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EDITORIALS

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Blister Calendar Packs—Potential for Improvement in the Supply and Utilization of Multiple Drug Therapy in Leprosy Control Programs

The concept of multiple drug therapy (MDT) for leprosy has been widely accepted and the World Health Organization (WHO) recommended regimens for paucibacillary (PB) and multibacillary (MB) patients[1] have been introduced in many leprosy control programs worldwide.[2–4] In recent years, increasing efforts have been made jointly by governments, international organizations, and voluntary agencies to expand and intensify MDT implementation in leprosy-endemic countries. However, alongside the availability of finance and infrastructure, there is a need for careful revision of the operational methodology and technology currently used in field control activities in order to make this expansion more effective.[5,6] One important aspect of this improvement process, on which the effectiveness of combined chemotherapy crucially depends, is the constant availability of all the required antileprosy drugs at the periphery and their regular intake by patients for the prescribed period of time. It has been suggested that the use of "bubble" or "calendar" packs for the dispensing of drugs for the treatment of leprosy, and perhaps also for tuberculosis, may prove of practical value.[7]

Recently, blister calendar packs (BCP), for the presentation of antileprosy drugs for PB and MB patients using WHO regimens, have been introduced in Danish International

[1] Chemotherapy of Leprosy for Control Programmes. Report of a WHO Study Group. WHO Tech. Rep. Ser. 675, 1982.

[2] Report of a Consultation on Implementation of Multidrug Therapy for Leprosy Control. Geneva: World Health Organization, 1985, WHO/LEP/85.1.

[3] Report of the Second Coordinating Meeting on Implementation of Multidrug Therapy in Leprosy Control Programmes. Geneva: World Health Organization, 1986, WHO/CDS/LEP/87.2.

[4] Lopez Bravo, L. Global review of the implementation of multidrug therapy (MDT). Second Coordinating Meeting on Implementation of Multidrug Therapy in Leprosy Control Programmes. Geneva: World Health Organization, 1986.

[5] McDougall, A. C. and Georgiev, G. D. Multiple drug therapy for HD: will the light fail without new concepts and strategies? The Star **47** (1988) 1–2, 16.

[6] Feenstra, P. and Tedla, T. A broader scope for leprosy control. World Health Forum **9** (1988) 53–58.

[7] Winsley, B. E., McDougall, A. C. and Brown, K. E. Chemotherapy of leprosy; "bubble" or "calendar" packs for administration of rifampin, dapsone, clofazimine or prothionamide/ethionamide. Int. J. Lepr. **51** (1983) 592–594.

Development Agency (DANIDA)-assisted MDT projects in four hyperendemic districts in India, covering a population of more than 12 million.[8,9] Presently, in these projects, more than 7000 MB and 10,000 PB patients receive their medication in BCPs,[10] and it is expected that about 1.7 million packs will be used in the next four to five years.[8] In The Philippines, with the support of the Sasakawa Memorial Health Foundation and WHO, BCPs for MB and PB patients have been used in the implementation of MDT. Since 1985, over 2000 patients have completed a full course of chemotherapy, with supervision at the "barangay" primary health care level, and this form of dispensing has proved extremely popular with both patients and staff.[11] Recently, the Thailand government has introduced BCPs for leprosy treatment in a few provinces with both specialized and semi-integrated leprosy control programs on a trial basis.[12] The Leprosy Mission of South Africa project in the Transkei has produced low-technology packs which have been used successfully for several years.[13] There is preliminary evidence from those countries where BCPs have been applied that this method is highly appreciated by program staff and patients alike. In The Philippines, the use of BCPs has now been extended to the entire National Leprosy Control Program[14] and also introduced into the Tuberculosis Control Program for the dispensing of antituberculosis drugs (rifampin, pyrazinamide, and isoniazid).[15]

Based largely on experience in the preparation of the operational plan for DANIDA-assisted MDT projects in India and a trial protocol for Thailand, but also taking into account the fact that many thousands of patients are already receiving MDT in BCPs, we feel that there is a wider potential of such a device for improved performance in leprosy control programs. The possibilities are that BCPs may a) facilitate drug planning and supply, b) assure proper treatment of the patients in the periphery, c) simplify drug dispensing and improve the efficiency of clinics, d) reduce drug wastage and misuse, e) improve clinic attendance by the patients and their compliance to self-administration of drugs at home, and f) be used as a tool for the education of health staff, patients and the family about combined chemotherapy. We have attempted to analyze the additional cost of providing antileprosy drugs in packs (as opposed to the usual methods) in relation to the overall cost of an average leprosy control program. The potential of BCPs, not only as a convenient and attractive method of presentation of drugs, but as part of a complex operational system covering drug planning, supply, dispensing and proper use by the consumer, contributing to the efficiency of MDT implementation in control programs, whether vertical (specialized) or horizontal (integrated), is emphasized.

Design of blister calendar packs for WHO MB and PB regimens

For DANIDA-assisted MDT projects in India, BCPs for WHO MB and PB regimens were especially designed, taking into consideration patient convenience (reasonably small size, easy retrieval of tablets) and the field operations of MDT control (monthly clinics, etc.) (Figs 1 and 2). The packs carry drugs for both supervised and self-administered treatment. The drugs for home treatment are organized on a "lunar month" basis, corresponding to the timing of the monthly treatment clinics. The upper part

[8] Georgiev, G. D. and Kielstrup, R. W. Blister calendar packs for the implementation of multiple drug therapy in DANIDA-assisted leprosy control projects in India. Lepr. Rev. **58** (1987) 249–255.

[9] Georgiev, G. D. Operational plan for DANIDA-assisted MDT projects of NLEP in India. Danish International Development Agency. Asiatisc Plads 2, DK 1448 Copenhagen, 1985 (unpublished document).

[10] Revanker, C. R. and Soerensen, B. H. Blister packs (calendar packs) for multiple drug therapy in leprosy control programme in India: a field trial. Lepr. Rev. **59** (1988) 84.

[11] Yuasa, Y. Operational considerations in multiple drug therapy (MDT) implementation. Regional Workshop on Multiple Drug Therapy (MDT), Cebu, The Philippines, Sept./Oct., 1987.

[12] McDougall, A. C. and Ellison, R. H. Guidelines for a pilot study of blister calendar packs in the multiple drug treatment of multibacillary leprosy in Thailand, 1986 (unpublished document).

[13] Wiseman, L. A. Calendar (blister) packs for multiple drug therapy in leprosy; an inexpensive, locally-produced version. Lepr. Rev. **58** (1987) 85–87.

[14] Manual of Procedures. Multiple Drug Therapy for Leprosy. Manila: Department of Health, Leprosy Control Services, 1987.

[15] Valesa, F. S. Tuberculosis Control Service, Department of Health, The Philippines, personal communication.

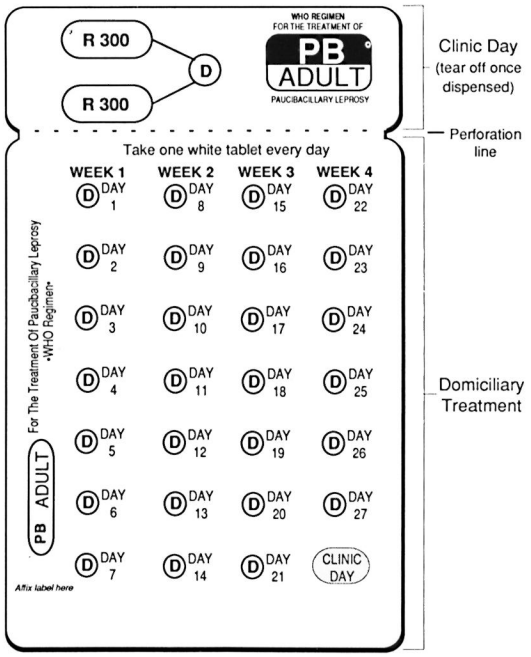

FIG. 1. Blister calendar pack design (diagram) for administration of dapsone and rifampin in paucibacillary leprosy.

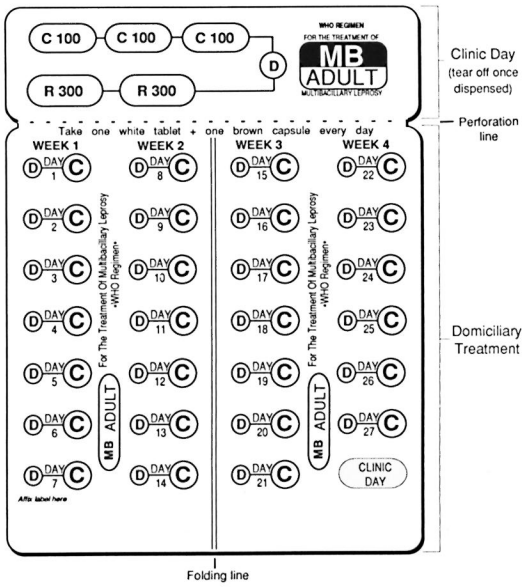

FIG. 2. Blister calendar pack design (diagram) for administration of dapsone, rifampin, and clofazimine in multibacillary leprosy.

of the BCPs contain the clinic supervised dose. After dispensing the drugs, this part is torn away along the perforated line and the rest of the pack, containing the domiciliary treatment, is given to the patient. The self-administered 27 daily doses are arranged in four weekly rows. The space for the 28th day of treatment does not contain drugs but is a reminder of the clinic day for supervised treatment. For convenient use by patients, the bubbled side of the pack is considered to be the front, the treatment layout in weekly rows and daily doses being printed on the side of the aluminum foil, facing the tablets. The print is easily visible through the transparent polyvinyl chloride (pvc) body of the pack, and the patient can see the actual tablets, their colors and treatment layout. Information concerning the type of regimen, the name of the drugs, expiration date of rifampin, etc., can be printed on the back of the foil cover. In addition, there is a space at the bottom of the pack to stick a label containing any message or information a particular control unit considers necessary (e.g., name of the patient, registration number, name of the clinic, month of treatment, etc.). The BCPs for MB and PB adult and child patients are in different colors, matching the colors of the registration cards.[8] Since colors have different meanings in different cultures, care should be exercised in avoiding those with a negative ethnic connotation.

Drug supply problems in MDT leprosy control programs and potential of BCPs for their possible solution

The effectiveness of MDT in control programs crucially depends on the constant availability of all required antileprosy drugs at the clinics and the regularity of supervised and self-administered medication throughout the recommended period of treatment for PB and MB leprosy. Some of the more important problems of MDT drug supply and the potential of BCPs in their resolution include:

Planning and drug supply for combined chemotherapy in leprosy control programs. More complex than dapsone monotherapy, MDT is considerably more expensive and, especially if funds are limited, demands careful and flexible planning. The estimation of the drugs needed is more complex because the regimens for PB and MB patients have different supervised and self-administered drug compositions, the durations of the regimens are different, and three

drugs are required in both child and adult doses. This is further complicated by unreliable information from the field, inefficient internal systems of order and supply, poor transport facilities, and inadequate or irregular funds. In addition, procurement of the different drugs from different suppliers makes coordinated delivery of drugs difficult. It is thus not surprising that many leprosy MDT control programs, both integrated and vertical, have difficulties in assuring continuous availability of all required drugs in the field. Irregular drug supply and the absence of one or more drugs for various periods of time may have serious consequences for the effectiveness of treatment and the motivation of the staff and patients. Repeated interruptions of treatment and the exclusion of one or another drug from combined chemotherapy, even for relatively short periods of time, may compromise the effectiveness of MDT and its ability to prevent the development of rifampin resistance in MB cases and, thus, undermine the whole concept of leprosy control with combined chemotherapy. It is well recognized that shortages and irregularities in drug supplies, in both general health services and in control programs (including tuberculosis and leprosy), may seriously affect the morale of health staff and the credibility of the service provided. Furthermore, the motivation of patients for regular clinic attendance and home treatment compliance is closely associated with the efficiency of the service and the availability of the drugs. As a precaution, some peripheral control units tend to overstock drugs, thus "freezing" some of the limited resources of the program. The use of BCPs for PB and MB treatment regimens may significantly simplify and facilitate the planning, ordering and supply of antileprosy drugs at all levels, since planning and ordering is made, not in quantities of three drugs in different doses, but in numbers of packs for MB and PB (adult and child) regimens. This is particularly important for middle level managers since they can more precisely estimate the annual and quarterly drug requirements by simple calculations (the number of patients under treatment and estimated new patients). A further important point, notably in the prevention of rifampin resistance, is that the patient is always provided with all the required drugs for proper treatment.

Dispensing drugs for combined chemotherapy. The WHO-recommended monthly treatment for an MB patient includes 2 capsules of rifampin 300 mg, 3 capsules of clofazimine 100 mg, 28 tablets of dapsone 100 mg, and 27 capsules of clofazimine 50 mg, a total of 60 items (30 items for a PB case). Assuming that an average of 30 patients per day attend a clinic/treatment point and 80% of them are PB and 20% are MB cases, no fewer than 1080 tablets have to be carefully counted during or prior to the clinic day, without taking into consideration the possibility that other drugs may have to be dispensed as well. This is obviously a tiresome, time-consuming, and unproductive job which has to be done routinely, and may partly account for the reluctance of health workers in integrated programs to actively participate in leprosy control.

The dispensing of antileprosy drugs in BCPs is easy, always provides the correct amount of the drugs, and relieves personnel from the constant burden of counting hundreds of tablets. Thus, at a busy clinic or treatment point, the leprosy or health paramedical workers will have more time to spend educating the patients in hand, foot, and eye care; attending to miscellaneous complaints and problems; and promoting patient-staff relationships. When BCPs for the PB and MB patients are of different colors, matching the patient registration or/and treatment cards, this may further facilitate the dispensing of drugs and avoid the accidental delivery of wrong treatment.

Another important point is that the antileprosy drugs, when presented in BCPs, can be more safely dispensed to patients by nonmedical persons. Community leaders, teachers, primary health workers, or other respected persons in the community can reasonably be entrusted with the delivery of drugs to the patients, particularly where there is a shortage of manpower, or in areas remaining inaccessible for long periods of time during tropical rainy seasons. The use of BCPs opens up the opportunity to involve the community in the provision and supervision of regular treatment for leprosy patients, a step forward in the meaningful and active participation of communities in leprosy control.

Protection of the drugs against wastage.

Protection against humidity and physical damage. At present, endemic leprosy is

found mainly in the tropical and subtropical regions of the world with their high temperatures and humidity. In the absence of proper storage facilities the shelf life of the drugs may be shortened. It is a common experience in the field that once bottles of clofazimine (and, to some extent, rifampin) are opened, the capsules tend to stick together and may become spoiled. The dispensing of drugs for self-administration wrapped in a piece of paper offers little protection against rain and humidity, and the drugs are easily spilled or damaged. Plastic and glass containers have been found to be useful for this purpose but, again, their availability calls for regular supply and additional cost. The use of BCPs for MDT offers certain important advantages: The blistered body of the BCP can be made of tropicalized, triple–laminated, pvc polymer which has a very low moisture perfusion rate and is more rigid than the monolayer pvc commonly used in other commercially available packs.[8] The back of the blistered body of the pack is sealed with waterproof aluminum foil. Such packs obviously provide considerable safety against humidity and rain, as well as against physical damage.

Protection against misuse and pilfering. Pilfering of drugs is common and, in the past, dapsone has often found its way onto the "black market."[16] With the use of more expensive drugs for leprosy this may take on a new dimension. It is also common knowledge that rifampin intended for leprosy has been used, to some extent, for treatment of other diseases.[4] Horizontal leprosy control programs which are part of basic health services often experience a chronic shortage of antibacterial drugs, and it is more than likely that the rifampin supplied for leprosy is used for the treatment of other infections. The wastage, pilfering, and misuse of drugs in MDT projects has not been studied, but there are indications that, at least in some places, a significant proportion of the drugs supplied for leprosy treatment is wasted in one way or another. When the drugs intended specifically for leprosy are presented in BCPs, the available evidence so far is that patients are remarkably possessive and appreciative, suggesting that they are probably taking the medication exclusively for their own treatment. Stocks can be easily controlled and pilfering may be significantly reduced. It is more difficult to remove a larger number of capsules from packs, and it is more noticeable than when they are taken from large stock bottles or tins. BCPs, conspicuous by their size and colors, could be difficult to sell on the black market in large quantities. Furthermore, the control of drug stocks in peripheral units can be easily carried out at the time of the regular monthly or quarterly stock-taking, or during supervisory visits to the clinics, since they can be counted easily and quickly.

Treatment compliance, motivation of patients, and social standing of leprosy

The existence of powerful medication and the efforts to make the required drugs constantly available to the customer will be useless unless the patient avails himself of the treatment in a proper way. Regularity of intake of both the supervised and domiciliary self-administered drugs, crucial to the effectiveness of MDT, cannot be achieved without the commitment and active involvement of the patient in the treatment process. The treatment behavior of leprosy patients is influenced by a complex mix of cultural, sociological, and psychological factors, including beliefs in the curability of the disease, confidence in the effectiveness of the drugs and duration of treatment. Where MDT has been implemented a dramatic improvement in clinic attendance has been noted, in the order of 80% to 95%,[4, 17, 18] a situation unknown in monotherapy control. Perhaps two factors are mainly responsible for this rather sudden change of behavior: a) confidence of the patients in the new drugs (time-defined treatment of shorter duration, more than one drug used), and b) improved efficiency of MDT leprosy services. However, the extent of improvement in home–treatment compliance is not yet well established.

[16] Huikeshoven, H. Patient compliance with dapsone administration in leprosy. Int. J. Lepr. **49** (1981) 228–258.

[17] Report of the Fifth Meeting of the Scientific Working Group on the Chemotherapy of Leprosy. Geneva: World Health Organization, 1986, TDR/THELEP-SWG(5)86.3.

[18] Ellard, G. A., Kiran, K. U. and Stanley, J. N. A. Long-term prothionamide compliance: study carried out in India using a combined formulation containing prothionamide, dapsone and isoniazid. Lepr. Rev. **59** (1988) 163–175.

The use of BCPs may further improve and sustain the regularity of treatment, particularly of MB patients, in more than one way:

Psychological aspects. The criteria used in given traditional cultures differ from the medical and modern concept of what is "effective" treatment. Objective truth could be less relevant to the patient than subjective beliefs based on imaginative logic, e.g., traditional medication causing drastic reactions (acute vomiting, diarrhea) are considered "strong." The widespread idea that drugs administered by injection are superior to those given in tablet form is another example. It would be hardly surprising if the presentation of MDT drugs in BCPs significantly enhances patient attitudes about the curative value of the treatment.

Monthly clinic attendance and daily intake of domiciliary treatment. Many patients commonly experience difficulty in grasping schedules of visits to clinics and times for the taking of medicine.[19] The concept of time and its measurement in traditional cultures differs significantly from that in accepted "modern" societies. In a study of self-administration of combined chemotherapy it was found that regularity of daily medication in leprosy depends to a great extent on the ability of the patient to remember to take daily doses.[18] The use of BCPs could be instrumental in overcoming these practical problems The clear visual outlay of individual daily doses and their arrangement in weekly rows (Figs. 1 and 2) may help the patients to overcome some of the problems of "timing without clocks"[19] and thus improve clinic attendance and self-medication.

One, perhaps not fully appreciated, reason for the indifference of many leprosy patients regarding their treatment is that both the disease and its sufferers have been, and remain, in many ways underprivileged in society and neglected by health services. Some patients become resigned to what they consider their fate, accepting a low position in society, devoid of hope and motivation. Formal health education has been used to disseminate knowledge, in the hope of changing attitudes and behavior of the community and the patients regarding the disease and its treatment, but with unconvincing results. However, there is already evidence that the introduction of a new and "expensive" treatment for leprosy (MDT) and the obvious steps which have been made to improve leprosy control services have not only increased the credibility of these services but have been seen by the patients and the community as a positive change in official attitudes toward leprosy, giving a new standing to the disease and patients alike. We suggest that the presentation of combined chemotherapy in BCPs may further strengthen this process and enhance the self-confidence and self-respect of leprosy patients.

Education of patients and relatives about MDT

The education of patients and their relatives on the drugs for MDT, their use, duration of treatment, and expectation from the treatment is essential for their motivation and cooperation. However, it has been observed that health workers experience difficulty in explaining the use of drugs to patients and that the patients themselves find it difficult to understand instructions.[19] BCPs may be a valuable tool for the education of health workers, patients and their families.[20] The distinct colors for PB and MB packs, the clear separation of supervised from the self-administered treatment, the "lunar calendar" arrangement of the domiciliary daily doses, and the display of the actual drugs to be used will all be of value in teaching health workers about the MDT regimens. In turn, it will be easy for them to use BCPs to give clear instructions to the patients and their families. A leaflet containing basic facts on the disease and its treatment, written in simple language and with proper illustrations, may prove of considerable value for the education of the patients and their families.[20]

Monitoring of treatment compliance

While the regularity of the monthly supervised doses can be measured easily by clinic attendance, the regularity of home

[19] Valencia, L. B. Leprosy—as seen by the patients. World Health Forum **9** (1988) 59–62.

[20] Georgiev, G. D. and McDougall, A. C. Multiple drug therapy for leprosy: basic information for health workers, patients and their families (in preparation).

treatment is more difficult to assess. For operational purposes, the counting of tablets coupled with a "spot" test of the urine, done during home visits, have together been useful for monitoring home treatment compliance[16] and have been introduced into some leprosy control programs.[21] In addition, patients should be asked to bring used BCPs with them to the clinic, where the number of used daily doses can be noted before new packs are issued. On such occasions, medication remaining in the pack can be counted inconspicuously and quickly, almost at a glance, thus making this method of supervision more acceptable to both the patient and staff. The family of the patient could play an invaluable role in this context; once the relatives have been instructed by the program staff on the importance of domiciliary treatment and the use of the BCP, they may be expected to greatly contribute to compliance and regularity of attendance.

Constraints to the use of BCPs on a large scale

Although preliminary experience with BCPs in leprosy control has been encouraging and keen interest has been shown by a few agencies, their operational potential may not yet be fully appreciated. Some reservations may arise from the somewhat "luxurious" appearance of the BCPs, contrasting with the chronic shortages of essential drugs for health services in developing countries. This, however, has to be balanced against the "perceived efficacy" of the drugs when presented in BCPs as well as the numerous operational advantages described above. The extra cost of BCPs may be seen as an argument against their use in large-scale leprosy control programs, but this view calls for critical analysis. The production of BCPs containing multiple drugs of different sizes and shapes requires advanced technology[8] and may indeed involve an appreciable initial investment.

The cost of drugs per patient varies significantly from year to year and from program to program, depending on the sources of supply and the currency used, but in the past few years there has been some tendency toward a decrease in prices internationally. In 1985, it was estimated[22] that dapsone monotherapy per patient per year cost US$2.25 ($0.20 per month), MDT per PB patient for 6 months cost US$6 ($1 per month), and MDT for an MB patient for 2 years, i.e., the minimum recommended by WHO, cost US$52 ($2.20 per month). Three years later in India, the cost of MDT for a patient with MB leprosy for 2 years is US$38 and for a complete MDT course for PB leprosy, less than US$3[23]—a reduction of 30% and 50%, respectively. The current cost of treatment is even lower—US$0.40 per month for PB and US$2.23 for MB patients. However, in the traditional system of drug dispensing the total cost of drugs for MDT for PB and particularly for MB patients is likely to be higher than the above effective costs because of wastage of drugs. Pilfering and misuse of rifampin is an "obvious" loss. Further "hidden" loss occurs when the patient takes the drugs from the clinic but they are wasted at home (not actually ingested, spoiled, lost).

With regard to BCPs, information available to the International Federation of Anti-Leprosy Associations (ILEP) indicates that one month's treatment for MB leprosy costs US$2.66 (as opposed to US$2.23 for loose drugs) and for PB leprosy, US$0.61 (as opposed to US$0.40 for loose drugs). The element of the BCP thus adds only US$0.46 and US$0.21 per month for the treatment of MB and PB leprosy, respectively. Furthermore, if mass produced, as in the case of contraceptives, the cost of the pack itself may, perhaps, become even lower. It is also important for the financial feasibility of using BCPs in a leprosy program to be analyzed, not only in terms of the cost of traditional versus BCP-dispensing systems, but also in relation to the total economics of the program and its efficiency and cost-effectiveness. The amount of money spent on drugs in the average leprosy control program is between 10% and 20% of the total budget for maintenance of the infrastructure (including referral system and hospital fa-

[21] Kumar A. Treatment compliance by leprosy outpatients and its monitoring under field conditions. Indian J. Lepr. **56** (1984) 313–318.

[22] Askew, A. D. Managerial implications of multidrug therapy. Lepr. Rev. **56** (1985) 89–97.

[23] Rao, C. K. Drugs against leprosy. World Health Forum **9** (1988) 63–67.

cilities), salaries, logistics, training, health education, disability care, rehabilitation, etc.[22] Since the prices for antileprosy drugs have been significantly reduced in the past few years, the proportion of an annual budget spent on drugs may now be considerably lower than the figure quoted in 1985.[22] The extra expenditure for their use in BCPs is certainly not prohibitive, particularly when seen in the context of potential improvement of the efficiency of the program.

Need for field operational research

Although initial experience with the use of BCPs has been very encouraging, there is as yet no scientific evidence to substantiate the proposed advantages already discussed or to confidently advocate their application on a large scale. However, by the time of the XIII International Leprosy Congress in The Hague (September 1988) a considerable amount of evidence will be available and presented from both Thailand and India, where, in the framework of both research trials and routine leprosy control, studies are in progress to assess the benefits and cost-effectiveness of BCPs in MDT implementation in specialized and integrated programs. Meanwhile, there is an urgent need for information about the economics and cost-effectiveness of leprosy control programs in general, a remarkably neglected subject in leprosy research. This becomes even more important in view of the conclusion, recorded repeatedly in recent years,[2–4] that in addition to a reasonably competent infrastructure, one of the main constraints to the wider and more rapid implementation of MDT is the lack of funds. This may be true in general, but it is also true that funds made available by governments and voluntary agencies in some endemic countries remain unused because of inertia and managerial incompetence. Alongside the provision of adequate funds, the success of MDT programs depends upon sound operational planning and strategy, capable and dynamic management, a willingness to adopt new approaches and technology, adequately trained and motivated staff, and the systematic involvement of the patient, family, and community in case-finding and treatment.

Since the publication by WHO in 1982 of MDT for all cases of leprosy,[1] much emphasis has been put on the need to apply MDT widely in control programs as soon as possible. Much less attention has been given to the details of operational strategy, methodology, and technology which are needed for efficient MDT implementation. Unless this is remedied, there is a danger that leprosy control will, in a few years time, face the situation which is all too apparent in the case of tuberculosis[24]—a serious failure of epidemiological impact, despite the availability of effective chemotherapy. In a recent report of the WHO Scientific Working Group on the Chemotherapy of Leprosy, the view was in fact expressed that, at current rates, the implementation of MDT for leprosy could take several decades.[17]

The proposals for the use of BCPs for drug supply and utilization discussed in this paper will certainly not solve all of the problems, but it is possible that they may benefit one vital area of MDT implementation at surprisingly low cost. Their potential certainly warrants further study. They are, perhaps, best viewed as a sophisticated but yet appropriate and affordable device for the presentation of treatment for leprosy, along lines which are likely to be acceptable to program managers, health staff, and patients.

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[24] Holm, J. Tuberculosis control in the developing world: it's time for a change. World Health Forum **5** (1984) 103–107.