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CONTENTS

Lepr Rev (1988) **59,** 193–194

Editorial

AIDS AND LEPROSY

AIDS is now an accepted problem in certain leprosy endemic areas, particularly in Central Africa. Infection with HIV (Human Immunodeficiency Virus) leads to a profound drop in T-lymphocyte function. The effect of this is to lower resistance to a wide range of opportunistic and other infections. Among the infections that were recognized early as developing in individuals with AIDS were those with the *Mycobacterium avium-intracellulare* group. However, it was not long before it was realized that lowered resistance to *M. tuberculosis* itself was also a major problem especially in Central Africa. Tuberculosis in AIDS patients is also a problem in non-tropical areas. There has been not only a slowing down of the annual decline in total morbidity, but also, the suggestion of an upswing in the incidence of the disease in some areas.

With this in mind it is pertinent to ask a number of questions about the implications of the AIDS pandemic for leprosy workers. So far there have been few reports of a direct association between HIV infection and leprosy (Lamfers *et al.* 1987[1] and a patient observed by Dr W R Freeman, Department of Ophthalmology, University of California and Dr T H Rea, Section of Dermatology, University of Southern California). However, it is necessary to remain vigilant because such an association may not have become more apparent for a number of reasons. The most important of these is that leprosy takes a long time to develop and patients may die from other causes resulting from HIV infection before leprosy becomes clinically apparent. On the other hand, leprosy might make a patient more susceptible to HIV as it is itself a disease with immunocompromising features. Moreover, there have been suggestions that tuberculosis may predispose an individual to HIV infection or may be the first clinical manifestation of HIV disease. The effect of further depression of host resistance to *M. leprae* in a patient who already has leprosy would be a swing across the spectrum—downgrading—towards the lepromatous pole. Thus, it is important to look for an increased incidence of multibacillary leprosy in an area where the disease is predominantly paucibacillary. Another possible way in which HIV infection could manifest itself is in a failure to respond to chemotherapy or to maintain progress after a course of chemotherapy. A defect in T-cell-mediated immunity without a concomitant defect in antibody function may result in erythema nodosum leprosum (ENL) being the first manifestation of recurrence of active leprosy in an immunosuppressed patient. Such a case has been described by Adu *et al.*[2] following renal transplantation in a patient with latent leprosy. In this patient symptoms of ENL did not develop until 2 years after the onset of immunosuppressive therapy.

It has also been suggested that the effects of HIV infection in a leprosy endemic area might be quite unexpected, resulting in an increase in the detection rate of tuberculoid leprosy, if the effect is to turn subclinical leprosy into tuberculoid leprosy. Another unexpected finding might be an accelerated decline in the detection rate of leprosy if patients with lepromatous leprosy are unrecognized because they die before the onset of clinical symptoms. Thus, leprosy workers should be ready for any unexpected change in the existing pattern of disease.

At the present time, there is a need for more data on HIV levels in new patients presenting with

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leprosy in areas where there is a high incidence of HIV infection in the general population. It is important that parallel studies should be made on new patients presenting with tuberculosis and also on symptom free individuals in the general population.

An added problem exists in those areas where leprosy vaccine trials are being undertaken. Most of these vaccines contain live BCG, giving a possible risk of dissemination of the BCG organism. Many of the cases of dissemination of BCG in the world literature have been described in children with congenital immunodeficiency diseases. This suggests that there is a definite risk of dissemination of BCG in immunodeficiency states due to the HIV virus. Local reactions and dissemination of BCG have both been described in HIV positive individuals. Two were adults and five were children. Thus, BCG should not be used in HIV infected subjects with symptoms of immunodeficiency or lymphadenopathy.[3] The World Health Organization and the Advisory Committee on Immunization Practices of the Unites States Public Health Service still recommend the continued administration of standard vaccines to symptomless HIV infected children. Moreover, there are some who believe that giving BCG before the onset of immunodeficiency might prevent the early onset of mycobacterial infection. Therefore, there appears to be no evidence so far to support a curtailment of leprosy vaccine trials among individuals who show no signs of clinical AIDS. However, vaccine should be withheld from patients with clinical evidence of disease. Those engaged in leprosy vaccine trials in HIV epidemic areas should be aware of the difficulties that will be encountered in assessing the results of these trials if the subjects are not HIV tested in parallel. It may be necessary to have HIV serology on all subjects that develop leprosy as well as a parallel sample of the surrounding population.

Those working in the leprosy field involved in HIV screening will have to concern themselves with the ethical issue of the need to inform those who are HIV+^{ve}. This will involve a need for counselling with the added implicit expense. In addition, there will be a need for practical health education in parallel with the HIV screening.

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WHO Guidelines for protection of personnel; HIV infection

'Guidelines for personnel involved in collection of skin smears in leprosy control programmes for the prevention and control of possible infection with HIV' is a WHO document—WHO/CDS/LEP/87.1, issued recently, giving details of protection of personnel in areas where HIV infection is known or suspected to exist. The full text was printed in *Leprosy Review*, (1987) Number 3, **58,** 207 and also appears in the *International Journal of Leprosy*, (1987) Number 2, **55,** 421.

Lepr Rev (1988) **59,** 195–199

A comparative evaluation of serological assays for lepromatous leprosy

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Summary A comparative antibody analysis of sera from 26 patients with lepromatous leprosy showed consistently high titres to the phenolic glycolipid I disaccharide and to the ML04 epitope of the 35 kD protein antigen of *Mycobacterium leprae.* Antibody titres of these two specificities were positively correlated ($p < 0{\cdot}01$) and both declined after chemotherapy, although this trend was apparent earlier after the onset of therapy for the anti-35kD antibody response. Two healthy subjects (out of 18 tested) from the leprosy endemic area had pronounced anti-PGL-1 but no demonstrable anti-35kD antigen activities. In contrast with the above results, antibody levels to lipoarabinomannan were much lower and with great individual variation between the LL patients. Finally, antibody levels to the *M. leprae*-specific IIIE9 epitope (peptide 422–436) of the 65kD protein antigen were not demonstrable in the majority of LL patients.

Introduction

Serological studies in leprosy have been pursued for the past 80 years[1] with interest in diagnosis, classification within the spectrum of disease, monitoring of chemotherapy, prognosis of subclinical infection[2] and response to vaccination.[3] Recent progress in the molecular definition of *Mycobacterium leprae*-specific, antigenic determinants provided a new impetus to these studies. The phenolic glycolipid I (PGL-1) and its terminal disaccharide have been used in a solid-phase binding enzyme-linked assay,[4–6] whereas a competition test has been applied using monoclonal antibodies (MAB) to the 35 kD antigen and other protein or polysaccharide antigens,[7–12]

These assays confirmed results from previous studies which showed that serum antibody levels are profoundly increased in multibacillary (lepromatous) but not in paucibacillary (tuberculoid) leprosy. The relative immunodominance of the respective antigens has not as yet been fully evaluated. The purpose of this paper has been to compare antibody levels to distinct epitopes in individual patients with lepromatous leprosy.

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Materials and Methods

SERA

Thirty patients, attending the clinic of the JALMA Institute for Leprosy (Agra, India) were classified as lepromatous leprosy (LL) according to the Ridley–Jopling scale. The 18 control sera were from healthy subjects living in the Agra region. Sera were collected from patients before and at various times after chemotherapy which was given in accordance with WHO recommendations.[13]

ANTI 35 KD PROTEIN, ML04-COMPETITION ASSAY

Microtitre plates (Immulon, M129B Dynatech) were coated with 50 μg/ml (25 μl/well) *M. leprae* soluble extract (MLSE) for 20 hr at 4°C. After washing 3 times with phosphate buffered saline (PBS) the plates were blocked with 3% bovine serum albumin (BSA) in PBS for 1 hr at 20°C and serum samples, serially diluted (100–51200) in 3% BSA–0·05% Tween −20 were added to wells. After 30 min incubation at 37°C in a humidified chamber, peroxide-labelled ML04 MAB (25 μl/well) in BSA–Tween was added and incubated for 1 hr at 37°C. Plates were washed and incubated with 3,3′,5′5′ tetramethyl benzidine (TMB)-H_2O_2 substrate (100 μl/well, of a fresh solution containing 50 μg/ml TMB and 0·006% H_2O_2 in 0·08 M Na Citrate pH 5·0) for 30 min at 20°C. The reaction was stopped with 50 μl/well of 0·5 M H_2S0_4 and the optical density read at 450 nm in a titertek multiscan reader. Antibody titres are expressed as reciprocal serum dilutions giving 50% inhibition of ML04 binding to MLSE coated wells (ID_{50}).

ANTI-LIPOARABINOMANNAN (LAM) ML34-COMPETITION ASSAY

This test was performed with MAB ML34 which binds to an epitope expressed on (LAM).[15,16] The competition assay was done essentially as described in the previous paragraph, but using ^{125}I-labelled ML34 as in the original technique.[17]

PHENOLIC GLYCOLIPID BINDING ASSAY

Microtitre plates were coated with 5 μg/ml phenolic glycolipid I disaccharide (PGDS) (3,6-Dimethyl-β-D-Glucosyl (1–4) 2,3-Dimethyl-α-L-Rhamnosyl) conjugated to BSA (from R Gigg) in PBS (50 μg/well) for 20 hr at 4°C, washed with PBS and blocked with 3% BSA for 1 hr at 37°C in a humid chamber. Serial doubling dilutions (100–51200) of test sera in 1% BSA Tween (50 μl/well) were added to PGDS-coated or uncoated plates and incubated for 2 hr at 37°C. Plates were washed with Tween/PBS, then incubated with 50 μl/well of 1:1000 diluted peroxidase coupled goat anti-human IgM (Sigma Chem. Co. UK) for 1 hr at 37°C. After washes with Tween/PBS, substrate was added and the reaction read as described above. Relative binding values were calculated over the range of serum dilutions with OD values corrected for binding to the uncoated plate, using a positive reference serum as 100%. Antibody titres were expressed as reciprocal serum dilutions giving 15% binding (ABT_{15}).

ANTI-65kD ANTIGEN TESTS

Microtitre plates were coated overnight at 4°C with 50 μl/well of the *M. leprae*-specific IIIE9 peptide[18] dissolved in 0·1 M Na bicarbonate at 0·1 μg/ml concentration. Plates were washed with PBS and blocked for 1 hr at room temperature with BSA/Tween. After incubation with sera for 2 hr and washing with PBS, plates were incubated for 1 hr with 1/1000 dilution of peroxidase conjugated rabbit anti-human IgG (Sigma Chemical Co) in BSA/Tween, washed, and developed as described above. The IIIE9 MAB was used as the positive control.

Additional tests were performed with radiolabelled IVD8 antibody[12] using the competition assay as described before.[17]

STATISTICAL ANALYSIS

Correlations betweeen antibody titres of the various specificities and for antibody titres related to years of chemotherapy were analysed using correlation coefficients.

Table 1. Antibody levels in patients with lepromatous leprosy

Sample no.	Years of therapy:	BI*	Antibodies† to: 35kD ID_{50}	PGDS ABT_{15}	LAM ID_{50}
Patients					
1	0	3·7	8440	4380	71
2	0	4	6860	> 5120	87
3	0	5	8440	1698	31
4	0	4	7350	3308	14
5	0	4	8440	15219	577
6	0	5	2110	1537	172
7	0	4	690	12775	69
8	0	NA	8440	6182	268
9	0	4·5	6400	5385	102
10	0	NA	1710	4217	291
11	3	0	1260	< 100	13
12	3	0	5200	221	68
13	3	2	320	1131	219
14	3	NA	1130	3591	> 625
15	3	3	350	1440	68
16	4	3	12800	16781	125
17	5	5	3200	18243	268
18	6	0	1130	2588	115
19	7	0	800	282	25
20	8	0	120	2983	87
21	10	1	920	572	74
22	10	0	< 100	976	20
23	12	0	300	146	20
24	12	0	< 100	428	21
25	12	0	400	100	17
26	15	NA	< 100	5761	16
Controls					
1–16			< 100	< 100	10–50
17			< 100	1479	26
18			< 100	1130	25

* Bacteriological index. NA, not available.

† The values represent reciprocal dilutions (titres) of test sera giving 50% inhibition (ID_{50}) of binding of monoclonal antibody ML04 (35kD protein) and ML34 (LAM) or giving 15% binding to PGDS coated micotitre plates.

Results and Discussion

Sera from untreated patients showed consistently high antibody levels in the PGDS binding and the anti-35kD (ML04) competition assays (Table 1). The performance of the ML04 competition test using peroxidase-labelled ML04 monoclonal antibody showed considerably higher serum titres than in previous assays which employed a radiolabelled ML04.[7,8]

Unlike the uniformly raised anti-PGDS and anti-35kD protein antibodies, we observed considerable variation between individual LL patients in their anti-LAM antibody response, represented by the ML34-competition test. The individual variations could not be related to the bacteriological index. These results related only to one epitope (ML34) of LAM and the immunogenicity of epitopes detected by other MABs (ML02)[15] (L9)[10] was not evaluated.

In view of the cross-reactivity of the ML34 epitope of LAM with several mycobacteria,[16] it is not surprising to find antibody levels in healthy controls which consequently limits the usefulness for diagnosis of leprosy. High titres of antibodies against phenolic glycolipid I were found in 2 out of 18 control sera which were negative in the ML04 competition test. This result is in agreement with previous reports of 'false' positive reactions to PGL-1 in 5% of control sera.[5,12]

Correlation between these tests was examined with the sera from patients prior to therapy and those with up to 5 years of therapy. PGDS *vs* ML34 and PGDS *vs* ML04 showed positive correlation at the $p < 0{\cdot}02$ and $p < 0{\cdot}01$ levels respectively whilst no significant correlation was found between ML04 *vs* ML34.

All three tests showed a statistically significant correlation between decrease of titres and length of chemotherapy. The ML04-competition test showed by far the best correlation ($p < 0{\cdot}001$) and may therefore be the most suitable for monitoring the response of patients to chemotherapy.

Marginal levels of binding activity to the IIIE9 peptide of the 65KD protein were demonstrable in sera of 2 patients only. Competition experiments using radiolabelled IVD8 antibody, whose epitope is also contained on the IIIE9 peptide, showed similarly marginal activity in sera with very high anti-35kD and PGDS antibody levels (results not shown). Therefore, our results suggest that the *M. leprae* specific epitope of the 65kD antigen is poorly immunogenic in patients with lepromatous leprosy.

In conclusion, we found that essentially all patients with LL produce high levels of antibodies towards PGL-1 and 35kD protein antigen. This strong immunodominance and the species-specificity of both epitopes is particularly favourable for further serodiagnostic and seroepidemiological evaluation. This is apparent in view of the fact that sera from LL patients do not contain significant antibody titres to two other *M. leprae* specific epitopes defined by the ML06/ML10 MABs on the 12kD antigen[7] and by the IIIE9/IVD8 MABs on the 65kD antigen. Of the other MAB-defined *M. leprae* specific epitopes, it appears that only half of the LL patients react with the 18kD antigen[10] whilst the response to the 28kD antigen[19] has not yet been evaluated. Technically, the availability of chemically synthesized PGDS is favourable for assay standardization although variable levels of non-specific IgM binding to the solid phase interfere with the analysis of sera at low dilutions. On the other hand, the competition assay is less prone to non-specific factors and therefore possibly more reliable to detect low antibody levels.

Acknowledgments

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LEPROSY CONTROL AND FIELD WORK

Prometheus–PHC (Primary Health Care)

Dr Manuel Quimper, Instituto de Medicina Tropical, 'Alexander von Homboldt', A.P. 5045, Lima, Peru, South America, has developed a project for the use of microcomputers to improve primary health care services in Peru. The descriptive leaflet summarizing this interesting initiative includes the following:

Prometheus–PHC: A computerized, integrated health information system:

Designed to improve the quality of primary health care services . . . and other medical services in Peru and other countries.

Information technology which works first at the community level . . . where the real needs of the people are and secondly at the level of direct supervision.

Computer-based expert assistance for health promotors . . . and an automated system for planning and supervision at health centres and area hospitals.

Appropriate high level technology: Powerful microcomputers which work with batteries, have no moving parts and are recharged by inexpensive solar panels (less than $20 each) made in Peru.

An 'intelligent' system: an exact, continuously up-dated community census, which monitors and records all health services activities, automatically schedules future primary health care visits, monitors the growth and development of all community children, records all immunization and precisely targets future needs, automatically manages inventories of medicines and supplies, and provides expert assistance for the diagnosis and treatment of: diarrhoea, respiratory infections, malnutrition, high risk pregnancy, fever, trauma, emergency. Rapid error-free transmission of information between computers of all types at different levels of the Health System.

Avoiding loss of data through redundant storage of information.

The Prometheus–PHC prototype being used, at this moment in the central jungle region of Peru:

In 10 health posts along the Rio Pichis, the Prometheus–PHC pilot project has shown that:

Prometheus–PHC is reliable, well received, and can be easily used by local health promotors in their native communities.

Local promotors can be trained in the use of the system in less than 1 week even those who have never seen a typewriter before.

Dr Quimper has supplied the following additional technical information:

The equipment about which you asked me in your letter of 29 March is a real Microcomputer, an item which belongs to the so called 'Lap top personal computers' with a RAM (Random Access Memory) of 275 Kbytes, powered by a rechargeable 9 Volt battery.

The computer, a Hewlett–Packard 110 model, had no mobile parts and was shown to be a robust, and reliable piece of equipment (at least for the first 2 years).

We developed in the country the solar energy unit for the recharging of the batteries, using discarded (broken) materials brought from a factory in the USA, and manufactured the panels with our own craftsmen. They cost less than US $5 each. The software was designed by us and the programming was in Basic language.

At the beginning of the project we ran into some difficulties because of the small storing capacity of the batteries. However, introducing a 12 Volt standard acid battery (car type), as an additional accumulator, we improved the capacity of power storing and went on without any further problems.

At the end of the project, some of the computers presented problems related to the lifespan of the internal batteries, which diminished the amount of charge they could hold. Again, that was solved by replacing the batteries with new ones, a task performed locally, though it required a special type of screwdriver.

(The approach, on the evidence so far, seems of potential value for the collection of data in the field and it is apparently workable by local health staff. As many people in South America and elsewhere, are already familiar with keyboards, visual display units and computers, this initiative warrants further attention. *Editor.*)

United Nations Association International Service; Brazil

We are indebted to Jane Carter, General Secretary of UNAIS, 3 Whitehall Court, London SW1A 2EL, for keeping us informed about a series of volunteers from the UK who have been recruited to work in the Manaus area of Brazil, under the supervision of Professor Sinesio Talhari. Qualified nurses are being sent out to help supervise the multiple drug therapy programme in the Amazonas; they do this from small health centres or clinics in 4 designated centres of population, at varying distances from the capital of Manaus. Experience has already shown that this improves training of local staff and adequate follow-up of patients. This project, operating under difficult conditions, well away from the more developed centres in Brazil, is supported by CAFOD and LEPRA and is likely to be on-going over the next 5 years at least.

Lepr Rev (1988) **59,** 201–203

Comparison of colchicine and aspirin in the treatment of Type 2 lepra reaction

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Summary In a double blind controlled trial, 34 episodes of acute Type 2 reaction in patients with lepromatous leprosy were treated with colchicine (1·5 mg/day × 4) and the response was compared with a similar number of episodes treated with aspirin (1·8 g/day × 4). Both drugs were found equally effective in mild degree reaction, whereas colchicine gave marginally better result in moderate degree reaction. Neither of the drugs was found useful in severe degree reaction. However, a better efficacy of colchicine was observed in the management of joint and nerve pain associated with Type 2 reaction. Minor side-effects like diarrhoea, nausea and vomiting were noted in only 1 patient while under colchicine therapy.

Introduction

Colchicine was tried by Sarojini & Mshana[1] in Ethiopia on 10 male adult patients for acute ENL attack. In all the patients, dramatic effects were obtained. On the other hand, Stanley *et al.*[2] found little or no effect on the steroid requirement of 5 adult male patients with severe Type 2 reaction. Sharma *et al.*[3] found it to be effective in mild to moderate cases of Type 2 reaction and a few cases of severe reaction with pustular lesions. At the Central Leprosy Teaching and Research Institute, Chingleput, India, a trial was undertaken to find out the efficacy of colchicine in comparison with that of acetyl salicylic acid (aspirin) in the management of acute Type 2 lepra-reaction.

Materials and methods

This was a double-blind study on 68, acute, Type 2 reactional episodes observed among 30 adult, active, lepromatous leprosy patients (6 females and 24 males). All cases were admitted to the hospital attached to the Central Leprosy Teaching and Research Institute, Chingleput throughout the trial period during 1984 and 1985. The severity of each reaction was graded as per the criteria given by Waters.[4] Very mild (Grade 1) and very severe (Grade 5) reactions were not included in this study. The diagnosis of each attack of Type 2 reaction was confirmed by biopsy of an active skin nodule (ENL).

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All patients were bacteriologically positive varying from 2·66 to 4·33 (Ridley's logarithmic scale). Out of the 30 patients, 20 were under dapsone monotherapy and 10 under multidrug therapy (dapsone, rifampicin and prothionamide) for a period varying from 3 months to 3 years. None of them had taken clofazimine earlier.

A detailed clinical examination was conducted with special reference to density and distribution of ENL lesions, presence or absence of malaise, insomnia, anorexia, rise of temperature, pain/tenderness in peripheral nerves, joint and muscle pain, eye reaction, testicular tenderness and swelling, and lymph node, spleen and liver enlargement.

Laboratory examination included routine urine and blood examinations (haemogram, platelet count, blood urea estimation and liver function tests). Both clinical and laboratory examinations were carried out at the beginning and end of each treatment period.

Half of the reactional episodes (34) were treated with 1·5 mg of colchicine daily in 3 divided doses while the other half received 1·8 g of aspirin daily in 3 divided doses. Duration of treatment was 4 days in both the groups. To camouflage the identity of the drug, colour, shape and size of the capsules containing powder of each drug were kept uniform.

On the basis of allocation, either of the drugs was alternatively given to the patient for the reaction. If the patient did not respond to the drug by the end of the 4th day, the next code drug was given from the 5th day. On the other hand, if the patient responded well, the next code drug was given only when the next episode of reaction occurred in the same patient. If there was no improvement with either of the drugs during the first 8 days, the case was taken out of the trial and treated with steroids.

During the entire period of trial, no other drug was given apart from antileprosy drug(s) in unchanged dosage.

Assessment of the drug response was graded as mild, moderate or excellent, taking into consideration fall of temperature, disappearance of ENL lesions and improvement of other signs and symptoms of reaction.

Results

The clinical response in both treatment groups is presented in Table 1. For mild reaction, both the drugs were found equally effective, where as in severe type neither of them was able to control the reaction. In moderate grade reaction with colchicine therapy, 9 out of 14 episodes (64·3%) showed moderate to excellent response against 4 out of 14 (28·6%) in the aspirin group.

Table 1. Comparison of clinical response of colchicine with aspirin

Severity of reaction and number of episodes in each group	Mild reaction (Grade 2) 10				Moderate reaction (Grade 3) 14				Severe reaction (Grade 4) 10			
Degree of improvement	a	b	c	d	a	b	c	d	a	b	c	d
Colchicine group	0	0	1	9	1	4	7	2	8	2	0	0
Aspirin group	0	0	2	8	2	8	2	2	8	2	0	0

Note: a, no improvement; b, mild improvement; c, moderate improvement; d, excellent improvement.

Though details were not presented, nerve pain (neuritis) was reduced remarkably with colchicine therapy in 50% (12 out of 24) of reactions associated with neuritis against 18·2% (4 out of 22) in the control group. One patient under aspirin therapy developed right ulnar nerve abscess, followed by ulnar claw hand for the first time. He was immediately put on steroids.

For joint pain, there was a better response in the colchicine group, i.e. 81·8% (18 out of 22 reactions) against 34·8% (8 out of 23 reactions) in the aspirin group.

Side-effects were milder in both the groups. One patient while under colchicine therapy had nausea, vomiting and diarrhoea. The pre-treatment and post-treatment results of renal and liver function tests and platelet count did not reveal any abnormal variation.

Discussion

In short, our study did not reveal any special advantage with colchicine therapy in contrast to the findings observed by Sarojini & Mshana.[1] The marginally better improvement in moderate grade reaction could be due to a statistical factor, as the number of reactional episodes is rather limited in the present series. This mild to moderate clinical response is in line with the observations of Stanley *et al*[2] and Sharma *et al*[3] in their respective series. However, in our study colchicine has shown better ability to relieve joint and nerve pain.

The main limitations of this study are; (a) colchicine has not been tried for longer duration to see its effects on prevention of ENL reaction after the acute attack is under control; and (b) the number of reactional episodes treated with colchicine is rather limited. Nevertheless, trial indicates that colchicine has shown activity possibly equivalent to that of aspirin, chloroquin and antimonials in the management of mild to moderate degree Type 2 reaction in leprosy.

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TEACHING MATERIALS AND SERVICES

Video at Karigiri, South India, for leprosy teaching

In the Annual Report for 1987 of the Schieffelin Leprosy Research and Training Centre, Karigiri, Tamil Nadu, South India, we read with interest of the continuing development of 'Karigiri Video'. Under activities: 'The Government of India and The Leprosy Mission have initiated a project entitled, 'Control/Eradication of Leprosy through Community Health Education'. This programme is being financed by USAID. We have been asked to produce 32 programmes for medical and paramedical personnel, patients and the community, on various aspects of leprosy. These video cassettes will be distributed to 50 medical colleges and to all the 44 leprosy training centres in the country, for their teaching programmes.

All the cassettes produced under this project will be in support of the National Leprosy Eradication Programme.

The Video sub-committee of the Government of India—USAID Project, met at Karigiri on 28 and 29 May 1987, to review the programmes already produced and to suggest new subjects for medical undergraduates. The members included: Dr Gurmohan Singh, Head, Department of Dermatology, Benaras Hindu University; Dr (Mrs) Surrinder Kaur, Head, Department of Dermatology, P.G.I. Chandigarh; Dr D K Srinivasa, Head, Department of Preventive and Social Medicine, JIPMER, Pondicherry; Dr (Mrs) E S Thangaraj, Medical Co-ordinator, The Leprosy Mission, New Delhi; Dr M Christian and Mr Sanjay Agawal from Karigiri.

Further information from India, or other countries, on the development and use of video in leprosy teaching would be most helpful, and we hope that readers will submit material for publication. *Editor.*

Christoffel Blindenmission–LEPRA. Ophthalmic Course, Karigiri, India 1988

A 4-day ophthalmic teaching module was held at the Schieffelin Leprosy Research and Training Centre, Karigiri from 29 February to 3 March 1988. This course, which was sponsored jointly by the Christoffel Blindenmission and LEPRA, was designed to give instruction to leprologists on the detection, prevention and management of the ocular complications of leprosy by means of a series of lectures, clinical and surgical demonstrations, videos and slide-tapes.

Teaching included presentations on basic anatomy, physiology and pathology of the eye with special emphasis on leprosy: in addition there were lectures on the clinical signs and management of lagophthalmos, corneal ulcers, intra-ocular inflammation and infiltrative lesions together with a discussion on the global aspects of blindness in the disease.

The course, which was attended by 16 participants, was run by Dr Margaret Brand from Carville, USA and Mr Timothy ffytche from St Thomas's Hospital, London, together with contributions from Dr N Suryawanshi and Dr Mary Jacob of Karigiri. The Director and staff of Karigiri and The Leprosy Mission are to be congratulated on their continued support for this important and increasingly popular contribution to teaching.

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Clofazimine and dapsone compliance in leprosy

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Summary The regularity with which multibacillary patients, who were being treated with the WHO Study Group regimen in a THELEP-sponsored field trial in South India, ingested their prescribed daily clofazimine and dapsone was studied. The ingestion of clofazimine was monitored using a specially prepared formulation containing minute amounts of isoniazid as an innocuous marker. Overall drug acceptability and compliance was excellent. Approximately 75% of the prescribed daily clofazimine and dapsone doses were being ingested and it was concluded that only 5% of the patients would have benefited if their treatment had been supplemented by acedapsone injections.

There was however a marked correlation between the self-administration of the 2 drugs with the consequence that the patients at greatest risk of developing rifampicin resistance because of poor dapsone compliance were the very ones most unlikely to take their daily clofazimine treatment. The results obtained emphasize the importance of employing regimens containing high degrees of supervised drug administration, especially in areas where drug compliance is known to be poor.

Introduction

It is recommended that all multibacillary patients should be treated with a combination of rifampicin plus dapsone plus clofazimine.[1] The efficiency of two such regimens is currently being evaluated in a THELEP-sponsored field trial at the Schieffelin Leprosy Research and Training Centre in Karigiri, in the North Arcot District of Tamil Nadu in South India.[2] In regimen A, supervised 600 mg doses of rifampicin and of clofazimine were given on each of 2 consecutive days once every 4 weeks. The patients were also given 100 mg tablets of dapsone for daily self-administration supplemented with intramuscular injections of 225 mg diacetyldapsone (acedapsone) once every 8 weeks which release on average 3 mg dapsone daily. Regimen B was identical to that recommended by the WHO Study Group for the routine treatment of multibacillary patients,[1] consisting of monthly supervised doses of 600 mg rifampicin and 300 mg clofazimine supplemented by daily doses of 50 mg clofazimine and 100 mg dapsone for self-administration. Treatment was to be continued for at least 2 years and until the patients became smear-negative.

‡ Deceased 12.6.88

0305-7518/88/059205+10 $01.00

This report describes a study of the self-administration of clofazimine and dapsone by patients being treated with the WHO Study Group regimen in the field trial. It had three principal objectives; first, to compare the self-administration of dapsone and clofazimine; second, to provide a data base of individual patient compliance for future attempts to judge whether gross irregularity in drug self-administration might result in patients eventually relapsing with rifampicin-resistant strains of *Mycobacterium leprae* and thirdly, to assess the proportion of patients whose dapsone compliance was so poor (those who ingested on average less than 6 mg dapsone per day) that they would have potentially benefited from the 8-weekly acedapsone injections included in regimen A.

The unusual pharmacology of clofazimine, characterized by its steady accumulation in the body and the slow elimination of only a minute proportion of the daily dose in the urine,[3–7] makes it impossible to study the day-to-day self-administration of the drug directly by detecting clofazimine or its metabolites in the urine. We therefore studied its compliance using a clofazimine formulation containing minute amounts of the antituberculosis drug isoniazid as an innocuous marker for monitoring daily self-administration[8,9] and assessed its ingestion by means of a simple colorimetric urine test for the isoniazid metabolites isonicotinic acid and isonicotinylglycine.[10] Such a procedure is essentially capable of demonstrating whether or not the scheduled marked dose has been ingested. Dapsone compliance was assessed using a sensitive high-pressure liquid chromatographic procedure to supplement the findings obtained by the simple dapsone/creatinine ratio method.

ISONIAZID-MARKED CLOFAZIMINE CAPSULES, COLLECTION OF URINE SAMPLES AND PILL COUNTING

Capsules containing 50 mg clofazimine plus 6 mg isoniazid of identical appearance to standard 50 mg clofazimine capsules were specially manufactured for the study by Ciba-Geigy. The bioavailability of the isoniazid-marker component of the formulation was confirmed by demonstrating in a healthy subject (GAE) that the kinetics of the urinary excretion of isonicotinic acid and isonicotinylglycine after the oral ingestion of one of the capsules were closely similar to that demonstrated previously after the ingestion of 6 mg doses of isoniazid in aqueous solution, capsules or tablets,[8]

Two pilot studies were conducted among leprosy patients in Karigiri to determine the length of time during which reliably positive urine samples would be obtained when tested by the isonicotinic acid method after the ingestion of the isoniazid-marked clofazimine capsules. In the first pilot study urine samples were obtained from 20 patients pretreatment and 1, 2, 5, 8, 10, 24 and 48 hr after an isoniazid-marked clofazimine capsule had been ingested on an empty stomach at 9 am one morning. In the second pilot study, 10 patients ingested a single isoniazid-marked clofazimine capsule at 7 pm one evening and urine samples were collected pretreatment and at 1, 2, 12, 14, 16, 18, 20 and 24 hr later. Both sets of samples were randomized and recoded prior to testing.

Once each month, between their clinic visits, the patients were visited in their homes by a paramedical worker to encourage them to take self-administered treatment regularly last thing each evening. The paramedical workers also counted the patients' stocks of clofazimine capsules and dapsone tablets as a potential indicator of their compliance and retrieved any extra capsules or tablets held by the patients indicating scheduled doses that could not have been ingested.

In April 1984, towards the end of the second year of their entry into the field trial, supplies of 28 isoniazid- marked clofazimine capsules were issued in place of the standard formulation to patients being treated with the WHO Study Group regimen on the occasion of their monthly clinic visit. Approximately 1 week later urine samples were obtained between 6 and 8 am from 419 of the patients by means of surprise home visits and the patients' remaining stocks of clofazimine capsules and dapsone tablets counted. The 419 patients from whom the samples were obtained were typical of all the 488 patients currently being treated with the regimen; their ages ranged from 16 to 74 years (mean 44 years), they weighed from 32 to 68 kg (mean 46 kg), 75% were classified as having

lepromatous leprosy, 30% were female and 75% married. Prior to entry into the trial they had been treated for up to 20 years with dapsone monotherapy (mean 11 years).

Analytical procedures

Aliquots of urine were preserved with a crystal of thymol and stored at 0–4°C until shipment by air (without refrigeration) to London for analysis. The ingestion of isoniazid was revealed by testing for the presence of the metabolites isonicotinic acid and isonicotinylglycine, positive results being indicated in non-smokers by the formation of blue or green colours within 15–30 min of reaction, and in smokers by grey or brown colours. Negative results were indicated by yellow or straw colours among non-smokers and pink or orange colours among smokers.[9,11]

The concentrations of dapsone plus its diazotizable metabolites (μg/ml) and creatinine (mg/ml) were estimated by modifications of the Bratton and Marshall and alkaline picrate procedures, respectively, and individual dapsone/creatinine (D/C) ratios calculated for each urine sample.[12] The proportion of dapsone doses that had been ingested was calculated by comparing the mean D/C ratios of the test urine samples with an appropriate mean value for fully compliant patients after allowing for the contribution from blank urine. Among samples with D/C ratios of less than 30, acid-labile dapsone concentrations were measured by the high pressure liquid chromatographic method previously described for estimating thiacetazone,[13] but monitoring at 313 rather than 328 nm for increased sensitivity. Prior to the initial extraction 0·1 ml of a 10 μg/ml solution of thiacetazone was added as an internal standard, acid-labile conjugates of dapsone were hydrolyzed by treating with a tenth volume of 2N HCl at room temperature for 15 minutes[14] and the sample then neutralized with NaOH.

Results

PILOT STUDIES

The results of the two pilot studies are summarized in Table 1. They showed that urine samples obtained up to 12 hr after the ingestion of an isoniazid-marked clofazimine capsule gave reliably positive isonicotinic acid tests and suggested that by 36 hr almost all of samples would have given negative results. Since all the test urine samples were obtained within 12 hr of the time when patients should have ingested their last isoniazid-containing clofazimine capsule, it could therefore be inferred that a negative urine-test result would imply that such a dose had not been taken and that the percentage of positive urine-test results would provide a reasonable indication of the proportion of patients who had ingested their prescribed clofazimine capsule the previous day.

Main compliance study

The clinic attendance of patients on both regimens was excellent and over 90% of the patients

Table 1. Percentages of positive isonicotinic acid tests obtained among urine sample collected at varying times after the ingestion of isoniazid-marked clofazimine capsules

Time (hours)	0	1	2	5	8	10	12	14	16	18	20	22	24	48
First pilot study	*0*	*60*	*100*	*100*	*100*	*100*	—	—	—	—	—	—	*15*	*0*
Second pilot study	*0*	*70*	*100*	—	—	—	*100*	*90*	*90*	*70*	*50*	*40*	*20*	—

Table 2. Proportions of isoniazid-marked clofazimine capsules and dapsone tablets ingested

				% doses ingested
Clofazimine	Colours after testing for isonicotinic acid			
Positive results	blue/green	grey/brown*	totals	
	114	187	301	72
Negative results	none/yellow/straw	orange/pink*		
	41	77	118	
All	155	264	419	
Dapsone	Number samples/patients		D/C ratios†	
This study	413		85 ± 2	78‡
Supervised	10		107 ± 12	
Untreated controls	10		7 ± 1	

* Colours indicate smokers or tobacco chewers.
† μg dapsone/mg creatinine (means ± S.E.s).
‡ $\frac{\text{Mean test D/C ratios} - \text{mean blank ratios}}{\text{Mean supervised ratios} - \text{mean blank ratios}}$.

collected at least 90% of their prescribed chemotherapy during the first 2 years of treatment.[2] The qualitative results obtained when the 419 urine samples collected were tested by the isonicotinic acid method are summarized in Table 2. Positive results were obtained from 301 of the samples indicating that on the evening prior to the surprise collections of the urine samples about 72% of the patients had ingested their prescribed clofazimine capsule. It was apparent from the colours of the reaction products that a high proportion of the patients (63%) were either smoking or chewing tobacco, and this was subsequently admitted by over 80% of the nicotine users identified in this way.

Dapsone/creatinine ratios could be determined for 413 of the 419 urine samples collected. The results obtained (Table 2), taken in conjunction with those from similar Indian patients who were being treated with 100 mg daily doses of dapsone under strict supervision and from untreated controls,[15] indicated that about 78% of the prescribed dapsone doses had been ingested by the field trial patients in the period immediately prior to collecting the urine samples.

The remarkable correlation between the taking of dapsone tablets and clofazimine capsules is set out in Table 3, the proportions of positive isonicotinic acid urine tests declining from 85% among those samples with D/C ratios of over 50 to zero among those with D/C ratios of less than 10. On the basis of the highly correlated self-administration of dapsone and clofazimine, one could

Table 3. Correlation between the ingestion of dapsone and clofazimine

Dapsone compliance			*Clofazimine compliance*
D/C ratios	Number patients	% tablets taken‡	Number (%) positive isonicotinic acid tests
> 50	334	*93*	284 (*85*)
30–50	30	*33*	7 (23)
10–29·9	31	*11*	5 (*16*)
< 10	18	*0*	0 (*0*)
All patients	413	*78*	296 (*72*)

‡ See footnote Table 2.

conclude that the compliance of about 70% of the patients being treated with the WHO Study Group regimen was probably 'excellent' as evidenced by 284 of the 413 urine samples having D/C ratios of greater than 50 and giving positive isonicotinic acid tests. By contrast only about 10% of the patient population could be considered to be 'poor' compliars who might be taking potentially inadequate amounts of dapsone and clofazimine as evidenced by the 44 urine samples with D/C ratios of less than 30 and negative isonicotinic acid tests. The compliance of the remaining 20% of patients was graded as 'intermediate'.

No relationship could be demonstrated between the apparent regularity with which the patients self-administered their prescribed clofazimine and dapsone treatment and their age, sex, marital status, previous duration of treatment, disease classification, extent of deformity and whether or not they smoked.

Clofazimine-induced skin discoloration was noted after about 12 weeks treatment with the WHO Study Group regimen as compared with about 20 weeks among patients treated with the fully supervised intermittent clofazimine-containing regimen A, and was much more marked at both 12 and 24 months in the former patients.[2] There appeared to be no discernable relationship between the patients' degree of skin pigmentation when treated with the WHO Study Group regimen and their estimated drug compliance.

Table 4 presents an analysis of the relationship between the urine test results for clofazimine and dapsone ingestion and the numbers of extra clofazimine capsules and dapsone tablets held by the patients at the time the surprise home visits were made to collect the samples. While only a quarter of the urine samples from patients with correct, fewer than correct or only one extra clofazimine capsule gave negative isonicotinic acid tests, this proportion rose to 45% among samples from patients holding 2 or 3 extra capsules ($p = 0{\cdot}01$), while all the samples from patients with 4 or more additional capsules gave negative results ($p < 0{\cdot}001$). Similarly the proportions of urine samples with D/C ratios of less than 30, indicating that at least 48 hr had elapsed since the last dose of dapsone has been ingested,[15] increased from 9% among those with fewer than 3 extra dapsone tablets to 44% among those with 3 or more additional tablets ($p < 0{\cdot}001$).

Counts of patients' stocks of clofazimine capsules and dapsone tablets

The apparent marked correlation between the extent of patient compliance assessed by objective urine tests, and the numbers of extra clofazimine capsules and dapsone tablets held by the patients when the urine samples were collected, prompted an analysis of all the information on pill counts that had been gathered as a result of the 4-weekly visits by the paramedical workers to the homes of

Table 4. Relationship between the urine test findings and numbers of extra clofazimine capsules and dapsone tablets held by the patients

Number of extra capsules or tablets	*Clofazimine* Negative urine tests proportion (%)*	*Dapsone* Low D/C ratios proportion (%)†
0	85/345 (25)	31/325 (10)
1	4/24 (17)	2/30 (7)
2	9/19 (47)	2/28 (7)
3	5/12 (42)	4/11 (36)
4 or more	13/13 (100)	7/14 (50)

* Isonicotinic acid method.
† Less than 30 μg dapsone per mg creatinine.

Table 5. Correlation between numbers of extra capsules and tables held during the first 2 years of multidrug treatment and estimated patients compliance

Compliance status: D/C ratios Isonicotinic acid urine test	Excellent >50 +ve	Intermediate (All others)	Poor <10 −ve
Number of patients	250	65	28
Average number of medicament counts	24·9	24·3	24·5
Occasions with extra clofazimine capsules	3·3±0·2*	4·0±0·5	5·5±0·8
Occasions with extra dapsone tablets	3·3±0·2	3·7±0·5	5·3±0·8
Total number of extra clofazimine capsules	9·4±0·8	14·9±2·7	23·9±5·6
Total numbers of extra dapsone tablets	9·7±0·8	15·1±3·2	25·4±6·0

* Means±S.E. of mean.

the patients being treated with the Study Group Regimen. It was argued that if the pattern of compliance over the whole 2-year period was fairly consistent, then the patterns of the stocks of pills held by the patients shown to be either compliant or non-compliant at one point in time, might differ consistently over the whole period. This was indeed the case (Table 5).

Records of the stocks of medicaments were available for at least 18 of the 26 4-weekly scheduled home visits during the first 2 years of treatment for 343 of the patients in the compliance study. Although the numbers of extra clofazimine capsules and dapsone tablets held by the excellent compliars tended to decline during the 2 years, the pattern of extra medicaments held by the intermediate and poor compliars did not change significantly during this time. That there were highly significant differences in the patterns of pill retention between patients was shown by the marked correlations ($r = 0{\cdot}51$ and 0·56, respectively) between the individual total numbers of extra colfazimine capsules and dapsone tablets recorded during the first and second years of treatment. The individual 2-year totals of extra clofazimine capsules and dapsone tablets in the patients' possession were also very highly correlated ($r = 0{\cdot}92$), in fact on almost half of the occasions when extra clofazimine capsules or dapsone tablets were noted, their numbers were identical.

Over the whole 2-year period, patients classified as being poorly compliant on the basis of the urine test results summarized in Table 3, were more frequently found to have in their possession extra clofazimine capsules and dapsone tablets than the patients whose compliance had been judged to be excellent (Table 5). Similarly, the total numbers of extra capsules and tablets held by the poor compliars was approximately 2·5 times that of the excellent compliars ($p < 0{\cdot}001$).

Proportion of patients whose dapsone compliance was so poor that they might have benefited from acedapsone injections

Injections of 225 mg acedapsone once every 8 weeks deliver on average about 3 mg dapsone per day[16–18] or 3% of that ingested by fully compliant patients prescribed 100 mg dapsone daily. It was therefore concluded that the proportion of patients whose compliance was so poor that they might have benefited from acedapsone treatment could be assessed by determining the proportion of urine samples with acid-labile dapsone/creatinine ratios of less than 6% of that of compliant patients. A pool was therefore prepared by mixing equal volumes of the 284 urine samples from the main study with D/C ratios of greater than 50 and positive isonicotinic acid tests; i.e. from the patients designated as excellent compliars (see Table 3). The D/C ratio of this pool was 100 confirming that such patients were indeed ingesting virtually all their prescribed dapsone treatment.[15] Twenty-one of the 49 urine samples with original D/C ratios of less than 30 were shown by high pressure liquid chromatography to have acid-labile dapsone/creatinine ratios of less than 6% of that of the pool

(equivalent to an average daily intake of less than 6 mg dapsone), suggesting that 5% of the total patient population might have benefited from twice-monthly acedapsone injections. The original D/C ratios of their urine samples had averaged 8·2 (range 3·7–15·5).

Discussion

The evidence that about 75% of the clofazimine capsules and dapsone tablets prescribed for daily self-administration by the patients being treated with the WHO Study Group regimen in the field trial were actually being ingested indicates that the overall compliance of the patients was excellent; indeed it was concluded that about 70% of the patients were probably taking almost all their prescribed treatment. These results confirm the excellent compliance of patients in Karigiri demonstrated previously when patients were being treated with dapsone monotherapy.[19] Such regularity in drug self-administration is quite exceptional; in other parts of India and the rest of the world it is common to find that only about a half of the prescribed treatment is actually being ingested.[20]

The remarkable correlation between the self-administration of clofazimine and dapsone by the Karigiri patients accords with the excellent acceptability of clofazimine by the patients who did not find the skin pigementation it causes unduly troublesome. It was concluded that only about 10% of the patients were probably self-administering potentially inadequate amounts of dapsone and clofazimine. Furthermore, in only half these patients (5% of the total patient population) were the amounts of dapsone being ingested so low that the intake of the drug would have been significantly augmented by giving 225 mg acedapsone every 8 weeks, as in regimen A. Whether, if any relapses occur, they will be found predominantly among such patients remains to be seen. At the present moment, after a total of over 1000 patient-years observation following the completion of treatment with each of the two regimens, not a single patient has relapsed.[21]

The apparent accumulation of clofazimine in the skin of patients being treated with the WHO Study Group regimen was considerably more rapid than that in patients being treated with regimen A. If the compliance of patients on the Study Group regimen throughout their first 2 years of treatment had been similar to that demonstrated at the end of the period and they had ingested about 75% of their prescribed 50 mg daily clofazimine doses, their average monthly intake of the drug would have been about 1350 mg. Since such an amount is only slightly greater than the 1200 mg given under supervision as two consecutive 600 mg doses every month to the regimen A patients, it is suggested that the absorption of 50 mg doses of the drug may be substantially more complete than that of 600 mg doses. Such a possibility is in accord with the very low aqueous solubility of the drug and evidence from the excretion of unchanged drug in the faeces that only about 70% of 100–300 mg doses of clofazimine are absorbed.[3–5]

The marked correlation between the numbers of extra clofazimine capsules and dapsone tablets held by the patients when the urine samples were collected for the compliance study and the urine test results was useful as it justified the analysis of the pill count data collected during the first 2 years of multidrug treatment to provide evidence for the overall pattern of compliance.

Such findings, however, do not justify reliance on pill counts as the only method for obtaining routine evidence of patient compliance. Thus 25 of the 44 patients classified as poor compliars, whose urine samples had dapsone/creatinine ratios of less than 30 and gave negative isonicotinic acid tests, were found to have correct numbers of capsules and tablets. Clearly, in order to satisfy the health-care staff, these patients had removed a clofazimine capsule and dapsone tablet each day—but did not ingest them. The other patients, who also failed to ingest their treatment but took less trouble to give the impression that their compliance was satisfactory, might, if pressed more strenuously, also have resorted to more efficient deception.

The most important finding of this study is the striking correlation between the taking of clofazimine and dapsone as demonstrated by the urine test results (Table 3) and confirmed by the

extremely similar numbers of extra clofazimine capsules and dapsone tablets found when the patients were visited in their homes by the paramedical workers. Perhaps such an outcome might have been anticipated in view of the excellent acceptability of both clofazimine and dapsone, which provides little incentive for preferential drug ingestion. It is therefore highly likely that the marked correlation in the taking of the 2 drugs will also occur among dark-skinned patients in other parts of the world where the overall regularity of drug self-administration is much inferior to that demonstrated in Karigiri.

The saluary conclusion of this investigation is therefore that the multibacillary patients most at risk of developing rifampicin resistance because of poor dapsone compliance, are the very ones least likely to take their prescribed clofazimine capsules when they are treated with the WHO Study Group regimen. The correct numbers of clofazimine capsules and dapsone tablets apparently held by many of the poorly compliant patients suggests that often the failure to take their drugs was not accidental and would therefore not have been overcome by, for example, simplifying treatment by manufacturing combined capsules containing clofazimine plus dapsone.

Since the spread of rifampicin-resistant leprosy would jeopardize all prospects of controlling leprosy with multidrug treatment, it is of the utmost importance to prevent patients relapsing with rifampicin-resistant *H. leprae*. The results of this compliance study therefore emphasize the value of comparing the efficacy of regimens containing higher degrees of supervision, such as regimen A in the field trial, with that of the Study Group regimen even though among excellently compliant patients such regimens may be marginally less effecive than the Study Group regimen.

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NEWS AND NOTES

Mycobacteria and human disease: Textbook by J M Grange

This 177-page hardback, price £16.50, published by Edward Arnold Ltd, 41 Bedford Square, London WC1B 3DQ, was originally envisaged as a successor to *Mycobacterial Diseases*, published (by the same firm) in 1980. But, as the author says in his preface, there have been so many changes in recent years that it has been necessary to completely rewrite the text. The main chapter headings include: the genus *Mycobacterium*; the species of mycobacteria; diagnostic mycobacteriology; immunology of mycobacterial disease; epidemiology and control of mycobacterial disease; leprosy; tuberculosis; other mycobacterial diseases; therapy of mycobacterial diseases.

This is a most informative book, and what is more, it is highly readable; there are very few people in this field who would be able to cover the microbiology, immunopathology and clinical features of tuberculosis, the 'miscellaneous' mycobacterial infections, and leprosy so convincingly.

The Preface draws attention to the increasing and regrettable gap between 'high-tech' researches and those responsible for the basic care of the victims of Mycobacterial diseases. We wish this book every success in bridging the gap.

Bombay Leprosy Project Report, 1976–86

In commemoration of the Tenth Anniversary Day, 6 October 1986, this Report of Activities gives a comprehensive account of this well-known Project in Bombay and we are grateful to the Director, Dr Ganapati for sending a copy, together with a document which highlights the most important programmes in recent years (1982–86). These include: the involvement of general health services; involvement of non-health agencies; treatment; training; research; the role of slum women in the diagnosis of leprosy; health education through video films and academic work by paramedical auxiliaries. *Source*: Bombay Leprosy Project Administrative Office, Vidnyan Bhavan, 11, VN Purav Marg, Sion-Chunabhatti, Bombay 400 022, India.

Robert Cochrane Fund for Leprosy

The Fund, in memory of the great leprologist Robert Cochrane, is administered by the Royal Society of Tropical Medicine and Hygiene. It is to be used to finance up to three travel fellowships each year to a maximum value of £1200 each.

The intention is to enable leprosy workers to travel for practical training in field work, or in research, or to enable experienced leprologists to travel in order to provide practical clinical training in a developing country. There is no restriction on the country of origin or destination providing the above requirements are fulfilled.

Application forms are available from the Society and must be received by the Society at least 6 months ahead of the proposed trip. All applications must be sponsored by a suitable representative of the applicant's employer or study centre, and agreed by the host organization. A 2-page report on the travel/study should be submitted to the Society within 1 month of the recipients return.

Apply: Robert Cochrane Fund for Leprosy, Royal Society of Tropical Medicine and Hygiene, Manson House, 26 Portland Place, London WIN 4EY, England.

Innovations in medical education, New South Wales

From the School of Medical Education, University of New South Wales, Australia, we have received a report on a workshop forum held in 1987 on the subject of 'Implementation of Innovations in Medical Education'. The meeting was sponsored by WHO and held in the Regional Teacher Training Centre for Health Personnel in the University of New South Wales. These reports are available free of charge to *bona fide* applicants and frequently report activities of considerable interest to those involved in teaching and training.

Acceptability of clofazimine by leprosy patients

At the 49th Meeting of the ILEP Medical Commission in Malta, December 1987, information was presented from an enquiry sent to ILEP members about their experience with patient acceptance (or otherwise) of clofazimine. Although the total number who replied and provided quantitative data was a little disappointing, the answers received indicated that, with some exceptions, the skin colouration and other side-effects of this drug had *not* been a problem in practice. This accorded with a previous comment from WHO:

'During a WHO consultation on "Implementation of multidrug therapy in leprosy control", held in Geneva from 16–19 October 1985, the participants agreed that, with a few exceptions, skin discolouration which occurs in leprosy patients who are treated with clofazimine does not significantly affect patients' compliance to treatment if clofazimine is used at the dosage recommended by the WHO Study Group on Chemotherapy of Leprosy for Control Programmes (WHO Technical Report Series No. 675).'

Lepr Rev (1988) **59,** 215–223

Impact of MDT on leprosy as measured by selective indicators

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Summary The impact of multidrug therapy (MDT) on the leprosy situation in endemic districts where MDT has been introduced, is studied, using a hypothetical model.

This analysis indicates that there will be significant falls in prevalence rates during the first 5 years, mainly as a result of discharge of cases during screening and due to shortening of the duration of treatment. These changes have to be interpreted with caution. Already some districts like Wardha in India have shown dramatic falls in prevalence rates from 11·1 in 1981 to 1·8 in 1987.

The impact of MDT on disease transmission as measured by decline in incidence rates and case detection rates will, however, be gradual.

Introduction

The National Leprosy Control Programme in India was initiated in 1955.[1] After nearly three decades of leprosy control using dapsone monotherapy, the strategy was revised in 1982.[1] The new strategy is based on multidrug therapy (MDT) as recommended by WHO.[2] MDT was introduced in India on recommendations of the Swaminathan committee[1,3] in 1983. As of February 1987, 33 endemic districts in India (prevalence 5 or more/1000) have been put under MDT. There are 412 districts in India and leprosy is endemic in 201 of them. Many areas in India thus have 3–5 years experience with MDT.

The initial optimism continues to grow and there is reasonable hope that the leprosy problem can be considerably reduced by the year 2000. However, it is important to understand the Epidynamics of leprosy in an area where MDT has been introduced. The trends in the leprosy situation, as measured by selected indicators currently being used, have to be interpreted with caution. It is crucial that when looking at these indicators, the actual impact of MDT on transmission of *M. leprae* infection, be differentiated from changes brought about by policy decisions, definitions of indicators and secular trends.

This paper seeks to look at an hypothetical area of one leprosy control unit, where MDT is being introduced at time zero (T0). It seeks to predict what should happen in 3 to 5 years (T0 + 3, T0 + 5). Since there are considerable differences in interpretation of guidelines on MDT,[3] use of actual data

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may not be representative. The policy for intake into MDT of paucibacillary and multibacillary patients, criteria for discharge, definitions of indicators and their interpretation vary considerably at the district level.

Methods and materials

Let us assume the multidrug therapy is introduced in an area of an average leprosy control unit (LCU), with the statistics as follows:

POPULATION DETAILS

1	Name of LCU	Leprad
2	Population	500,000
3	Area	1500 sq. km.
4	Estimated prevalence	20/1000 (1981)
5	No. of estimated cases	10,000
6	Estimated incidence rate (annual)	2/1000
7	New case detection rate (annual)	1·5/1000
8	No. of new cases detected each year	750

PATIENT PARTICULARS

1	No. of cases	10,000
2	Multibacillary (MB) 25%	2500
3	Paucibacillary (PB) 75%	7500
4	Proportion of active PB and MB cases	25%
5	No. of active MB cases	625
6	No. of active PB cases	1875
7	Total active cases	2500
8	Deformity rate (Grade II and III)	25%
9	No. of cases with deformity	2500
10	No. of child (15 yr and below):	
	Cases 30% of total	3000
	MB 10%	30
	PB 90%	2700

NEW CASES PARTICULARS

1	No. of new cases detected per year	750
2	Case detection rate	1·5/1000
3	No. of MB cases (10%)	75
4	No. of PB cases (90%)	675
5	Deformity rate	5%–10%
6	Proportion of child cases (40%)	300 cases

Let us assume that with the above statistics, MDT was introduced in 1981 in the area where dapsone has been used since 1971. If we take 1981 as 'T0' let us see what will happen to the following selective epidemiological and operational indicators: 1, prevalence rate; 2, incidence rate; 3, deformity rate; 4, active MB rate, PB rate; 5, positive case rate; 6, child rate; and 7, case detection rate.

DEFINITIONS

Prevalence rate

Gross prevalence (GPR): No. of living cases per 1000 population (including released from control, self-healed cases).

Operational prevalence (OPR): No. of cases requiring treatment or surveillance per 1000 population includes cases under treatment, released from treatment but under surveillance, plus unregistered cases—sometimes the total is called known cases.

Active prevalence (APR): No. of active cases MB and PB/1000 population, based on active cases. (It is total 2·5+2·6.) It is assumed that prevalence figures are calculated on population actually examined during surveys.

Incidence rate (IR): No. of new cases of leprosy detected per 1000 population per year. The assumption is that if repeated annual population surveys are done, new cases detected among a population previously examined and declared free of leprosy one year earlier, are considered as incident cases. Cases arising from immigrants, births or unexamined population in the previous year, are not included in calculation of incidence rates.

Deformity rate (DR): Proportion of cases with visible deformity (WHO deformity Grade II and III[4]).

MB Rate: Proportion of MB cases (BL and LL) as compared with total cases.

Active Case Rate (MB and PB). MB, the proportion of MB cases clinically active or bacteriologically positive as compared with total cases. PB, the proportion of clinically active PB cases as compared with the total cases.

Bacteriologically positive rate (BPR): PB cases that are skin smear positive in India are grouped along with MB cases that are positive and are put on the WHO regimen of MDT[3] for MB patients. The proportion of cases that are bacteriologically positive as compared with the total cases under treatment constitute this rate.

Child rate (CR): Proportion of cases below 15 years of age.

Case detection rate: (CDR): No. of new cases detected in the area per 1000 population (census). It includes cases detected by all sources including surveys and voluntary reporting.

Results

CHANGES THAT WILL OCCUR AT T+1 YEAR—BEFORE MDT IS INTRODUCED

In most LCU an active release from control has not taken place. During the preparatory phase, screening of all cases, PB and MB is done. Intake into MDT is according to the Government of India guidelines.[3,5] PB patients on monotherapy with dapsone are released from control, if: they are classified as indeterminate (Ind), tuberculoid (TT), or borderline tuberculoid (BT), and were skin smears negative at registration; they have completed 3 years of treatment with dapsone; and if they are clinically and bacteriologically inactive as judged by a doctor or a senior non-medical supervisor (NMS).

In patients with MB leprosy, treatment is continued till clinical and bacteriological inactivity and then a further period of 5 years. In many control programmes however PB and MB patients are treated for much longer periods. It is estimated that the screening phase before MDT is introduced will take 1 year. It is essential to train all cadres of staff to enhance their clinical skills, before screening commences.

CHANGES AT END OF 1 YEAR AFTER SCREENING PERIOD

If one assumes that only a maximum of 25% of PB cases and MB cases are active:

The No. of inactive MB cases will be 2500– 625	1875
The No. of inactive PB cases will be 7500–1875	5625
Total	7500

Assuming that at least 50% of the inactive MB and PB cases would have completed 7 and 3 years of treatment respectively, 50% (i.e. 3750) cases could be straight away released from control, (remaining 938 MB+2812 PB).

IMPACT ON PREVALENCE RATE

If the prevalence rate (OPR) was 20/1000 with 10,000 cases and at screening 3750 cases are released from control, then the prevalence rate would fall to 12·5/1000, (10,000−3750/500,000 × 1000) before MDT is introduced at T0. The prevalence rate would also be considerably influenced by previous definitions of prevalence rates used (see definitions). If the operational prevalence rate was originally used and now the defination is changed to active prevalence rates, and only 25% of cases are active (i.e. 2500), then the active prevalence rate will be 5/1000. This in itself would show a considerable fall in prevalence rates, even before MDT is introduced. The fall would be greater if gross prevalence rates were originally used.

IMPACT AT THE END OF 1 YEAR

Cases under treatment at beginning of MDT:

MB, 625 active + 50% (938)	inactive	1563
PB, 1875 active + 50% (2812)	inactive	4687
Total		6250

PB cases

Let us assume that all the PB cases are put under MDT. There are 4687 PB cases under treatment with 1875 active cases. These PB cases would have received varying durations of treatment with dapsone. However, we will consider that all of them are put under the WHO-PB regimen. At the end of 6 months it is estimated that only 25% of the active cases will continue to be active, i.e. 469 cases. The remaining 4218 cases, who had had previous dapsone monotherapy, can be released from treatment but are kept under active surveillance for a period of 2 years.

MB cases

Let us assume that all MB cases (active and inactive) are put under the WHO–MDT regimen. There were 1563 MB cases under treatment and of them 625 were active (bacteriologically, or clinically). At the end of 2 years, the 938 inactive cases would be ready for release from treatment (RFT). At least $\frac{1}{3}$ of the active cases, i.e. 208 with initial BI of 1 and 2 would have become negative and ready for RFT. Thus 1146 cases would be released from treatment but kept under active surveillance for a period of 5 years.

AT THE END OF 3 YEARS THE STATISTICS WOULD BE AS FOLLOWS

Old cases

MB cases under treatment at T0	1563

MB cases eligible for RFT at end of 3rd year (938 inactive + 208, i.e. $\frac{1}{3}$ active cases)	1146
MB cases still requiring treatment (625–208)	417
PB cases under treatment at T0	4687
PB cases under surveillance eligible for RFC	4218

New cases

Cases detection rate 1·5/1000 population	500,000
New cases detected:	750
MB 75	
PB 675	
PB cases eligible for RFT (1st year cases)	675
PB cases remaining under surveillance (2nd and 3rd year cases) 675 × 2	1350
Total PB cases under surveillance (469 + 1350)	1819
MB cases eligible for RFT (10% of 1st year cases)	8
MB cases remaining under treatment (2nd and 3rd year cases) 75 × 2	150

Total

Total new MB cases under treatment (150 + 68)	218
Total MB cases under surveillance (1146 + 8)	1154
Total cases under treatment at end of 3rd year: (old + new)	
PB (50% of 3rd year new cases 675/2)	338
MB (417 + 218)	635
Total	973

At the end of the 3rd year

MB cases required treatment/surveillance (1154 + 218)	1372
PB cases required treatment/surveillance	1819
Total	3191
Operational prevalence rate $= \frac{3191}{500{,}000} \times 1000$	6·4
Active prevalence rate (635 MB + 338 PB active cases) $\frac{973}{500{,}000} \times 1000$	2

Apparent impact of MDT, 3rd year

Prevalence rate (per 1000)	T0	After screening	T + 3 yr
Operational prevalence rate	20	12·5	6·4
Active (APR)	—	5	2

Incidence rates (IR)

Based on sample surveys the IR is unlikely to change within 3 yr.

Case detection rate

Will be considerably influenced by intensity of case detection. Since the load of MDT work during

the first 2 years is high the case detection usually suffers. Overall, no impact on the case detection rate is likely. It is important to retrain staff to improve case detection by such measures as health education aimed at increasing case detection.

Deformity rate

Among the total cases under treatment and surveillance the deformity rate may in fact go up. The deformity rate is really ratio (proportion), i.e.

$$\frac{\text{Case with deformity}}{\text{Total case}} \times 100.$$

A large number of PB cases without deformity will be RFCed by the end of the 3rd year, whereas the MB cases with deformity will still be included in the calculation. Depending on the intensity of previous case detection, the deformity rate among new cases will vary. If previous surveys had been done recently deformity rates should fall among new cases.

MB case rate

The MB rate will in fact increase as this too is a ratio and the numerator (MB cases) will decrease (2500 to 1372), but the total will decrease considerably (10,000 to 3191) as PB cases are released from control. Thus the MB rate will increase from 25% to 43%. However, the positive case rate may fall depending on the new MB cases detected.

Child rate

Among total cases may fall considerably as most of them would be PB and released from control. But the child rate among new cases is unlikely to fall.

STATISTICS AT END OF 5 YEARS

MB cases that required treatment of surveillance at end of 3rd year		1372
PB cases that required treatment of surveillance at end of 3rd year		1819
	Total	3191

All the above PB cases can now be released from control as they would have completed 2 years of surveillance. The 938 inactive MB cases at T0 can also be released from control.

New cases

Cases under treatment at end of 3rd year (PB 338 + MB 635)		973
New cases detected 4th and 5th year:		
MB, 75×2		150
PB, 675×2		1350
	Total	1500
Total cases requiring treatment or surveillance at end of 5 years:		
PB (4th and 5th year new cases)		1350
MB $(75 \times 5) + (1372 - 938)$		809
	Total	2159

Operational prevalence rate: $\frac{2159}{500{,}000} \times 1000$ 4·3

Active prevalence rate: $(33\%)\frac{713}{500{,}000} \times 1000$ 1·4

(The positive MB cases would become negative at rate of 10–20% per year.)

Discussions

The impact of MDT in 5 years of the prevalence rates as calculated is as follows:

Prevalence rate per 1000	T0	After screening	T+3 Yr	T+5 Yr
Operational	20	12·5	6·4	4·3
Active	—	5	2	1·4

(P) Prevalence = (I) incidence × (D) duration of the disease. In leprosy the duration of treatment or surveillance is considered the duration a patient is included in prevalence calculations. Then: I(2) × (1–4)D = P(2–8), where 1–4 years, is the mean duration of treatment or surveillance.

Thus the impact on the crude prevalence rate after 5 years merely reflects changes in 'D'. One could show a fall in prevalance rate from 20 to 4·3 or 20 to 1·4 depending on definitions of prevalence rates used and policy of release from control prior to MDT. These would not be the true MDT effects if one is looking at impact on transmission of *M. leprae* infection and incidence rates of disease.

IMPACT AFTER 5 YEARS OF MDT ON PREVALENCE AND INCIDENCE RATES

After 5 years as mentioned, the case load is going to decrease considerably once old cases are released from control. Usually when arriving at prevalence rates, 'point prevalence' is calculated, but when incidence rates are arrived at the period incidence is calculated. In such instances D = duration of disease, if taken as duration of treatment of leprosy (excluding period of surveillance), the incidence rate can turn out higher than the prevalance rates.

At the end of 5 years the figures are as follows for the total number of cases requiring treatment or surveillance:

	Treatment	Surveillance	Total
PB	675/2 = 338	1350 − 338 = 1012	1350
MB	75 × 2 = 150	1372 − 938 = 434	584
Total	488	1446	1934

Approximately 338 PB cases will require treatment. This is because the other 1012 cases are in the 2 years surveillance phase.

Assuming that 675 new PB cases and 75 new MB cases are detected each year, at the beginning of the 6th year the only PB cases under treatment will be those detected in the second half of the previous (5th) year. During the year these cases, plus most of the cases detected during the first half of the 6th year, will be released from treatment. Thus at the end of the year only half the new PB cases detected will be under treatment, plus the 75 new MB cases. During the 6th year closing figures will be:

Old cases under treatment (5 years MB cases)	PB	338
	MB	375
		713
New cases detected 6th year	PB	675
	MB	75
		750

Based on the above figures, the cases under treatment only at end of the 6th year will be: MB 375 + 338 PB cases = 713. The point prevalence rate calculated on cases under treatment only will be: $713/500{,}000 \times 1000 = 1{\cdot}4$. The active point prevalence will be: (40% of 713 = $285/500{,}000 \times 1000) = 0{\cdot}57$. The case detection rate (CDR), however, will be $750/500{,}000 \times 1000 = 1{\cdot}5$. Thus the CDR will be 2·63 times the prevalence rate!! The incidence rate will still probably be 2/1000.

In Wardha, a MDT district in India, the active prevalence rate (APR) is 1·8/1000 and the case detection rate (CDR) is 2·6 in 1986, similarly in Vijinagaram the APR = 2·8 and the CDR is 2·2.[6]

The calculation $P = I \times D$ no longer holds good when, in a chronic disease, 'D' becomes less than 1 year. When targets for case detection are calculated this has to be borne in mind. These trends in MDT districts also indicate that the concepts of incidence and prevalence have to be reviewed.

There is, however, a considerable reduction in case load and fall in prevalence rates. In most MDT districts in India this is seen—Wardha, a fall in APR from 11·1 to 1·8, Purulia 19·2 to 7·7, Srikakulam 18 to 2·6.[6] This reduction has to be viewed with caution. There may be a large number of disabled and deformed leprosy patients now removed from the statistics and declared 'cured', who may still need considerable supportive care in the years to come— 'Care After Cure'.

Assuming that the incubation period of leprosy is 3–5 years one can begin to see the effects of MDT on transmission, as measured by incidence rates only after 5 years. An early marker, would be measurement of *M. leprae* infection using serological tests. The incidence rate as well as the case detection will probably decline after 5 years.

Changes in the deformity rate, incidence rate among contacts, the child rate and the MB rate will occur among the new cases, assuming intensive case detection continues and the backlog of old cases have been detected and treated.

It was initially suggested[7] that 80% of estimated cases would have to be detected before MDT is to be introduced. This would mean that all the new cases detected would be put on dapsone monotherapy, till MDT was introduced. Hence the current thinking is that MDT be introduced irrespective of what proportion of estimated cases have actually been detected. But during the first 2 years of MDT, the backlog of cases would have to be detected in an intensive case detection programme. The impact of MDT will be considerably influenced by the gap between the estimated cases and actual cases under treatment.

An extremely interesting article on the 'Epidemiology and decline of leprosy in Asia'[8] suggests that, using composite data from East Asia, the decline in new cases had already begun in the 1960s. The fall, however, has been gradual up to the year 1980 prior to MDT. Skinsnes[8] commenting on the East Asia model indicates that it would take 25 years after the peak in the new case detection rate, for leprosy to come down to 25% of its peak.

Assuming that the MDT effect is more pronounced and rapid, one would assume that the declines in the new case detection in MDT districts would be apparent after 5 years of MDT.

The impact of MDT would probably be earlier in low prevalence areas, if a high proportion of estimated cases are put under effective chemotherapy.

At the managerial level, however, one has to keep in mind that:

The impact of MDT will mainly be on reduction in the case load for the first 5 years.

This impact is significant, but interpretation of the falls in prevalence rates cannot imply fall in transmission.

Incidence rates will probably be affected only after 5 years.

Discharge of a large number of cases from statistical formulation should not make one forget patient's long term rehabilitative needs.

Targets based on prevalence rates alone could be misleading.

The fall in prevalence rates is useful managerially in planning resource allocation.

As active case finding is likely to suffer during the initial period after the introduction of MDT, measures to enhance voluntary reporting by means of health education should be encouraged.

It has also got to be understood that the impact on the trends in leprosy, as measured by selected indicators, will be considerably influenced by:

Definitions of indicators and their interpretation.

Efficiency of programme implementation before and after MDT.

Adequacy of population coverage, case detection, case holding and the service delivery components.

Initial prevalence and incidence rates.

When one looks at the possible impact of MDT on the leprosy situation by the year 2000, there is considerable cause for optimism. This optimism, however, should be guided by the knowledge of the Epi-dynamics of leprosy in an MDT area.

Acknowledgments

We wish to thank the Danish International Development Agency, Dr G D Georgiev and the Government of India especially, Dr C K Rao for organizing numerous workshops in the areas of evaluation and monitoring. Participation in these workshops and interaction with colleagues from many MDT districts, helped develop the ideas that have been formulated in this paper. We also wish to thank Mr N Christopher and Mr C Lewis for their secretarial help.

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NEWS AND NOTES

Armadillo survey: Universities of Oxford and Minas Gerais, Brazil 1988

The explanatory brochure for this project reads as follows:

The Serra da Canastra National Park lies in the province of Minas Gerais, S.E. Brazil. It is a beautiful 71,525 ha area of grassland plateau at 1400 m above sea level, and is a rich source of wildlife, dominated by armadillos and their relatives, the anteaters.

It is hoped that this joint project between the Universities of Oxford and Minas Gerais will enhance Anglo-Brazilian relations. The students of both nationalities should, through shared experience with contemporaries of a different cultural background, gain a greater mutual understanding.

The Survey aims to continue the work of Dr Christiane Encarnação who, in her Ph.D. thesis, investigated the social behaviour of the 6 species of armadillo in the Park. A rudimentary population census will be carried out for each species, together with a general study of their behaviour and ecology and an investigation of their ectoparasites. Studies will be centred around the 6-banded armadillo, *Euphractus sexcinctus*.

There are, in all, 20 species of armadillos, which range in length from 10 cm (the pink fairy armadillo, *Chlamyphorus truncatus*, of Argentina) to 1 m (the giant armadillo, *Priodontes maximus*, thinly scattered over most of S. America). They principally feed on ants and live in burrows.

The 6-banded armadillo (*Euphractus sexcinctus*), the main study subject, is about 40 cm long. Unusually, it is largely diurnal. Although not a widely distributed species, and hence little studied, it is the commonest in the Park.

Other species to be seen in the Park are: 'the naked-tailed armadillos (2 species—*Cabassous unicinctus squamicaudis* and *Cadassous tatouay*); the long-nosed armadillos (2 species—*Dasypus novemcinctus* and *Dasypus septemcinctus*); and the giant armadillo (*Priodontes maximus*).

Armadillos will be caught in humane traps, as used by Tracy Carter and Christiane Encarnação.[1] These may be acquired cheaply in Brazil. The animals will then be tracked by a combination of the following methods.

Spool-and-line tracking

Spool-and-line tracking devices essentially consist of a fixed spool of thread, with a range of up to 2300 m, enclosed in a plastic sheath. This is attached to the study animal, the thread pays out freely, and the trail may subsequently be followed to the burrow. This technique, developed by Dr M A Miles of the London School of Hygiene and Tropical Medicine[4,5] provides information on distances travelled at night, home, range, size and burrow type and location. It complements radiotracking and is advantageous in that it is inexpensive and allows the tracking of several animals simultaneously and continuously.

Radio-tracking

Betalights—details are available from the address below.

Each armadillo caught will be examined for ectoparasites, which will be identified by an expert at the Federal University of Minas Gerais.

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Close-contact surveys and mass-screening studies for leprosy in Turkey

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Summary Beginning in 1984, the Department of Dermatology at Istanbul University Medical School and the Department of Public Health of Uludağ University Medical School embarked on: a, close contact surveys; and b, mass-screening studies in the Province of Van in Turkey. Methodology and results are described in detail. The total number of cases in the whole country is unlikely to exceed 4300 and leprosy cannot be considered to be a serious public health problem. However there is room for improvement, notably in compliance to prescribed medication, the reduction of disability rates and the better use of general health units.

Introduction

Beginning in the year 1984, the Department of Dermatology at Istanbul University Medical School and the Public Health of Uludağ University Medical School prepared joint projects aimed at a contemporary solution to the leprosy problem in Turkey.

At the outset the patient's records from original sources were arranged and updated. Incidence and prevalence rates and the actual status of disease in selected areas were ascertained. CARITAS, HEKS, EMMAUS International, the Van and Environs Development Foundation, Istanbul Leprosy Relief Association and other national establishments all helped to realize these endeavours.

Materials and methods

The Study Group prepared two types of project: 1, close contacts surveying studies; and 2, mass-screening studies.

In the first type of project the aim is to visit and examine one by one all patients and close contacts within the province. During the visits treatment of patients is rescheduled according to MDT regimens and social aid is also provided. The new cases among the close contacts are identified according to the clinical form, treatment started according to the WHO standard and they are registered. In Northern and Western Anatolia provinces where the leprosy prevalence rate is high (Muğla, Afyon, Zonguldak), and where the prevalence rate is low (Bursa) all patients and their

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contacts are screened. In Eastern Anatolia provinces, with high prevalence rates (K. Maras, Sivas) all patients and their contacts are screened. These 2 different regions with higher local prevalances when compared with the general prevalence rate, have been selected specifically.

In the second type of project, the people who live in different regions of Van province which has leprosy at endemic levels, mass screening has been applied. Until now, in 5 regions of this province with house-to-house search, about 35,000 people have been examined for clinical manifestations. During these visits not only leprosy cases are considered; help was also given to people who have tuberculosis, malaria, parasitosis and other diseases. In this type of study, known patients also received therapy and social aid, as in the first project.

It is planned that patients and close contacts will be visited at least once in 5 years. In both types of project follow-up, therapy, diagnosis and other aspects of the work are applied according to WHO standards. Drugs and other aids were provided by the project personnel with the assistance of the Ministry of Health.[1,2]

Results

The results of the same study groups, in regions with different prevalence rates and applying two different methods, are shown below.

1. CLOSE-CONTACT SURVEY STUDIES

All patients in 6 provinces are included in this group. The number of registered patients in these 6 provinces was 614. This represents 16% of all registered cases in the country. The findings of this population determined during the survey are shown in Table 1.

During the survey a total of 29 patients, 5 female and 24 male, could not be examined because they were temporarily out of the area. Seventy-two patients, 40 female and 32 male, who were taking drugs before examination, were considered completely cured and they were excluded from drug therapy and transferred to the follow-up group.

All patients were receiving only dapsone (not on a regular basis) before the screening. After screening, MDT regimens were started in all patients and they were then entered in the chemotherapy group.

Table 1. Leprosy patients–close-contact screening results

			Total	
	Female	Male	No.	%
Number of registered patients at the beginning of screening	235	379	614	100·0
Results of screening:				
Deaths	(−) 32	(−) 63	(−) 95	15·5
Emigrated (left control area):	(−) 34	(−) 58	(−) 92	15·0
Out of control	(−) 7	(−) 7	(−) 14	2·3
Misdiagnosis	(−) 11	(−) 25	(−) 36	5·8
Number of previously registered patients after screening:	151	226	377	61·4
Newly diagnosed cases	(+) 6	(+) 7	(+) 13	2·1
Transferred	(+) 4	(+) 6	(+) 10	1·6
Latest result of the region	161	239	400	—

Eighty-two per cent of all examined patients were considered generally as inactive multibacillary forms (BB, BL, LL). From these patients 173 skin smears were taken with random selection, and it was found that 14 (8·0%) had BI 1, 8 (4·6%) had BI 2 or more.

The rate of disabilities in these examined patients, as grade II or more according to WHO classification, was higher than 65%. Only 1 case was found below the age of 14 in this study and had no disabilities.

2. MASS-SCREENING STUDIES

In the last 3 years, 33,458 people were examined in 5 randomly selected regions of Van province. From place to place, with very difficult geographical conditions, all regions were screened house-to-house with the help of a group of final-year medical students. The results according to the years are presented in Table 2.

The 18 new patients which were identified in the first year, and 3 of 6 patients which were diagnosed in concomitant years, were considered questionable cases at the outset but 1 year later the diagnosis was confirmed and they are registered. For that reason the 24 cases who were diagnosed in the first 3 years, in our opinion, cannot be considered in the incidence rate in calculations for the area. The area in which screening has been completed in the first 3 years should be kept under surveillance for another 5 years and during this period any new cases carefully recorded.

At the beginning none of these patients had been under MDT regimens. Today about 30% of them are taking drugs regularly according to the MDT regimens.

The number of cases under 14 years of age are 5 in the whole patient population (7·0%).

The number of new cases under 14 years of age is 2 (8·3%).

In about 60% of cases, disabilities, WHO grade II or higher, have been observed. They are all in advanced age groups.

The 46% of cases which were identified during mass-screening are in multibacillary (BB, BL, LL) forms, group. In the patients who were registered in the same region previously this ratio is 74%.

Table 2. The results of mass screening in Van province (Bahçesaray, Çaldiran (1984), Pay-Unseli (1985), Saray (1986) health units)

	1984*	1985	1986
Number of examined persons	15,848	8040	9570
Previously registered cases in the region:	49	61†	76‡
Deaths	(−) 7	—	(−) 4
Left control area	(−) 7	(−) 1	(−) 3
Misdiagnosis	(−) 1	(−) 1	—
Out of control§	(−) 4	(−) 3	(−) 2
Number of previously registered patients after screening	34	59	69
Newly diagnosed cases	(+) 18	(+) 4	(+) 2
Total patients	52†	63‡	71
Number of patients that completed treatment as prescribed	—	5	22

* For more detailed information see: *Lepr Rev*, 1986; **57**, 243–9.

† The 9 patients have been added who were previously registered in the Pay and Ünseli regions.

‡ The 13 patients have been added who were previously registered in the Saray region.

§ Are not discarded from registration.

As close contacts of patients, 300 people were identified. They were taken under control and examined once in a year. The number of close contacts per patient appears to be 4·2. This figure, when the family structure and number of persons per family are considered together, is however too low. This discrepancy can be explained in two ways; the people who are included in this figure are those who are in close contact with the patient. The close family members who do not live in the same village are not included in this figure. Some families have more than 1 leprosy patient, and close contacts for these families represent 2, 3 or even 5 patients. Seventeen (70·8%) of 24 newly diagnosed cases who were identified during mass screening belong to these families with a close-contact group.

DISCUSSION

With two different methodologies, and in areas which has different leprosy prevalence rates, a total of 685 leprosy patients has been studied. This figure represents 17·8% of all leprosy cases in the country.

In the areas where the disease is endemic, there are 1613 registered cases and in the rural portions of these areas, about 2 million people are living. In the region where the prevalence rate is highest (2·08% 0.) when whole country and area are considered, we performed a mass screening. The rate of new cases in close-contact group were 24% (17 new cases/71 patients) and the rate of new cases which has no contact history is 2 per ten thousand. (7 new cases/33, 458 people).

In those areas where leprosy is sporadic, according to 1985 general census, 22 million people are living in rural areas. In these we have 2238 registered cases. In some sampled provinces of these areas mass-screening was performed by us, and we examined 614 registered cases and their families. We found 13 new cases in a close-contact group. The rate of new cases in contact groups in these areas is thus 2·1% and this figure is 12 times less than the figure for the endemic region. If we generalize this ratio, in endemo-sporadic and sporadic regions there are indications that the number of new cases in the close-contact group will be in the region of 47.

In sporadic and endemo-sporadic regions we have not performed mass screening. For that reason we can not estimate directly the number of new cases in the non-contact group. However, if we apply the same ratio (the ratio of newly diagnosed cases in close-contact groups of two different areas which is 12) to the same areas non-contact groups, and since we have identified 7 new cases in 34,000 people of a high prevalence area with mass screening, and we did not perform mass screening in sporadic, endemo-sporadic areas where 22,000,000 people are living, we can obtain an approximate number:

$$\frac{22{,}000{,}000 \times 7}{34{,}000} \times \frac{1}{12} = 377 \text{ new cases for the non-contact group.}$$

If we add all of these figures to the total registered cases, we can say that there could be a maximum of 5090 leprosy patients in Turkey.

However, the survey which has been performed shows that 15·5% of registered cases had died, and 5·8% of registered cases are misdiagnosed or have no leprosy at all. For that reason it is possible that the diagnosis in approximately 820 patients of today's registered cases is inaccurate, This could mean that the maximum mumber of leprosy cases should be around 4300 in Turkey. Also our results indicate that unknown leprosy cases in Turkey should be in rural regions and among the adult contacts of patients.

It can be said that the number of patients under the age of 14 is low when compared to the same age group (30%) for the whole population.

In estimating the number of patients we have taken into consideration the rural areas of population, because 97% of registered cases are in rural areas.

In summary, when the total number of cases are taken into consideration it cannot be said that

leprosy is a serious health problem in Turkey. However, there is considerable room for improvement.

1 Patient compliance to the therapy is unsatisfactory. Furthermore many of them are still on dapsone monotherapy.

2 The ratio of patients disabled at grade II or higher, is high. This renders the patients economically 'weak' and requires expensive support including hospitalization.

3 Health units are ideal for leprosy control; their personnel should be educated and encouraged in finding new cases and in the distribution of drugs to patients.

4 There is a high ratio of migration to the cities in Turkey and this includes leprosy patients. We found 15% of migration among leprosy cases. The registration system should act more rapidly in notifying health authorities about migration.

If we can overcome all of these obstacles, leprosy may well disappear rapidly from Turkey.

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NEWS AND NOTES

Armauer Hansen Institute, Würzburg, Germany

The objective of the Armauer-Hansen-Institute results from the targets of the German Leprosy Relief Association (GLRA) and the Medical Mission Institute (MMI).

These are according to the articles of association of the GLRA: all actions aiming directly and indirectly at eradicating leprosy, and their integration into the general health service, particularly by offering; financial support for research and training of personnel; and health information and education.

As laid down by the statutes of the Medical Mission Institute, its main functions are: encouragement of tropical medicine and sociological studies; and conducting medical training courses for missionary personnel and training of physicians and hospital personnel.

In accordance with its objective the Hansen-Institute is divided into two parts, one financed by GLRA, the other by MMI, which are partly interrelated.

The following targets have been agreed upon for these sectors: GLRA: reference laboratory for leprosy work in projects; and introduction and improvement of MDT in leprosy and tuberculosis; MMI: teaching laboratory for the development and presentation of adapted technology for health institutions in developing countries; instruction of missionary personnel, technical advisers in developing countries and foreign experts in adapted medical technology; and research on topics in tropical medicine.

The reference laboratory for leprosy focuses on the following areas: performing bacteriological and histological diagnosis, checking the progress of therapy and follow-up.

The following tests are performed: staining and microscopy of skin smears and skin homogenates with the determination of the bacteriological index (BI) and identification of the different morphologicai forms of the bacteria; histological examination of skin biopsies for the classification of the disease; and quality control for those laboratories lacking supervision also in the fields of other mycobacteria, especially of TB.

Training: training of doctors, nurses and lab-technicians doing leprosy work in courses and practical teaching; and elaborating recommendations for the performance of quality controls.

Research: it is intended to meet the requirements of the project countries; its results should be of direct and indirect use for practical leprosy work. Therefore important questions are to be discussed in regular colloquies. These issues should then be pursued and their outcome be published.

Documentation: documentation, in particular of literature not or hardly registered in medical data banks; and availability of the latest findings in leprosy research in an applied form.

Standards and technology in many health institutions in developing countries are too much based on the medical technology of highly industrialized countries. They often fail under the poor conditions of rural hospitals.

Laboratory technology there has to be adapted to the following criteria: function in the hands of lesser trained personnel; function without regular supply of electricity and water; little service needed; inexpensive; sufficiently exact; quick; and producible in the respective countries, if possible.

Teaching laboratory: the Medical Mission Institute Würzburg (MMIW) has installed a medical teaching laboratory where methods meeting the criteria mentioned above are collected, developed and presented. The programme has been part of the syllabus of the training courses 'Medicine in Developing Countries' for doctors and nurses at the Institute for Tropical Hygiene of the University of Heidelberg since 1982.

Training: in courses and individual practice doctors, lab-technicians and nursing staff going abroad as well as personnel from overseas are made familiar with adapted laboratory methods.

Research: candidates for a medical thesis work on suitable technologies and topics in tropical medicine.

AIDS-aid: a task force against AIDS in developing countries has been set up with a special team. It works in close cooperation with MISEREOR in Aachen and the German Institute for Medical Mission in Tübingen. It is to adapt Elisa-testing to simple conditions and advise church-related hospitals in safety procedures, such as blood transfusion, checking and sterilization and aspects of care of AIDS patients.

Further information: Armauer Hansen Research Institute, Hermann-Schell-Strasse 7, D-8700, Würzburg, P.O. Box 348, Germany.

Bureau for Overseas Medical Service

The Bureau runs a register for health workers who are interested in working in the Third World and acts as a coordinating agency for a wide range of health posts. It also provides advice and information on prospects for resettlement, runs short basic training courses for working in the Third World and provides information on training opportunities in the UK and Europe. A bi-monthly newsletter and job list is circulated to all members of the register. Details of posts that require filling urgently are sent to members of the register with appropriate qualifications and experience. For more details please contact Jane Lethbridge, Director, Africa Centre, 38 King Street, London WC2E 8JT, Tel: 01-836 5833.

Lepr Rev (1988) **59,** 231–234

Leprosy in Turkey

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Summary An account is given of the historical development of leprosy work and control measures in Turkey. Detailed information is recorded on the distribution of the disease according to year of registration; age; sex; classification. After thorough examination of the patient registers and other sources of information, it can now be confidently stated that reliable data exist for a total of 3851 leprosy patients in Turkey. Studies of distribution of cases in the provinces and regions reveal some curious discrepancies between areas of high and low prevalance, not explained by socio-economic or other factors. The systematic examination of registers and other records, as described in this article, may be of value in other countries, especially when the incidence rate is decreasing, in defining the overall problem and maintaining the interest of health authorities and personnel.

Introduction and Historical background

For thousands of years many tribes and nations have passed through or settled in Anatolia. Among them the first who recognized leprosy were probably the Hittites. They established the city of Paflagonia (Kastamonu) and built a leprosarium.[1] In the following centuries, with migrations from Palestine and the Middle East, leprosy became established in Anatolia and during the rule of the East Roman Empire (Byzantium) it became endemic. Byzantium built 5 leprosaria in Constantinopolis (Istanbul) alone. During the rule of the Ottoman Empire the situation did not change very much and the new rulers of Anatolia built leprosaria in many cities. Leprosy patients who lived in these centres received enormous aid from local people. According to Zambacho Pasha, during the last decades of the Ottoman Empire, there were 600,000 or more leprosy patients in the whole country.[1,2]

Within the first years of the Republic (mid 1920s) the patients in the leprosaria of Istanbul were taken to a special leprosy hospital in Bakirköy. In 1941 a new leprosy hospital was also built for Eastern Anatolia, in the city of Elazig.[1]

In Turkey, the fight against leprosy began in the early 1960s. The Ministry of Health and Social Assistance (SSYB) etablished a study group with the help of the World Health Organization (WHO) and this group discovered many new patients, especially in Eastern and South Eastern Anatolia.[2] We can see the distribution of leprosy patients according to the year of registration in Table 1.

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Table 1. The distribution of leprosy patients in Turkey, according to the year of registration[1]

Registration years	No. of registered cases	Patients today on registration			The rate of registered patients who are alive today (%)
		Female	Male	Total	
⩽1960	2530*	124	250	374	—
1961–70	6295	718	1364	2082	33·1
1971–80	1197	244	410	654	54·6
1981⩽	320	102	190	292	91·3
Unknown	—	153	296	449	—
Total	10342	1341	2510	3851	37·2

*This figure is not reliable.

During these years studies aimed at finding new cases of leprosy have been performed both widely, as mass screening and, as in local dispensaries. In the following years mass screening has been abandoned, and the duty has been left totally to the local health units which cover a very limited population with the responsibility for polyvalent health care.[3] Provincial health authorities supervise and support them.

Information about leprosy patients

Information was compiled first in 1984 by sending a questionnaire to all Provincial Health Directories (67 provinces). This way was chosen because leprosy records are compiled at provincial level and a copy sent to the Ministry of Health. In the mean time other archives that included information about leprosy prevalence rates were also consulted.[4] This primary information was loaded onto a computer and it was found that Turkey had 4155 registered leprosy cases by the end of 1984. However, when we checked these registered cases we found several mistakes, especially double or multiple registrations. During 1985 we wrote to the provinces and the Ministry of Health and tried to exclude multiple registrations and dead cases.

Today in Turkey all the registered patients have been meticulously scrutinized and their lists are prepared and sent to leprosy hospitals. With the help of the new registration lists it is now possible to find out whether a patient has been previously registered or not. These corrected results were loaded again onto the computer which revealed that there were 3851 registered cases at the beginning of 1986. The distribution of these cases according to sex and age are shown in Table 2.

Mean age of registered female cases is $49 \pm 13{\cdot}5$ (1 SD), male cases 47 ± 14 (1 SD). Percentage of females is 34·8, males 65·2. The age of patients when they were first registered was also determined when possible. With the registrations material available today it was impossible to find reliable data on all cases (10,342) that registered until the beginning of 1986. Reliable data has thus been collected on 3851 cases but we are constantly trying to verify certain details. It has to be acknowledged that two thirds of the cases registered before 1980 are not in registration books today because they had died, were out of control or for other reasons.

With regard to age, we can consider the patients who were registered in 1981 and in the successive 5 years. About 91% of them are in registration books today and their mean age when they are first registered are $35{\cdot}5 \pm 15{\cdot}4$ (1 SD). Distribution of leprosy cases according to the sex and clinical forms is shown in Table 3.

When we look carefully at Table 3 we can see that the general ratio of 1/1·87 between the sexes is

Table 2. The distribution of registered cases, according to age and sex

Age groups	Sex		Total	
	Female	male	No.	%
⩽14	4	13	17	0·4
15–44	439	919	1358	35·3
45⩽	864	1513	2377	61·7
Unknown	34	65	99	2·6
Total no.	1341	2510	3851	100·0
%	34·8	65·2	100·0	

Table 3. Distribution of registered cases in Turkey, according to clinical form and sex

Clinical forms	Sex		Total	Distribution (%)
	Female	Male		
Indeterminate	111	254	365	9·5
Tuberculoid	383	625	1008	26·2
Borderline	56	97	153	4·0
Lepromatous	752	1447	2199	57·1
Others*	6	17	23	0·6
Unknown	33	70	103	2·6
Total	1341	2510	3851	100·0

* These clinical classifications are obsolete today. But as all patients are not seen again a new classification is impossible. ($x^2 = 9{\cdot}36$, $df = 5$, $p > 0{\cdot}05$).

consistent when we consider the distribution of clinical forms also. The difference of distribution of clinical forms between female and male groups is not statistically significant.

Today, only 61·5% of registered cases are under surveillance. Observation data on the rest of the cases are insufficient. There is no important surveillance difference between female and male groups ($x^2 = 1{\cdot}55$, $df = 1$, $p > 0{\cdot}05$).

Most surveyed leprosy cases are of tuberculoid form (70·3%), with lepromatous cases following them (62.2%). Statistical difference between these two clinical forms are significant ($x^2 = 20{\cdot}44$, $df = 1$, $p < 0{\cdot}001$).

With the advancing age of patients, losses are increasing and surveillance rates are decreasing. Young and adult patients have a higher internal migration rate when compared to older patients. Data on age at detection are not significantly different between tuberculoid and lepromatous patients.

Distribution of patients in Turkey

When we take population figures of Turkey in recent years the prevalence rate of leprosy for

registered cases is 0·07 per thousand. In the past the highest leprosy prevalence for Turkey was 0·1 per thousand. Especially after 1965 the figures began to decrease towards today's level. The distribution of leprosy in the country also shows some peculiarities. Since the first surveys, Eastern and South-Eastern parts of Anatolia are focal points. In Van, Tunceli and Agri provinces of these regions, the prevalence rate is about 10 times (0·7 per thousand) higher than Turkey's mean figure. Some provinces of Eastern Anatolia are following these provinces which have the highest ratio. In Western Anatolia, Bilecik, Zonguldak and Afyon there is a prevalence rate which is about twice as high as Turkey's mean value. In the provinces which have high prevalence rates, some regions have a very high number of cases and neighbouring villages or regions have a very low ratio. For example, in the North Eastern part of Van province, Çaldıran region has a high number of cases, which exceeds the provincial prevalance rate, and in a neighbouring region, which carries similar natural and social conditions, we detected a very low number of cases.

The provinces which have a high prevalence rate in Western Anatolia, have been surveyed carefully by our study group, and it has been confirmed that this high prevalance rate is true. In these regions of Western Anatolia, a few regions or groups of villages are focal points of disease, and the rest of the province is free of leprosy.

Conclusion

It is difficult to say that all leprosy patients were registered in the years 1961–65 when mass screening activities were undertaken in Turkey. However, these activities produced reliable information about the regions with higher prevalance rates. As a matter of fact, during the last two decades it has been found that most of the self-reported patients were indeed living in these regions.

For the control of leprosy in other countries it might also be useful to review and analyse old registration lists, especially when leprosy incidence rates have been decreasing, general health conditions are becoming better and health institutions are organized to deal with leprosy control as well.

To analyse old registration lists, qualitatively and quantitatively, it may help to undertake regional studies by choosing small population samples. Such studies will help to define the profile of the disease in the country and will maintain the enthusiasm of health personnel and health authorities in pursuing the goal of eradication.

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Tuberculoid leprosy on hairy scalp: a case report

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Summary Involvement of the hairy occipital area of scalp in a patient having tuberculoid leprosy is reported. To the best of our knowledge involvement of hairy scalp by a tuberculoid lesion has not been reported so far.

Introduction

Scalp is considered to be one of the 'immune zones' in leprosy. The involvement of the scalp in leprosy has been reported, though rarely. In the cases reported so far, the scalp was found to be affected mainly in bacilliferous leprosy and the involvement was mostly on the bald area of the scalp. However, in the present case a tuberculoid lesion was found on the hairy occipital area of the scalp, well inside the hair line.

Case report

K.R. a 45-year-old Indian male, a worker in the Bhilai Steel Plant, presented to us with the complaints of erythematous skin lesions on both his legs and scalp, of 6-months duration. The lesions were asymptomatic and were gradually increasing in size. There was no family history of similar lesions.

Cutaneous examination revealed a well-defined erythematous, dry, anaesthetic, raised circular plaque about 1″ in diameter with sparse hairs over the occipital area of the hairy scalp (Figure 1). Two similar natured bigger lesions were seen, one on the dorsum of the right foot and the other on the medial aspect of the lower part of the left leg. There was no nerve thickening. The slit-smear examination from the skin lesions did not reveal any acid-fast bacilli. Histopathology from the scalp lesion showed well defined, compact granulomas consisting mainly of lymphocytes and histiocytes with a few Langhans' type of giant cells (Figure 2). These granulomas were located in the upper part of the dermis and at places were eroding the epidermis from below. No acid-fast bacilli were seen in the section.

The patient was put on tablet dapsone, 100 mg daily and capsule rifampicin 600 mg once a month on an empty stomach (supervised). All the lesions responded well after 8 months of combination therapy with dapsone and rifampicin.

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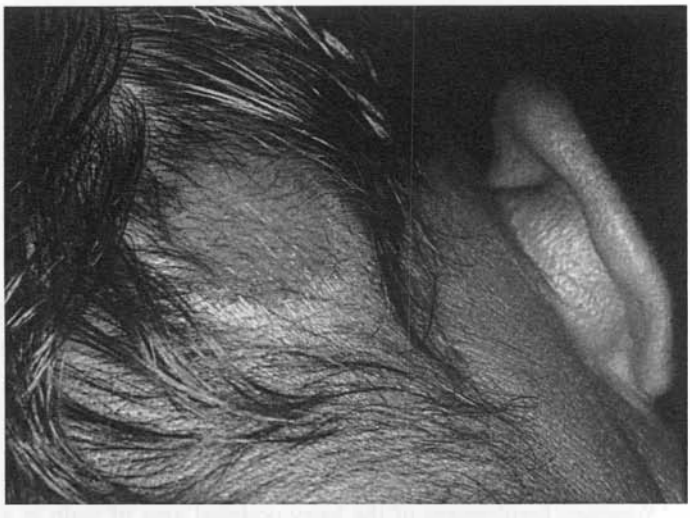

Figure 1. Tuberculoid lesion on occipital area of hairy scalp.

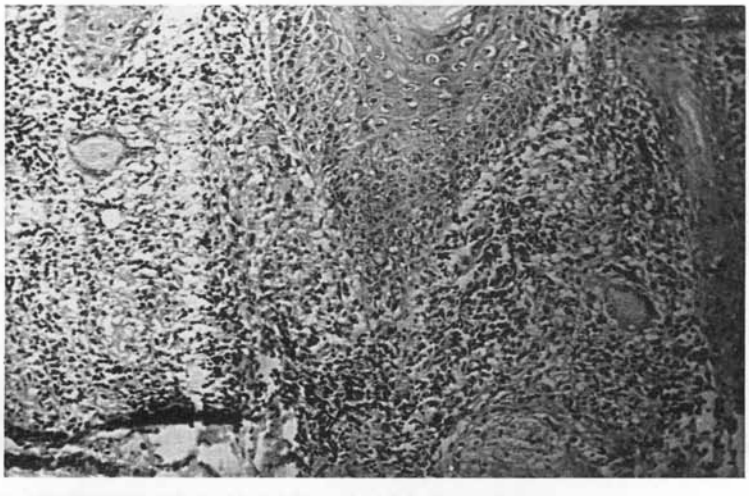

Figure 2. Tuberculoid granuloma with Langhans' giant cells (H&E original magnification × 100).

Discussion

It is known that *Mycobacterium leprae* has a distinct predilection for the cooler areas of the body. Scalp, which has been shown to have a higher temperature[1] as compared to that of the forearm, was considered to be one of the 'immune zones' for leprosy. However, in rare instances involvement of the scalp has been described in borderline lepromatous and lepromatous leprosy. Out of the 10 cases of lepromatous leprosy observed by Faget,[2] 3 showed clinical involvement, 2 of them had diffuse infiltration while 1 had a nodular lesion. Involvement of the scalp was also reported[3] in newly diagnosed cases of lepromatous leprosy. Kaur & Kumar[4] observed acid-fast bacilli in all the 16 cases of lepromatous leprosy and in 4 cases of borderline leprosy. Bedi *et al*[5] after a sudy of 20 cases of

lepromatous leprosy, detected acid-fast bacilli in 2 cases and histopathological changes of leprosy in the scalp of 4 patients. Parikh *et al.*[6] observed the involvement of scalp in lepromatous and borderline lepromatous leprosy. Malviya *et al.*[7] found lepromatous nodules on a bald area of scalp in a patient of lepromatous leprosy. Parikh *et al.*[8] came across a case of borderline tuberculoid leprosy on the scalp of an Indian Brahmin male who had followed the ritual of shaving off his scalp hair throughout his life. In this case, the involvement of scalp was probably due to the equivalent temperature of the shaved and the bald scalp.

However, in the present patient, the tuberculoid lesion was on the hairy occipital area of the scalp. The clinical impression was confirmed after histopathological examination from the scalp lesion. This case suggests that hairy scalp may not always act as an 'immune zone' for leprosy.

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NEWS AND NOTES

St Francis Leprosy Guild, UK

This agency '. . . collects donations to help missionaries and others in their work among victims of leprosy throughout the world'. Address: 21 The Boltons, London SW10 9SU. Medical adviser: Dr T J Ryan, Consultant Dermatologist, Slade Hospital, Headington, Oxford OX3 7JH, England.

Dermatology and Leprology Research Institute, India

We are grateful to Mr V Peria Swami, Project Director for the above Institute, Main Road, Anakapalli–531 001, Visakhapatnam District, Andhra Pradesh, India, for the following information:

'The Dermatology and Leprology Research Institute took root in November 1986. The building which lodges our Institute was donated by Dr B Narasimha Rao, the Director of this Institute. With funds released by Emmaus Swiss, we renovated the building to make it suitable for our work.

We aim to enthuse private practitioners to treat leprosy patients in their own clinics and disseminate to them sufficient knowledge in diagnosis and treatment, as well as to impart knowledge about modern trends in diagnosis and treatment to undergraduates in medicine. Also, to improve the efficiency of trained nonmedical field workers, they have to be re-oriented in a scientific system of detecting early cases and in techniques to create awareness in the public about the curability of leprosy and the importance of mass cooperation.

Our institute is financially supported by Emmaus Swiss. We do not get any government grants. Our staff includes a qualified doctor, a project officer, senior paramedical worker, accountant, health education worker and physiotherapist.

For teaching purposes we will follow the syllabus prepared by Gandhi Memorial Leprosy Foundation (Wardha, India) which is recognized by the Government of India.'

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Case detection; are the present survey methods effective? A review of leprosy surveys in Bombay

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Summary The results of active surveys carried out in Bombay during the last 15 years show that such surveys predominantly detect non-infectious cases with 1–2 skin lesions. Considering the work input in terms of field workers' days required to detect each case, particularly an infectious case, the present survey methods are not cost effective. Health education is found to be more effective and efficient in case detection than active surveys.

Modified methods which can identify infectious cases at an early stage are discussed and suggested.

Introduction

SURVEY

An important component of leprosy control programme, carries special value in the hyperendemic areas and aims at the following objectives: 1, early diagnosis and treatment to cure the cases without residual damage, and 2, identification and treatment of infectious cases to break the chain of transmission.

Active case detection in the form of school surveys has been extensively carried out in Bombay since 1970.[1] Surveys are also being routinely conducted in the city in other groups of the population such as household contacts, industrial workers, slum dwellers and the other residents of the city. Since the present survey methods are being adopted by the voluntary and government organizations as part of their routine work, the time has come to evaluate the methods and the results of the extensive survey work already carried out, in terms of their ability to fulfil the above said objectives.

Case detection by survey methods

The results of active surveys are summarized in Table 1.

School surveys. Of all the surveys, school surveys have been the most extensively carried out as they experience least difficulties and the coverage of examination often exceeds 95%. The case detection rates in school surveys ranged from 3 to 10·8 per 1000. Over 90% of cases detected in school children had early leprosy, of which 80% had single skin lesions.[1,2,3,5] Only 2–4% cases had smear +ve leprosy. This indicates that prevalence of infectious leprosy among children is low. This

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view is further supported by the results of the survey of non-school going children[4] and that of the children of pre-school age.[7]

The finding that 60% of the lesions were found on the covered parts of the body, i.e. trunk and limbs up to knees and elbows, suggested that complete stripping of the body while carrying out surveys was necessary.[2,5]

Contact surveys. Though contacts of known leprosy patients are examined regularly at clinics, the contact surveys as such were undertaken later to find out the associated cases and the source of infection. Contact surveys showed high case detection rates, i.e. 30–60/1000 (Table 1). However it was interesting to note that the associated cases were predominantly non-infectious and they were found in the families of only 23% and 14% of cases,[4,6] thus suggesting a possibility of an extrafamilial source of infection.

The results of school surveys suggested existence of hyperendemic pockets in different parts of Bombay, which in turn makes it necessary to examine the whole population.

Slum surveys. About 43% of the population of Bombay live in slums.[5] Whole population surveys in slums are comparatively easy, generally giving 75–80% coverage.[4,8] Case detection rates in different slums varied from 6 to 23 per 1000 with 9–10% infectious cases.[4,5,8] It was interesting to note that of the infectious cases, 94% were adults and 82% were male adults while the same population group, i.e. male adults, had the lowest coverage of examination, i.e. 60%.[4]

Survey of industrial workers. This survey was mainly undertaken to cover male adults who escape examination in door-to-door surveys. It has been observed that of the total adult cases registered at the Acworth Leprosy Hospital during the last 10 years, 33% were industrial workers, of which 25–30% had smear +ve leprosy.[9].

Table 1. Results of surveys carried out in Bombay

	Cases detected	Rate of case detection	Deformed cases (%)	Smear +ve cases (%)
1 School survey				
Ganapati *et al.*[1]	209	3·0/1000	—	3·9
Ganapati *et al.*[2]	1265	7·0/1000	3·0	2·8
Ganapati *et al.*[3]	733	10·8/1000	—	2·4
Ganapati *et al.*[4]	30	7·3/1000	—	3·3
A. L. Hospital[5]	2579	5·1/1000	1·9	1·9
2 Survey of non-school going children[4]	30	8·5/1000	—	3·3
3 Survey of children of preschool age[7]	20	4·7/1000	—	—
4 Contact survey				
Ganapati *et al.*[4]	12	62·0/1000	—	8·3
Ganapati *et al.*[6]	41	44·0/1000	—	5·0
A. L. Hospital[5]	4444	31·0/1000	1·9	1·5
5 Slum survey				
Ganapati *et al.*[4]	176	10·7/1000	—	9·9
A. L. Hospital[5]	3808	9·0/1000	—	—
Revankar *et al.*[8]	381	11·9/1000	—	9·2
6 Survey of industrial workers				
Koticha *et al.*[9]	316	17·0/1000	16·0	6·3
7 House-to-house survey (not published)	622	4·8/1000	—	4·0

In view of the above, surveys of industrial workers should have been launched extensively. But this has not happened due to multifaceted difficulties. Surveys of industrial workers could hardly cover a satisfactory number of workers as they work in 3 shifts. Since the surveys disturb normal working in industry, the cooperation of management is limited. The most important difficulty experienced was that the cases detected often faced problems of social and vocational dehabilitation, making it necessary to have an undertaking of job security from the employer before undertaking industrial surveys.

Results of industrial surveys show a high case detection rate of 17 per 1000 with 16% deformed cases.[9] Smear +ve cases, however, were only 6·3%, much less than what was expected.

House-to-house survey. To bring the entire population of Bombay under a leprosy control programme house-to-house surveys have recently been started. Though the results are not yet published, the population so far covered by the Acworth Leprosy Hospital reveals cases (predominantly with single skin patch) at the rate of 4·8 per 1000 with 4% infectious cases (Table 1). These figures are likely to be different in different parts of Bombay. This type of survey requires good public co-operation, otherwise it is difficult to cover a good number of people in spite of repeated visits and absentee surveys.

Case detection through non-survey techniques

An attempt made by Ganapati *et al.*, using health education as the method of case detection, yielded interesting results (Table 2). Considering the difficulties in assessing the impact of health education, this particular attempt calls for reviewing in detail. Health education programmes in the form of film shows, talks with slide shows, group talks exhibiting photographs and exhibitions were carried out over a period of 3 years in a slum population of 20,000 in Bombay. In the fourth year, a total population survey was conducted. Of the 347 cases prevailing in the slum, 184 (53%) had already come voluntarily during the first 3 years, which included 82% of the existing infectious cases, i.e. 27 out of 33.[10] This achievement was attributed to the effect of health education and establishes a definite role of health education in case detection.

Table 2. Leprosy case detection by non-survey technique, i.e. by health education

	Non-survey technique	Survey technique	Total
Smear −ve	157	157	314
Smear +ve	27	6	33
Total	184 (53%)	163 (47%)	347

Ganapati *et al.*[10]

Other non-survey techniques like mass smear examination and immunological tests, e.g. lepromin and FLA–ABS or ELISA tests, tried elsewhere in India and in the world (see discussion) have so far not been used in Bombay for case detection.

Work input against the achievements in active surveys

Generally, in the present methods of survey, the targets of examination given per worker per day are 200 children for school surveys and 15 families (consisting of 60–75 members) for house-to-house and slum surveys. Based on the previous studies, the prevalence of leprosy among school children and the non-slum population is 5 per 1000 and that for the slum population is 10–12 per 1000. The corresponding rates for smear +ve leprosy are 0·2, 0·4 and 1·1 per 1000 respectively,[11] Table 3

Table 3. Work input in terms of field workers' days work per detected case

Type of survey	Field workers' working days	
	Per case of leprosy	Per infectious case of leprosy
School survey	1 day	25 days
House-to-house survey (non-slum population)	3 days	35 days
Slum survey	1·5 days	15 days

shows the calculated work input in terms of field workers' days work required to detect each case of leprosy by survey methods in different sections of the population. Considering the fact that each worker has to put in 1–3 days work for every case and 15–35 days work for every infectious case, the present methods of survey appear to be very unimpressive, cost-effectively.

Discussion

The results of active surveys undertaken in Bombay during the last 15 years have shown that such surveys predominantly detect non-infectious cases with 1–2 skin lesions. However, these cases possess great potential for shelf-healing. Browne[12] reported self-regression in 97·2% of his cases with 1–2 skin lesions in the hyperendemic area.[12] The author of the present paper also has observed complete cure in the absence of treatment in 98% of the 108 single lesion cases detected in school surveys. Under such circumstances, detecting these cases through active surveys, using tremendous man-power and expenditure, is of very little value.

Currently, while conducting surveys, there is an emphasis on complete stripping of the body which often poses great difficulties in the case of female examination in field conditions. From the reports, it is clear that 40% of the lesions are found on the exposed parts of the body and 20% are seen on the deltoid regions, arms, elbows and knees,[2,5] the parts which can be exposed without difficulties. If the workers, therefore, are asked to restrict their examination to exposed and easily accessible parts of the body, there would be good co-operation from the adult population, the survey would be quick and about 60% of cases would still be detected. This will definitely relieve workers from unnecessary tension and they can pay more attention to signs like erythema and shiny skin which indicate early infectious leprosy.

In the interest of public health, identification and treatment of infectious cases of leprosy, is important. Since the present surveys are unable to detect such cases, there is an urgent need to develop a method by which their identification, preferably at the preclinical stage, is possible. Infectious patients, generally pass a substantial preclinical period of bacterial positivity (nasal and dermal) during which time they can be diagnosed only by smear examination.[13] Asymptomatic bacterial positivity in contacts of leprosy patients, as well as in the people residing in hyperendemic areas, and their increased susceptibility to develop leprosy subsequently have been already reported.[14,15,16] Though mass smear examination is likely to be unaccepted and operationally difficult, it can be applied extensively while examining the male adult population where prevalence of smear +ve leprosy is high. Supported by health education, this method would be of greater value from the public health point of view.

Routine palpation of peripheral nerves is known to be essential in making ultimate diagnosis of leprosy. Thickened nerves without overt symptoms and signs of neurological deficit would indicate

early lepromatous leprosy (which, however, should be further proved by smear examination). Field workers are expected to palpate the nerves while examining for leprosy, but in the papers reviewed, nowhere has any specific mention been made about its exclusive importance, if any, in case detection.

Immuno-epidemiological tests, such as the lepromin test, FLA–ABS and ELISA tests, are also suggested to be of help in the identification of incipient multi-bacillary cases.[17,18] Their potential in indicating infection with *Mycobacterium leprae* without acquisition of CMI is being tested at several places but their use will depend largely upon their application for masses in field conditions.

A comparative study, using health education against active surveys for case detection was in favour of health education.[10] A similar study carried out at Dichpalli, India, not only proved the effectiveness of health education in case finding but also in case holding.[19] However, it is difficult to assess the impact of wide-spread health education in the form of newspaper advertisements, documentaries in cinemas, posters and stickers carrying messages in public vehicles, etc. in a city like Bombay.

In view of the above discussion to make case detection efforts more effective and meaningful, the following suggestions are made:

1 Health education should be more regularly used for case detection.
2 While conducting surveys, there should be emphasis on smear examination. Quick examination of exposed and easily accessible parts of the body should replace present methods of complete stripping. The importance of this approach should be included in the training of field workers.
3 Studies using immunological tests for detection of the infected susceptible population should be encouraged.

Acknowledgment

The author is grateful to the Superintendent at Acworth Leprosy Hospital for his valuable guidance and for giving permission to publish this paper.

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Leprosy control in a Bombay slum—a general assessment

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Summary During the course of a medical student elective period, the author collected data from one of the largest leprosy control projects in the slums of Bombay, where the disease is hyperendemic. Particular attention was given to case-detection rates over a period of 5 years, drop-out rates, disability–deformity, stigma and socio-economic conditions. In this retrospective study, carried out during a limited period of time in one project, it seems that compliance, regularity of attendance and utilization by the patients of the excellent services offered all run at a level which is often disappointingly low. The current priority is for improved case-holding and some of the factors needed to bring this about are discussed.

Introduction

Originally leprosy in India was considered largely a rural problem but increasing urbanization caused the emergence of the disease as a major public health problem of the cities. The significance of endemic and hyperendemic city slums as reservoirs of infection, with overcrowding and unhygenic living conditions ideal for the spread of leprosy, has been recognized and quantified by various authorities.[1,2]

In Bombay a number of voluntary field-based units carry out leprosy control work; free treatment clinics are held in hospitals and municipal dispensaries, many of which are situated within the slum areas. Considerable resources are also devoted to large-scale surveys and health education work.

The intention of this study was to examine the impact of these activities in a hyperendemic slum. The results are interpreted in the light of the particular obstacles to effective leprosy control in a slum environment.

Bharat Nagar, the area chosen for the study, is a large slum in North Bombay. It is relatively isolated; its boundaries are limited by surrounding water.

A census in 1978 estimated its population as 15,000. By 1981 it had risen to over 18,000 and it is probably still growing with a population of around 20–24,000.

Overcrowding is severe and facilities are poor. Most inhabitants have no access to latrines and drinking water must be bought from the owners of the few taps.

Most of the original inhabitants are Harijans who work as sweepers and scavengers for the

* This study was conducted under the auspices of Dr R Ganapati, Director, Bombay Leprosy Project (BLP) and on a student sponsorship with LEPRA, the British Leprosy Relief Association.

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Municipal Corporation, Railways and Housing Societies. The large Muslim population works at a variety of unskilled jobs and provides workers for the Deonar slaughter house. Locally, the slum has a 'bad image' as a place of 'smuggling, gambling, illegal liquor trade, prostitution and crime'.[3]

Leprosy control work started in 1978 with the opening of 2 weekly clinics in the slum. Between this time and the beginning of 1981 extensive health education involving film shows, slide shows, group talks and an exhibition was carried out. Then, during 1981, an intensive survey of the area was completed. By the end of this year 347 cases had been detected; 184 being voluntarily reported and a further 163 detected by the survey which covered 80% of the enumerated population.[4] For the past five years multidrug therapy has been used where practicable; case detection and treatment continue with a fortnightly clinic.

As a result of this work, the prevalence rate for the area had been calculated as 24 per thousand, twice as high as the average slum prevalence rate for Bombay.[1]

Those cases detected up to the end of the survey year were followed up by examination of patient records and, where possible, examination and interview of patients was carried out to confirm classification and to obtain additional information. Cases were classified by mode of detection, type of disease, treatment status and outcome of treatment.

A year-wise analysis of cases detected since the time of the survey was also done and the source of these cases considered.

The 'tile test' was used to establish the level of compliance amongst patients taking dapsone.

As this was a retrospective study, its scope was limited by record availability and accuracy. Where records were occasionally incomplete, inconsistent or unavailable, those cases for which definite information could not be obtained were excluded from the figures given.

Results

During the 5 years since the end of the mass survey 106 further cases were detected. Figure 1 shows the total cases detected in the area since the start of leprosy control work.

Over the 5 years since the survey, during which only 1 school survey (yielding 5 cases) was conducted there was an average annual case detection rate of 1·06 per 1000, with a gradual decline in detection over the last 3 years (see Figure 2 and Tables 1 and 2). The majority (65·1%) were detected by voluntary reporting, the others by school and contact surveys.

The proportion of new cases which were found to be new immigrants to the slum, arriving since the survey, time is shown in Figure 3 (and Table 3). In total 23·6% of patients were recent arrivals in the slum.

The origins of 8 of the 10 smear positive cases were determined. Four were individuals who also had moved into the slum since the survey. Two were from amongst the 20% of the population who had not been examined during the survey period. One other case had been missed by the survey and 1 case had been declared healthy during the survey period, 2 years prior to detection. This suggests that this is a genuine example of early detection of an infectious case.

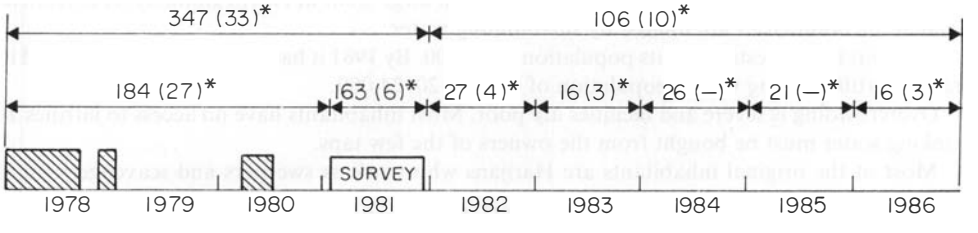

Figure 1. ▨, intensive health education programme; *, smear positive cases.

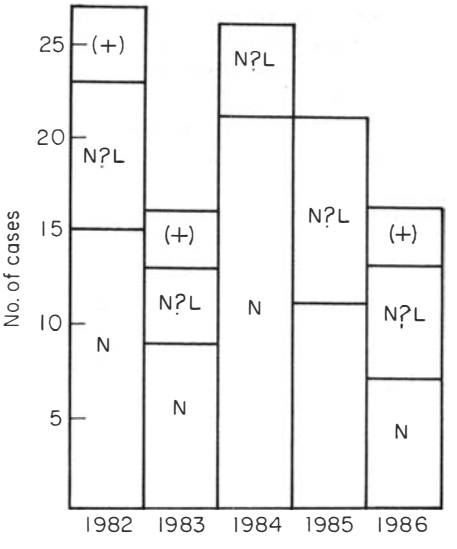

Figure 2. Case detection 1982–86. Cases are classified as smear positive (+), smear negative intermediate, i.e. indeterminate and borderline (N?L) and non-lepromatous, i.e. tuberculoid and pure neuritic (N). Despite a gradual decline in the case detection rate over the last 3 years, all types of cases are still occurring.

Table 1. Case detection year-wise 1982–86

	Adults		Children					Case no./ deformity	
	M	F	0–4	5–14	N	N?L	(+)	(1, 2, 3)	Total
1982	13	8	—	6	15	8	4	4	27
1983	6	5	—	5	9	4	3	2	16
1984	9	5	1	11	21	5	0	0	26
1985	4	10	—	7	11	10	0	1	21
1986	5	4	—	7	7	6	3	2	16
Total	37	32	1	36	63	33	10	9	106

Table 2.

	Voluntary cases	Contact cases	School survey	Total case detection	Case detection/ 1000 p.p. per annum (population estimated = 20,000)
1982	16	11	—	27	1·35
1983	9	7	—	16	0·80
1984	16	6	4	26	1·30
1985	14	7	—	21	1·05
1986	14	1	1	16	0·80
Total (+) cases	8	2	—	10	0·10 (Average rate over 5 years)
Total cases	69	32	5	106	1·06

Table 3. Proportion of cases new in slum since mass survey completed

	%
1982	33·3
1983	22·2
1984	5·0
1985	36·4
1986	30·8
Average	23·6 (over 5 years)

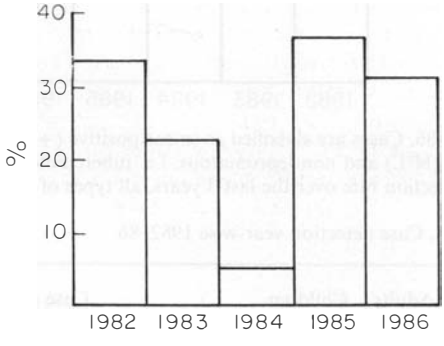

Figure 3. Proportion of cases arriving in slums since mass survey. Over 5 years since the mass survey, 23·6% of patients are recent arrivals to the slum who were not living there at the time of the survey.

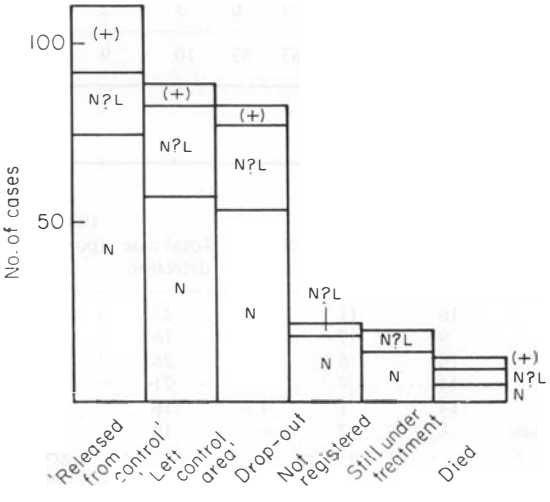

Figure 4. Outcome for cases detected 1978–81. Of all cases detected, 32·8% completed treatment and were released from control as inactive cases.

The outcome of cases detected up to the end of the survey are represented by Figure 4 and Table 9.

Almost one third of cases (32·8%) had been treated and released from control, a quarter (26·6%) had left the area without completing treatment and a further quarter (24·5%) 'dropped out' from treatment.

Figure 5 (and Table 4) shows the changes in deformity grading over the period (minimum 5 years) since detection. Of 34 cases with anesthesia, 5 patients recovered sensation, while 4 cases developed visible deformities. Two cases with grade 2 deformities progressed to grade 3.

Ten patients who had initially been registered with a deformity grading were interviewed. The changes in deformity status were compared with treatment (Table 5).

Seven patients had foot anesthesia; only 1 had received suitable footwear; 5 had been referred for concessionary footwear but had not attended. The hands of 8 patients were affected; 1 had been recommended for operation and 5 could repeat appropriate advice and exercises which had been taught. The total number of cases which had received physiotherapy is indicated in Table 6.

Detailed smear records were available for 21 cases; of these 15 (71·4%) had completed 24 doses. Their bacteriological assessment gave an overall conversion rate of 80% (Table 7).

Analysis of paucibacillary cases is given in Table 8. 52·6% of dapsone treated cases and 61·4% of cases receiving MDT were declared inactive.

There were 47·8% of positive 'tile tests' amongst patients collecting only dapsone, a considerably higher compliance rate of 71·4% was found amongst patients receiving multidrug therapy. These compliance rates are comparable to those found overall in the slum clinics (52·1% for patients on monotherapy, 77·4% for patients on MDT).

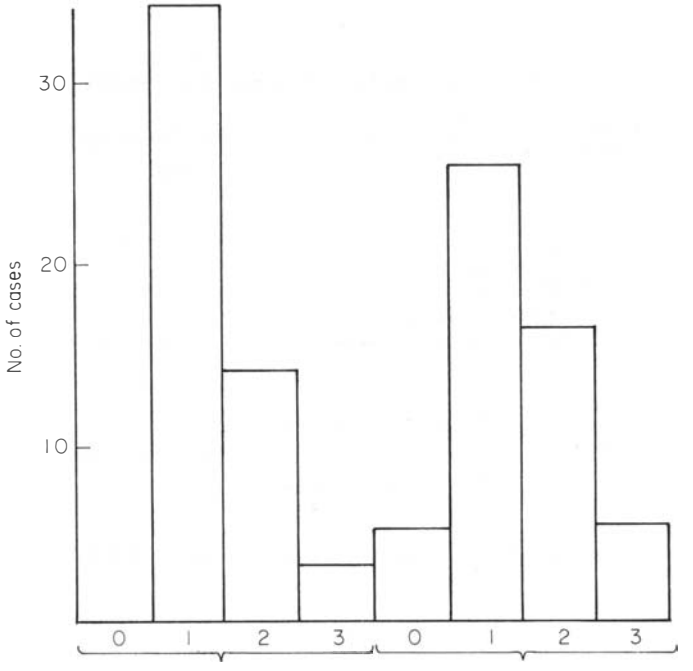

Figure 5. Comparison of current deformity grading with deformity grading at time of detection (up to the end of 1981). 0, indicates no deformity or disability; 1, anesthesia, altered sensation; 2, ulcers, clawing, footdrop, slight absorption; and 3, wrist drop, severe absorption, contracture, blindness. Cases are graded according to most severe deformity.

Table 4. Changes in deformity grading

Grade	Initial grading (no. cases)	Most recent grading (no. cases)
0	—	5
1	34	25
2	14	16
3	3	5
Total	51	51

Table 5. Comparison of deformity changes with treatment given

	Treatment given	
Deformity grading	MDT	DDS only
Showed improvement	5	1
Stayed same	1	1
Got worse	0	2

Table 6. Physiotherapy and health education given compared to deformity grading

	Grading			
	1	2	3	Total
Health education/physiotherapy given	8	9	3	20
No physiotherapy	16	3	—	19
Hospitalization for treatment	—	2	1	3

Table 7. Changes in Bacterial Index of multibacillary cases

BI before MDT	Still (+) after 24 doses						(−) after 24 doses	
	No. of patients	0·1–0·9	1–1·0	2–2·9	3–3·9	4–4·9	No.	%
⩾5	—	—	—	—	—	—	—	—
4–4·9	2	1	—	—	—	—	1	50
3–3·9	4	—	1	1	—	—	2	50
2–2·9	5	—	—	—	—	—	5	100
1–1·9	3	—	—	—	—	—	3	100
0–0·9	1	—	—	—	—	—	1	100
Total	15	1	1	1	—	—	12	80

Table 8. Clinical assessment of paucibacillary (smear negative) cases

	Clinical Status					
Treatment	I	MI	AR	S	A	Total
Less than 1 month Rx	8	—	—	—	83	91
DDS only	81	1	9	1	62	154
6 months MDT	50	6	7	—	12	75
9 months MDT	3	1	—	—	—	4
12 months MDT	1	—	2	1	2	6
12–24 months MDT	5	2	2	—	—	9
>24 months MDT	3	—	—	2	2	7
Total	151	10	20	4	161	346

Table 9. Outcome of cases detected up to end of mass survey period

	N cases		N?L cases		(+) cases		Total	
	Voluntary	Survey	Voluntary	Survey	Voluntary	Survey	No.	%
Not registered	—	19	—	3	—	—	22	6·5
Left area	22	35	16	9	5	2	89	26·6
Still under treatment or observation	9	5	4	2	—	—	20	6·0
Released from control	32	43	11	6	15	3	110	32·8
Dropped out	28	26	13	10	5	—	82	24·5
Died	4	1	2	2	2	1	12	3·6
Total	95	129	46	32	27	6	335	100

Discussion

The benefits of multidrug therapy implementation are highlighted by the number of cases treated and released from control (33%). Generally, the cases still under treatment are those who have been too irregular in attendance to be considered for MDT.

The drop-out rate (24%) is comparable to that obtained in MDT trials in similar areas with no significant difference between voluntary and survey detected cases. However, it rises to 51% if those patients leaving the area are included in this total. Thus half the patients who stop attending the clinic apparently do so because they leave the area. The reasons for moving are not necessarily related to the individual's disease. Reasons given for leaving are similar to those reasons that patients move into the slum, principally the search for employment and changes in family circumstances such as marriage. Only in 1 case could it be confirmed that the patient had been expelled from his home and taken to begging.

It is of particular concern that despite a policy of active case-holding and repeated home visits, 7 infectious (smear positive) cases left the area still smear positive and 5 dropped out from treatment. Some of these claimed to be taking treatment elsewhere; due to the stigma associated with leprosy there is a tendency for patients to avoid the clinic conveniently situated in their home area. Such

patients may obtain drugs privately or attend clinics where they are less likely to be recognized. This makes it difficult for workers to keep accurate records of treatment especially as patient honesty cannot be relied upon.

A useful indication of effective treatment and effective patient education lies in changes in deformity grading. In principle grade 1 and 2 deformities can be reversed by a combination of drug treatment and physiotherapy. Occasionally surgery is necessary. It would seem significant that of 6 patients showing improvement, 5 had completed MDT, while neither of the 2 patients whose condition worsened had received a course of MDT.

Efforts had been made to make physiotherapy, ulcer dressing and corrective surgery available as well as making appropriate footwear available to patients at concessionary rates. The chief obstacle to success in this area seems to be the reluctance, often for practical reasons, of patients to take advantage of these facilities. Reasons vary from 'long queues at the hospital', lack of money or time, to the hope that the disability will improve without treatment. A particular problem for obviously deformed patients is caused by a refusal to allow them on public transport. Therefore, although considerable progress has been made in making available normal hospital facilities to leprosy patients, a large number of patients still cannot, or do not wish to use these facilities for dressings, physiotherapy and surgery. Additionally it is difficult to find trained physiotherapists in the city who are prepared to work with leprosy patients and to hold clinics in slum areas.

The year-wise case detection rates indicate that there is probably still a relatively high incidence of leprosy in this slum. Case detection rates are approximately equal for males and females; a high proportion (34·9%) of cases are amongst children.

The detection of 65% of cases and 80% of infectious cases was by voluntary reporting. This is encouraging as such cases, if given sufficient encouragement, should be less likely to drop out, or refuse to accept treatment.

Over the last 3 years there has been a drop in total case detection. However, infectious cases are still arising. When the sources of these infectious cases were examined, it was found that 50% had arrived from outside the area since the mass survey of 1981. Bearing in mind the average incubation period, it seems likely that these patients are bringing the infection from other areas.

Moreover, 25% of infectious cases were found in individuals who had been living in the slum during the survey, but were amongst the 20% of the population not available for examination at that time. (As has been pointed out by other studies, the sector of the population likely to be missed (working adult males) is the same sector in which a high proportion of infectious cases are found.)

Considerable success in reducing the reservoir of infection represented by leprosy colonies has been achieved in Bombay by intensive programmes of multidrug therapy combined with health education.[5] Yearly surveys of the healthy population of 1 leprosy colony have shown a reduction of the occurrence of new cases to 3 per 1000 (all non-infectious tuberculoid cases) since the administration of MDT for all multibacillary cases was started. This is despite a prevalence of 480 cases per 1000 population, 28% of which were lepromatous (LL) and 41% borderline.

This success has not been paralleled in the normal slum, where the disease is also hyperendemic. Although 166 cases have been declared inactivated, the incidence rate is still high. Several reasons for the differences may be suggested.

1 The leprosy colony concentrates a large number of infectious cases in a small population, in a small well-defined area, making treatment easier to administer.

2 The social stigma of the disease, high in a normal slum, is less likely to be an obstacle to the acceptance of diagnosis or treatment in a leprosy colony.

3 In the leprosy colony, various other facilities were provided including drinking water and washing places. Rehabilitation programmes were undertaken and education offered for the children. As well as drugs, dressing materials were provided in the colony. An additional result of these benefits may have been increased confidence in the drugs supplied, ensuring better drug compliance. The introduction of multidrug therapy has itself improved compliance in the slums, but even with a compliance rate of about 70% there is room for further improvement.

4 The poor socio-economic level of most slum dwellers, while providing ideal circumstances for the spread of infectious disease, means that health consciousness is low, and health care a very low priority for these people.

These results would seem to suggest a need for a shift of emphasis in leprosy control in the slums, if the dual aims of reducing the reservoir of infection and reducing the morbidity (chiefly caused by nerve damage) amongst patients, are to be achieved efficiently.

In the past considerable resources and enthusiasm have been put into mass surveys of endemic populations. However, there has been a certain degree of disillusionment with the results and their value has been widely questioned from the point of view of optimal use of manpower resources. These figures suggest particular limitations to the usefulness of surveys in slum areas. The principle behind the use of surveys is that by diagnosing virtually all the cases in a given area it will subsequently be possible to bring them under treatment, and so control the spread of the disease. This cannot be effectively applied if there is a continuous movement of infectious cases into, and away from, the area, and a high drop-out rate amongst cases. The survey component of control programmes serves only to emphasize the scale of the problem faced, unless the education of patients and of the general public and treatment of disabilities and psychological, social and economic problems (as well as infectivity) are intensified.

The success of multidrug therapy when properly implemented has been demonstrated; the number of patients benefiting will be increased by improving the social and psychological support offered, rather than by searching out more cases. The current priority would appear to be improving case holding and for this to be achieved more resources will have to be devoted to the practical, economic and social problems, which cause leprosy patients in such a community to regard the disease as the least of their problems and treatment as a low priority.

Acknowledgments

The author is grateful to Dr R Ganapati for much help and advice during the collection of data and the writing of this paper.

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[5] Ganapati R, Naik SS, Revankar CR, Vartak RB, Desai AP, Panvalkar NA, Deshpande SS. Supervised Administration of Multidrug Therapy in Leprosy colonies. *Indian J Leprosy*, 1986; **58,** 86–80.
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NEWS AND NOTES

Leprosy for medical practitioners and paramedical workers: Ciba-Geigy

The third, revised edition of this excellent booklet, written by R H Thangaraj and S J Yawalkar, published by Ciba-Geigy in 1988, is not available and copies may be obtained from the company, CH 4002, Basle, Switzerland.

Slide/script and audiotape sets on leprosy (English)

American Leprosy Missions now has available two slide-script and tape sets produced by Roy Pfaltzgraff. Details are as follows:

Leprosy in general practice—this set of 80 slides briefly covers the essentials of the diagnosis and management of leprosy for a medical practitioner who has had little or no previous experience with leprosy. It gives guidelines on the basic features of the disease, the treatment and the main complications that may arise during the active course of the disease, and what to do in case complications arise. (length, 32 minutes).

'Differential diagnosis of leprosy'—consists of 80 slides chiefly of African dermatological conditions that may be confused with leprosy. The emphasis is on making a definite diagnosis by clinical methods in a 'field' situation. It provides a good overview of tropical dermatology. (length, 22 minutes).

These sets are available at the subsidized price of US$10.00 per set, including a tape and printed script. Apply to: American Leprosy Missions, One Broadway, Elmwood Park, New Jersey 07407, USA.

Questions and Answers on the Implementation of Multiple Drug Therapy (MDT) in Leprosy. Portuguese translation

This booklet of 35 pages is available, in English and Portuguese, from the Health Unit, OXFAM 274 Banbury Road, Oxford OX2 7DZ, England. It includes a number of questions, and *some* of the answers, relating to problems which may arise in the practical implementation of multiple drug therapy, using the regimens recommended by WHO. Attention has however been drawn, notably by readers in South America, to a number of defects in the Portuguese translation and these include the following: Certain words are inadequately chosen to describe the real meaning, for example: 'exame dos testes microscopicos do corte da pele,' should be 'baciloscopia de espregaço de corte de pele'. For 'pauci-bacilar' substitute 'paucibacilifero'; for 'multi-bacilar' substitute 'multibacilifero'; for 'reincidencia' substitute 'recidiva o recaida'; for 'sitio' substitute 'local o region'; for 'beneficial' substitute 'benéfico'. 'Leprosos' is a derogatory expression that should not be used, the correct term is 'paciente de lepra'.

Further comments on the quality of translation are being collected and a correction slip will be included in copies of the present edition, pending the possibility of a full revision.

International Disability Education and Awareness

Based at William House, 101 Eden Vale Road, Westbury, Wiltshire, BA13 3QF, England, this organization runs courses periodically on disability and rehabilitation. The broad description introducing a recent course ran as follows: 'We welcome anyone who is working or is about to work overseas with people with disabilities and those concerned with work in this field. Practical and theoretical sessions provide a forum for participants and tutors to share their experiences, skills and ideas and to look at some of the fundamental issues behind Disability and Development.'

Technical Guide for Smear Examination for Leprosy

The first edition in English (1983) is now virtually out of print and a second (reviewed) edition is due to be published by the end of 1987. This Guide has been translated into French, Thai, Arabic, Spanish, Turkish and Bengali. A translation into Portugese has been done and is being prepared for the press. Hausa and Indonesian are in hand, but not yet translated. Distribution seems to have been fairly wide; for instance in the Eastern Mediterranean alone, Dr Wahdan, Director of Disease Prevention and Control for the Regional Office of WHO, has recently written to say that nearly 2000 copies were distributed to Arab-speaking countries in the Region—and the sales from distributing agencies in London and Oxford have been impressive. Addresses and method of application for the various translations will be published in the next issue of this journal. Meanwhile enquiries to Secretary, TALMILEP, DAHW, Postfach 348, D-8700 Würzburg, West Germany.

Lepr Rev (1988) **59,** 255–258

Involvement of students in a leprosy health education programme—an experiment

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Accepted for publication 4 December 1987

Summary The students participation at college and high school level can be obtained for leprosy health education programmes if proper motivation is given, involving non-leprosy agencies such as the student community will help to overcome the stigma of leprosy in society. The experiment of 'Involvement of College Volunteers' and 'Mitra' are described and have the potential to spread to other regions.

Introduction

Leprosy programmes are usually run with a shortage of manpower and inadequate finance. The involvement of non-leprosy agencies at different levels in leprosy programmes is left as the ultimate strategy in the present situation, and is also likely to expediate the process of removing stigma about leprosy in society. The student population at college level or at high school level are always enthusiastic, having open minds to absorb new messages. They are bound to be decisionmakers in their families, and in turn society too, and thus working with them is thought to be rewarding. A brief account of the experiment by our organization which has been running for more than 3 years, and involves the students in health education programmes on leprosy is presented here.

Involvement of college students in leprosy health education and treatment programme

METHOD

An advertisement in a newspaper regarding the participation of college students in the leprosy programme was printed 1 month before the October and Summer vacations and the same notice was also circulated in colleges in Bombay city.

Interview technique. The group interview technique was adopted by calling the applicants in batches of 20. After a 20-minute health education talk on leprosy with audiovisual aids, students were asked to fill in an objective type questionnaire. Then they were allowed to ask questions on leprosy and each student was asked to describe the picture projected on the screen. The pictures were of natural scenary, graphs, cartoons etc. The group interview technique saves time and there were no grumbles or grudges from candidates who were not selected.

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Training of the college volunteers. Approximately 20 students were selected in each vacation for a further training programme of 3 days as the health educator in leprosy.

The topics covered in the training programme are as follows:
1, introduction; 2, clinical demonstration of different types of leprosy cases; 3, hints on how lectures can be made effective; 4, practical demonstration of working of audiovisual aids; and 5, demonstration of audiovisual educative set.

Lecture series on leprosy; 1, health problems in India; 2, leprosy update; 3, leprosy control programme in Bombay city; 4, demonstration of *M. leprae* under microscope; and 5, video cassette on leprosy.

1, Attend the health education talk on leprosy in slum or chawl; 2, group discussion on news items on leprosy, posters on leprosy. etc; 3, video cassette on leprosy; and 4, feed-back of training programme.

Participation. These trained college student volunteers were expected to participate in the leprosy health education programme in the following stages.

Stage 1 The college volunteer accompanied the senior person when the senior person gave a health education talk on leprosy.

Stage 2 The volunteer organized the health education talk in chawls, slums or schools and the senior person delivered the lecture on leprosy.

Stage 3 The volunteer organized and gave a talk on leprosy.

When the volunteer reaches the third stage, they are given Rs.20/–per talk as a remuneration. This helps the college volunteers to earn money while learning and gaining the confidence to face the community leaders and audiences of the different sectors of society. These efforts also help in the development of their personalities. The college volunteer was asked to report on their talk on leprosy and feed back was asked, without their knowledge, from the leader of the place where they had delivered the lecture. The responses were quite encouraging. In order to keep the students association in touch with our organization and with other volunteers the monthly meeting was called on Sundays when they were allowed to do a brief audiovisual presentation on a topic of their choice, other than leprosy, and to discuss the difficulties which they came across in field conditions.

RESULTS

The leprosy organization has benefited by getting more health education talks at 30% of the cost of routine leprosy health education services (see Table 1).

Table 1. Cost of health education talks given by students

Batch	No. of applications received	No. of candidates selected	No. of candidates with active participation	No. of health education talks given	Population covered	Expenditure (Rupees)
October 1984	102	21	10	70	5324	2364/–
May 1985	59	17	4	322	39638	8499/–
October 1985	32	12	2			
May 1986	57	23	3	276	27577	8800/–
October 1986	52	19	6			
Total	302	92	25	668	72539	19663/– Rs.29/– per health education talk.

The same students were requested to participate in leprosy treatment programmes and with the help of 8 students, the multidrug therapy programme was successfully launched at 7 leprosy colonies situated in and around Bombay city.[1] This has given them an opportunity to put into 'practice' what they used to 'preach' and 'teach'. The initial aggressive therapy of 21 days and the subsequent monthly pulse therapy was managed by them successfully and 260 infectious leprosy patients benefitted. The expenses incurred were Rs.486/– per month for the treatment of 260 leprosy cases which is 50% cheaper than using the services of the full-time leprosy workers of the regular programme. All 7 students can now take skin smears and check patients' urine in field clinics for DDS content by 'DDS Tile Test'.

The college undergraduate students can be involved successfully in leprosy health education and treatment programmes. It is cheaper and effective and acts as an auxillary force to augment routine services in leprosy.

Involvement of high school students in health education programmes of leprosy

METHOD

In order to get the participation of high school students in the health education programme of leprosy the 'Mitra' (Friend) project was initiated 3 years ago. 'Mitra' is a 4-page monthly bulletin in which 1 page is devoted to leprosy and other diseases giving scientific information and orientation programmes such as 'do it yourself'. Through this the attempt is made to develop a rapport between students and the leprosy organization. Ten such issues of 'Mitra' per year were sent to the student subscriber on subsidized membership of Rs.3/– per year along with 30 leprosy seals which were Rs.3/–. They were expected to paste these leprosy seals on their mailing. They were also requested to write a leprosy slogan such as 'Leprosy is curable' in prominant places in the villages. They took an oath that they were friends of leprosy patients, that they know the scientific facts about leprosy and that they would not hate leprosy patients. Penfriend activity among them was also established. It is expected to be a student-to-student programme through 'Mitra' student subscribers.

'Get-to-gethers' (Mitra Melava) of students were organized at the institute as well as in the schools in Maharashtra, who responded to the request for them to get involved in the leprosy health education programme.

In a full 1-day session of 'Mitra Melava' the following programme is expected to be completed. 1, Talk on leprosy with audiovisual aids; 2, visit to leprosy hospital and talk with leprosy patients (when it is at our institute); 3, practical demonstration of 'Solar Stove', filmstrips on science, the experiments revealing the science behind magic tricks; 4, group discussion on leprosy; 5, quiz competition on leprosy; and 6, oath of leprosy.

A total of 59 get-togethers were organized in 3 years, 21 were held in Bombay and 38 in Maharashtra.

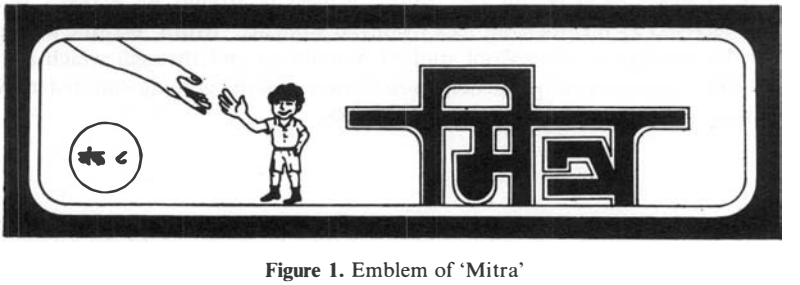

Figure 1. Emblem of 'Mitra'

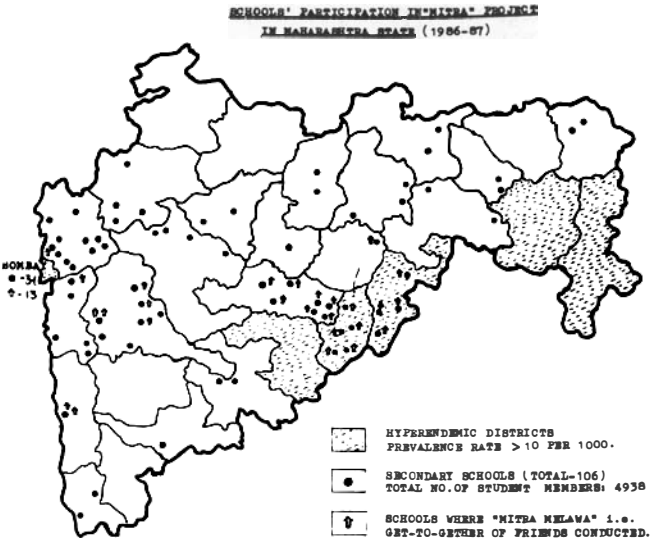

Figure 2. Schools' participation in the 'Mitra' project in Maharashtra State, 1986–87.

Table 2. Participation in 'Mitra' project

Year	Number of schools participated	Members of 'Mitra'		
		Students	Individuals	Total
1984–85	81	2827	425	3282
1985–86	79	3847	633	4480
1986–87	106	4802	520	5322

RESULTS

When considering student-hours participation in the leprosy programme one has to take into account that 250 students cooperated with the leprosy institute by pasting leprosy seals on their post (of which 58 became penfriends), 95 students have written a slogan about leprosy in public places and S.T. Stands with coloured chalk and 35 students pasted the leprosy posters in different places. They also relayed information on leprosy to their parents and friends. Two students could detect early leprosy cases. Two schools had taken part by displaying a project model on leprosy in an annual science school exhibition, and one of them received an award. One hundred and eight schools (teachers and headmasters) received leprosy messages and schools displayed 'Mitra' issues on their noticeboard for the information of other students.

The yearly expenses incurred for the 'Mitra' project is around Rs.50,000/– out of which Rs.15,000/– is received as membership fees from the students. 'Mitra' became a simple tool to communicate the message to the school student population and through which a 5% positive response is received by way of active participation. 'Mitra' activity is being initiated in 'Konkani' in the Goa region in the next academic year, i.e. 1987–88.

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Lepr Rev (1988) **59,** 259–262

SPECIAL ARTICLE

The teaching of leprosy in the university*

T FURTADO
Department of Dermatology, Faculty of Medicine, Federal University of Minas Gerais, Brazil

Firstly we would like to extend our sincere thanks for the honourable invitation from Dr Sergio Tarle to participate in the 6th Brazilian Congress of Leprosy, with the theme 'The Teaching of Leprosy in the University', and to say that many other colleagues, including many of those present here, could certainly perform this significant task better.

We think the choice of the theme could not be more appropriate and felicitous. The modern university is undergoing a significant transformation. Its objectives are being extended when the services to community are added to the indisoluble duality of teaching and research. As a consequence of this fact it is necessary to modify academic programmes, adjust the ultimate objectives of research, and turn to the needs of the community.

This approach will necessitate leaving the old and untouchable ivory tower. It overtakes the traditional concerns of producing knowledge and of training higher level professionals, and makes the compromise necessary to answer the problems of society.

In the area of health this change implies an understanding of the multidisciplinary character of the majority of health issues. The idea must be established that preservation of health and prevention of disease does not depend exclusively on the doctor. In fact there are economic, social and cultural aspects involved, such as economic development, sanitary conditions, elimination of misery, of hunger, of ignorance, and the establishment of social justice, to assume equality of the rights of the man in accordance with the Letter of Assembly of the United Nations from San Francisco, 1948, of which we are signatories. So, the causes of disease and death can be combated, such as malnutrition, inadequate housing, unsanitary environment, and difficulties of access to education and health services.

In this context, the active participation of the community is necessary in discussions by health groups during the development of public health programmes.

It is necessary for the modern university to associate itself with the execution of objectives of the Declaration of Almar Atar from 1978, of which 160 member-countries of the World Health Organization (WHO) are signatories, to assure 'Health for all peoples in the year 2000'. Undoubtedly, there are common areas between the university and the health services in the promotion of the extension of primary care to the population.

* *Editorial Note*: This article has been translated from Portugese by Professor C W Picanco-Diniz in Oxford. It appeared in *Anais Brasileiros de Dermatologia*, **62** (Suppl. No. 1) 223–300, 1987 and we are indebted to the Editor for permission to reprint.

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Leprosy is a social disease, not just a disease with a diagnosis and therapy. It is necessary to try to involve with the same energy, the different factors of the population's health: social, economic and psychological, in the fight against leprosy. In Davey's words: 'the problem of leprosy is entangled in a dense atmosphere of ignorance, fear, myth and superstition, that often reduces the possibility of early diagnosis and effective therapy.' Furthermore, prejudice is inclined to be a strong influence, e.g. the poor concept the patient has of himself and of his place is society, which reduces the possibility of recovery. It is common that the patient is unable to recover his personal identity and his self-respect. However, a change in attitude towards the leprosy patient has occurred more recently.

The problem of the prejudice towards the leprosy patient deserves a short comment here. It was the theme of the PhD Thesis of the Professor Domingos Granida Jr., whom fate took away prematurely, and with whom I had a modest collaboration. The leprosy patient may or may not be accepted by the people, because there are many clinical forms with different visual appearances. On the other hand, patients with other diseases, such as leishmaniasis with nasal lesions, may be mistakenly identified as leprosy patients. Further, the refusal of patients to accept that they have leprosy, also hinders the removal of prejudice. We think that the liberation from the millenia of prejudice depends less on changing the disease's name, than in changing of the point of view previously mentioned. The ultimate objective is of assuring assistance to the leprosy patient through the public health services, the universities services, as well as to educate the population through a programme of public health education by different means of communication. It would be a priority in the first and middle schools because young people are more 'accepting' than older people. This programme could use video-cassettes, films, slides and posters as well as lectures to different communities.

Leprosy has been a scourge of mankind for about 1000 years. Since the discovery of the bacillus by Hansen in 1874 until the present, there have been many additions to the knowledge and control of this endemic disease. However, there remain many obscure points about the disease and its infectious agent, and there is no vaccine for its definitive prevention, although there is much research in this area with promising results, e.g. Convit *et al* and Stanford.

At the moment, in accordance with the recommendations from the World Health Organization (WHO), the control of this endemic disease must be centralized for both the detection of early cases and for multidrug therapy. However, the recommendations may be based on incorrect estimates; of the 5·3 millions reported cases a better estimate may be about double this number. In Brazil the number of reported cases is 218,845 and it is therefore a high endemic area: 1·7/1000 inhabitants. Recently a Master's Thesis from Dr Oswaldo Macedo Cuntijo completed under my supervision, showed that the control of the leprosy patient is inadequate, because 67·5% of the reported cases had not been submitted to a periodic check up. Only 2·7% of the persons who were in contact with contagious leprosy patients were subsequently examined and recorded. The advanced clinical stage was detected more commonly (76%) than the initial clinical stage. Many factors have been pointed to as explanations for failure in the fight against leprosy. In the project to implement the multidrug therapy, Oliveira *et al.* suggest the following reasons: 1, the high level of dissatisfaction amongst active professionals in the health area; 2, no standard laboratory diagnosis; and 3, the poor regard of leprosy patients for modern leprosy therapy. Finally, they call attention to inadequacies, both quantitative and qualitative, in human resources. The latter point of view has also been singled out in a report from WHO 1985, as one of the reasons for the difficulties of implementing multidrug therapy.

The application of scientific knowledge in the fight against leprosy is a most useful and efficient area. In this, the university with its research centres, is a natural place for the development of such knowledge. It is necessary to renew our academic programmes with regard to leprosy in the universities and to discuss and analyse the results.

With the objective of determining the actual situation of the teaching of leprosy, we sent questionnaires to the teachers of dermatology in the 76 schools of medicine throughout Brazil. The

detailed presentation of the answers will be matter for another article. However, a few conclusions can be reported here:

1 The teaching occurs normally in dermatology out-patient departments.
2 The teaching in the out-patients department occurs during the first presentation of cases, as with other diseases.
3 There is a little difference in the frequency of the teaching in dermatology as opposed to general hospitals.
4 The teaching of the prevention of the deformities and disabilities is inadequate.
5 Practical teaching occurs in all schools, as with the integrated programme of dermatology teaching.
6 There is evaluation of the teaching in about two-thirds of the schools of medicine.
7 In post-graduate studies (intern doctor) there are the same trends as in the undergraduate studies.
8 In the post-graduate studies for Master and Doctoral degrees, there is the specific subject 'Hansenology'.

Two remarks are worth making. There is a clear tendency to avoid prejudice towards the leprosy patient in medical care and teaching. However, the quantitative data shows that we advance very little in the control of the disease. What could we do to adapt the academic programmes in the education of human resources to the diagnosis, therapy and control of leprosy?

McDougall, the editor of *Leprosy Review*, in an article entitled 'The Medical Student and Leprosy', affirms that the same situation exists in all countries, and suggests working with undergraduate students, because they are more easily motivated than the others, on the problems of public health. He emphasizes the experience of basic training in leprosy with medical students from Egypt, India and Nigeria. These students have been able to develop positive attitudes about the clinical approach to leprosy. We think that that experience could be extended to other health areas (nursing, social service, sociology, psychology, physiotherapy and occupational therapy), to form multidisciplinary groups working in the hospitals and out-patient departments of the universities, as well as in the public and private units of the health services.

In the countries where leprosy is endemic, the health group could be formed around the central figure of the general practitioner, who will make the diagnosis, determine the therapy, and treat the majority of cases. If there are difficulties and complications, the general doctor could call on specialists (dermatologist, neurologist, psychologist and occupational therapist) The social worker will have the significant task of preventing a high decree of absenteeism in therapy.

The constant work of the general practitioner in private out-patient departments and surgeries in detecting incipient cases, as has been recommended by the master Francisco Edvardo Rabello, will have a strong influence in the control of leprosy. The careful dermatological examination, associated with investigations of any neurological changes, will be made periodically in order to detect leprosy in domestic contacts, and in children of school age. It is important that these activities be extended to all regions of the country by the doctors of the public or private health services.

The specialists in leprosy will make the master plan, and coordinate and administer the services of health care.

In the same context, we would emphasize the necessity to include especially the subject of leprosy in post-graduate studies of dermatology, tropical diseases and clinical medicine. The other specialists previously mentioned would be taught the issues relevant to each discipline. Updated training courses will be carried out in programmes, so making for a continuous education.

This proposal could be established in the short and medium term, with the changes in the assistance model to complement the system of integrated health services. In this system, the health care services are unified in an hierarchy, and located with adequate mechanisms for the first and subsequent referrals. In fact, it is essential for the success of public health reform that the schools of medicine promote the integration of the teacher with the health care services. It is not possible to divorce the training of professionals in schools from the system of developing health care.

In conclusion our proposals may be summarized as follows:

To decentralize the primary care that is carried out presently by the sanitary dermatology services and leprosy services, to the general out-patient departments of the public and private health services and the schools of medicine.

2 To give a central position to the general practitioner in the primary services.

3 To emphasize the teaching for students in the schools of medicine.

4 To emphasize the detection of early cases and vigilance over the people who come into contact with contagious leprosy patients.

5 To implement the multidisciplinary health groups centred on the general practioner.

6 The dermatologist and other specialists will be consulted in the event of complications or difficulties in diagnosis.

7 The master plan for the coordination and administration of the health care services will be made by specialists in leprosy and public health.

8 The development of the human resources for the multidisciplinary health group will be made by the different sectors of the university, especially the schools of medicine with the participation of the National Institute of Social Assistance and Precaution as well as the Secretaries of State and Town Councils of Health.

9 A programme of public health education for the population will be made by the Ministry of Health in collaboration with the universities.

10 Prejudice, as a social and cultural phenomenon, will be combated in this context. We are 'in debt' as far as leprosy is concerned and the balance needs to be redressed. Society expects of every health professional that they be competent and compassionate.

Lepr Rev (1988) **59,** 263–264

SPECIAL ARTICLE

Leprosos purgate

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Accepted for publication 29 March 1988

The motto of Leeds Medical School reads 'Agrotos Sanate, Leprosos Purgate', exhorting students to heal the sick and cleanse the leper. Opportunities to do the latter being distinctly limited in Yorkshire, I was determined to use my 10-week elective period to learn about the care of patients with not only leprosy, but also other diseases of the developing world.

My destination was the Greenpastures Leprosy Hospital in Pokhara, Nepal. Run by the International Nepal Fellowship, this hospital forms part of the Leprosy Control Project, organized in conjunction with the Nepali government. The hospital is a referral centre for patients from all over Western Nepal, in addition to providing routine care for leprosy patients within its own district.

Nepal, famous for Everest and the Himalayas, is one of the poorest countries in Asia. The mountains which attract trekkers and mountaineers from all over the world, make travel and communications difficult and unpredictable. Distances are measured by the number of days it takes to walk. Despite the provision of rural health posts, many leprosy patients have to walk several days in order to receive treatment.

As the name suggests, Greenpastures Hospital is set in grassy fields which provide grazing for the buffalo of the hospital farm. It is overlooked by the Annapurna range of mountains which appear out of the clouds in the early morning, to give a breath-taking view. There are about 120 beds, patients admitted for foot ulcers or reconstructive surgery being housed in the wards, whilst most of those being treated for leprosy reactions lived in huts in the grounds.

Out-patients were seen by paramedical workers, specifically trained in the diagnosis and routine treatment of leprosy. Those patients with complications or incidental illness were referred for a medical opinion. The majority of patients were admitted either for foot ulcers or reactions, or electively for reconstructive surgery. Those with complicated ulcers requiring septic surgery joined the medical students list. Under the watchful eye of the Nepali theatre technician, I learned to do a number of these simple operations.

Ulcer prevention was the aim of the health education scheme run by the occupational therapy department. This comprised a series of talks and demonstrations about foot, hand and eye care for the patients. Those who had satisfactorily completed the course were awarded a certificate. This

* This account of an elective period by a final year medical student in the UK is in the latest of a series supported for nearly 20 years by LEPRA and more recently by the St Francis Leprosy Guild, 2 The Boltons, London SW10 9SU. *Editor*

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scheme was still in its infancy when I saw it and still had to prove its value in preventing ulcers, but patients were certainly very keen to join the course and gain the certificate.

In marked contrast to the almost crude procedures in septic surgery, was the refinement of surgical reconstruction. I enjoyed assisting at these very delicate procedures to correct claw hands and foot drop. While the value of these operations in restoring function is self-evident, the cosmetic improvement, in a country where leprosy still carries a great social stigma, is also important. This was illustrated to me by a 22-year-old woman who had a claw hand, but no other signs of leprosy. As I examined her, she became tearful, explaining that her family had been unable to arrange a marriage for her because of her deformity. Clearly, reconstructive surgery could be of great benefit in this case.

While much of my time was spent dealing with leprosy, I had plenty of opportunity to see and treat more general medical problems. A skin clinic was run once a week, where, with the help of a few Nepali phases including 'does it hurt'?, 'does it itch?' and 'how long have you had it', I was able to diagnose most of the commoner presenting problems; scabies and fungal infections had always to be excluded in any itchy lesion.

Having made a diagnosis, my next problem was to explain to the patient how to use the prescribed treatment. I was rather discouraged when once, despite an elaborate mime explaining how to use potassium permanganate soaks, the patient still turned round to ask if he should drink them.

Tuberculosis is rife in Nepal, its spread being guaranteed by poor nutrition and living conditions and the Nepali habit of spitting constantly. Many patients were being treated for both leprosy and TB. Other, for me, unfamiliar medical problems included a wide range of intestinal infestations, typhoid and kwashiorkor. The latter I saw in the daughter of a leprosy patient, the youngest of a large family. It was rewarding to see her transformed from a miserable and apathetic child to one who was smiling and energetic.

How well then did my elective experiences fulfil the aims and expectations I had held before I went? I certainly learned a lot about the management of leprosy and by the time I left, I felt confident in dealing with its common complications. I also had the opportunity to diagnose and treat patients with a variety of disorders which I would be unlikely to see in the United Kingdom. It was an education to have to learn to have to do without so many of the facilities that I had come to see as 'essential', the lack of equipment for complicated investigations taught me now often it is perfectly possible to do without. The necessity to re-use and resterilize needles, syringes and gloves until they were unusuable put the current crisis in the UK National Health Service in a different perspective.

Acknowledgments

I am grateful to the staff of the Greenpastures Hospital for the way in which they made me so welcome, allowing me to become part of the team for a short time, in particular to Dr M Lavender, Dr W Van Braekel and Sister Maria Schimpf. Thanks are also due to the Dora Ratcliffe Fund and the St Francis Leprosy Guild for providing funds to help to finance my elective.

Lepr Rev (1988) **59,** 265

Obituary

MELVILLE CHRISTIAN
MD
1932–1988

One of India's leading leprologists, Dr Melville Christian, died of a heart attack on 12 June, aged 56. He leaves behind a wife and two children. Dr Christian was Director of the Schieffelin Leprosy Research and Training Centre at Karigiri in Tamil Nadu, one of the largest and most influential leprosy programmes in southern Asia. He had held the Directorship since 8 May 1987, previously having served as Deputy Director (Training) and Head of the Branch of Epidemiology and Leprosy Control. Preceding his appointment to Karigiri in 1979 he was Medical Superintendent at the Government of India leprosy centre Chingleput.

Dr Christian's main contribution to leprosy work lay in the areas of leprosy control and epidemiology. He was a World Health Organization (WHO) Consultant, a member of the independent evaluation team set up jointly by the Government of India and the WHO, and a member of the Task Force for the Eradication of Leprosy constituted by the Indian Ministry of Health and Family Welfare. His research involvement has been valued at the THELEP (Therapy of Leprosy) Steering Committee of the WHO and the THELEP Scientific Working Group since 1982. His most recent appointment was as Medical Consultant for India with The Leprosy Mission International.

Dr Christian's priority at Karigiri was staff development and training. Under his leadership the vital areas of service, research and training were strengthened, and particular attention was accorded to relationships between staff, patients and the community.

Dr Christian concluded his first annual report with words which spoke of hope and confidence in God, and the firm conviction of his guidance for the future:

> 'Be our strength in hours of weakness
> In our wanderings be our guide
> Through endeavour, failure, danger
> Father, be there at our side'.

Lepr Rev (1988) **59,** 266–272

Letters to the Editor

A LESSON FROM THE DECLINE OF TUBERCULOSIS AROUND THE WORLD

Sir,

I was interested to see a report (*Lepr Rev*, 1987; **58:** 1–5) relating to operational problems in leprosy programmes in the event of a decline in endemicity. The editorial has rightly emphasized its concern for the proper placement of staff with specialized training in leprosy, who will be underutilized as their load is reduced. Often health planners hold the optimistic view that these facilities now available only for leprosy sufferers, can be utilized to meet other public health needs of the future.

In this regard we have another lesson to learn from similar problems faced by tuberculosis centres and sanatoria when the need for the specialized institutions for that disease was declining. At the same time in India and other countries in South East Asia, the rate of infection and prevalence of the disease remained static and the absolute number of cases have increased as a result of the population explosion.[1] Nevertheless, as in leprosy, highly effective regimens and short courses of treatment made hospitalization unnecessary in most cases of tuberculosis. The need for thoracic surgery declined rapidly. WHO recommendations for domicilliary treatment of this disease have been adopted widely. All these measures have drastically reduced the need for sanitoria and specialized centres in India and in various parts of the world, despite the fact that the incidence is still remarkably high. In such a situation the health planners felt that the specialized staff and the facilities can be used to meet needs such as converting the sanatoria into general hospitals with thoracic surgery units or as referral centres for TB and other chest diseases.

I would like to share my observations seen while visiting some of these 'converted' centres in India. All of them were run by voluntary organizations. The outcome was not encouraging for reasons such as the following:

1 Most of the centres were situated away from towns and cities. Therefore very few people used these facilities.
2 There was a lack of confidence among the public about the capabilities of specialized staff to handle other conditions, however similar it may have been to their original area of specialization.
3 There was a reduction in input from donor agencies and the donors.

This shows that in the wake of the continuous decline of leprosy rates already being observed,[2] leprosy institutions should plan and set their priorities ahead of time. Needless to say that in any such planning, priority has to be given to the strategy of maintaining a static workload when the leprosy caseload decreases. Implementation of such policies in different stages will avoid unforeseen setbacks, e.g. increasing the ratio of the caseload of other conditions in proportion to the reduction of caseload of leprosy to maintain the workload.

It takes some time to build up the liaison and confidence necessary among the public where leprosy centres function, if integration of leprosy with other primary health case programmes, has to be initiated. It also takes time to retrain and enhance the skills of the personnel. Finally, it may adversely affect the monetary support to leprosy programmes, if the over optimistic impression is created among the masses that there is a rapid decline in leprosy after MDT, and by not mentioning the need to take care of complications among cured leprosy patients with residual disabilities.[3]

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R PREM KUMAR

LEPROSY ERADICATION IN PARAGUAY

Sir,

With much concern we read the item 'Leprosy eradication in Paraguay in the near future (*Lepr Rev*, 1986; **57:** 94).

The Board of Directors of the Patronato de Leprosos del Paraguay, considers it necessary to make the following comments:

1 The Malcolm L. Norment Clinic under Patronato's sponsorship has completed 55 years of continuous charitable work in the control of leprosy in Paraguay.

2 The Clinic works in close cooperation with the Leprosy Department of the Ministry of Public Health and Social Welfare of Paraguay in the programme for the control of leprosy patients through the use of multidrug therapy (MDT), since 1981, in a specific area of the City of Asuncion.

3 Our experience based on the use of MDT (currently Isoprodian–RMP) is as follows:

Number of patients with MDT	210
Number of patients that complete treatment	86

Months of treatment needed to achieve bacteriological negativity, according to classification

	LB	TI	Total
12 months	28	19	47
12–18 months	15	6	21
19–24 months	7	—	7
25–36 months	7	1	8
Over 36 months	3	—	3
Total:	60	26	86

Number of patients deceased: 1 case.

Number of patients quitting MDT treatment due to:

Intolerance	38 cases (77%)
Change of address	5 cases (10%)
Lack of education	6 cases (13%)

Based on the above statistics of the area under our control, the Patronato de Leprosos del Paraguay deems it very premature to assess the possibility of eradicating leprosy in the Asuncion area, Capital City of Paraguay, due to:

1 The large number of patients quitting treatment due to intolerance, 38 cases, 77%.

2 The short post-treatment control periods so far:

	Cases
1–6 months	5
7–12 months	9
13–24 months	19
25–36 months	23
Over 36 months	30
Total:	86

We hope that the above information will contribute to clarify the leprosy problems in Paraguay.

ANIBAL FADALAE
R R ORTIZ

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REPLY: LEPROSY ERADICATION IN PARAGUAY

Sir,

This is to thank the Board of Directors of the Patronato de Leprosy, Paraguay, for pointing at a report on the Paraguay project, based on a wrong press release. Of course leprosy has not yet been eradicated in Asunción, and probably will not be eradicated in Paraguay until 1990. I did not know of this notice, and I am really glad that due to your letter I have an opportunity to rectify this.

As to the matter itself, I certainly have to make some distinct and critical remarks. The Paraguay Project is directed to the eradication of leprosy and tuberculosis in Paraguay and includes at least 6000 cases of leprosy and 24,000 of tuberculosis. Until the end of 1987, more than 1600 of these leprosy cases, from Asunción and some country areas, were taken into treatment. Under the direction of Dr A Alvarenga and Dr O R Leguizamon this programme has progressed so well that it has been possible to start projects in the countryside and other cities. Both authors reported on the state of their studies in April 1984 at the International Leprosy Congress of New Delhi, in April 1986 at the International Symposium in Wuerzburg, and in July 1986 at the International Congress of Infectious Diseases in Munich. Results will be published for example, in Fontilles (XVI, 11–31, 1987) which is available in Spanish speaking countries. This means that results are well known at an international level. Tolerance of medication was really good. Some cases of intolerance do not have irreversible consequences and seldom caused discontinuance of therapy.

Within this enormous programme, colleagues from the Patronato de Leprosos treated 210 cases. If, from this relatively small number of patients, not less than 77% were discharged because of intolerance, it only depends on a lack of follow-up care for patients. Without such aftercare, a project with these kind of aims and dimensions will never be successful.

In case those colleagues from the Patronato intend to continue with cooperation—and I do hope they will, because our several discussions in Asunción proved how in accordance our opinions were—this will make sense only if adequate patient care can be guaranteed.

E. FREERKSEN

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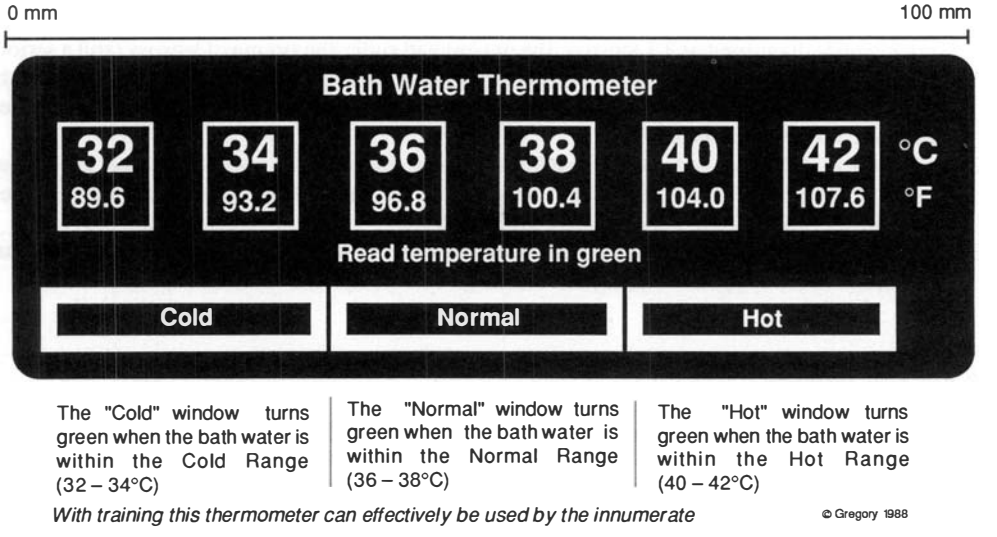
A LIQUID CRYSTAL THERMOMETER AS AN AID TO THE PREVENTION OF DAMAGE FROM EXCESSIVE HEAT IN ANAESTHETIC EXTREMITIES

Sir,

I understand that patients with leprosy whose hands or feet lack normal sensation due to nerve damage, experience considerable day-to-day difficulty in protecting their extremities against the effects of excessive heat from various sources. In recent years, liquid crystal thermometers (LCT) have been developed with a variety of different applications, one of the most practical being the measurement of body temperature in the new born infant.[1] Thermochromic liquid crystals react to changes in temperature by changing colour and can be made to respond to temperatures from −30°C to as high at 120°C depending on the application. As the temperature increases, liquid crystals behind each window will first show a red colour, then change to green, and finally blue, before becoming invisible to the eye. When a window appears in green this indicates that the temperature specified by that window has been reached.

A liquid crystal thermometer (LCT) in the form of an encapsulated plastic strip (Figure 1) has



been produced with readings from 32 to 42°C (90 to 107°F). It is used for measuring the temperature of bath water (as for instance in the bathing of infants or the elderly), but liquid crystal thermometers can also be applied to other heated surfaces such as a cup or mug and may have useful applications in the field of leprosy. Although many patients with loss of sensation in the hands and feet soon come to recognize the dangers of handling hot objects, e.g. in cooking, a liquid crystal thermometer covering the appropriate temperature range may be of value in the learning stages as a device for focussing attention on the need for constant vigilance with regard to heat. (A simple strip thermometer range 30–40°C has also been developed for use as a standard clinical thermometer[1] and another is under study as an aid to the time of ovulation in the female). I would be glad to hear from readers who consider that the bath water thermometer described above may be of value in leprosy.

E L GREGORY

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Reference

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OBSERVATIONS ON GRANULOMA MULTIFORME IN UGANDA

Sir,

Granuloma multiforme (GM) is a skin disease of unknown origin that clinically resembles tuberculoid leprosy. It was first described by Leiker *et al.*[1] in 1964. The importance of its early recognition by leprosy workers, particularly in some parts of Africa, cannot be overstressed, for the following reasons:

1 If erroneously diagnosed as TT leprosy, the patient will suffer the stigma of leprosy (still a serious matter in many countries): and no amount of leprosy drugs will effect a cure. Moreover, the leprosy worker's credibility will be challenged when the patients eventually realize that their lesions are not due to leprosy.
2 As lesions of GM can coexist with genuine leprosy lesions, and may 'come and go' during treatment, failure to recognize them may result in cured leprosy patients having their chemotherapy for leprosy unnecessarily prolonged.
3 Wastage of drugs by treating this disease as leprosy (particularly important now that there are suggestions that all types of leprosy should be given MDT).

Differential diagnosis

The disease starts with itching followed by skin lesions, which may continue to be irritable for up to 3 months. The lesions, which may last for months or years, often leave some residual hypopigmentation after spontaneous healing. The clinical picture varies considerably: most commonly seen varieties are annular lesions with papular or nodular edges. However, slightly elevated plaques or markedly elevated plaques may be seen. The disease has been found only among adults; with a higher incidence among females; and not among children. The lesions show no loss of sweating, no loss of sensation, and there is no nerve involvement.

The disease has been reported from Nigeria,[1–3] Kenya,[3] Tanzania,[5] the Congo[4], Zaire and the Cameroons[5] and Leiker[5] reports a very important focus on the island of Sumba in Indonesia. It would seem, therefore, that the disease is not confined to Middle Africa, as was originally thought.

Having had experience of GM in Nigeria, I found 3 cases in Uganda not long after my arrival there to work in Bukedi District. One of the patients had lesions not only on the lower arms and legs, but also on the backs of the hands—a rare site, and one which could clearly confuse diagnosis between GM and granuloma annulare. The diagnosis of GM in all 3 cases was confirmed by biopsy (Dr D L Leiker).

Furthermore in one of my cases (a female aged 47), there was a possibility of co-existent leprosy and GM, a combination which has been established by Browne[6] in a female patient in Nigeria.

I believe this disease is overlooked for two main reasons: a, it has been comparatively recently reported in the literature; and b, paramedical workers are not aware of the possibility in differential diagnosis. Since the publications listed below, do your readers have further experience of this condition?

Acknowledgments

I wish to thank Dr D L Leiker, Dr W H Jopling, Dr A S Garrett, and Dr M G Corcos for their assistance and encouragement with this letter.

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RELAPSE OR REVERSAL REACTION: THE CASE FOR A THERAPEUTIC TRIAL OF STEROIDS

Sir,

In paucibacillary patients, it is often difficult to distinguish between relapse and type I reversal (upgrading) reaction.[1–3] By definition, relapse is a recurrence of leprosy either during the surveillance period or thereafter. Reversal reaction means acute exacerbation of some or all existing lesions and the appearance of new lesions with neuritis.[4] Reaction should be recognized early and treated in time to prevent deformities. In both relapse and reversal reaction, new lesions occur which appear erythematous and oedematous and there may be associated neuritis. Severe neuritis is seen more often in reversal reaction than in relapse.[5] Differentiating relapse alone, from relapse with reversal reaction, is also difficult, especially when the relapsed lesion undergoes reaction very soon, as in the case we describe below. If histological examination of the lesion can be done, it may be possible to differentiate relapse and reversal reaction, but this facility is not universally available, especially under field conditions. Hence we propose that it is better to give a therapeutic trial with prednisolone, 30 mg daily for 10–15 days, which will control and suppress the reversal reaction, but not the relapsed lesions. Any infection, including leprosy, is disseminated and masked by steroids, but when simultaneous antileprosy treatment is given, dissemination of infection is not a problem. It has, in fact, been shown in mice experiments that steroids do not increase the multiplication of *Mycobacterium leprae*.[6]

Case report

K, male, aged 30 years, appeared in the out-patient clinic of this Institute in 1967 with numerous erythematous and infiltrated skin lesions and thickening of nerves. His skin smears were positive for AFB. A provisional diagnosis of borderline leprosy was made and this was confirmed on biopsy. The lepromin test done at that time was weakly positive. He was treated with dapsone regularly and became clinically inactive and bacteriologically negative. In 1982, the patient was advised to stop dapsone treatment and to report complaints, if any, in the future. He was under surveillance till July

1986, when he presented himself with many new lesions, of small to medium size, of 1 month duration over face, abdomen, front and back. The lesions had well-defined margins; they were erythematous, swollen and with a smooth and dry surface. The peripheral nerves were not thickened. One plaque on the left side of the face near the eye was large in size with impending lagophathalmos. We were not sure of neuritis of left facial nerve twigs supplying oribularis oculi muscle. A biopsy of the lesion on the abdomen was done and sent for histopathological examination. The patient was treated with steroids, i.e. prednisolone 40 mg daily along with multidrugs of paucibacillary regimen, i.e. rifampicin, 600 mg monthly supervised, and dapsone, 100 mg daily. After 10–15 days of steroid therapy the patient recovered from the impending lagophthalmos and the oedema of the plaque on the face cleared; the other erythematous and oedematous lesions of skin became pale and flattened. With a further course of steroid therapy the patient recovered completely from his ocular weakness on the left side, and all dermal lesions became flat. Our diagnosis of the case as a reversal (upgrading) reaction was confirmed by the histopathology report which showed it as BB (mid-borderline) leprosy with reversal reaction.

Comment

There is no doubt that it is difficult to distinguish relapse from reversal reaction by clinicobacteriological examination alone. Histopathology may be helpful, but the non-availability of such a facility in many programmes and the time taken for the report to be available, seriously delays the diagnosis of reversal reaction and its effective management. Hence we recommend a simple course of prednisolone, 30–40 mg daily for 2 weeks, to see if the signs of suspected reversal reaction subside (erythema and oedema of dermal lesions). In such cases the disease will not flare up or disseminate if the patient is given antileprosy drugs simultaneously. The use of corticosteroids in field situations in optimum dosage is also recommended by other workers.[7–9] Wheate[5] states that it is a difficult task to differentiate between relapse and reversal reaction in the field and that precise criteria should be developed to identify these 2 conditions. We suggest that the clinical response to steroids may be a valuable indicator in this context.

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Lepr Rev (1988) **59,** 273–276

Teaching Materials and Services

Handbook of Leprosy by W H Jopling 3rd edition; ELBS

We have on several occasions drawn attention to the English Language Book Society, which makes available selected books for purchase in many developing countries, at remarkably low prices. The third edition of W H Jopling's *Handbook of Leprosy* is available at only £4.50. Apply to any reputable bookseller, the British Council office in your area, or to William Heinemann Ltd, 23 Bedford Square, London WC1B 3HH.

OXFAM–LEPRA packs of teaching–learning materials

About 20 packs remain; then the service will close. Apply OXFAM, 274 Banbury Road, Oxford OX2 7DZ, England.

Contact; story telling for health teaching

Contact is a bimonthly publication of the Christian Medical Commission, a sub-unit of the World Council of Churches. It is published in English, French, Spanish and Portuguese, with a present circulation in excess of 26,000. The December 1987 issue dealt with the value of story telling for health teaching. Each issue also carries valuable information on teaching and learning materials and training courses.

Effective teaching; Dundee, Scotland

Although too late for this number of our Journal, it is worth recording that a course on Effective Teaching has just been held in the Centre for Medical Education, Ninewells Hospital and Medical School, Dundee DD1 9SY, Scotland, UK—and is likely to be repeated in future years. This Centre continually holds courses of instruction on medical teaching and is probably one of the most active in Europe in this field. Much of the content is relevant for those working in Third World countries.

Community Based Rehabilitation; a course in London

The Tropical Child Health Unit, Institute of Child Health, University of London, 30 Guildford Street, London WC1N 1EH, runs a course leading to a diploma for teachers and planners of Community Based Rehabilitation in Developing Countries. Further details from the Course Principal at the above address.

Education for Health

From a recent issue: 'Village education helps to change attitudes towards leprosy in India,

Despite a great deal of knowledge about leprosy, there are still instances when people with the disease are treated as outcasts in India. To improve the situation, the Gandhi Memorial Leprosy Foundation has been recruiting village representatives to influence their communities.

The foundation's director, S P Tare, reports a number of cases where the approach is seen to be working.

In one village, leprosy patients were barred from bathing in the public pond. Students from the local high school, who had heard lectures organized by the foundation, took the lead in persuading other villagers that there would be no danger if everyone used the pond for bathing.

By appointing contact persons, and taking care to identify people to whom other villagers turn for guidance, attitudes are gradually being changed, says Mr Tare, adding: "It is only by involving the people in health education that the social stigma of leprosy can be removed."

Meanwhile, a health education manual has been produced for those involved in leprosy work. The manual, published by the International Federation of Leprosy Associations, is designed to help health workers communicate more effectively in different areas of leprosy control, such as treatment sessions, school surveys, village health talks, and motivating local authorities to support leprosy patients.

The purpose is to help health workers learn to understand the point of view of patients and communities, and to develop skills in communication.

The federation is based at 234 Blythe Road, London W14 OHJ, England.

Apply Education for Health, WHO, Avenue Appia 1211, Geneva, Switzerland.

Rapid diagnosis of infectious diseases

In a recent issue of the *Bulletin of the World Health Organisation*, 1988; **66,** (1). 115–21, the News and Activities section carries the following information on rapid diagnosis of infectious diseases and production of immunological reagents:

'The general objectives of the WHO Programme on Rapid Diagnosis of Infectious Diseases and Production of Immunological Reagents, which was reorganized in 1985, are to develop countries' capabilities to produce immunodiagnostic reagents and to strengthen the institutional framework for effective support of clinical diagnosis and epidemiological surveillance of infectious diseases. The programme is oriented to developing countries, and activity concentrates on the rapid identification of viral, bacterial, parasitic, and rickettsial diseases at various levels from local laboratories to national reference diagnostic centres. Several diagnostic techniques are now available and others appear promising, but their implementation demands the availability of high quality reagents. The production, control, and distribution of such reagents is therefore also a very important part of the programme, whose principal components are described below.

Introduction of simple diagnostic methods to laboratory practice

Following are the principal techniques recommended by WHO for routine use in diagnostic laboratories.

The *agglutination test*, which is effective in identifying various microorganisms, is very simple and inexpensive. In the slide or tube form, the test has found application in the diagnosis of *Salmonella*, *Shigella*, *Brucella*, and *Neisseria meningitidis* sero-groups. The simplicity of the test makes it a suitable model system for the development of other diagnostic tests; indeed, any new, more complex method would only be recommended for practical use if it offered some definite advantage over the agglutination test, such as greater sensitivity.

Another widely used diagnostic test recommended by WHO is *passive agglutination*, in which the antigen or antibody is precoated on a carrier material. Traditionally, microorganisms or red blood cells have been used as the carrier but, recently, various materials, e.g., the surfaces of particles of bentonite, microscopic fibres of regenerated cellulose, the internal pore surface of microscopic agar-gel beads, polyacrylamide gel, and polystyrene beads, have been proposed for this purpose. Various indicators, such as radioisotopes, fluorochromes, and enzyme substrates, may be used to quantify the results of the test.

ELISA (*enzyme-linked immunosorbent assay*) is a versatile method for the diagnosis of a wide range of infectious diseases. ELISA methods can be used to detect antigens in tissues and cells and also to identify IgM antibodies—thereby permitting the rapid identification of diseases. Usually, a spectrophotometer is required to quantitatively read the results; however, with the recent introduction of dot-immunobinding assays, results can be read without any equipment. This innovation has led to the development of assays for the simple, rapid, sensitive detection of antibodies against a wide range of infectious agents.

The *immunofluorescence* test can be used in local diagnostic laboratories, although a fluorescence microscope is required to read the results. Indirect immunofluorescence is one of the best methods currently available for the rapid diagnosis of many organisms, and, in the case of acute respiratory viral infections, virus antigens in pharyngeal aspirates can be identified in 30 minutes to 2 hours. To encourage laboratory workers to use the ELISA and immunofluorescence tests, WHO has produced bench manuals on both of these methods, and standard conjugates of anti-immunoglobulins labelled with horseradish peroxidase or fluorochromes are also available. Single copies of the manuals and samples of the standard conjugates are available upon request from: Chief, Microbiology and Immunology Support Services, World Health Organization, 1211 Geneva 27, Switzerland.

Medical schools in Africa

We are grateful to the Information Service in the Programme of Health Manpower Development, WHO, for a complete list of medical schools in Africa. We publish here a selection, from countries where leprosy is still a significant problem, in view of the importance of ensuring that medical students receive proper instruction during their training.

Angola:
Faculdade de Medicina, Caiza Postal No. 116, Luanda.

Benin:
Faculté des Sciences de la Santé, Université nationale du Bénin, B.P. 188, Cotonou.

Burkina Faso:
Ecole supérieure des Sciences de la Santé, B.P. 7021 Ouagadougou.

Cameroon:
Centre universitaire des Sciences de la Santé, Université fédérale du Caméroun, B.P. 1364, Yaounde.

Central African Republic:
Faculté des Sciences de la Santé, Université de Bangui, B.P. 1383, Bangui.

Congo:
Institut supérieur des Sciences de la Santé, (INSSA), Brazzaville.

Côte d'Ivoire:
Faculté de Médecine, Université d'Abidjan B.P. V 166, Abidjan.

Ethiopia: Faculty of Medicine, Addis Ababa University, PO Box 1176, Addis Ababa.
Gondar College of Medical Sciences, Addis Ababa University, Gondar.
Jimma Health Science Institute, Jimma, Kaffa.

Gabon:
Centre universitaire des Sciences de la Santé (CUSS), B.P. 4.009 Libreville.

Ghana:
University of Ghana Medical School, PO Box 4236, Accra.
School of Medical Sciences, University of Science and Technology, University Post Office, Kumasi.

Guinea:
Faculté de Médecine, Institut polytechnique "Gamel Abdel Nasser," Conakry.

Kenya:
College of Health Sciences, University of Nairobi, Box 30195, Nairobi.

Liberia:
A.M. Dogliotti College of Medicine, University of Liberia, Box 1018, Monrovia.

Madagascar:
Faculté de Médecine, Etablissement d'Enseignement supérieur des Sciences de la Santé, Université de Madagascar, B.P. 375. Antananarivo.
Faculté de Médecine, Etablissement d'Enseignement supérieur des Sciences de la Santé, Université de Madagascar, Ambodrona, Mahajanga.

Mali:
Ecole nationale de Médecine et de Pharmacie du Mali au Point 'G', B.P. 1805, Bamako.

Mozambique:
Faculdade de Medicina, Universidade Eduardo Mondlane, Av. Dr Salvador Allende, Caixa Postal 257, Maputo.

Niger:
Faculté des Sciences de la Santé, Université de Niamey, B.P. 237, Niamey.

Nigeria:
University of Benin, College of Medical Sciences, P.M.B. 1154, Benin City, Bendel State.
College of Medical Sciences, University of Calabar, Calabar, Cross River State.
College of Medicine, University of Nigeria, Enugu, Anambra State.
College of Medicine, University of Ibadan, Ibadan, Oyo State.
Faculty of Health Sciences, University of Ife, Ile-Ife, Oyo State.
Faculty of Health Sciences, University of Ilorin, Ilorin, Kwara State.
Faculty of Medical Sciences, University of Jos, P.M.B. 2084, JOS, Plateau State.
Faculty of Medicine, Bayero University, Kano, Kano State.
College of Medicine, University of Lagos, P.M.B. 12003, Idi-Araba, Lagos, Lagos State.
College of Medical Sciences, University of Maiduguri, Maiduguri, Borno State.
College of Health Sciences, University of Port Harcourt, Port Harcourt, Rivers State.
College of Health Sciences, University of Sokoto, Sokoto, Sokoto State.
Faculty of Medicine, Ahmadu Bello University, Zaria, Kaduna State.

Rwanda:
Faculté de Médecine, Université nationale de Rwanda, B.P. 30, Butare.

Senegal:
Faculté de Médecine et de Pharmacie, Université de Dakar, Dakar.

Somalia:
Faculty of Medicine, National University of Somalia, PO Box 15, Mogadishu.

Sudan:
College of Medicine, University of Juba, PO Box 82, Juba.
Faculty of Medicine, University of Khartoum, PO Box 102, Khartoum.
Faculty of Medicine, University of Gezira, Wad Medani.

Togo:
Faculté de Médecine, Université de Bénin, B.P. 1515. Lome.

Uganda:
Medical School, Makerere University, PO Box 7072, Kampala.

United Republic of Tanzania:
Faculty of Medicine, University of Dar es Salaam, PO Box 65001, Dar es Salaam.

Zaïre:
Faculté de Médecine, Université de Kinshasa, B.P. 834. Kinshasa XI.
Faculté de Médecine, Université de Kisangani, B.P. 2012, Kisangani.
Faculté de Médecine, Université de Lubumbashi, B.P. 1825, Lumbumbashi.

Zambia:
School of Medicine, University of Zambia, PO Box 50110, Lusaka.

Zimbabwe:
The Godfrey Huggins School of Medicine, University of Zimbabwe, PO Box A 178, Avondale, Harare.

Interactive video: medical student teaching, Bristol, UK

Dr Adrian Longstaffe, Director, Interactive Video Unit, Department of Pathology, The Medical School, Bristol, UK has produced a tutorial for the teaching of pathology to medical (and veterinary) students and the following is from the early paragraphs of his descriptive brochure:

Shortly after deciding to implement a computer-assisted learning (CAL) programme, the organizers became aware of a CAL initiative by Dr Pat Harkin at Leeds University. This consisted of a BBC based microcomputer system with tutorials illustrated by colour transparencies displayed on random access carousel projectors under computer control. At the same time, at Leicester University, Dr Jane Mercer was coordinating a multidepartmental project to produce a pathology videodisc.

With all this developmental work already in progress, it became obvious that the time was right to build on this experience by implementing a major IV learning system at Bristol. This was to be used as a working unit for the medical, veterinary and dental undergraduate students and at the same time was to be available as a base for further development of IV both within the University and within other UK pathology departments.

A project proposal was submitted to the Computers in Teaching Initiative (CTI) of the University Grants Committee (UGC) which resulted in an award in November 1986. Following a further grant from the University of Bristol early in 1987, the first stages of the project were put in motion.

Phase one of the project consists of workstations made up of BBC Master microcomputers controlling Philips VP831 videodisc players through a software ROM called Videostar. The signals are mixed by a Cox genlock board and an Abbey Audio overlay unit before being displayed on a Philips CM 8533 medium resolution colour monitor. The workstations in the Medical School are networked with Econet to a 20 Mbyte hard disc and have a single 5·25″ floppy disc drive.

Pathology teaching is an ideal subject for use with videodisc as it can be taught using still pictures for which the videodisc has an extremely high capacity and short access time. (Up to 54,000 stills per side maximum search time 5 seconds.)

In collaboration with Dr Jane Mercer and the Department of Pathology at Leicester University, the first of a series of collaborative videodiscs was produced in the early months of 1987. Entitled *U.K. PATH I*, it contains 10,600 still pictures of gross and microscopic specimens of diseased tissues together with 1000 stills of normal undiseased tissue. This disc will be the first of a series, with regular updates produced very few years.

Criteria to determine the exact end of MDT in leprosy

The proceedings of a workshop held in Würzburg on the occasion of the inauguration of the Armauer-Hansen Institute are now available from: Armauer-Hansen Institut, Hermann-Schnell-Str. 7, D-8700 Würzburg, PO Box 348, West Germany. We are grateful to the Director, Dr Susanne Pritze for drawing our attention to this interesting publication; copies are available on application to the above address.

Leprosy for medical practitioners and paramedical workers: Ciba-Geigy

The third, revised edition of this excellent booklet, written by R H Thangaraj and S J Yawalkar, published by Ciba-Geigy in 1988, is now available and copies may be obtained from the company, CH 4002, Basle, Switzerland.

Lepr Rev (1988) **59,** 277–279

News and Notes

Tropical Diseases and HIV Infection; UNDF–World Bank–WHO, Kenya, 1987

An important meeting was held in Nairobi, Kenya in December 1987 on 'Interrelations of Tropical Diseases and HIV Infection', sponsored by the UNDP/World Bank/WHO Special Programme for Research and Training on Tropical Diseases (TDR) and the WHO Global Programme on AIDS (GPA). The main objectives of the meeting were fourfold: 1, to review what is known about the interactions of HIV infection and tropical diseases; 2, to determine the major research questions raised by these interactions; 3, to design appropriate outline epidemiological protocols to answer the questions; and 4, to disseminate the findings of the meeting to encourage the relevant research. Following plenary sessions, the participants formed 3 working groups to plan studies, respectively, on malaria, mycobacterial diseases and other parasitoses. Jointly, TDR and GPA have made this undertaking a priority area for research, and funds will be allocated for relevant research proposals.

In the context of leprosy control the following issue of particular concern were listed:

1 Are people infected with HIV more or less likely to develop clinical leprosy?
2 What are the effects of a coexisting HIV infection in an individual who develops clinical leprosy (e.g. is there downgrading to lepromatous leprosy?).
3 If, as a consequence of issue(s) 1 and/or 2, there is an increase in the number of cases of lepromatous leprosy in an area, does this lead to increased incidence rates of leprosy among those not infected with HIV?
4 Are persons infected with HIV and also with *M. leprae* but who die from HIV-related causes before they develop clinical leprosy likely to be sources of *M. leprae* infection? (This might also increase the risk of leprosy among those in the community not infected with HIV).
5 Are the present leprosy treatment regimens sufficient, particularly in terms of relapse rates, for tuberculoid and lepromatous leprosy patients also infected with HIV?
6 Are the incidence rates of Type I and II reactions and adverse drug reactions increased in leprosy patients with HIV infections?
7 Does clinical leprosy accelerate the progression of HIV infection to AIDS?

Source: WHO document TDR/GPA/TD-HIV/87.3

The Leprosy Mission (International)—change of address

Please note that from the beginning of September 1988 The Leprosy Mission (International) will be moving to 80 Windmill Road, Brentford, Middlesex TW8 0QH, United Kingdom.

Acworth Leprosy Hospital, Bombay

We are grateful to the Honorary Secretary, Mr S S Naik, Acworth Leprosy Hospital Society for Research, Rahabilitation and Education in Leprosy, Wadala, Bombay, 400 031, India, for information about publications from their centre: 1, Competitive examination in leprosy for medical students—a report; 2, Rehabilitation projects in leprosy—16 years experience; 3, The Dr Raghavendra Row Memorial Fund for leprosy teaching; and 4, Involvement of students in leprosy health education programme—an experiment.

In addition, a 4-page news bulletin on leprosy in Marathi (the State language) has been written and circulated free of charge to 2000 paramedical workers in Maharashtra.

The unquiet eye; a diagnostic guide: Oxford, UK

This is a 97-page booklet, written by Mr A J Bron, Department of Ophthalmology, the Oxford Eye Hospital, Walton Street, Oxford, UK, published in 1981 by Glaxo Laboratories Ltd. It is extensively illustrated with high-quality pictures and has numerous sections on methods of examination. Apply to Glaxo Laboratories Ltd, Greenford, Middlesex UB6 0HE, England. Some of the points in the book are also discussed by the author in an 18-minute film strip, available from the same address.

Orientation in leprosy for doctors, HKNS, India

This is a 28-page booklet, written by Drs E S and R H Thangaraj and Dr K C Das, published by HKNS, 1 Red Cross Road, New Delhi 110 001, India, covering all important aspects of the subject for doctors. It is well illustrated with colour pictures and should be invaluable not only for doctors but also for medical students, especially in India.

Hansenologia; Dermatologia Tropical: Portuguese; Professor Talhari, Brazil

This is a 108-page paperback, covering all aspects of leprosy, profusely illustrated in black and white and colour, written in Portuguese and published in 1984. Enquiries to Professor Sinesio Talhari, Centro de Dermatologia Tropical e Venereologia 'Alfredo da Matta', Manaus, Amazonas, Brazil.

AIDS in the Americas

Volume 21, Number 4, 1987 of the *Bulletin of the Pan American Health Organisation* carries an article on the Acquired Immunodeficiency Syndrome (AIDS) in the Americas, which warrants close study. The enormity of the problem is described in some detail and Table 1 lists the number of cases and known deaths from AIDS in all countries of the Americas, by subregion and country. Brazil, for instance is recorded as having 2013 known cases and 734 deaths. Two paragraphs from the text warrant quotation:

The economic costs of AIDS are also huge. For example, in the United States an estimated US$1·5 billion will be spent for drug treatment of AIDS patients alone in 1991, and the total cost of direct medical care that year is projected at US$16 billion. The combined impact of the pandemic of AIDS, AIDS-related diseases, and neurologic disease upon health care, insurance and legal systems, economic and social development, and indeed entire cultures and populations will be extraordinary and profound.

Already, the depth and extent of personal and public reaction to AIDS throughout the Region has been considerable. However, this response has been generated by only 48,104 reported AIDS cases in this Region and about 59,600 worldwide. The potential stresses resulting from the occurrence of 270,000 projected AIDS cases in the United States alone by 1991 plus many thousands of cases in the rest of the Region may be correspondingly much greater.

Social science research on leprosy: GMLF, India

Dr A M Kurup, Chief Research Scientist, has sent a copy of a 118-page publication describing '. . . a national seminar on social science research on leprosy organized by the Centre for Social Science Research on Leprosy and attended by a multidisciplinary group of Social Scientists, Medical Scientists, Leprologists, Leprosy Programmers and International Agencies.'

This is a valuable source of information, notably on research aspects. Copies are available from: Gandhi Memorial Leprosy Foundation, Hindinagar, Wardha 442103, Maharashtra, India.

China Leprosy Journal, March 1988

It is a pleasure to regularly receive copies of this Journal from the People's Republic of China and to see evidence of so much continuing activity at both laboratory research and field levels. This one (Volume 4, Number 1) has 27 contributions, covering many important aspects of leprosy and it is a pity that the language (Chinese throughout) limits their usefulness. (We have in fact already written to the Editor of the *China Leprosy Journal* to respectfully propose that more extended summaries in *English*, together with the full names and addresses of authors would be much more valuable, and much cheaper to distribute, that the Journal in its present, essentially Chinese, form. *Editor*).

Dapsone syndrome due to weekly 'maloprim'

The *Lancet* of 5 March 1988 carries an interesting letter from Dr Lindsay Grayson and colleagues in Fairfield Hospital, Fairfield 3078, Victoria, Australia on the above syndrome, occurring in a 30-year-old adult female who became seriously ill 4 weeks after starting maloprim and chloroquine. Their concluding paragraph runs as follows:

'The dapsone (or DDS) syndrome was first noted by Lowe in 1950' and has been associated with daily doses of 50–300 mg. The complication can prove fatal. The dapsone syndrome occurs during the first 6 weeks of therapy and the clinical picture is of a severe infectious mononucleosis-like illness with exudative tonsillitis, lymphadenopathy, and mononucleosis in association with prominent exfoliative dermatitis, hepatitis, and eosinophilia. Our patient had taken pyrimethamine/sulphadoxine without ill-effect and subsequently took chloroquine alone without complication, which suggests that dapsone 100 mg weekly (as maloprim) was responsible for the reaction. This would be the first report of this syndrome occurring on low-dose therapy. The patient responded well to high-dose steroids but slow steroid reduction was needed.

(We would appreciate correspondence from readers on any similar cases, *Editor*.)

Leprosy: topics for research in endemic countries

In the Autumn 1987 issue of *TDR Newsletter*, Number 24, pages 6 and 7 carry lists of topics for research in endemic countries, on which the respective Steering Committees invite proposals. Those under leprosy are as follows:

Development and validation of seroepidemiological methods, e.g. specific tests for antibody/antigen detection, for *Mycobacterium leprae* using molecular probes and for cell-mediated immune (CMI) responses both *in vivo* and *in vitro*; development of prophylactic vaccine(s): development of candidate subunit structures, establishment of effective vectors for immunization, identification of CMI-inducing antigens/epitopes, production of recombinant and/or synthetic vaccine candidates; identification of means to overcome pathogenic host responses; development of human and animal model systems, identification of genetic markers of disease, investigation of lymphocyte subsets and their repertoires and the role of lymphokines; identification of methods to prevent and control nerve damage; investigations of nerve damage in humans and animal models, determination of the role of CMI in nerve damage, identification of the function of cells/antigens in tissue lesions; identification of means for better use of existing drugs: testing of new combinations in animal models, conduct of clinical trials in multibacillary patients using newer regimens; assessment of needs for improved therapy: study of relapses after cessation of treatment, identification of risk factors for relapse, survey of rifampicin-resistant leprosy; identification of new drugs for leprosy: selection from inventory and/or design of new compounds, development of new microbial screens, conduct of animal studies for antileprosy activity, conduct of short-term clinical trials in humans; identification of new drugs for treatment of leprosy reactions: development of models for screening drug activity, testing of active drugs for pharmacological and mutagenic effects, toxicity and structure/activity relationships; and evaluation of immunotherapeutic methods: conduct of immunoreactivity trials, study of immunotherapy combined with chemotherapy.

Apply: Secretary, Special Programme for Research and Training in Tropical Diseases (TDR) World Health Organization, 1211 Geneva 27, Switzerland.

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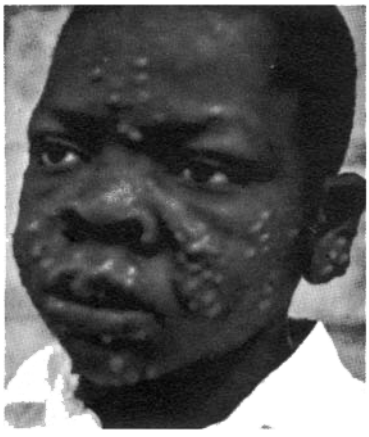

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Lamprene
Capsules of 50 mg and 100 mg

Composition: Clofazimine. *Capsules* of 50 mg and 100 mg. Indications: Lamprene, employed in combination with dapsone and rifampicin (®Rimactane), serves as treatment for multibacillary forms of leprosy, such as lepromatous (LL), borderline lepromatous (BL), and mid-borderline (BB) leprosy, as well as erythema nodosum leprosum (ENL). Combined chemotherapy is necessary in order to prevent the emergence of resistant strains of *M. leprae*. Dosage: *Adults* (of approx. 60 kg body weight): for the treatment of multibacillary leprosy (LL, BL, BB) the WHO (World Health Organisation) recommends the following dosage schedule: Lamprene: 300 mg once a month under surveillance + 50 mg once a day as self-medication. Rifampicin: 600 mg once a month under surveillance. Dapsone: 100 mg once a day as self-medication. This threefold combination should be administered for at least 2 years and, whenever possible, until such time as the skin smears become negative. If the patient develops ENL, the treatment with dapsone and rifampicin should be continued as before, whereas the dosage of Lamprene should be raised to at the most 300 mg per day. These high daily doses must not be given for longer than 3 months. *Children:* Children should receive lower doses adapted to their body weight. Administration: The capsules should be taken at mealtimes or together with milk. Contra-indication: Known hypersensitivity to clofazimine. Precautions: Leprosy patients suffering repeatedly from abdominal pains and diarrhoea, as well as those with liver or kidney damage, should if possible not be treated with Lamprene. Treatment with daily doses of Lamprene exceeding 100 mg should not be continued for longer than 3 months, and during this time the patient should be kept under medical supervision. If gastro-intestinal symptoms develop during the treatment, the dosage should be reduced or the interval between doses prolonged. In the event of persistent diarrhoea or vomiting, the patient should be hospitalised. Pregnancy and lactation: As in the case of any form of drug therapy, Lamprene should be employed with caution during pregnancy, especially in the first 3 months. Clofazimine crosses the placental barrier and causes temporary discoloration of newborn infants. The active substance also passes into the breast milk. Unwanted effects: The following side effects have been observed: Reddish to dark-brown discoloration of the skin and of the leprous lesions, particularly in pale-skinned patients at sites exposed to light. Discoloration of the hair, conjunctiva, cornea, and lacrimal fluid, as well as of sweat, sputum, urine, and faeces. This discoloration is reversible, although in the case of the skin it often does not disappear completely until some months after the cessation of treatment. Dryness of the skin, ichthyosis, pruritus, photosensitivity, acneform eruptions, and non-specific skin rashes. Nausea, vomiting, abdominal pains, diarrhoea, anorexia, loss of weight, and eosinophilic enteropathy. Storage: Protect from heat and moisture. Packages: 100 capsules of 50 mg or 100 mg. Further information is available on request.

Rimactane
Capsules of 150 mg and 300 mg

Composition: Rifampicin. *Capsules* of 150 mg and 300 mg. Indications: *Leprosy:* in combination with other antileprosy drugs as treatment for lepromatous and dimorphous (borderline) forms of leprosy, as well as in patients with other forms of leprosy, in whom intolerance of, or resistance to, other antileprosy drugs is encountered. Administration: At least ½ hour before a meal on an empty stomach according to WHO recommendations. Contra-indications: Hypersensitivity to rifamycins. Jaundice associated with reduced bilirubin excretion. Note: Daily treatment with Rimactane is generally better tolerated than intermittent therapy. Resumption of treatment with Rimactane after termination of a course of long-term therapy with the drug involves risks and should therefore, if possible, be avoided. In patients with *liver diseases*, as well as in *severely undernourished patients*, treatment with Rimactane entails a higher risk and its therapeutic benefits should therefore be weighed against the possibility of its causing further damage. If such treatment is necessary, the dosage must be correspondingly reduced. During pregnancy the use of Rimactane should, if possible, be avoided. Rimactane passes into the breast milk. Mothers in whom its use proves unavoidable should refrain from breast-feeding their infants. Unwanted effects: Gastro-intestinal disturbances; disorders of hepatic function, e.g. mild transient elevation of the transaminase values, may occur – chiefly at the start of treatment – but do not generally necessitate discontinuation of the medication; isolated occurrences of jaundice, leucopenia, and eosinophilia; particularly in patients taking Rimactane intermittently or in patients in whom daily treatment is resumed after a temporary interruption, side effects – possibly of immunopathological origin – may take the form of influenza-like symptoms ('flu syndrome) and, in rare instances, of cutaneous manifestations, thrombocytopenia, purpura, and fever, as well as of acute renal failure, dyspnoea, or haemolytic anaemia. If serious complications occur, such as thrombocytopenia, purpura, renal failure, or haemolytic anaemia, treatment with Rimactane should be stopped at once and not reinstituted at a later date. Packages: 8, 16, and 80 capsules of 150 mg; 8 and 40 capsules of 300 mg. Further information is available on request.

1. Chemotherapy of leprosy for control programmes, Report of a WHO Study Group, WHO Technical Report Series 675, WHO, Geneva 1982.
2. S. J. Yawalkar, J. Languillon, S. K. Hajra, A. C. McDougall, S. Gosh, D. V. A. Opromolla, C. J. S. Tonello. Once-monthly rifampicin plus daily dapsone in initial treatment of lepromatous leprosy. Lancet 1199, 29 May 1982.