected populations" and inability to spray dwellings, but he has also noted that it is futile in a developing country to develop rural health services when these absorb funds that should first be spent on malaria eradication or effective control, because the economic and health losses due to malaria will outweigh benefits of the services. On the other hand, wholehearted conversion to the idea of malaria eradication

often halts all funding of former control measures including the staff needed for their maintenance. This is largely due to overconfidence and short-sightedness, but partly due to the fact that enthusiastic eradicators forget to mention conventional established measures and this is naturally construed to mean that they don't matter.

Many scientific aspects are ignored at high levels as well as at the field level. For example, towards the end of a malaria eradication program, even the fewest residual cases are extraordinarily important -- their importance increases with the decrease in incidence -- but this is just the critical time when health and medical officers tend to become complacent. (A. A. Sandosham).

A most important point concerns the lack of a professional market for qualified scientists so that there is a lack of persons with local experience of the people and conditions at the time a campaign starts. Provision of experts by international organizations may be inescapable but this helps to preclude the development of a nation's own scientific manpower (F. Biagi), leaving it unprepared for later maintenance. Where there is already trained staff at the end of an eradication campaign, Gabaldon (*loc. cit.*) believes that it should at all costs not be disbanded but transformed into an organization that can be called upon to meet all emergencies concerned with vector-borne diseases. It is also necessary to preserve the infrastructure of conventional control teams where these already exist.

Sandosham (1970) questions the wisdom of having the busy State Chief Medical and Health Officer in Malaysia in administrative charge of the State Malariologist and an eradication program that "has to be prosecuted with the vigour and thoroughness as in waging war." He rightly quotes Gabaldon's opinion that regular local health services in a country are entirely incompetent to take care of the maintenance phase.

Problems of bureaucracies

A bureaucracy is a moderately closed system that inevitably tends to enlarge itself until internal communications become fragmented. (Northcote Parkinson describes the basis of the system: "(1) 'An official wants to multiply subordinates, not rivals.' (2) 'Officials make work for each other.'") Bureaucracies, including the special bureaucracy of the military, tend to put survival value on the obsessive-compulsive or authoritarian personality type (Lasswell 1959, Kuttner 1960), but of course there are all degrees of obsessiveness or authoritarianism. Obsessive-compulsive scientists have two particular uses: as museum or laboratory workers (where however they may fall into the habit of regarding organisms as patterns on slides instead of living creatures in the ecosystem), and as right-hand-men supporting more adaptive scientists. They frequently rise to high office in bureaucracies and ultimately impart a rigidity at the very time when flexibility is most needed. George Bernard Shaw cynically wrote that those who can, do; those who cannot, teach. Of course, many teachers are also capable doers. In the same cynical vein we may say

that those who can, do; but those who cannot, help to swell the ranks of administrators. But again, many administrators are also capable doers. "The Peter principle" may also hold: the tendency for people to rise to at least the first level of their incompetence (Peter & Hull 1969). There is a curious unmistakable tendency among administrative bureaucrats to develop mistrust and often jealousy of the technically or scientifically qualified man, and thus either to ignore him or to contrive situations where he is not available to give an opinion. (Incidentally, jealousy is one of the several major cankers of a bureaucracy). Some administrators are so utterly ignorant of the complexities of scientific, and especially biological, work that they regard a good scientist as a sort of servant-technician. A number of scientists play into their hands by being narrowly and needlessly technical, unworldly, and unaware of practical or economic problems, or that there are other problems to plague the administration -- they should learn how and when to present a case. I hope I won't be misunderstood in introducing some cynicism. It is necessary in order to review the structure of a bureaucracy. Only by such a review and some knowledge of the people in chains of command can one make efficient use of a bureaucracy to achieve some end such as a control program. Northcote Parkinson's laws should also be studied (Parkinson 1958, 1959).

There have been many studies that attempt to pick out some "universal opposites" in human personalities, with interestingly similar results. These and other sources will repay study, since it should be obvious that anyone who has to deal with people should try to study them. Some generally useful works are those by Allen (1970), Berne (1961, 1964), Chapman (1968), and Harris (1967). Arthur Koestler (1945) has named two types, flexible-holistic and technological-manipulative, as the Yogis and the Commissars. Nigel Calder (1969) describes the tender-minded Mugs (from mugwumps, who regard themselves as being above politics or between parties) and tough-minded Zealots. Chad Walsh (1926) describes the relatively timid Bourbons and the blue-printing utopia-planning Jacobins. Erich Fromm (1964), going more deeply into menacing aspects of the human psyche, contrasts unfettered with narcissistic types and the "syndromes of growth or decay" they promote. Politicians, administrators, scientists, and peasants, whether right- or left-winged and in whatever country, are drawn from these personality types and it is wise to learn to distinguish them.

Problems at the level of field and laboratory

Francisco Biagi, in discussion, has observed that relatively mild weather through the year in humid tropical climates, by obviating the need to prepare for the winter, tends to a lack of foresight that becomes extended to other aspects of life as a general attitude. This attitude is made worse by difficult terrain and scattered population, as well, in many places, as by religious beliefs that everything is preordained (perhaps also by a belief that it is the responsibility of the government to step in).

The commonest bugbear of malaria control and eradication schemes is the locking out of and other opposition to spray-teams and inspectors.

This is not without good reason. One cause is the attitude of the invaders, who are often overbearing and officious or unthinking and who often take strong exception to any objections by villagers. Officiousness is too common, and any kind of uniform, plus the carriage of equipment and arrival in jeeps, encourages this. Once you give an ordinary man even an arm-band, you may bring him a step closer to being an armed bandit. Thus, in many cases the activities of spray-teams is practically a police action, and is resented. I am reminded of a revealing passage in the diary of Erwin Baelz when he investigated cases of tsutsugamushi disease (scrub typhus) in Japan in the summer of 1876 and encountered reluctance among sick farmers to be "treated" (or rather, "investigated," for there was no useful treatment) in a temple converted into a makeshift hospital. He indignantly stated: "The behavior of the people makes exact studies very difficult . . . we found resistance, almost conspiracy . . . Though public officials supported us magnificently, and though we had a big airy room for free-of-charge treatment of patients for two weeks not a single patient came to Mr. Kawakami for admission . . . Patients visited in their filthy homes [Baelz reveals much of himself in his writing] could not be moved either to seek treatment or to accept any medicine of European origin . . . for fear of autopsy . . . We had no choice but to ask for help from the police . . . succeeded in transporting patients to the hospital . . ." (Audy 1968).

A second cause of opposition is the unpleasant consequences or side-effects of spraying. The most immediate is the killing of cats and poultry (cp. the killing of fish by molluscicides or herbicides) -- whence the term common in Mexico for the sprayers, matagatos or cat-killers. Antagonisms may be increased by the fact that sprayers either do not know how to protect the animals or do not trouble to tell the villagers what to do. Opposition has risen in the Pontine Marshes near Rome (where energetic measures were taken after occupying Nazis had dismantled the pumps) because of the great increase in (DDT-resistant) flies (A. A. Sandosham). A longer-term side-effect is the great shortening of the life of thatch roofs, from Southeast Asia to New Guinea, because the spraying kills off mobile 'parasitic' wasps and allows larvae of moths (Herculia spp.) in the roof to go unchecked. There is circumstantial evidence that bed-bugs become resistant and increase in numbers following spraying (R. Ewers). Another form of side-effect is the disruption of the household in preparation for and recovery from the spraying. All this becomes more irksome if the benefits of the spraying are not very obvious.

A third cause of opposition is esthetic. In 1958-60 a pilot study by malariologists of the Institute for Medical Research, Kuala Lumpur, in preparation for malaria eradication in Malaysia, showed that spraying of wettable powder was unacceptable to the Malays because they had very clean houses and objected to the mess on the walls: they would promptly clean the mess off (Edison & Wharton 19). Shortly after, a pilot study was conducted under auspices of WHO by Moorehouse who agreed with this

finding but reported it only in a mimeographed report for official use* (H. Wharton). I have noted on a recent visit to Malaysia that in spite of this, wettable powder instead of emulsion is being used following official instructions but I do not know of the response by men and mosquitoes.

It should be noted that in some places it is the better educated and wealthier people who oppose sprayers, because they make the houses messy (A. A. Sandosham).

A special situation of "inaccessible malaria" arises where revolutionary groups are in action. For example, there are bandoleros or guerrilleros in ill-defined parts of Colombia who spend part of their time as small-holding farmers and cannot be distinguished from ordinary peaceful peasantry (cp. the situation during the "emergency" in Malaya). No spraying is possible in these areas. Not only is malaria increasing but infected people move and introduce malaria to "clean" areas (H. Groot).

A separate problem is that of surveillance in the absence or near-absence of disease. It is humanly impossible to keep alert for something that is hardly expected to arise. Positive blood films are routinely inserted to check the vigilance of laboratory staff, but they are usually more expertly prepared than usual (and probably very positive!) so that they are routinely identified correctly. Administrators also become bored and lulled into false security, even to the extent of cutting down funds. In Ceylon, at about the time the malaria eradication scheme broke down, a backlog of some 100,000 slides had to be discarded unseen (C. Sivagnanasundram). Similarly, in a study of routine surveillance of nurses for pulmonary tuberculosis by routine search of large numbers of regular miniature x-radiographs, fewer were found by this modern method than by the old one of examining nurses who presented themselves because of symptoms. Positive x-ray films were found retrospectively. As already noted, the occasional rare but important case of malaria toward the end of an eradication scheme may go unnoticed or unreported because of a feeling of false security.

It is unfortunately still necessary to repeat the old advice about care in selecting and cleaning slides and in the preparation of blood films. Only a ring may be left of a thick smear after staining, and thin films are often useless. In Malaysia, it has been necessary to distribute detailed instructions to people who should already know (Yap 1970).

Whenever the home is to be involved in health programs, it is wise to win the confidence and interest of the womenfolk (cp. Miyasaka 1962). Although it is so obvious and has also been so often stressed (e.g. Read 1966) that approaches to people who are going to suffer interference should

*A published document is in the eye of the scientific public. Official reports with limited circulation doubtless risk containing statements that might have been omitted or modified if they were going to be published. (This remark is not provoked by the particular report quoted above.)

be friendly and considerate as well as knowing, this is very often neglected. How many operators have thought of finding appropriate proverbs or quotations from religious texts to help gain the support of villagers? (Cp. Gadallah 1962).

Misperceptions by people*

The misperception most familiar to us is that of the householder or villager who looks upon us and our teams as "Government" or foreign and therefore inimical. Education of the people must precede imposing on them but this demands insight into local beliefs and attitudes. As we all know, a poster showing the life cycle of Plasmodium may be entertaining but utterly incomprehensible to some people, and the incomprehensibility may be made worse by attempts to explain scientifically. Fred Dunn has noted how the belief of Malaysian aborigines that one type of hantu or ghost causes malaria by sucking blood and injecting venom allows them to accept at once the rationality of treatment by quinine, mepacrine, or chloroquine, such intensely bitter drugs as to be eschewed by the hantu (Dunn 1971). It should be obvious how a control scheme should be presented to these people so as to have their hearty collaboration.

Some misperceptions are as amusing as they are instructive. A long-term study involving repeated sampling of blood among villagers in Uganda was brought to a halt when one of the investigators went on leave to Nairobi and returned with an obviously fierce little sports car, 'kali sana. Unfortunately, it was painted a bright red and word instantly spread as to the use that had been made of all that vital blood. During pilot experiments in malaria control in Malaya, blood samples from kampongs near Tampin were believed locally to have been sent to Korea for the benefit of UN troops in the Korean War. This belief was only partly quashed by having villagers visit the laboratory and observe the use made of the blood and the large stores of slides (T. Wilson).

Another kind of misperception is that of farmers in California and elsewhere who tend to decide on the needed amount of irrigation by their own personal discomfort felt in hot weather, instead of by the accepted tests of soil moisture. This leads to over-irrigation and multiplication of mosquito breeding (R. Peters).

A common and important form of misperception is that of the people at the receiving end of control measures. They are often unconvinced of the veracity of the inspectors or the sense of the program. They may believe it ridiculous to spend so much effort and expense for mosquitoes that don't

*On the subject of misperceptions generally I would recommend Ralph White's (1966) study of the origin of wars.

trouble them when there are obvious and serious diseases and lack of food. Efforts to inform these people and get their support are often incredibly naive, never getting into the world and level of comprehension of the people. I remember hearing of the first time a Sunderland flying-boat landed in the harbor at Mombasa or Dar-es-Salaam. The Swahili word for an airplane is (or was) simply ndege, bird. One onlooker, awed by the huge plane seen sideways suddenly exclaimed in Swahili, "That's not a bird! It's a fish!"

Manmade maladies

"Manmade maladies" is a generalization of the well-known term manmade malaria, to cover the many troubles we bring on our heads by our own behavior (Audy 1947). The structure of huts and care taken in maintenance have a great influence on transmission of tick-borne relapsing fever in East Africa (Walton 1964) and Chagas' disease in Latin America. The use of water containers, encouraging the breeding of Ae. aegypti and other domiciliated vectors, is not necessarily improved by providing a water-supply for each house because there are social and ecological factors that are not satisfied by piped water (W. C. Reeves); nor are the usual water-containers always the most important. In the Ivory Coast, many jars are kept in houses, containing infusions of various plants used for medicinal purposes: these are prolific sources of Ae. aegypti (Pichon et al. 1969). Modern technology produces vast quantities of waste including discarded containers and old tires, ideal breeding places for Ae. aegypti. Rice growing in Japan makes control of Culex tritaeniorhynchus almost impracticable (W. F. Scherer). Ed Buescher has described how cinder blocks were used for building walls around houses in Puerto Rico -- the top row of blocks had no covers, thus creating miles of breeding containers for Ae. aegypti (W. F. Scherer).

Palin sap is extracted from Borassus trees in the Upper Volta by boring small lateral holes that later enlarge to form breeding sites for most of the feral yellow-fever vectors (J. Hamon). In the Ivory Coast excessive tree-cutting and hunting-out game, combined with cultivation of the cleared land and retention of narrow galleries of bush beside rivulets brings tsetse flies into especially close contact with man and has encouraged recrudescence of trypanosomiasis. In various parts of West Africa, temporary shelters are built just before the rainy season near patches of shifting cultivated, making malaria control impracticable (J. Hamon). A similar situation obtained in the many shelters built around Elahera in Ceylon when the sapphire-rush started in 1966. These were inaccessible to sprayers because they were scattered, because the ground was very treacherous due to undermining by tunnels, and because the rush attracted criminals (Wickremasinghe 1969).

A special group of man-made maladies follow replacement of one species by another as a result of efforts to control or eradicate the first. It appears that the death of cats following antimalarial spraying of houses in San Joachim, Bolivia, was responsible for an invasion by a grassland

rodent (Calomys) that excretes a virus for long periods in its urine. A very severe epidemic of an apparently new disease, Bolivian hemorrhagic fever (650 cases, 115 deaths, in 2500 people) (Smith 1968, who also describes other effects of human interference). An attempt to eradicate Ixodes persulcatus by acaricides in a focus of tick-borne encephalitis in the USSR apparently led to its replacement by I. trianguliceps and a great increase in hemorrhagic fever with a renal syndrome (Bashkiev and Boiko, 1966).

Religious beliefs have often interfered with health and control programs. Schofield has described how wandering monks in Ethiopia present a serious hazard to health by spreading many infections. It is however impossible to treat these people because they believe it is spiritually better for their souls to suffer afflictions than to be free. Robert Traub has described to me a large-scale effort to control malaria in parts of Bengal during World War II. After a great deal of physical and emotional effort, thousands of local laborers were assembled and trained as crews to carry out mosquito-control by digging ditches, spraying latrines and houses, removing vegetation from ditches, etc. After some months, large numbers of the best crews were "forced to resign because of religious reasons." They were Jains, to whom all life is sacred, and accustomed to carrying a brush for clearing a place lest they kill an ant by sitting on it, who had found out that the exercises were not propitiatory but were aimed at destruction of insects. They were well aware that their resignation meant starvation and probably death because there was a famine at the time and they would no longer be provided with rice at Government-controlled prices. I quote this example to show the intensity and sincerity of such beliefs. Much of the same intensity and sincerity extends to non-religious traditional beliefs, but there is ample evidence that these can be changed by a sufficiently informed and sympathetic approach. Religious convictions can sometimes be circumvented by rationalization, as when Buddhists who would have opposed larvicides or knockdown insecticides such as pyrethrum came to accept residual insecticides because if a mosquito settled on a sprayed wall that was its own concern.

Attraction of people to towns added to population growth from within often leads to the development of an urban fringe of shanty towns or uncontrolled building projects. Innumerable breeding sites for Anopheles stephensi, which has there developed resistance to DDT and BHC, have been inadvertently encouraged in greater Karachi, where the resultant urban malaria threatens the whole malaria eradication program of West Pakistan (Bruce-Chwatt 1970). The urban fringe of Cartagena, Colombia, with its innumerable inadequate water containers and litter, is a breeding center for Ae. aegypti (H. Groot).

Movements of people and traffic

The health implications of pilgrimages are well known, but there are other mass movements that affect control programs (Bruce-Chwatt 1968, Audy 1964a). In 1955 refugees from the Tachin islands into Taiwan included some 1,200 who had filariasis; six years later over 4,000 "returnees" from the Sino-Burmese border included 320 with malaria parasites in their blood (Yen 1964). In 1963, indigenous malaria cases reported for the whole of Ceylon had plummeted to only 6, but there were 11 imported cases that year.

Because of the more attractive wage rates in Venezuela, there is a steady illegal flow of Colombian 'wet-backs' across the border north of Cucuta. Many of these migrants are malarial. The situation is made worse by the fact that A. nuneztovari is a difficult species to eradicate, making the treatment of people especially important (H. Groot).

Another form of traffic is by small craft and bootleggers, transporting Ae. aegypti along the Caribbean coast of Colombia from infested islands. In 1969 the port cities of Cartagena and Baranquilla became reinfested, presumably from this source (H. Groot). Yet another form of traffic involving Ae. aegypti breeding sites is that in old automobile tires used for making shoes, etc. This is a serious problem from the U.S. into Mexico and from Venezuela into Colombia.

Where to lay blame

Attaching blame has several consequences. It may be a cowardly shirking of responsibility by projecting at least some of one's blameworthiness onto another. This inhibits honest action by the blamer and arouses resentment in the person blamed, thus worsening any situation. It may be a kind of despairing cry for remedial action, in the belief that if blame can be laid on someone then something can and will be done about it. This is futile. But exactly what is blameworthiness? A child leaves his roller skate where Dad steps on it; a mother leaves her pills where her child easily finds them; a chemical industry produces 1.5 million tons of DDT to the delight of agriculturalists and health officials and all those troubled by the many DDT-susceptible pests, but to the later dismay of ecologists and perhaps the detriment of mankind. Who is to blame for the population avalanche? Who is to blame for My Lai? It seems that there are very many kinds and degrees of blameworthiness. It also seems that (a) many blunders are unmeaning (some are even well-meaning) due to lack of thought or judgment, to ignorance, or to preoccupation with self or one's own business -- the man most "at fault" may have been deceived by others or himself, or he may have acted on incomplete data, or he may have been rushed into hasty decisions; (b) small mistakes may have disproportionately large consequences; (c) responsibility is often collective, when to pick out one man is merely to find a scapegoat; (d) bureaucracies are especially liable to collective blunders; and (e) after the event, refusing to accept responsibility honestly, for example

by "passing the baby" to others, (pasando la papa caliente), may be more reprehensible than the original error.

Words are important and for present purposes we are conjouring up the wrong ideas by using the wrong word, confusing blame with responsibility. Blame is inseparable from ideas of scolding and punishing. It comes from the same Greek root as blaspheme, and implies damaging, hurtful speech. Blaming is petty, immature, harmful, and sadly typical of domestic, political, and administrative life.

Where should we lay the blame? Lay it in some secluded place, sneak away quietly, and forget it.

We may then proceed with the sensible task of discussing the nature and determination of responsibility.

Summary

Human behavior often encourages infectious and other diseases (witness the expression "man-made malaria"). Some of this behavior interferes with programs of vector control, e.g. artifacts that encourage vector breeding, shelters inaccessible to sprayers, peripheral urban sprawl, movements, migrations, and traffic. Many other factors operate as well. One must consider separately the distinct groups of people involved and the communication that is essential between them: those who are only politically involved; those who plan and make decisions but are remote from the individuals directly affected; those scientist-administrators who organize and direct the control or eradication program; experts; those who carry out practical measures in the field and come into contact with people; those who are to be protected by the program; and those who may be affected by the measures as distinct from the protective effects of the program. The basic human frailties involved are ignorance (culpable or otherwise), inadequate training and understanding, misperception, inappropriate attitudes, intolerance for either old or new ideas, unrealistic or inappropriate priority- or value-systems, loss of alertness in long-term routines, timidity when firm action is needed, and fear (of demotion, of power-groups, of loss of favor, of loss of revenue, or effects on tourism, etc.). These result in incompetent procedures, rejection or suppression of evidence, concealment of facts, opposition, bribery, undue haste under political or bureaucratic pressure, bureaucratic inertia, officiousness by petty officials and arrogance by the high, and having political decisions override sensible caution or scientific data or the lack of enough data for realistic planning. Examples of these are given so that appropriate lessons can be drawn, but there are obvious diplomatic difficulties in advertising blunders without causing offense. Even so, news reporters could do much good by bringing facts out into the open: that would add a new and salutary fear, the fear of exposure.

The history of plague in San Francisco's Chinatown in 1900 shows that control measures were obstructed for nearly four years due to fear, vested interests, corruption, and bureaucratic inertia. The Governor and a judge

were involved in the active obstruction. A study of cholera in England in 1831 is likewise instructive. Similar processes can be observed today and should be brought into the open. Problems may be considered separately at the political, administrative, and laboratory or field levels. Some serious defects of bureaucracies are noted.

Many blunders are unmeaning or even well-meaning; and any man pushed in two different directions is likely to move in a third. Blame should never be sought, only responsibility. Collective responsibility is a characteristic weakness of bureaucracies: search for a scapegoat should be replaced by attempts to rectify and clearly state the apportionment of responsibility.

The problems concerned are general, to do with human nature; thus much is to be gained by going beyond problems of vector control.

Acknowledgements

I am indebted to the following for the trouble they took to respond to a letter of appeal sent in April, or for other personal communications: Doctors Francisco Biagi, Paul Bres, L. J. Bruce-Chwatt, David Clyde, Wilbur G. Downs, R. Ewers, Arnolde Gabaldon, Hernando Groot, J. Hamon, W. McD. Hammon, Chamlong Harinasuta, Terry Iddins, Harald N. Johnson, Kian-Joe Lie, Richard F. Peters, William C. Reeves, Albert Rudnick, A. A. Sandosham, William F. Scherer, C. Sivagnanasundram, C. E. Gordon Smith, Robert Traub, H. Wharton, T. Wilson.

Specific items of information thus personally communicated have been acknowledged in parentheses in the text.

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