Filaria in Okinawa

Chokei Yoshida

1 Assessment of endemicity (size of the problem)

Any disease before it comes under a particular control program should have been first recognized by the people of the community who are suffering from it in their own sphere of life. This recognition may be in some instances so obscure that it should be brought to light or reaffirmed scientifically by research workers, epidemiologists or by public health officials. When the cultural standard of the community is high enough to have knowledge about the availability of medical science of controlling the particular disease, their discomforts will gradually become "felt-needs", which in some cases may be successfully fostered by instructive information media, and by the general climate of opinion. And when the felt-needs of the community become relatively urgent and frequently arouse public opinion, then the responsible public official becomes obliged to bring himself to weigh up the problems. These steps are the usual way through which a public health problem comes to the forefront in a developing country where the public health authority is seriously occupied by a cluster of major public health problems.

In the Ryukyu Islands (present Okinawa Prefecture; situated in the southernmost subtropical part of Japan) under the jurisdiction of U.S.C.A.R. (United States Civil Administration of the Ryukyu Islands), the frequent investigations and their sensational reports on the high endemicity of filaria were warming up the climate of opinion, and when C. Yoshida in 1960, reported about the incredibly high rates of filarial infection among the students of the Ryukyu University and Ryukyu Police Academy (8.9% and 19.0% respectively), a signal-fire was ignited, as it were, to let the people and the government know that the filaria problem had reached its peak.

Generally, when the responsible official wishes to construct and launch any program for which the needs are relatively urgent and the chances of success most promising, in order to improve public health, it is essential for him to obtain sound basic data on the distribution, prevalence and public health importance of the particular problem. Thus it had become a matter of common knowledge that filaria is a very common kind of infectious disease not only to the peasants, fishermen or the people of lowest class of society, but also to the university students, white-collar workers or the high-brow and the possessing class. The Health and Welfare Bureau of the G.R.I. (Government of the Ryukyu Islands), in this context, could have data on these items which had been reported by various investigators in prewar and postwar days.

2 Establishment of priority

Priority may refer to the importance attached to specific health problems which take precedence on planning boards over others in the overall health plan. This, however, does not imply that the morbidity and/or mortality of the particular disease should be always the highest among all other diseases and health problems. Priority should be determined not only by the magnitude or urgency of the disease shown in terms of the usual indices of mortality and morbidity data but also by the intrinsic importance of the effects of the disease which are outstanding as causes of temporary disability, of incapacity for work, or of permanent crippling sequelae, thus of decrease of productivity as a whole. Filaria in the Ryukyu Islands, for example, gave a good illustration in this context. As shown in the Table 1, the annual incidence of reported filaria in the Ryukyu Islands, seemed by no means to indicate adequately the actual degree of endemicity of filaria nor to show the real trend in the Ryukyu Islands since 1957.

| Year | Male | Female | Total |
|------|------|--------|-------|
| 1957 | 28   | 18     | 46    |
| 1958 | 19   | 9      | 28    |
| 1959 | 21   | 2      | 23    |
| 1960 | 125  | 125    | 250   |
| 1961 | 51   | 28     | 79    |
| 1962 | 823  | 830    | 1653  |
| 1963 | 323  | 335    | 658   |
| 1964 | 337  | 280    | 617   |

Table 1. Incidence of reported cases of filaria in the Ryukyu Islands since 1957
3 Feasibility of countermeasures (mass campaign)

The feasibility of a program, that is, whether it can be successfully carried out involves technical and administrative factors, and these may be questioned on the following considerations.

3.1 Technical factors

Technical feasibility implies, as in the case of malaria eradication, the possibility of indicating the processes that would lead to an absolute interruption of transmission in any epidemiological circumstances that might be encountered. Applicability of control measures should be first of all studied and guaranteed by research workers of medical and paramedical sciences. The following points of the problem have long been scrutinized by several institutes of endemic and infectious diseases in Japan; (i) Mass diagnosis, (ii) Mass treatment, (iii) Vector control and (iv) Health education and environment sanitation. And though there were still a lot of questions remaining unsolved, the arguments were generally considered to have been boiled down to the minimum points that would be adopted by the administrator of public health for planning the mass eradication program.

(1) Mass diagnosis of filariasis had been in general carried out by examining the peripheral blood at night (p.m. 9-12). Though this method involved some problems about its sensitivity and acceptability to the public it was quite reliable and specific giving few false positives.

(2) Mass treatment of a communicable disease (filariasis) has two essential implications. In the first place it reduces the existing damage and potential danger to the individual microfilaria carriers and thus makes a fair return for the collaboration in the program. Secondly, it aims at exterminating the sources of infection in a community and thus gives a substantial reward to the public for their support of the program. Therefore, although it was preferable in general to emphasize the preventive over the curative services when priority in the overall public health was to be established, treatment of the microfilaria carriers was a vital part of the F.E.P. In fact, it was not too much to say that the feasibility of filariasis control first became promising when the drug, diethylcarbamazine, was found to be specifically effective to kill the microfilariae in the human body. Doses and mode of administration of the drug had been studied in various ways in Japan and the Ryukyu Islands and one of the most effective and economical patterns of mass treatment was adopted by the G.R.I.

(3) As to the vector control, a considerable amount of experience had been made available for the planning of the eradication program in Japan as well as in various parts of the world. The house-spraying program with wall deposits of DDT, so widely used with success against malaria vectors, had proved inadequate against filariasis carried by Cx. fatigans. Many organo-phosphorus compounds had been tested against Cx. fatigans in houses, and Baytex and malathion appeared to be the most promising experimentally. And when the residual spraying operation was adequately coordinated with insecticidal larvae control and the general environmental sanitation measures aimed at the reduction of breeding sources, then the operation made a great contribution to the whole eradication program.
(4) Public health education with special emphasis of the environmental hygiene will also make the feasibility of eradication more promising because the permanent control of such domestic mosquitos as Cx. fatigans and other culicine is best effected by environmental sanitation measures.

3. 2 Administrative factors

(1) Prospect of continuity: Even a carefully organized and perfectly administered program will not give perfect results. Particularly in filariasis, the onset of illness is so insidious with a long serial interval that it will take quite a long time to see whether any missed source of infection might have spread microfilariae to the cleaned community or not. In other words, one must wait for a time interval, theoretically at least, longer than the maximum incubation period of filariasis in order to deny the possibility of its recurrence. It can therefore easily be expected that the satisfactory accomplishment of a program may require a long-sustained effort throughout the country. In order to keep the continuity of policy, there should be established an ad hoc advisory committee composed preferably of representatives who are acceptable, influential and discerning persons from various fields of activities related to the public health problems. Even brief lapses can cause the loss of all that has been gained by the long-lasting program.

(2) Availability of resources is one of the essentials which cannot be stressed too strongly. No matter how idealistic the objective and structure of the program may be, it is futile to attempt any mass campaign if the resources necessary for its achievements are not available. A program will contain provisions for the organization and details of the measures needed for its implementation. Other essential items in the planning will be included in the following main categories:

(a) Manpower requirement

The planner can construct the nicest, most imaginative and precise plans but the actual work has to be done by someone else, and even when the specialist workers are available, they have to be adequately supported by many ancillary workers. Therefore, well-trained adequately main-tained and well-equipped staff are essential at all levels of the program. As there are numerous aspects and phases of the control program, and the failure to carry out any one of them can negate all other efforts, the qualifications of all members of the program team must be acceptable at least for the delegation of particular responsibilities needed at all echelons. In the case of the F.E.P. in the Ryukyu Islands, it was easily anticipated that the available number of the auxiliary workers, i.e. laboratory technicians, public health nurses, statisticians, etc. would be exhausted as the program started running. And applications for ‘ad hoc’ laboratory technicians were invited from the pool of senior high school graduates. Emphasis was placed on the principle that the recruiting ground should preferably be the particular district where the program was just under operation so as to create a high esprit de corps. This principle had proved to be of extreme importance beyond expectation when the percentage of the population covered by the first round of field survey was found to be over 96% on an average at the last stage of attack phase in Miyako the target area. Those ancillary technicians, though they were at first employed temporarily and paid lower, worked very hard and enthusiastically as if they were working for their own profit-making businesses. They did not abandon the non-response people and visited their houses to collect the blood specimens necessary for filling up the percentage of coverage even at the witching time of night. When the percentage of those covered kept going higher through the operations and these admirable results of their efforts were frequently reported by the mass communications throughout the country, the program operations became more enthusiastic and inspired and got into smooth running order. Such experience had indicated to us how good use could be made of the personnel and the facilities of mass communications. However, it should be noted that even those young and inspired workers may become tired of the monotonous tasks during the long-lasting period and their uncertain future may undermine their high spirits. Therefore, the responsible officials should be discerning in supervising and longsighted in reorienting these auxiliary personnel.

(b) Facilities and budget

Space, buildings, medical supplies and equipment, facilities for communication and transport, all must be available. In the case of the F.E.P. in the Ryukyu Islands, consumptions could be purchased by the fund through the channel of the U.S.C.A.R. and all the fixtures and equipment from the Japanese government, whereas the G.R.I. provided all the working funds including the existing set-up of the Health Bureau. There was no need to dwell upon the importance for the financial backing. However, it cannot be too much stressed that the continuity of a proper amount of capital outlay and circumstantial recurrent expenditure should be guaranteed by the official sponsorship of the government. Therefore, it is clear that not only the Bureau of Health and Welfare but the general climate of public opinion and administration must be behind the
program to enable legislation, the release of funds and community support to take place. And it is also a matter of importance for the planner that he should have prospective idea transferring the whole budget smoothly to another new plan for the improvement of the public health.

4 Organizational pattern of mass campaign

The organizational pattern of the F.E.P. must be established. When it has been recognized that the size of the problem is sufficient and the resources are adequate, there is still a lot of spadework to be done before the implementation proper should start.

The first step to be taken is to decide the responsible organizational units for the mass campaign in F.E.P.; who will run it technically, and how the mass campaign will fit into the country’s health services at central, intermediate and peripheral levels. In many areas and countries where the general health services are very rudimentary or non-existent, a mass campaign against a certain disease may require an ad hoc organization system for operation. In some countries where the early stage of a mass campaign against a given disease is followed by the undertaking of a new program against another disease nevertheless the necessary surveillance of the earlier campaign, the existing specialized personnel and facilities for the former program may be properly utilized without any laborious spadework. And in countries where there already exists well-developed general health services, mass campaign can be usually operated by the existing structure, with the participation of the relevant organizational units at all levels, so that the latter have been involved in the initial planning. The extent of involvement of general health services in mass campaigns thus varies from country to country depending upon several points; (i) state of development of the general health services, and (ii) nature and stages of the mass campaign.

As to the first point, the network of health services which was fairly well developed throughout the Ryukyu Islands was one of the most helpful factors that contributed to the prompt launching of the F.E.P. Moreover, there were facilities and personnel properly maintained for the epidemiological surveillance of malaria. Drivers, mosquito-collectors, insecticide spray-men with experience of more than 10 years in the preceding malaria eradication program were available from the outset of the F.E.P. Assessment had been made of the strength and weaknesses of these residual services for malaria eradication in order to fill up the depleted complements for the start of the new F.E.P. Shortage in the personnel was expected only in the staff of mass diagnosis and statistical work in the control units. Thus the existing normal mechanism of the general health services was favorably utilized for the F.E.P. at central and peripheral levels with little reinforcement of auxiliary personnel.

The second point, the nature of the disease against which the particular mass campaign is designed, has a great influence upon the extent and timing of the participation of the general health services in the mass campaign. In the case of eradication programs against certain infectious diseases with relatively shorter serial intervals of infection such as malaria, yaws, smallpox, and trypanosomiasis, rapid, extensive and intensive operations are usually required in order to obtain the desired “Knock down” effect in its attack phase. And accordingly these operations often necessitate the establishment of an ad hoc administrative organization in addition to the framework of the general health services, as in the case of the previous malaria administrative organization (M.E.P.) in the Ryukyu Islands. On the other hand, there are quite a lot of communicable diseases which require steady and long-lasting control measures rather than a “crash-type” campaign mainly because of their long serial intervals of infection. And the control procedures against such sorts of diseases as tuberculosis, leprosy, etc., are often successfully carried out through the existing structure of the general health services. Filariasis, generally having extremely long and various incubation periods and the clinical onsets being formidably insidious, may require a special working unit with high sensitivity to prevent exacerbations, or reintroduction and administrative problems emerge.

Amongst them the following three are of utmost importance: epidemiological surveillance, integration of the machinery or the F.E.P. into the general health services and public health education or the improvement of the public attitude towards health matters. Having decided the extent of the participation of the general health services in the campaign, the F.E.P., the following considerations were taken; (i) to allocate and deploy the activities at all echelons of the campaign, (ii) to define fields of responsibilities for all activities deployed above, and (iii) to elucidate the lines of command throughout the structure.

5 Integration of the mass campaign into general health services

5.1 Single-shot campaign

This is a common type of program for the control or eradication of a particular infectious (or non-infectious) diseases on a country-wide basis, carried out only once without any succeeding campaign program. In some countries where local health structures do not exist but where the need for some measures of breaking the vicious circle of excessive sickness, low productivity and poverty does exist, a
mass campaign may well be justified. There are roughly three basic categories of country in various degree of development of general health services, namely;

(A) Undeveloped, where local health structures do not exist or are extremely rudimentary,

(B) Developing, where general health services are available but are not satisfactorily enough established to take a minimum charge of the long-term procedures to ensure the maintenance of the results obtained by the mass campaign, and

(C) Developed, where the standard of the overall health services has risen fat beyond the critical level for the tasks in the consolidation and maintenance phase, but where there still exists particular infectious diseases which require certain radical measures such as a mass campaign.

The concentrated energy at the peak of the mass campaign can be utilized in various ways producing results of various kinds and degrees (Fig. 1: level 1, 2, 3 or 4). The extent of utilization depends much upon the attitude and capacity of the health department. All of the professional and non-professional health workers engaged in the mass campaign, the equipment and facilities that were used, the release of funds supported by the government and all of the favorable effects of the mass campaign may be assimilated into the general health services at the disposal of the health and welfare authority. And accepting that the extent of utility of the mass campaign depends also upon other circumstances in the particular country, it should be noted that the minimal network of general health services for the epidemiological surveillance should be established by the end of the consolidation phase (Fig. 1, level 3). If financial and other circumstances do not permit the early creation of such local and regional health services to be responsible for the residual works, there is less opportunity of success for the whole mass campaign, and all that has been gained by laborious works may be lost (Fig. 1, level 4).

5.2 Accumulative campaign

This is a kind of the “single-shot campaign” with a prolonged preparatory phase usually seen in the mass campaign against malaria which requires some higher level of administrative machinery to keep surveillance effective. When the concurrent development of the general health service infrastructure and the mass campaign itself have accumulated and reached the elementary level of efficiency (Fig. 2-A) at which the general health services can undertake the definite responsibility, then the particular mass campaign is allowed to step forward into the attack phase and so on.
5.3 Piston campaign

In this case "the earlier stage of a mass campaign against a given disease is followed by the consecutive undertaking of activities against other diseases, maintaining nevertheless the necessary surveillance of the earlier campaign (WHO Technical Report Series No.294) "(Fig. 2-B). This is the most common pattern of campaign carried out in some of the developing countries where there is a certain series of similar infectious diseases. There are many factors influencing the varieties of the pattern, among which the following are of particular interest; (i) interval between subsequent campaign, (ii) types of disease, and (iii) attitude of the health authority toward mass campaign.

The interval between the consecutive campaign will vary greatly depending upon several fundamental characteristics of the problem, namely the urgency of the successive campaign program, the practicability of its operation and the nature of the disease against which the foregoing mass campaign was designed. When the consecutive undertaking of operations against another disease is clamorously urged by the felt needs of the public, and certain operational requirements have been satisfied after the pre-requisite estimate of feasibility has also been carefully fulfilled, then the second mass campaign will draw nearer, sometimes with some parts of its activities overlapping with those of the foregoing program. It can be illustrated in the case of the F.E.P. in the Ryukyu Islands, where the insecticide spray-men and other auxiliaries were engaged both in the continuing Malaria Eradication Operation and the consecutive F.E.P operation.

The kind of disease against which the consecutive mass campaign is on schedule has particular importance with regard to the effective utilization of the existing resources and public support. In the Ryukyu Islands, for instance, the experience of the people of the Malaria Eradication Campaign together with the existing equipment, facilities and personnel, were all favorable for accepting the F.E.P., because of the resemblance of the two campaigns in the mode of infection.

As to the positive utilization of mass campaigns, it must be fully recognized by those who are responsible either for the general health services or for the particular mass campaign that mass campaign are to be regarded as an integral part of the overall health program of the country and not as a temporizing measure for soothing the urgency of the problem. Therefore all possible efforts should be made by them to scoop the concentrated energy at the summit of mass campaign so as to boost up the level of the general health services, utilizing all the energy such as material and human resources. All the successful experience and tangible results accumulated in the infrastructure of the general health services during the foregoing mass campaigns, will furnish the health personnel with confidence and prestige and will enable them more easily to obtain the participation and sup-

Fig. 2 Types of mass campaign and their contribution to general health services.
port of the members of the community. All these points can be illustrated by the example in the F.E.P. and M.E.P. in the Ryukyu Islands (Table 2). The majority of the people in the campaign districts, Miyako and then Yaeyama, when the operation started, seemed to have fresh memory in their last participation in the M.E.P., and they were readily receptive of the new campaign program. The remarkable achievement in the total coverage shown below fully confirms these observations. Consequently it was easily expected that the people in these successful campaign districts would also be co-operative if a campaign against another disease(s) was adequately explained to them.

6 Benefits of mass campaign

In many aspects, a mass campaign differs from general health services. It also possesses many advantages as well as disadvantages in comparison with the general health services. In order to make full use of the mass campaign, its advantages, as favorable effects upon the community and general health services, should be thoroughly comprehended by the responsible officials in echelon concerned. Some favorable effects of a mass campaign are enumerated below;

(1) Strong appeal: A mass campaign usually starts pompously with a strong and direct appeal to the public. The public attention is constantly drawn to the particular health problem by the means of a mass campaign. Hence, there occurs positive receptiveness among the public and chances are thus created to obtain public and government support. Those were the great advantage which were also recognized at the start of the F.E.P. in the Ryukyu Islands. And prior to the start of the F.E.P. proper, Miyako District Health Centre, together with the Filarisisis Control Committee, a parade of all the personnel, fully dressed in their uniforms, some on their vehicles, scooters, jeeps and trucks, some on foot, marched in procession through the main streets in the district and distributed pamphlets and leaflets to the public, while newspapers, radios, T.V.s and all other media of mass communication reported on a large scale about the launching of the history making national program.

(2) Bridgehead: It offers a foothold for the developing general health services. In Yaeyama the southernmost group of islands, where the M.E.P. had now been almost accomplished its material objects, vigilance posts in the rural areas were then utilized adequately by the public health nurses as their sub-stations. This is an example of one of the favorable effects of the mass campaign on the expansion of the general health services network. The bridgeheads, which were constructed during the processes of the mass campaign, can and should eventually lead to the organization or expansion of general health services especially at the local level. As to the staffing problem, a mass campaign is so to speak “an intake of raw materials for health workers”. It usually utilizes a large number of auxiliary personnel, trained comparatively quickly to perform one or more simple operation reliably. This opens the possibility of utilizing such personnel for further work, since after the necessary retraining, they can participate in other mass campaigns or be incorporated into the general health services” (WHO Technical Report Series No. 294).

(3) Rapid demonstrable results: In a mass campaign, efforts can be concentrated on a single, immediate objectives, and produce tangible results so rapidly that the public can easily improve their understanding about the cause and effect of the health measures. In the Ryukyu Islands, people had already learnt what substantial rewards the previous M.E.P. had given within a few years to their enthusiastic coopera-

7 Recommendations

1). An advisory committee should be established at the central level to ensure that the wide-range information can be obtained from various channels and sectors of professional fields and that fundamental policy can lead the implementa-

| Locality | Population | No. examined | % examined | No. Mf (+) | Mf rate |
|----------|------------|--------------|------------|------------|---------|
| A        | 30,138     | 29,810       | 98.9       | 4,749      | 15.9    |
| B        | 14,390     | 14,234       | 98.9       | 2,986      | 21.0    |
| C        | 5,124      | 5,074        | 99.0       | 983        | 19.4    |
| D        | 4,588      | 4,551        | 99.2       | 1,086      | 23.9    |
| E        | 10,201     | 10,104       | 99.0       | 2,307      | 22.8    |

Table 2. The result of the “carpet operation” in Miyako District (1965)
tion of the program without inconsistency.

2). The responsible planner should have a definite view concerning the reinforcement of the general health services by incorporating auxiliaries into permanent positions and should hand this over to his successors. Such single purpose auxiliaries may well be integrated into multi-purpose health workers after proper training and orientation.

3). As it is unrealistic and unattainable to gather all the population at night once every year until the eradication of filariasis has been confirmed, an adequate sampling method must be devised so that the microfilaria rates or their trends in the whole community can be properly detected. Children of the compulsory school age, especially of the junior high school age, can be well recommended as a representative sample of the whole community in which they live.

4). Support for research work: Although the basic methodology for filariasis eradication has been established enough to carry out the operation, a lot of questions still remain unsolved with reference to the epidemiology, mass diagnosis, mass treatment and surveillance. Among others, especially in the F.E.P. in the Ryukyu Islands, these studies enumerated below should be encouraged because the geographical insularity with different degrees of endemicity offers a golden opportunity for such research work.

a) Correlation between microfilaria prevalence rates and mosquito transmission, in other words, an entomological scale to assess the filarial endemicity in a human population.

b) Studies on biting habits and resting places of vector mosquitoes.

c) Experimental surveillance study on a community using annual examinations on sample of 1 in 10; i.e., a junior high school students group from their community.

d) Use of medicated salt, soy sauce, bean paste and other condiments in certain secluded endemic area where such foodstuff are sold by a single agency.

e) Comparison of economy and ethciency of various methods of treatment including the timing, dosage and coverage of medication.

5). As an important part of the public health activities, positions and functions of trained health education personnel should be secured and there should be promotion at all levels of the general health service structure, in order to support the achievement of the mass campaign.

8 Conclusion

The achievement of the operations in the first year of the program in the Ryukyu Islands stood unrivaled in the world, as the field operations of mass diagnosis, mass treatment and insecticide spraying succeeded in covering more than 98% of the population concerned. If progress continued at this rate, the accomplishment of the whole program could be hoped for and the incidence of filariasis would drop sharply to negligible or to nil. However, a mass campaign is not such a single purpose action as a penicillin injection for the treatment of an infectious disease. Mere elimination of a disease is not the ultimate and entire target of a mass campaign. It should be actively utilized in strengthening the existing general health services and also in enlightening the public with respect to the promotion of their own health.

In this paper, various aspects of the F.E.P. have been reviewed and its possible effects either on the general health services or on the community have been discussed mainly from the point of view of epidemiology, health service administration and health education. Three points will emerge as a result of these discussions:

1. Although there seems to be no serious technical defect in the administrative management of the F.E.P., there should be a certain doctrinal guiding principle for the planning and implementing the F.E.P. at the top level of the organization.

2. From the epidemiological point of view, there seems to be enough ground for controversy and room for further study. In order to encourage constructive discussion on the epidemiological problems, research work should be welcomed more generously and promoted more extensively.

3. A mass campaign usually takes a long time to finish its full course, and it offers a lot of material golden opportunity for the deployment of the public health education activities. To assure that these activities are carried out in such a way to influence people to take an active and responsible part in the long-range health program, more and more of the specially trained health educators should be produced systematically either in the governmental university or in the in-service training project.

Acknowledgement

This paper is extracted and revised from the dissertation presented to London University by C. Yoshida in 1967.

This paper is revised from Asian Parasitology Vol.3 Filariasis in Asia and Western Pacific Islands, 109-118 by The Federation of Asian Parasitologists in 2004.
References

[1] WHO Expert Committee on Public Health Administration: WHO Tech Rep Ser No.215, 1961.

[2] WHO Chronicle: Advances in filariasis control, 1962; 16 (5): 160-166.

[3] WHO Expert Committee on Filariasis: WHO Tech Rep Ser No.223, 1962.

[4] WHO Study group. Integration of mass campaign against specific diseases into general health services: WHO Tech Rep Ser No.294, 1965.

[5] Yoshida C. Studies on filariasis in the Ryukyu Islands, (1) Present status of endemcity and its analysis. Endem Dis Bull of Nagasaki Univ 1966; 8(2): 2-106.