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UNSEEMLY BEHAVIOR

One of my favorite stories is about the stoned toilets of Somalia. It seems that health advisers from a Western nation were appalled by the toilet habits of the Somalis. The entire country seemed to be covered with indiscriminately scattered human feces. Hardly a toilet, flush or eny other kind, was to be found in this impoverished nation. Fecally transmitted parasitic, bacterial, and viral diseases were rife. So with all the best intentions, these experts decided to use their government's aid funds for a pilot project that would provide simple water-seal toilets to a selected village. In due course, several hundred of the cast-concrete devices were placed over soak-away pits that had been laboriously dug to the prescribed dimensions. The advisers then returned to their offices in the capital, satisfied that they had propelled these people onto the road to modern sanitation.

A year later they returned to the village and were met by a community elder, who courteously thanked them for their gift. But he said, "They are, good sirs, useful

as seats, although not too comfortable. However, as toilets they are a mess." Somewhat surprised by this—what could go wrong with a water-seal toilet that had no moving parts?—they made an inspection tour of the latrines. The elder's description proved all too accurate. Each toilet was indeed a mess, clogged and rendered useless by a heap of stones and feces. The confused advisers questioned the elder. Why would anyone dump stones into a toilet? The elder looked surprised; everyone, he thought, knew that Somalis distracted themselves while defecating by clicking two stones together. And when they finished they dropped the stones into the most convenient receptacle—the water-seal toilet.

The tale of the toilets of Somalia provides a typical illustration of how behavior, unseemly and otherwise, perpetuates many diseases that drain the human resources of Third World peoples. Behavior is a crucial factor in the epidemiology of these infections, and in addition, the culturally rooted beliefs that influence behavioral patterns can be a formidable barrier to the application of available, potentially effective public-health remedies. Nevertheless, health professionals working in the tropical regions have largely ignored modification of behavior as a means of disease control. Nor have they taken into account the behavior and beliefs of the target populations when designing health campaigns. The notion persists among health authorities that high-technology panaceas can, by themselves, be effective. Many are surprised when their drugs, vaccines, and sanitation projects are rejected or allowed to fall into disuse. Educational persuasion has been the single concession to the need to induce behavioral change. But those of us who have evangelically displayed at village meetings charts showing the life cycles of parasites

and the mechanisms of disease transmission know how futile this intellectualized approach to public health can be.

In developing this chapter's theme—the relationship of behavior to health—I should first like to return to the subject of bowel habits. My wife, a lady of intelligence and sensitivity, adamantly maintains that the reading public is not ready for a discourse on feces. It is with some temerity that I disagree. Shit as a source of infection with an array of pathogens is too important to be dismissed because of its aesthetic failings.

To a great extent behavior is an expression of physiological functioning. Therefore, a description of cultural idiosyncracies with respect to bowel habits should begin with the origin of the feces. For starters, there is the throw-away bit of trivia that the singular of *feces*, a plural word, is *fex*—pronounced "fakes." Feces are popularly regarded as the residue, the "metabolic ash," of nutritive intake. Actually, except for some cellulose bulk, they consist of water, intestinal secretions, and bacteria. The proteins, sugars, and fats of the digested food are absorbed in the small intestine, whereas water is absorbed in the large intestine. Diarrhea, the production of fluid or mushy stools, can arise from several causes: (1) conditions that speed up the passage of the food-fecal mass through the gut, thus preventing adequate water absorption; (2) functional failure of the large intestine to absorb water; or (3) abnormal exudation of fluid from the tissues into the intestinal lumen. Conversely, constipation, characterized by hard, dry, small stools, is due to slowed peristalsis, with correspondingly prolonged fecal passage. Abnormal fluid balance, as may occur with fever, can also cause constipation.

The normal American or European, whose diet has a relatively low fiber content, will pass a formed stool of about 100 to 250 grams within eight to seventy-two hours after eating—that is, about once a day. By contrast, the diet of the rural peoples of the tropics has a much greater cellulose content. This diet accelerates the transit of feces, and they tend to pass much bulkier stools two or three times a day. In addition, scholars of comparative bowel behavior have noted that these peoples are quick to heed the "call to stool." (When I come across this term in scientific papers it always evokes for me the image of a bugler blowing the refrain "Call to Stool.") One author who compared Westerners' behavioral ability to withhold defecation with that of the Africans in the group he had studied commented on the "phenomenal capacity of the young Bantu to defecate upon request." So it is unlikely that the rural peoples of the tropics would, or could, take time from their labors to visit a latrine, situated some distance away, several times a day—even if latrines were provided.

Nevertheless, one might think that with all of the great outdoors available, feces would be so widely scattered that contamination risks at any one point would be limited. However, the few studies carried out on defecation territoriality indicate that this is not the case. Humans, like most other social animals, seem to select very circumscribed areas in which to void their body wastes. An excellent model of this phenomenon has been provided by a group of parasitologists and anthropologists who examined the relationships of human behavioral factors to hookworm infection in a rural population in West Bengal. Their study is particularly fascinating in that it reveals how the behavior and biology of man and parasite interact with each other and

with the environment both to perpetuate and to limit the infection.

After two years of interviewing the villagers and actually plotting the location of old and new fecal deposits, these investigators concluded that there were socially recognized defecation grounds, comprising in area only 1 to 2.5 percent of the settlement and its surrounding fields. The concentration of feces favored transmission. When passed to the ground with the feces, hookworm eggs embryonate rapidly and hatch. Within twenty-four hours an infective-stage larva has developed, which will live in the soil, awaiting the barefoot boy with cheeks of brown or his similarly unshod relative. At the first opportunity, the larva wiggles to the surface, penetrates the skin of the intruder, usually between the toes, and begins a migration through the host's body to the intestine. There it matures into a blood-sucking, anemia-inducing, adult. The larva does not spread very far from the fecal mass in which it has originated, so where the ground is heavily fecalized, as in Bengal, there is a potentially serious risk of infection.

Under these conditions a high rate of infection, accompanied by a high worm burden in each infected individual, would be expected. However, a parasitological stool survey of the population of the community showed that while a high percentage of the people were infected with hookworm, the average number of worms harbored was relatively low. A search was therefore made for behavioral factors which would account for this discrepancy, and indeed a delicate behavioral balancing act was found to be operating. On the regulatory side—limiting the extent of infection—was the fact that the Bengali was a quick defecator whereas the worm was a slow penetrator. The five minutes that the individual

spent on average in the defecating grounds was too short to permit many larvae to find and enter the skin. Religious custom also proved to be a limiting force. The Hindu codex prescribes a set of rituals to offset what is considered to be the polluting effect of defecation (one Bengali religious text goes so far as to direct people to face north in the morning while defecating and south in the evening). The most important post-defecatory imperative is ritual ablution, which is antiparasitic in that it washes the adherent larvae from the skin. Higher-caste Bengalis, who are more strict in this observance, were found to have fewer hookworms than members of the less orthodox lower castes.

The time when defecation habitually occurred also affected transmission in various ways, both limiting and enhancing it. Men were found to prefer to defecate in the morning. The coolness and moisture during this time of day made the larvae more active and viable—and thus more infective. Men tended to have higher worm burdens than women, who tended to defecate more frequently in the afternoon. But the behavioral-epidemiological interaction is even more complicated. The larvae from the men's stools tended to die during the heat of the ensuing day, while those from the women's stools tended to survive and mature to the infective state during the ensuing evening. For this reason the women were more of a menace to the men than the men were to the women.

The greed of oil-producing nations and the resulting deterioration in economic health of agriculturally based tropical countries are contributing to the further spread of fecally transmitted infections. The fertilizers produced by the petrochemical industry have, like all oil-derived products, taken a mega-leap in price and are

becoming too costly for the native farmers, who are therefore returning to the ancient practice of organic farming—fertilization by feces. For the farmer, feces are becoming too valuable to discard. The feces of the fields multiply the foci of soil-transmitted infections, such as hookworm. The return to "night soil" as fertilizer contaminates the produce, producer, and consumer with a host of pathogens. For example, contaminated irrigation water becomes contaminated drinking and bathing water. The tropical countries can expect increasing threats to health with each incremental rise in the cost of crude oil.

Nothing frustrates, maddens, and depresses health workers quite so much as the public's indifference to, or rejection of, their carefully contrived projects. Things go better in affluent societies, where most of the citizens are aware of the causes of their diseases. Although the tropical poor are just as concerned about their health as the inhabitants of London or Los Angeles they haven't the foggiest notion of the germ or worm origins of disease, let alone the epidemiological intricacies responsible for the spread of these infections. Bad spirits, bad air, bad bananas, or a bad monkey that peed in the river are just a few of the agents considered responsible for illness. Given beliefs like these, it is no wonder that a Thai hill tribesman, for example, will make the government hospital or clinic his last port of call when ill. He will first seek medical attention from a local exorcist, who will prescribe herbs and perform a suitable ritual. If the illness persists, he will probably seek relief from another tribal medical specialist, who will attempt to blow the offending spirit out of his patient's ear. If this gives no relief, the tribesman will consult the third-echelon specialist, the injection doctor, a semiquack

whose medical kit consists of a syringe, a hypodermic needle, and a supply of outdated antibiotics. Finally, *in extremis*, our tribesman will go to the government health assistant or physician. In American Samoa, where there is a fine medical service, I have seen children dying of bacterial diarrhea who, when finally brought to hospital, still had in their mouths the plant nostrums given to them by the *kahuna* (native priest-healer). The Samoan doctors helplessly complain that when these children die—as they too often do because by the time they are brought in it is too late for life-saving measures—the *kahuna* has the gall to admonish the parents, "See, you brought your child to the hospital and it died."

If beliefs, customs, ignorance, and apathy perpetuate disease and vitiate health services, what about the measures, useful in the control of some diseases, that entail no public participation? The application of insecticides to combat vector-borne diseases, such as malaria and onchocerciasis, and the construction of water and waste-treatment systems are two examples. Unfortunately, this type of strategy has not been notably successful in tropical regions. Vectors have become resistant to insecticides, and the capital outlay necessary to provide safe water to burgeoning populations has been more than most tropical countries can afford.

There is yet another approach to the control of infectious diseases—the mass administration of therapeutic agents, such as vaccines and drugs. This strategy incorporates both passive and active components. Government services supply and distribute the therapeutic agent (public passive), but the people must accept and swallow the pills or extend their arms for injection (public active). Generally speaking, national health workers have been efficient in organizing the logistics of these

campaigns, but getting the drug to the people is only half the battle. Even where there is a satisfactory therapeutic agent, one that is safe, effective and cheap, the problem has been getting the people to the drug. Treating a sick individual patient is not difficult. The person under medical care is usually quite willing to take medicine. However, where mass administration of a drug is needed to break the links of disease transmission, cooperation is poor. There have been situations where a disease, such as malaria, could be almost totally controlled if the entire population could be maintained on the therapeutic or prophylactic course of the drug. During the first rounds of drug administration enthusiasm is great and 80 percent or more of the people accept treatment. Thereafter, participation rapidly wanes, until less than 10 percent are continuing the regimen, and the infection returns to precampaign levels.

I should like to tell you two cautionary tales about mass drug-administration campaigns. One campaign failed because its designers did not appreciate certain traditional aspects of the people's behavior and customs. The other campaign was successful because local customs and social structure were recognized and exploited.

THE CAMPAIGN THAT FAILED

A team of expert malariologists undertook to demonstrate how malaria could be controlled in northern Nigeria by the mass administration of chloroquine (an antimalarial drug). For their pilot project a village was selected in which malaria was highly endemic, and each week for a year the antimalarial pills were distributed to the inhabitants. At the end of the year the malariologists

examined everyone's blood for the presence of malaria parasites, and were perplexed to find almost as much malaria as before the project began. Either the people were not taking the pills, or there were other complicating, unaccountable reasons for the lack of change.

The post-mortem analysis revealed that the failure was basically caused by customary and behavioral factors that conflicted with the project's design. It was found that many of the men, women, and children had not taken the antimalarial, and that the reason for this poor level of participation was different for each group. The men's rejection of the drug resulted from the failure to co-ordinate drug distribution with their food habits. The health workers went through the village giving out the pills at 7 A.M., before the men went to work in the fields. However, the men didn't eat their first meal until 9, and taking the pill on an empty stomach tended to induce nausea and vomiting. The children detested the bitter, naked pellet. For this group a chocolate-coated antimalarial should have been formulated. As for the women, it was impossible to determine the extent of their participation. The village was a Muslim community that enforced purdah. When the drug distributors passed the enclosed family compound, the women's hands appeared from behind the fence, as if disembodied, to receive the chloroquine. It remained uncertain how many of the village women actually received the pills, how many of those who received the pills swallowed them, and how many gave the pills to their children.

Even with the relatively low level of participation taken into account, the infection rate in both humans and vector mosquitoes still seemed inexplicably high. Again, analysis revealed that this high rate was due to

certain traditional practices that the malariologists had been unaware of when the campaign began. The village had been selected because of its relative remoteness, which, it was thought, would isolate it from "contamination" by malaria carriers coming from untreated villages. But in fact there was a great deal of to-ing and fro-ing. "Controlled" villagers would walk miles to visit relatives or sell farm produce in distant untreated villages. And people from these untreated villages would come to the pilot-project village for the same purposes. This meant that new parasite carriers, sources of infection to the mosquito, were constantly being introduced.

What also puzzled the malariologists was the high frequency with which infants were infected. Here too, a probing into traditional practices provided the answer. Men from the pilot-project village often married women from other villages. When one of these women became pregnant it was traditional for her to return to her village of origin to give birth. The highly susceptible infant became infected in this untreated village and was a gametocyte carrier by the time it was brought home.

THE CAMPAIGN THAT SUCCEEDED

On the other hand there is Samoa and the campaign to liberate it from the grip of filariasis.

Mosquito-transmitted Bancroftian filariasis has been endemic throughout the islands of the Pacific basin since very early times. Captain Cook described the swellings of limbs that he saw when he visited Tonga. Herman Melville in *Omoo* gave an account of elephantiasis in Tahiti. Melville also noted that the Tahitians attributed the disease (this was in the 1840s) to the eating of

breadfruit and unripe yams. Change comes slowly to the lovely high and low islands that bejewel the Pacific. Surveys in the 1950s showed the infection rate in adults to be over 50 percent in most of the inhabited islands of Polynesia. In 1972, when we carried out a study in Tonga using a new, highly sensitive diagnostic technique, we found that 45 percent of the children had acquired filariasis by the age of two and virtually all of the adults were infected.

Filariasis is unpredictable. Approximately half of those infected remain essentially asymptomatic. The others, the clinically affected half, suffer recurrent fevers accompanied by painfully tender enlarged lymph glands (the site of the adult worm). In a few of the unfortunate, usually not more than 5 percent of those infected, the disease irresolutely progresses to the grotesque enlargement of limbs and genitalia known as elephantiasis.

Nothing much could be done to treat the infection until 1948, when the drug diethylcarbamazine (DEC, produced under the name Hetrazan) was discovered. DEC proved to be effective and safe; more than three decades later it is still the drug of choice. Most important, it is so inexpensive that national health departments can afford to purchase the quantities required to treat entire populations. The discovery of DEC thus made it theoretically possible to control, and possibly eradicate, filariasis in the relatively isolated islands of the Pacific. To do so, however, would require total coverage; the young and the old, the infected and the uninfected, those with symptoms and those without, all would have to take the full course of the drug. This might be readily feasible if the treatment involved just one dose, but the most serious defect of DEC is that

multiple dosage over a period of weeks or months is required to eliminate the microfilaria infection. Also, the first dose produces transitory side effects—headache, fever, and joint pains—in some of the infected (but not necessarily symptomatic) individuals. Although subsequent doses do not give rise to these adverse reactions, word soon gets around, and everyone becomes drug-wary. For these reasons, most antifilariasis campaigns have been frustrated by widespread refusal to take the necessary doses of DEC.

The antifilariasis program in Samoa was not exempt from these problems. When health workers distributed the pills, the courteous people accepted them with a display of acquiescence and then either discarded them or took them home to be hidden away on a back shelf. A continuing high infection rate and a few discreet inquiries revealed what was taking place—or rather, not taking place. The government, still determined to carry out the program, enlisted the aid of the traditional communal leaders, the talking chiefs. Samoan society is in many ways feudal, and the talking chiefs continue to wield considerable power and influence over their villages. But in the end the talking chiefs provided more talk than action. While they did have influence over the people, theirs was a rule by consent and they did not dare exert the pressure necessary to force people to take the unpopular drug.

In desperation the organizers of the campaign finally consulted an anthropologist who was carrying out a study on the hierarchical power structure in a Samoan village. The advice of this behavioral scientist was to forget the health workers, forget the talking chiefs, and seek the aid of the women. It was his opinion that in their unobtrusive way the women held the stoutest staff

of authority. And I assure you, Samoan women are very impressive—many are six feet tall and weigh over 250 pounds.

Somewhat doubtfully, the government acted on this advice. Health educators were sent from village to village to talk to the women, explaining the nature of filariasis and the strategy of the campaign. Once convinced, the village wives responded beyond all expectations. Perhaps many of them were influenced by the covert knowledge of the filaria-induced hydrocele, the swollen scrotum, hidden beneath the lava-lavas of their husbands. They banded together to form women's health committees. They planned treatment schedules and personally saw to it that every man, woman, and child took the full course of the drug, which they themselves distributed. No one escaped. A recalcitrant husband or son might flee to the hills to avoid treatment, but all his secret bolt-holes were known to the sorority and he was firmly marched back to the village to take his medicine.

Within two years of the first round of the women's war against filaria, the infection had virtually disappeared from Samoa. Unfortunately, for some unknown reason, in a few individuals DEC fails to clear all the microfilariae from the blood even after repeated therapeutic courses. These residual infections act as reservoirs and make it impossible to achieve total eradication. However, transmission was so reduced that for all practical purposes Samoa was relieved of filariasis for fifteen years. Now the prevalence rate is slowly beginning to rise again, and another antifilariasis campaign is about to begin. Happily, the women's health committees have remained intact in the intervening years. During that time they have continued their good work in other health areas, such as nutrition and immunization pro-

grams. It will now be a relatively simple matter to involve them in a new antifilariasis campaign.

The behavior causing the problems encountered by health workers in the malaria and filaria projects was "reasonable." For the most part it involved customs and patterns that could be understood by medical personnel. No profound imaginative leap is required for one to accept the fact that different societies will have different dietary habits, or that people of all groups will reject a therapy that produces adverse side effects, or even that some individuals in both affluent and primitive societies will seek medical aid from systems outside Western, scientific medicine. Given a modicum of intelligence and sympathy, we should be able to anticipate and deal with these problems. Occasionally, however, public-health professionals are confronted with a traditional practice or attitude so bizarre, so far removed from their intellectual frame of reference, that it brings their program to a numbing halt. This final story is about a personal experience of this kind of "alien" encounter. The experience was also one of the very few instances where research was potentially hazardous to my health—and life.

In 1961 my colleagues and I at the University of Singapore School of Medicine, where I was then employed, devised a serological method for measuring the antibody produced against malaria parasites. The test worked well in experimental mouse and monkey malarias and in the few cases of human malaria in the Singapore general hospital. However, to really prove its worth we wanted to evaluate the technique in a highly malarious community. The World Health Organization became interested and promised to find the necessary money if I would find the community.

Several days after WHO's letter promising support arrived, I had an unexpected visitor to my laboratory, Dr. Jan Saave, the medical officer in charge of the malaria-eradication program in what were then the Australian trust territories of Papua and New Guinea. Dr. Saave loomed in my laboratory door. He was a big man, not only in size but also in his florid imagination and in the intensity of his belief in his malaria program. He made me an offer I couldn't refuse. He would furnish the village for our study, an isolated Sepik community that hadn't as yet been subject to any malaria-control measures. He would join me in collecting serum specimens from the village's entire population in order to determine the level of antibody in the different age groups. After we completed this exercise, he would send in a team to begin mosquito-control operations by spraying with insecticide. Later, other malaria-program workers would trek to Salata (the village) to distribute antimalaria pills. In this way malaria was to be drastically reduced. We planned to return two years later to collect serum specimens again and determine if the people's immunity had been affected. It sounded ideal. Malaria was hyperendemic in Salata; there had been no previous control measures; and—I can now admit, after twenty years—best of all, it was in a wildly exotic setting I had always wanted to explore.

Some months after the meeting in Singapore, I arrived by air in Port Moresby. From there I flew in a satisfactorily large plane to Lae, where I boarded a very light aircraft that took me to a town called Maprik. Jan and jeep met me at Maprik, and we were on the road to Salata. Six kidney-jolting hours later the road dwindled to a path. It was now walking time. Porters had been sent ahead to meet us, and our entire group took off over hill and dale for the six-hour march to Salata.

I recall our arrival in the village as if it were yesterday. As we trudged up the final hill leading to Salata, Jan called out greetings in fluent pidgin. He then turned to me and said, "Bob, you are an important person, a professor; it is fitting that you be the first to meet the chief, so take your place at the head of the column." Flattered by this, I marched into the center of the village, where I met the chief in his full regalia of undress; a maquillage of many colors decorated his face, animal bones pierced nose and ears, and a pectoral made from a golden-lip oyster adorned his chest. I proffered my hand in friendship, and the chief extended his hand in reply. He then lowered his hand, grabbed my scrotum through my trousers, and gave a firm tug. I was about to howl in startled indignation when I heard Jan laughing uproariously. He was, of course, well aware of this traditional Sepik greeting.

With this testicular bond firmly established, our project went swimmingly. In the days that followed, hundreds of blood specimens were collected and hundreds of spleens were palpated for signs of malaria. Each morning Jan was busy treating the ailments of the Salatans. And Salata and its environs were exotic and beautiful beyond compare. Scattered through the village were several house tambarins, soaring cathedrallike structures of wood and thatch in which the men performed their most sacred rituals. On the outside, these Sepik temples were decorated with fancifully painted carved animals and mordant caricatures of human faces. Inside were large figures of gods and spirits, each endowed with a phallus of godlike size. In the filtered gloom of the house tambarin one could also find piles of human skulls, trophies of former battles (although some looked suspiciously fresh). At first light, the mist

hovered over the jungle canopy surrounding Salata, and flights of sulphur-crested cockatoos gave raucous greeting to the new day. Some afternoons, a guide led me through the forest searching for sight of the breathtakingly beautiful birds of paradise. At night there were sing-sings, with dancing to the music of bamboo flutes. Each flute produced only a single note, and the melody was made by a consort of flautists in the manner of bell ringers ringing changes. We sat by the fire with the village elders, watching the festivities and sharing with them a bottle of transcultural wine. It was all very chummy, until the last day.

On the morning of our departure the spray team arrived and to demonstrate its efficiency immediately set to work. Within an hour Salata was under a cloud of DDT. This is when the trouble began. I heard a ululating cry from the crowd of "well-wishers" who had gathered to say good-by. Jan was in the center of an agitated group of men who were waving spears and stone axes about. Ah, I thought, our warrior friends have come to give us a ceremonial farewell. Unaware of any danger, I joined Jan in the warriors' circle to make a film record of these last moments in Salata. Jan, who had been talking very fast in pidgin, paused to whisper to me, "We're in trouble. Run for the path when I tell you." This seemed strange to me, but when I looked carefully and saw the enraged faces of our "friends," I became suitably alarmed. I also noticed the spray team cowering nearby. After a while Jan's explanations seemed to cool the hotter heads and a sort of amity was restored. Our porters collected the loads, and we began the walk to the road and the waiting transportation.

As soon as we were safely beyond the village, I asked Jan to explain what the incident was all about. I was

astonished to hear that it was the yam that got us into the jam.

The yam is the basic food of the Salatans. It also plays an important role in the religious beliefs of these people. Huge ceremonial yams, some of them five feet long, are grown in sacred plots. Each is painted, and a superbly woven mask, to represent the spirit believed to inhabit the yam, is placed over one end. The yams are stored in sacred yam houses, and it was the spraying of these structures that caused the trouble. The Salatans had never seen DDT emulsion before and didn't know what to make of the white, milky fluid. They could think of only one similar substance—semen. The men of Salata decided that we were ejaculating, by way of the spray can, on their sacred yams. Why we would want to deposit semen on the yams they didn't know, but they did know that white men had some outrageously unseemly habits as well as peculiarly offensive medicines. They were convinced that spraying this "seminal fluid" was both a sacrilege and a means to defertilize the entire yam crop. They foresaw a year of starvation. Fortunately for us a few villagers had been to missionary school, and Jan was able to persuade them that the content of the spray cans was produced by the chemical industry, not by our prostate glands. They, in turn, (partially) convinced the other villagers. Still, an uncertainty lingered, and a compromise was reached; the sacred yam houses would not be sprayed. Also, rags were to be wrapped around the spray nozzles to prevent DDT from dripping onto any place where it might give offense to the spirits. As I recall the abject terror of the spray team, I very much doubt that any insecticide was applied after our departure. Certainly, malaria didn't decline in Salata until later, when mass chemotherapy was instituted.

To ameliorate, if not eradicate, the debilitating diseases of the tropics will require behavioral changes not only on the part of the populations at risk but also on the part of the public-health officials. Both the populace and the health worker must acquire a better understanding of the nature of the diseases and the preventive measures required. For the populace, doing this will mean surrendering many cherished beliefs and practices. For the health worker, trained in a scientific tradition quite different from that of the behavioral sciences, it will mean bridging a gap that has been described by the medical anthropologist Frederick Dunn as an "intellectual discontinuity . . . the long standing separation of the behavioral disciplines from the physical and biomedical sciences." Finally, for the researcher and those who fund research it will mean making the effort to raise their eyes from the microscope and take a new look at the world about them.