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CI/CIDSE Conference

On

Tuberculosis and HIV

The Challenge of Cure and Care

Wuerzburg, Germany
8th - 11th March 1999

Bankers: Postgirokonto Nürnberg (BLZ 760 100 85) Nr. 13898-853
Dresdner Bank AG, Würzburg (BLZ 790 800 52) Nr. 30 11 574 - Liga eG, Würzburg (BLZ 750 903 00) Nr. 300 6565

A compilation of background papers worked out by staff of the different units of the Medical Mission Institute

Editorial

Although the term "institute" in the name of the Medical Mission Institute may suggest a strong focus on academic research, its primary mission is to share practical solutions and provide rather basic advise for partners in developing and fast developing countries who work at peripheral levels close to the communities they serve.

In fulfilment of this commitment members of the Institute have elaborated background papers on some topics of outstanding interest in respect to tuberculosis and HIV/AIDS. They address issues such as "women", "children", "prisons" "refuges" or measures how to protect health workers from infection with tuberculosis during their work. We are aware that the complex issues of the conference could suggest other topics as well. Yet, we have chosen these topics because of the working experience we have.

It is a great pleasure to present these papers to the participants of the CI/CIDSE Conference on TB and HIV/AIDS for their kind consideration. As with other 'policy documents' we have edited we welcome your critical comments.

Klemens Ochel
Head of the Unit Health Services and HIV/AIDS
Medical Mission Institute
Wuerzburg. March 99

TB - HIV: FACTS, BASIC ISSUES AND BACKGROUND

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INTRODUCTION

The growing epidemic of human immune deficiency virus (HIV) has breathed new life into an old enemy – Tuberculosis (TB). In both developing and industrialised countries, Tuberculosis has re-emerged as a serious health problem. From 30 to 70 percent of young adults in developing countries are infected with *Mycobacterium Tuberculosis*. They carry a risk of developing the disease, although this risk is relatively small. Tuberculosis kills more youth and adults than any other infectious disease in the world today. It is a big killer comparable to malaria. More than 100,000 children die of Tuberculosis each year. The above mentioned increase can be attributed to at least four factors:

- the growing migration from countries or settings where TB is common,
- the transmission of TB in congregate settings (e.g. health care facilities, correctional facilities or shelters for the homeless),
- a deterioration of the health care infrastructure and
- the HIV/AIDS pandemic.

As more specific causes of the world-wide increase in Tuberculosis which are mainly related to the health sector, experts identified non-compliance with control programmes, inadequate diagnosis and treatment, ambulatory and self-administered treatment. This may lead to situations where Tuberculosis becomes incurable, in particular when multi-drug resistant species of the TB germ are causing the infection.

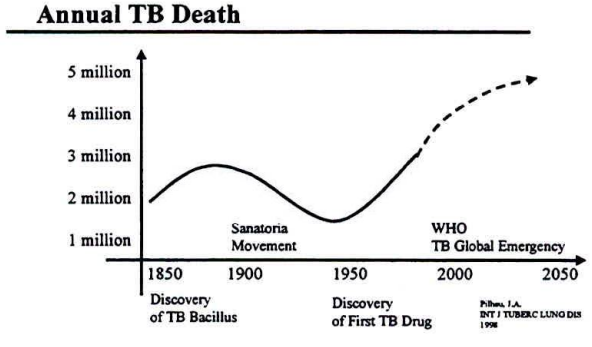
Tuberculosis and HIV/AIDS are problems which are not just additive, but augment each other in regard to their negative effects on the existence of humans. The HIV epidemic spurs the spread of TB and increases the Tuberculosis risk for the whole population. One third of the increase in the incidence of TB in the last five years can be attributed to HIV. By the end of the century, an estimated 15 percent of TB cases will be attributed to HIV. HIV weakens the immune system. Someone who is HIV-positive and infected with TB is 30 times more likely to become sick than someone infected with TB who is HIV-negative. WHO estimates that by the end of the century HIV infection will annually cause nearly 1.5 million cases of TB disease that otherwise would not have occurred! TB is the leading cause of death among people who are living with HIV. It accounts for almost one-third of AIDS deaths world-wide, 40 percent of AIDS deaths in Africa and in Asia. In Africa, HIV is the single most important factor determining the increased incidence of TB in the last ten years. Of nearly 31 million people world-wide who were HIV-positive in 1997, around one-third were believed to be infected with TB.[i] In 1993, the World Health Organisation (WHO) took an unprecedented step and declared Tuberculosis a global emergency, so great was the concern about the modern TB epidemic.

The health sector reform, which is currently taking place in low or middle income countries following the implementation of structural adjustment programmes, advocates the use of rational measures aimed at increasing efficiency of health services. However the negative effects on national TB control programmes in many countries underlines, that cuts in governments' social budgets have had the effect of favouring the development of the private medical and pharmaceutical sector, rather than rationalising the choice of priorities. The emphasis on cost recovery in basic health services is penalising the poorest groups, most vulnerable also for TB and HIV. Due to the rapid implementation of the health sector reform TB control programmes were disintegrated in several ways:

- the central programme unit very often was diluted and its own specific budget disappeared,
- antituberculosis drug supply systems were 'integrated' into pharmaceutical supply systems that were defective, inefficient and run by irresponsible people,
- bureaucratic conflicts happened with those in charge of general health information systems, or
- arbitrary cuts in hospital beds available for Tuberculosis patients have taken place, with no redistribution of human and financial resources, and no previous or parallel improvements in the conditions for ambulatory treatment of patients.

Decentralisation has been decided upon in a bureaucratic fashion and has been applied inadequately. The provincial and regional levels have not always received the supplementary resources they needed and at the peripheral level Tuberculosis control is still considered a 'vertical' programme. Presently, TB-control programmes are still managed as vertical programmes. In this manner, integration into primary health care services is made difficult. This raises the question what can be a solution in the future, a promotion of TB-programmes within the health sector, or the strengthening of primary health care through integration of TB and HIV work? What is the position and the role of church related socio-medical services and in which way should they develop in the future?

Figure 1:
Historical development of number of deaths due to TB



ISSUES RELATED TO TB AND HIV

History of Tuberculosis

Tuberculosis probably occurred as a sporadic and unimportant disease of humans in their early history. Epidemic spread began slowly with increasing population density. Experts estimate that a social network of 180 to 440 persons is required to achieve the stable host-pathogen relationship necessary to become endemic in a community. From the 17th century onwards the epidemic slowly spread world-wide as a result of infected Europeans travelling to and colonising distant sites. At first it was brought to the American continent. As late as 1880s, Tuberculosis was not commonly seen in Russia and it was relatively uncommon in India and at the same time it was almost unknown within the interior of sub-Saharan Africa.

Neither the vaccination against TB, nor the use of antibiotics have been decisive for the decline of Tuberculosis in industrial countries since 1850. History has taught public health science that multi-sectoral and integrated developmental approaches may lead to success.

The Magnitude of the Problem and Epidemiological Facts

(Key Issues: Incidence, Prevalence, Morbidity, Mortality, Demographic Changes)

The world-over 2 billion of people, this means one third of the population, are infected with TB bacilli[ii]. More than four million persons are estimated to get infected with both TB and HIV per year, of whom 80% live in developing countries. Three countries, India, China, and Indonesia, account for half of the annual world total of new TB cases.

Annually, 9 million people fall ill with active tuberculosis, 2 million in Africa alone. Nearly 3 million TB cases per year occur in south-east Asia. Over a quarter of a million TB cases per year occur in Eastern Europe. It is estimated that at least 8% of all TB cases world-wide show a connection to HIV infection. Of the 15.3 million people estimated to be infected

15.3 million people estimated to be infected with HIV and *M. Tuberculosis* at the end of 1997, 11.7 million (76 percent) live in sub-Saharan Africa. There are reports from some African countries that this proportion has risen to 60% already[iii],[iv]. HIV infection accelerates the development of active Tuberculosis and its course. Active Tuberculosis increases the morbidity and fatality of HIV infected persons[v],[vi]. The incidence of Tuberculosis is expected to rise from 10.2 million cases by the year 2000 to 12 million by 2005.

The TB germ, *Mycobacterium Tuberculosis*, is highly prevalent in much of the developing world and in poor urban parts of industrialised countries. In these communities, people typically become infected in childhood. But a healthy immune system usually keeps the infection in check. In the past, before the era of HIV, only 5 to 15% "carriers" ever developed active tuberculosis. TB germs are spread through the air from patients with active pulmonary tuberculosis. For people living with HIV and TB, the risk of developing active Tuberculosis is 30 to 50 fold higher than for people infected with TB alone. World-wide, over the next four years, the spread of HIV will result in more than 3 million new TB cases among both HIV-positive and HIV-negative people.

The world over 3 million people die of TB annually, one third of them in Asia. The highest fatality rates have been documented in Africa where 91-100 per 100,000 die of TB. That means that every twentieth death is caused by TB. TB is the cause of 7% of all deaths in developing countries. It is assumed that 26% of TB deaths in adults could be prevented.

Box 1:
Epidemiological Features of other frequent diseases in developing countries:

- measles:
  100 million cases per year
  3 million deaths per year
- malaria:
  300 million infections world wide,
  110 million cases,
  2 million deaths per year
- diarrhoea:
  death of 3 million children (<5ys.) per year,
- STIs/ STDs:
  10-20% of the adult population in developing countries; causing a decline of 10-17% by disability and suffering

Trends in Industrial Countries

The annual incidence of TB cases in the United States of America and in the Netherlands decreased from about 50 per 100,000 people to about 10 per 100,000 during the period 1953 to 1984. Since 1985 the rate has now increased to 35 per 100,000, the largest increase being observed in the age group 25 to 45 years. The results of a Swiss epidemiological study published in 1993 (using the method "DNA fingerprinting") are: a) there is at present in Europe an active spread of TB bacteria in the same social environment as in the United States of America, b) there is proof of a spill-over to the general population, c) the spread of strains of resistant bacteria could be documented, and d) public health measures are not coping adequately with the extent of the spread as they concentrate on traditional groups at risk like immigrants, the homeless, etc., and not the general population[vii]. In industrial countries it is unlikely that TB as a problem of public health undergoes an essential increase as the rate for TB infection is low for the age group who is vulnerable for HIV/AIDS[viii].

In the following some particular medical facts are outlined. The risk of TB reactivation in an HIV infected person is said to be 7.9 cases for 100 person years[ix]. HIV infected persons without prior TB infection develop primary TB in 37% of cases after exposition[x]. Disseminated and extrapulmonary forms of TB are more frequent in immunodeficient adults (factor two to five). 24-42% of HIV infected persons who do not suffer from AIDS show extrapulmonary diseases. Of those with AIDS 70% do.[xi] There is no increased risk as regards probability for other persons to become TB infected when in contact with an HIV infected person than from contact with a not HIV infected one. The explanation for that is the low rate of sputum positive pulmonary TB

in HIV infected persons. Epidemic incidence of TB disease caused by highly resistant bacteria poses a special problem. These bacteria are MDR-TB (multi drug resistant TB). The fatality rate is said to be 70-90% within 4-16 weeks after the onset of MDR-TB disease[xii]. It seems that hospices, AIDS wards or other institutions exclusively specialised for the treatment and care of AIDS patients promote this incidence. In addition, the increase in TB disease is a growing burden on health budgets. TB treatment costs have risen 50 times in the large cities of the USA during the past five years[xiii].

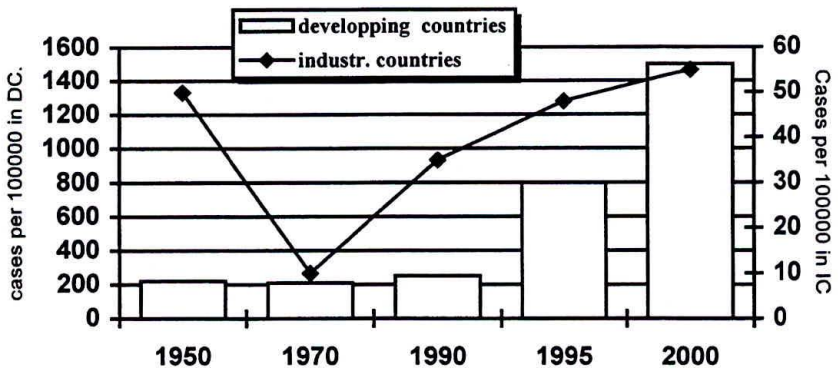
Trends in Developing Countries

In many countries, the AIDS virus is the major cause of huge increases in TB incidence over the last ten years. For example, in Malawi the number of TB cases increased from 5300 in 1985 to just over 20 000 in 1996, of which about 60% are attributable to HIV.

The average prevalence of TB infection in countries of sub-Saharan Africa in the age group 15 to 49 years is reported to be 40-50%. Relevant studies in Uganda, Rwanda and Ex-Zaire revealed an infection rate in adults of 60 to 100% in the mentioned age groups.[xiv] Incidence as well as prevalence of TB show a five to ten times higher figure in developing countries compared to industrial ones and are rising further. A doubling of figures was found in Uganda within a period of 4 years. Although factors like war, poverty, malnutrition, overpopulation and alcoholism are important in the promotion of TB, the spread of HIV infection is the most important risk factor in developing countries.[xv] It is said that HIV infection resulted in an additional 150,000 TB deaths in Africa alone during 1990.[xvi] The number of sputum negative cases is rising. In Africa, 20% of TB cases in the HIV infected are sputum negative, and in Asia it is said to be one quarter of all cases.

An undiagnosed or untreated sputum positive TB patient is likely to infect on average 10-14 other contact persons in the course of one year[xvii]. Of the latter 0.5 to 1.2 persons will develop TB disease during the following 1-3 years. According to a calculation made in Uganda and based on a model which considers the presently valid figures for HIV prevalence 20% and annual infection risk 2%, the frequency of cases suffering from active TB will rise 12% by the year 2000 to an incidence of 4218 per 100,000 inhabitants[xviii]. This means that 2% of the age group 15-49 will fall ill with active TB.

Figure 2:
Incidence trends in industrial and developing countries from 1950 to 2000



FACTORS DETERMINING HEALTH SEEKING BEHAVIOUR

(Key Issues: health cultures, stigma, discrimination;)

Social issues leading to greater vulnerability are relatively well researched. But insufficient attention is given to determinants of health seeking behaviour. A difference has to be made between factors lying in the person and external factors related to the social, cultural but also political environment.
It sometimes seems completely forgotten by programme managers that that the health culture of the population at risk is contributing enormously to the complexity of TB control.

Problems arise from the fact that it very often defers from that of clinical professionals. On the other hand the professional language used in programmes aggravates the stigma. Affected people feel offended by terms like "case load", "active case finding", "sputum positive patient", etc.

Social scientists call the health culture the information and understanding that people have learned from family, friends and neighbours as to the nature of a health problem, its cause, and its implications. Sick people use their health culture to interpret their symptoms, give their meaning, assign them severity, organise them into a named symptom, decide with whom to consult, and for how long to remain in treatment. Astonishing enough is the fact, that in research of health-seeking behaviour, very little attention has been given to the question how people who are symptomatic actively cope with Tuberculosis. It may be helpful for deeper analysis to use a health belief model. The health belief model predicts that the response of people to a threatening illness depends on four factors:

- the believe to be susceptible to the condition,
- the appreciation how severe they think the illness is,
- the assumption what benefits they think can be obtained by taking preventive action, and
- the perception how costly the barriers to obtaining that assistance might be.

Research has found that rather than the symptoms themselves, it is the varying interpretation of their meaning and what they imply for a functioning social life that motivates group members to seek care. Patients interpretation of symptoms, decisions on when and from whom to seek help, and the response to medical regimens conform to their own explanatory model of what is wrong, influence help seeking pathways. It is a pity that health care providers often do not recognise this. Patients efforts to cope are often construed by providers as ignorance, lack of concern, vacillation or non-adherence. It has to be recommended that in any programme, the doctor-patient relationship has to be analysed in respect to the impact of socio-cultural factors and adherence to Tuberculosis treatment. Three specific topics need to be assessed according to the setting:

- the perception and interpretation of Tuberculosis symptoms that trigger the search for medical care
- the influence of social stigma on help seeking adherence to therapy, and
- the adherence to treatment recommendations

Anyhow, as a matter of fact, the retention of patients' in treatment is particularly difficult in nations, regions or neighbourhoods where the level of formal education is low, difficulties and cost of transportation to clinic settings are enormous, patients lack fund with which to access clinical care while experiencing loss of income producing labour during clinic visits, and the organisation and administration of health care is problematic. These effects need to be assessed and to be addressed in a multiple interacting treatment and care model, if really cure of the patient is being aimed at.

MEDICAL ASPECTS

TB is a contagious disease. Like the common cold, it spreads through the air. Only people who are sick with pulmonary TB are infectious. *Tubercle Bacilli* can only be made visible under the microscope by acid fast staining and are found in sputum smears. Therefore, other names are used like acid fast bacilli (AFB) for *Mycobacterium Tuberculosis* or smear positive or sputum positive cases for patients. When infectious people cough, sneeze, talk or spit, they propel TB germs known as bacilli into the air. A person needs only to inhale one of these to be infected. The probability that Tuberculosis will be transmitted depends on infectiousness of the person with tuberculosis, environment in which exposure occurred and the duration of the exposure. Persons of the highest risk of becoming infected with *Mycobacterium Tuberculosis* are close contacts. Infection rates usually range from 21 % to 23 % for the contacts of infectious TB-patients. HIV infected persons with Tuberculosis disease are not considered more infectious than non-HIV-infected persons with Tuberculosis disease. Left untreated, each person with active TB will infect on average

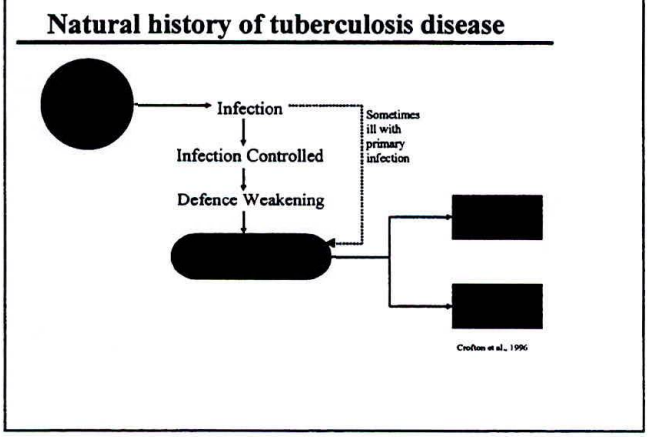
between 10 and 15 people in each year. But people infected with TB will not necessarily develop the disease. The immune system 'walls off' the TB bacilli which, protected by a thick waxy coat, can lie dormant for years and years. If someone's immune system is weakened, the chances of getting sick are greater. Some medical conditions increase the risk that TB-infection will progress to disease. The risk is approximately three times greater (e.g. among diabetics) up to more than one hundred times greater (e.g. among people with HIV-infection) for persons who have medical conditions than for those who do not. Such conditions include substance and drug use (esp. drug injection), recent infection with M. Tuberculosis (within the past two years), findings suggestive of previous TB (in a person who received inadequate or no treatment), prolong corticosteroid therapy, cancer of the head and neck, renal diseases, chronic malabsorption syndromes and low body weight.

The emergence of strains of Mycobacterium Tuberculosis that are resistant to anti-mycobacterial agents is a world-wide problem. The World Health Organisation –WHO- and the International Union Against Tuberculosis and Lung Diseases –IUATLD- have established a global project of drug resistance surveillance that is based on standard epidemiological methods and quality control through an extensive network of reference laboratories. The highest rates of multi-drug-resistant Tuberculosis have been reported in Nepal (48%), Gujarat State, India (33,8%), New York City (30,1%), Bolivia (15,3%) and Korea (14,5%). MDR-TB is caused by inconsistent or partial treatment, when patients do not take all their medicines regularly for the required period because they start to feel better, when doctors and health workers prescribe the wrong drugs or the wrong combination of drugs, or the drug supply is unreliable.

From a public health perspective, poorly supervised and incomplete treatment of TB is worse than no treatment at all. When people fail to complete standard treatment regimens or are given the wrong treatment, they may remain infectious. The bacilli in their lungs may develop resistance to anti-TB drugs. People infected by them will have the same drug-resistant strain. Drug-resistant TB is more difficult and more expensive to treat, and more likely to be fatal. In industrialised countries TB treatment costs around US $2,000 per patient, but rises more than 100-fold to up to US $250,000 per patient with MDR-TB. Up to 50 million people may actually be infected with drug-resistant TB. There is no cure affordable to developing countries for some multidrug-resistant (MDR) strains, defined as resistant to the two most important drugs, isoniazid and rifampicin.

Although patients with HIV-associated TB mostly have typical clinical patterns, their frequency of atypical manifestations is increased, making diagnosis more difficult. Recurrence rates may be higher than in HIV-negative persons through relapse or reinfection. Drug resistant TB has been associated with HIV, particularly in the U.S.A., where HIV-associated TB may occur in the context of other factors that decrease access to health care such as intravenous drug use and migration. Drug reactions, particularly skin eruptions, are more common in People Living With HIV/AIDS (PLWHA), notably to thiacetazone, which may lead to life threatening reactions. *M. Tuberculosis* also enhances the replication of HIV, leading to higher viral levels and possibly to more rapid progression of HIV disease in PLWH who develop TB compared to those who do not.

Figure 3:
Descriptive Model of the outcome Tuberculis infection



INTERACTIONS BETWEEN TB AND HIV PROGRAMMES

Impact of HIV on TB control programmes

According to experiences made in TB control programmes the impact of HIV on the programmes are manifold. First of all programmes have to deal with an increased number of patients. From 5 up to 10 percent of dually infected adults develop TB each year. If HIV seroprevalence rises as high as 10 percent of the adult population, 100 to 200 new cases of HIV-related TB can be expected per 100,000 total population. In most countries, this will represent at least a twofold increase in numbers of cases, with the most heavy impact on urban areas.

Problems arise in respect to diagnosis: In addition to the effect of an increased burden of Tuberculosis on establishing the diagnosis, it is also more difficult to diagnose individual cases. Furthermore, HIV causes several other pulmonary problems that may be misdiagnosed as TB.

Treatment becomes more complicated: The advent of highly active anti-retroviral therapy (HAART) in the industrialised countries may cause problems of drug interactions in the few who are able to afford this treatment; the protease inhibitors are contra-indicated while taking rifampicin. TB programmes are increasingly facing patients with other medical problems associated with HIV in addition to TB.

Despite all efforts morbidity and mortality will increase: Even in programmes that use the DOTS strategy, mortality in HIV-positive patients is high, mostly from other manifestations of HIV disease. This leads both to loss of the community's confidence in the programme as well as to deterioration in staff morale. Adherence to therapy and follow-up may be threatened by other medical and social problems affecting HIV-infected patients.

The stigma affects a wider group of people: The association of TB with HIV is widely recognised in communities bearing the brunt of the dual epidemic. HIV remains nearly everywhere a highly stigmatising infection. Some patients may choose not to attend health facilities through fear of being diagnosed with TB and by association with HIV. Misconceptions about TB and HIV also lead to some health care workers worrying about the risk of acquiring HIV from their patients. Other staff may discriminate against TB patients, perceiving them to be less deserving of care on account of the association with HIV infection.

The risk of nosocomial and institutional transmission has a negative impact on staff motivation: The high HIV seroprevalence among patients facilitates the spread of TB. As the HIV prevalence rises in the general population, institutional transmission also becomes a serious concern for those working in health care facilities or living in crowded surroundings in other institutions such as prisons, mines or barracks.

Box 2:
Public Health Model of HIV and Tuberculosis

- in a low HIV prevalent area, less than one per 1,000 of the potential population suffers from Tuberculosis (100 per 100,000 prevalence of the disease)
- in a low HIV prevalent area, one per 1,000 of the total population will develop Tuberculosis disease (incidents of disease)
- in a high HIV prevalent area, three to four per 1,000 of the total population will develop Tuberculosis annually (incidents of disease). About to 40 to 60 % of all TB-patients in sub-Saharan Africa are infected with HIV
- about 10 % of HIV-negative persons infected with Tuberculosis will develop in their lifetime
- almost 8 % of HIV-positive persons infected with Tuberculosis will develop Tuberculosis per year or have a lifetime risk of 30 % or greater
- HIV infection appears to be the highest risk factor for reactivation of Tuberculosis infection into active disease, however, more and more data suggests that a substantial proportion of TB infections in HIV-positive patients is the result of newly enquired infection.
- in the early stages of HIV-infection, the clinical presentation of Tuberculosis is similar to that in any immuno-competent host; in the advanced stages of HIV infection, about 1/3 will present as pulmonary form only, 1/3 as extra-pulmonary form 1/3 as a combination of both

In summary, HIV has adversely affected TB control programmes both directly through increases in caseloads and more difficult diagnosis, but also indirectly through its effect on health-seeking behaviour and the interaction between patient and provider at the health services. The control of TB in areas with a high prevalence of HIV infection is therefore, to a considerable degree, dependant on the success of the HIV control programme.

Impact of TB on HIV control Programmes

Since TB is one of the most common complications of HIV infection and is treatable, accurate diagnosis and effective treatment of TB should be two of the most important components of any HIV care program. As prophylaxis against opportunistic infections becomes more widely sought by HIV-infected persons in developing countries, preventive therapy for Tuberculosis in HIV-infected persons will become increasingly discussed. Although preventing TB in people living with HIV/AIDS (PLWA), who have not yet developed active TB, has been demonstrated in clinical trials, there are operational challenges to ensure that patients with active TB are not given preventive therapy whilst they need full treatment. Failure to exclude active disease will result in inappropriate monotherapy and lead to the development of drug resistance.

TB programmes and some countries have a well-developed strategy that is integrated into provincial and district hospitals and urban and rural health centres, and which ensures delivery of care to TB patients and monitors outcome. In contrast, strategies for care of patients with HIV-related illnesses are at an earlier stage of development in most affected countries. TB patients are also an easily identified group that has a higher prevalence of HIV infection than the general population. They are, therefore, a suitable target for interventions to reduce further transmission of HIV and, if possible, biomedical interventions to prevent or treat other HIV-associated problems.

In summary, TB diagnosis and treatment are vital components of any HIV care program. There exist considerable opportunities for synergy between TB and HIV programmes. The decentralisation and increasing autonomy for districts that health sector reform is bringing to many countries should be used as an opportunity to enhance the concerted management of the dual epidemics. Possible actions include: training; community care; IEC manuals and guidelines; advocacy; surveillance; collaboration with NGOs; and social mobilisation.

The potential synergy of TB and HIV programmes

The following statements refer mostly to the national level. Non-governmental organisations and church institutions have to develop their role in relation to the concepts outlined below. From case studies in five developing countries, WHO and UNAIDS have identified the following basic obstacles to the creation of greater awareness and commitment:

- lack of good epidemiological data on each of the dual epidemics
- lack of professional consensus about cost-effective approaches to TB control, STD control and HIV containment and
- reluctance to monitor effectiveness (coverage and outcome) of ongoing TB and HIV/AIDS programs

According to experts, real progress in controlling TB and providing care for HIV can only be made with a dual strategy targeting both epidemics: **TB control and HIV prevention**. This will require overcoming myths and misconceptions – and gathering the resources needed for action.

In respect to TB, their is consensus that continuing expansion of the DOTS strategy is needed to control the global burden of TB. In areas of high HIV prevalence, the control of TB is, to a considerable degree, dependant on the success of HIV control programmes. TB diagnosis and treatment should be vital components of the HIV care program, and HIV care must be included in TB programmes. It is also possible to prevent some cases of TB in PLWHA who have not yet developed active

if additional resources are available, establishment culture and drug susceptibility testing
- the establishment of treatment services within the health infrastructure where supervised short course chemotherapy is given and patient education is provided
- the assurance of a regular supply of drugs and diagnostic material
- the design of a plan of supervision and
- the formulation of a project development plan

The performance of TB Control Programmes in different countries has been assessed in 1998 by WHO and the IUATLD. Excellent progress against a global TB epidemic in nearly one-hundred countries is being overshadowed by the stalled or slow progress in many of the twenty-two countries which account for the vast majority of the world's TB cases. Table 1 (Annex) provides information on the level of performance according to different countries.

Constraints which were identified relate to financial shortages in programmes, poorly qualified staff and lack of capacity to develop and sustain effective TB programmes. During assessments and evaluations of programmes different insufficiencies can be noted. Very often there is an insufficient participation of patients and communities. Other problems are insufficiencies in respect of diagnostic services of the health sector and difficulties to achieve the necessary cure rates because of problems of adherence to treatment, effectiveness of drugs or follow-up by the health sector. Again and again it is shown that in many projects the conclusion has to be drawn that far too few people are entering the system of treatment and too many are not properly diagnosed! Experiences, how TB activities on a district level can be improved, are summed up in table 2 (Annex).

Despite adequate delivery systems, some patients with Tuberculosis do not complete treatment. Six specific interventions have been tested in randomised trials to improve adherence. Interventions examined were reminder cards, patient education and incentive for patients, help from peer group through community health workers, a combination of patient education and incentive, and intensive staff supervision. (*Note: the use of the term compliance with treatment is more and more discouraged, because it has the unfortunate connotation that the patient is docile and subservient to the provider. To complete treatment is usually an independent choice of the patient and best described as adherence. Recently, the term concordance has been suggested, to reflect the active exchange of information, negotiation, and spirit of co-operation).* A systematic review of randomised trials found that all the strategies tested seem to improve adherence. Independent effects of health education could not be assessed, and there are no trials available yet to test the effectiveness of directly observed treatment. DOTS has usually been introduced as part of a comprehensive effort to improve Tuberculosis services. The most accompanying interventions are improved accessibility of services, increased availability of drugs, changes in drug regimens, patient incentives, tracing of patients who default, and outreach efforts. Directly observed treatment may, therefore, simply be a marker for a serious commitment to Tuberculosis control. Health providers should draw on what is known to be effective when designing strategies appropriate to the local circumstances. Further innovations, especially those that are feasible in developing countries, should be evaluated in randomised control trials, before introduced into a routine practice.

DOTS

In recent years WHO has refined and promoted a specific strategy for TB control. DOTS is the name for a comprehensive strategy which primary health services around the world are using to detect and cure TB patients. The strategy depends on five elements for its success. If any of these elements are missing, the ability to consistently cure TB patients is jeopardised. The difference to other approaches is the fact that DOTS makes the health system, and not the patient, responsible for achieving a cure. There is a lively debate, if this is always positive. The five elements of DOTS:

- **directly**: resources should be directed toward identifying sputum smear positive cases for treatment. Until high cure rates are achieved, programmes should not actively search for other people in the community who might have TB
- **observed:** patients must be observed swallowing each dose of their medicine. This is especially critical during the first two months
- **treatment:** TB patients must be provided with complete treatment. Sputum must be examined under microscope after two months and at the end of the treatment. A recording and reporting system is needed to rigorously monitor and evaluate the progress made.
- **short course:** correct combination and dosage of a TB drugs must be used for the right length of time. The drug regimen includes isoniazid, rifampicin, pyrazinamide, streptomyzine and ethambutol.

Once infectious patients have been detected using microscopy services, health and community workers as well as trained volunteers observe and record patients swallowing the correct dosage of anti-TB medicines for six to eight months. After two months sputum smear testing is repeated, to check progress, and again at the end of treatment. A recording and reporting system documents patients' progress throughout. DOTS produces cure rates of up to 95 percent even in the poorest countries. DOTS prevents new infections and the development of MDR-TB.

A six-months' supply of drugs for DOTS costs US $11 per patient in some parts of the world. The World Bank has ranked the DOTS strategy as one of the "most cost-effective of all health interventions." In the few years since DOTS was introduced on a global scale, more than 1.7 million infectious patients have received effective DOTS treatment. In half of China, cure rates among new cases are 96 percent. In Peru, widespread use of DOTS for more than five years has led to the successful treatment of 91 percent of cases and a decline in the overall number of cases. In spite of this rapid progress, only 12 percent of estimated TB patients received DOTS in 1996. At the beginning of 1997, 95 out of 212 countries had adopted the DOTS strategy. Of those, 63 have implemented DOTS countrywide. If WHO targets to detect 70 percent and to cure 85 percent of new infectious TB cases are met by 2010, one-quarter of TB cases and one-quarter of TB deaths could be prevented in the next two decades.

The Centre for Epidemiological Research South Africa (HLABISA) published a study about the cost-effectiveness of directly observed treatment (DOTS) and conventionally developed treatment for tuberculosis. The essential results of that experience from rural South Africa can be summed up as follows. Directly observed treatment was 2.8 times cheaper overall, than conventional treatment to deliver. Directly observed treatment worked out 2.4 to 4.2 times more effective, costing US$900 per patient cured compared with either US$2,100 or US$3,700 for conventional treatment. Because directly observed treatment can considerably reduce a hospital stay, its implementation will increase the capacity of hospitals to cope with a rising Tuberculosis caseload, wherever the conventional approach is currently used.

The impact of the success of DOTS is limited in many developing countries by the low health coverage of the population, the allocation of insufficient sums to specific activities of the national Tuberculosis programme, particularly training and supervision and by the priority given to non infectious TB cases. It is important to note that there is no need for compulsory HIV testing, if DOTS is applied. TB patients can be cured with DOTS regardless of where they live and whether they are also infected with HIV. Hence there is no need to insist on testing for HIV. However, it makes sense to offer TB patients voluntary counselling and HIV testing which may be beneficial for planning their future.

Research

It is crucial, that the DOTS strategy should not be pursued in a way that excludes the possibility of developing other forms of TB control. It is crucial to devote resources for research

for new diagnostic tools, new drugs and effective vaccines for TB

Another aspect of research is MDR-TB. WHO's Global Tuberculosis Programme joined forces with the International Union Against Tuberculosis and Lung Disease and started the Global Project on Anti-Tuberculosis Drug Resistance Surveillance. In December 1997, a first report was published. Resistance of *M. Tuberculosis* to antibiotics is a man-made amplification of spontaneous mutations in the genes of the tubercle bacilli. Treatment with an inappropriate drug regimen, due to irregular drug supply, inappropriate prescription or poor adherence to treatment, suppresses the growth of strains susceptible to that drug, but permits the multiplication of drug resistant strains. This phenomenon is called "quiet resistance". Subsequent transmission of such resistant strains from an infectious case to other persons leads to disease which is drug resistant from the outset, a phenomenon known as primary resistance. In the report, the following important conclusions were drawn:

- Drug resistance is ubiquitous. Failure to improve TB control will lessen multi-drug resistance.
- There are several hot spots around the world where MDR-TB prevalence is high and could threaten control programmes. These are Latvia, Estonia and Russia, the Dominican Republic and Argentina and the Ivory Coast in Africa.
- There is a strong correlation between both the overall quality of TB control and use of standardised short course chemotherapy as well as low levels of drug resistance.
- The MDR-TB Level is a useful indicator of national TB control programmes performance.

Expectations in respect to classic science go into the improvement of diagnostic tests, the rapid detection of drug resistance, the development of new vaccines and the development of immuno-therapeutic agents.

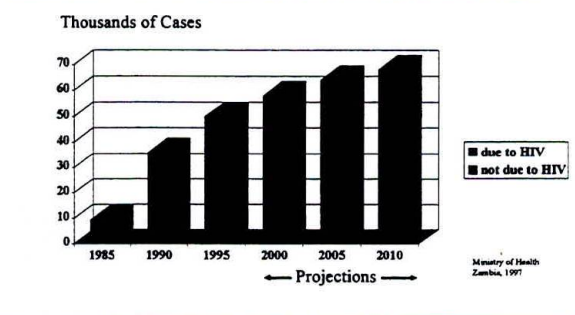
CONCLUSION

In the last decade, the HIV pandemic has contributed to the already worsening health problem of Tuberculosis. The most important factors responsible for the increase are man made like changes in the social context and growing poverty leading to migration. This goes together with the deterioration of the health care infrastructure in many countries and the fact that sometimes TB control programmes are poorly managed or under funded.

Of the 15.3 million people estimated to be co-infected with HIV and Mycobaterium Tuberculosis at the end of 1997, 11.7 million live in sub-Saharan Africa. The annual rate of new diseases of Tuberculosis is expected to rise up to 12 million by the year 2005. More than three million people will die of the disease every year. It is assumed that 26% of these TB deaths in adults can be prevented.

Real progress in controlling Tuberculosis and providing care for HIV can only be made with a dual strategy targeting both epidemics. Control of TB means curing patients, and HIV prevention means not only health education, capacity building, legal and spiritual support, but also assurance of blood safety, cure for opportunistic infections and sexually transmitted diseases. Lessons of capacity building which have been learned in the AIDS work may overcome blockages in TB control programmes in respect to help seeking behaviour and adherence to treatment. Church institutions have a specific experience to share in this respect. It is important that new alliances between public services and non-governmental services assure that the challenges of cure and care are met in the future.

Figure 4:
TB Epidemic in Zambia



ANNEXES

Table 1: State of performance of national TB control programmes

Countries with Very poor performance of TB Control		Countries which made important progress in TB Control	Countries with successful TB Control Programs
Low income countries	Middle income countries		
• Ethiopia • Afghanistan • India • Myanmar (Burma) • Nigeria • Pakistan • Sudan • Uganda	• Brazil • Indonesia • Iran • Mexico • Philippines • Russian Confederation • South African Republic • Thailand	• Bangladesh • Peru • Vietnam	• Armenia • Cambodia • Cuba • Malawi • Morocco • Mongolia • Nicaragua • Oman • Slowenia

Table 2: Measures to improve the outcome of a TB control programme

Measures to improve participation	Measures to improve the diagnostic (examination, sensitivity, reliability)	Measures to improve the therapeutic sub-system (effectiveness of drug regimen and adherence)
• Strengthen contact tracing • Reduce the stigmatisation through health education • Demystification of TB as an ordinary disease • Improvement of co-operation between health services and traditional healers • Promotion of voluntary testing and counselling services • Offer of tuberculin testing (or chemoprophylaxis) to all HIV positive patients	• Make sputum collection more efficient • Quality control of lab-technician: inter-reader variability, comparison with reference lab • Introduction of presumptive PTB treatment • Isolation of TB suspects; wearing masks obligatory for suspects (not for staff)	• In short course regimens replacements of drugs is of minor importance • Direct supervision of treatment of non-complicated cases at a peripheral level • Food or other incentives can be given to improve adherence • Monitor and evaluate cost-effectiveness of decentralisation and involvement of community

Epidemiologic Tables

Tuberculosis Control and Surveillance
Characteristics of the countries and regions in the Global Project on Anti-Tuberculosis Drug Resistance Surveillance, 1995

Country	Country/region population	TB cases notified in country/ region	Notification rate /100,00	Estimated sputum + cases
Benin	5,409,000	2,400	44	3,286
Bolivia	7,414,000	9,614	130	11,177
Botswana	1,487,000	5,655	380	2,677
Brazil	161,79000	88,109	54	58,244
China (Henan Prov.)	91,000,000	39,078	43	35,865
Cuba	11,005,866	1,579	14	991
Dominican Republic	7,823,000	4,053	52	3,872
India (Delhi state)	10,000,000	48,600	486	41,600
Ivory Coast	14,253,000	11,988	84	12,571
Kenya	28,261,000	28,142	100	17,804
Latvia	2,557,000	1,541	60	805
Nepal	21,918,000	19,804	90	16,471
Peru	23,780,000	46,787	197	26,753
Russia (Ivanovo)	1,271,100	662	52	566
Thailand	58,791,000	45,428	77	45,769
Vietnam	74,545,000	55,739	75	55,685
Zimbabwe	11,261,000	30,831	274	10,490

Characteristics and treatment outcomes of Tuberculosis patients in the countries and regions surveyed, 1995

Country	Estimated HIV (co-infection %)	Treatment success (%)	Cases for retreatment (%)
Benin	13.0	75	10
Bolivia	3.1	64	25
Botswana	50.0	72	10
Brazil	10.0	54	8
China (Henan province)	0.0	91	30
Cuba	1.3	91	7
Dominican Republic	10.0	71	16
India(Delhi state)	1.0	83	27
Ivory Coast	45.0	67	6
Kenya	30.0	73	20
Latvia	0.0	55	19
Nepal	0.7	73	8
Peru	0.4	81	15
Russia (Ivanovo Oblast)	0.0	70	14
Thailand	20.0	58	3
Vietnam	1.2	88	11
Zimbabwe	60.0	67	7

Tuberculosis Control and Surveillance Characteristics of the countries and regions in the Global Project on Anti-Tuberculosis Drug Resistance Surveillance,1995

Country	Country/region Population	TB cases notified in country/ region	Notification rate /100,00	Estimated sputum+ cases
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TUBERCULOSIS AND HIV/AIDS IN WOMEN

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INTRODUCTION

Tuberculosis is the leading infectious cause of death in women world-wide. The disease poses a major threat to women's health. Population growth, the HIV epidemic, increasing poverty and rising levels of drug resistance will inevitably increase the burden of this disease in women. Tuberculosis kills over one million women each year (1). The greatest burden of disease is in the age group 15 - 49 years. 80 % of deaths in this age group is due to tuberculosis (3, 4). It is widely not appreciated that this major cause of suffering and death in women is preventable.

WOMEN AND THE EPIDEMIOLOGY OF TUBERCULOSIS

Globally, the prevalence of infections with Mycobacterium tuberculosis is similar in males and females until adolescence, after which it is higher in males (6). Reasons for higher rates of infections among men may be due to:

- biological mechanisms placing men at higher risk of developing tuberculosis;
- greater number of social contacts experienced by men who tend to work outside the home more than women;
- undernotification in women as active case finding does not take place: suspected cases must present themselves to health services in order to get diagnosed; this puts women at a disadvantage.
- socio-economic and cultural factors (16, 17).

While the rate of infections after adolescence is higher in men than in women, more females progress to tuberculosis in their reproductive years than men of the same age. This may be due to:

- rapid hormonal changes during pregnancy;
- postpartum descent of the diaphragm;
- expansion of the lung;
- nutritional strain of lactation;
- stress and insufficient sleep due to the demands of child rearing (11, 12).

Women of reproductive age have higher mortality and case fatality rates from tuberculosis than men of the same age (18):

- increased biological susceptibility to tuberculosis related to child bearing;
- lower awareness of tuberculosis among women leading to delays in diagnosis and treatment;
- less access to health care for women;
- less income to be spent on health.

Late presentation which leads to worse prognosis is caused by fear and stigma (20-25): fear of young women not to find a husband if diagnosed; fear that the husband may take another wife; fear to get a divorce. The lower education of women may also delay presentation as signs and symptoms may not be recognized because they are unknown.

CONSEQUENCES OF TUBERCULOSIS IN WOMEN

Child survival and the welfare of households and communities are affected (28 - 30).

- There is a high risk of infection, disease and death for their children.
- If the woman dies, lack of care for children - especially daughters - becomes evident.
- The economic productivity of women is affected: reduced farming for subsistence as well as reduced production of export crops cause loss of income leading to poverty of households and communities.

TUBERCULOSIS CONTROL

DOTS (detection of infectious cases, documentation, treatment and supervision) in women is therefore vital. TB control programmes should, however, be sensitive to constraints for women:

- socio-economic factors: poverty is disproportionately high in women
- low social status and barriers in access to health care

- the reproductive role of women
- passive case-finding puts women at disadvantage

The minimum of 6 months of supervised treatment is often in conflict with womens' other duties. Women may face greater difficulties maintaining compliance:

- restrictions on women travelling alone;
- restrictions regarding being treated by male health providers;
- cultural values attached to women's health;
- lack of decision making power for women;
- fear of miscarriage due to drug taking (34);
- fear of reduced ability to breastfeed;
- fear of young women to have reduced chances to get married if diagnosis becomes known makes them discontinue visits to TB clinics.

TUBERCULOSIS AND HIV/AIDS IN WOMEN

HIV negative individuals infected with TB have a 10 % lifetime risk of developing tuberculosis. HIV positive individuals have an annual risk of between 3 and 13 % regarding progression to disease (35, 36). In one study in Africa up to 54 % of AIDS patients developed clinical TB in the course of HIV infection. While women during their reproductive years are most at risk of progressing from TB infection to disease, they are also at greatest risk of HIV infection. Women with HIV and tuberculosis are younger than men: 24:37 years (41). Thus, the HIV epidemic is increasing the incidence of TB in women in low income countries especially.

CONCLUSIONS AND RECOMMENDATIONS

Tuberculosis control should be given global health priority. It is cost-effective and can prevent an enormous lot of suffering and death. The DOTS-strategy needs to be gender-sensitive in its implementation in order to ensure that women may become aware of their special risks and have access to treatment. This needs political will of the countries affected and adequate financial resources given to TB control programmes both by governments, donor agencies and NGOs.

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APPROACHES TO ADDRESS TUBERCULOSIS IN PRISONS OF LOW INCOME COUNTRIES

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Data from several countries reveal that tuberculosis is a problem in prisons. [1,2,3] This is due to the fact that the majority of prisoners come from the poor sectors of society sharing a background of unhealthy living conditions. In addition, TB is frequently transmitted among prisoners who, in turn, become a source of infection for the general public, e.g. on the occasion of family visits or after discharge when tuberculosis was not cured during stay in prison.[4,5]

Because of the adverse implications of high tuberculosis prevalence in jails for prisoners, staff and the outside community, control programs have been started in prisons. The comparatively "closed setting" of a prison appeared to offer advantages for running a tuberculosis control program successfully.[6] However, a closer look reveals a number of problems which need to be tackled before positive results can be expected.

ENVIRONMENTAL FACTORS AND ASPECTS OF INTERNAL ORGANISATION AFFECTING THE OCCURRENCE OF TB AND ITS TREATMENT

- Overcrowding is a common feature of prisons often accompanied by poor ventilation. The latter is a special problem in countries with a cool climate where insufficient heating during periods of low temperature urges prisoners to keep windows closed for fear of freezing. Problems with ventilation get worse, if also laundry is dried in the cells/rooms because it otherwise may get stolen.
- In countries of a generally high unemployment rate, products manufactured by inmates cannot find a market leading to unemployment of prisoners. This automatically increases the time which they spend in their badly ventilated rooms.
- Where revenue from prisoners' production originally had been used for buying essential supplies including medicines, sudden economic decline, as experienced by many poorer countries, has a direct impact on food and drug provision as well as maintenance and repair of buildings, further worsening the unhygienic conditions.
- Diet is often insufficient,- either because of economic reasons or because nutritional restrictions are regarded as an adequate kind of punishment. Even if a sufficient diet is provided, repressive relationships among inmates may prevent its just distribution.
- The official power structure represented by the prison administration is accompanied by an unofficial power structure governing culture and affairs among inmates. This unofficial structure comprises of at least three levels: (1) the bosses - professional criminals often with outside connections, (2) the silent majority - those who just serve their term, and (3) the despised ones who may have offended this internal system, may be known as homosexuals (and/or rape victims within the prison) or may be outcasts from other groups.
- Communication and a certain degree of cooperation between the official prison administration and bosses is essential for any intervention which requires direct participation from the side of prisoners. Yet, the hierarchy among prisoners automatically reduces chances for any inmate of the lower categories to become involved and benefit from any program.

*The following insights are based on my own experiences during occasional visits in Philippine and Thai prisons and during an assessment of the TB situation in Moldovan prisons.[7] They match well with observations in countries of the former Soviet Union reported by Reyes and Coninx.[8]

- Regarding the official administration, low salaries, inadequate training and lack of career perspectives easily result in collusion between staff and bosses in criminal activities. This is another reason for a limited access to benefits for certain sectors of the prison population.
- Referrals from one prison to the other happen not only during the period of investigation, but also while serving a long-term sentence. They may be ordered because of
  (1) issues of internal security and/or overcrowding,
  (2) lack of food, medical facilities or staff or
  (3) even promotional reasons on grounds of prisoners' good behaviour. Such referrals hamper attempts for active case finding and lead frequently to interruption or even a complete halt of treatment for chronic conditions, because quality of health services differ between prisons. Respective decisions are often taken without consideration of a prisoner's health or treatment requirements.

ROLES AND RESPONSIBILITIES IN SERVICE PROVISION AFFECTING TB OCCURRENCE AND ITS TREATMENT

- Prison health services function under the authority of the correctional department, a unit usually attached to the Ministry of Justice. Thus, they are cut off from monitoring and/or support through the Ministry of Health for aspects of surveillance, diagnostic equipment and drug supply, control of standards of care provision, professional promotion and, last but not least, remuneration.
- Normally, the high social status attached to health personnel fuels staff motivation. However, working in a prison environment may carry with it a certain stigma. The comparatively low social reputation experienced by prison health care providers impedes their motivation to offer quality services.
- Prison health services have an ambiguous role to play: on the one hand, they are regarded by prisoners as representative of the system which is responsible for their detention; on the other, they are the first port of call for health problems and the gate keepers for access to certain benefits on account of a medical condition. Mutual trust between health service providers and prisoners cannot easily develop in such a situation.
- While tuberculosis is a widely dreaded disease also among prisoners, there is an abundance of even more immediate concerns for them. These are in the forefront, often so much so that infection with tuberculosis may be actively sought in order to get the benefits of treatment. The diagnosis of tuberculosis may permit to receive more nutritious meals or stay in the hospital for a few weeks. It will also entitle to receive drugs. Even if these are provided under strict observation, prisoners know techniques to avoid swallowing them. After return to their rooms, they may be kept for "sale" to guards in exchange for goods or some floor space to sleep on.
- On the other hand, there may be also an occasional influx of tuberculosis drugs organised by the bosses through their outside connections. These drugs are considered more effective than those offered by the prison health services. This leads to inconsistent treatment with its known consequences for development of MDR-TB.

OPEN QUESTIONS

An understanding of the above mentioned factors, which are typical for a prison situation, asks for tuberculosis control measures which address issues well beyond the medical realm and/or consistent implementation of the DOTS strategy. The following are important issues to be addressed:

1. It is essential that certain restrictive measures necessary for TB control are adopted and consistently implemented. This will be the case only if interests between providers and patients concur well enough to override concerns about personal autonomy of patients.
   - Will it be possible to agree on a TB control program in prisons looking at the differing interests of people who would need to cooperate in such a program?
   - What ethical implications has it if such a program is carried out in an environment of coercion?

2. It is essential for all tuberculosis programs to fuel and maintain motivation for high quality performance of providers and patients alike.

- What can be done to improve the situation regarding training and supportive supervision?
- What immediate priorities need to be met before a true concern regarding TB control can be expected?
- Whose message will/can prisoners trust?

3. It is essential to secure a continuous, adequate supply of anti-tuberculosis drugs as well as necessary laboratory equipment.
   - What needs to be done, if responsibility for the control program lies with a governmental department usually not involved in dealing with issues of health service organisation?
   - Is the suggestion to integrate prison health care with the health priorities of the Ministry of Health really a valid option in view of the notorious difficulties with interdepartmental co-operation? Which department, for example, will make the final decision in regard to referral of prisoners when referral is likely to result in incomplete treatment?

   It is essential to provide the required TB drugs consistently.
   - Will it ever be possible to interrupt the "black market for TB drugs" which is organised through the unofficial system with collusion of guards?
   - Who within the materially disadvantaged population of prisoners and guards can be expected to understand the negative impact of such practices on (public) health and make it a personal priority, if even well-off members of the mainstream society are not ready to adhere to DOTS on grounds that this would mean to sacrifice immediate material gains from their well paying patients who ask for new, more potent drugs?

CONCLUSION

TB control requires an assessment of priorities of different stakeholders and adaptation of messages and measures to meet immediate needs. Providing enough buildings or a balanced diet may be part of it. In addition, an adequate answer could also require a review of responsibilities in respect of areas of conflict in administrative interrelationships, which may gain from more flexible approaches. Even a review of legal codes and practices may be necessary, e.g. in regard to the adequacy of punishment in view of its risky implications. In many countries Church related organisations enjoy already established contacts with prisoners and official administration through their prison apostolates. Some of them are even involved in prison health education. They are especially well placed to address these burning issues and should be encouraged to reconsider the potential role they could play by co-operating with the public administration in this difficult field.

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MEASURES TO PREVENT TB TRANSMISSION IN HEALTH CARE FACILITIES

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Practical and affordable measures for the protection of health care workers from tuberculosis in developing and fast developing countries.

RISK OF TB INFECTION AMONG HEALTH CARE WORKERS

It is well known to health workers that they have an increased risk of getting into contact with infectious diseases during their work. Any kind of pathogenic bacteria, protozoa, viruses and fungi can be transmitted to them via the usual ways of transmission like contact with blood, through droplets in the air (aerogen) or contact with infective tissues. The majority of infections are harmless. This means, that they can easily be prevented, diagnosed or treated. It is important to make sure that they do not cause permanent damage (sequalae) and that effective preventive or curative measures are accessible also in developing countries like vaccination or antibiotic treatment. But the resurgence of tuberculosis has caused a lot of reluctance in health workers to work in TB wards or to deal with patients suspect for TB. They consider TB not only to be possibly fatal, but they know that TB may have both disabling effects requiring long term treatment and socially stigmatising properties. Furthermore this problem of nosocomial infections is aggravated by the risk of acquiring multi-drug resistant forms of TB or even HIV which is completely incurable.

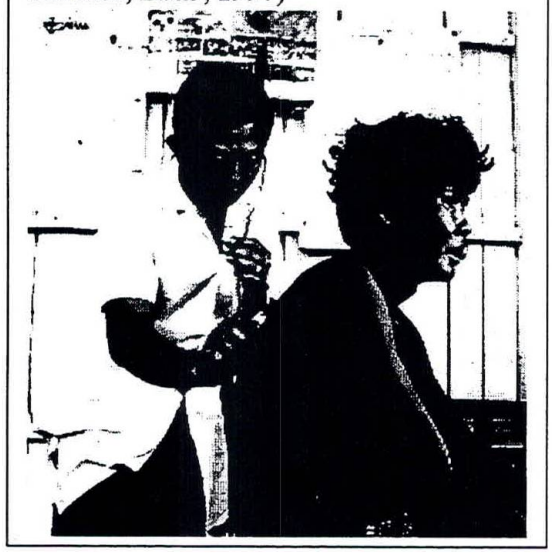
An increase of TB infections and diseases in health workers are confirmed in any health care setting in the world where TB prevalence is rising. There are several reasons for the increase of TB transmission in health care settings:

- Global resurgence of TB
- Poor hospital infection control practices
- The problem of multi-drug resistant tuberculosis and
- HIV-infection

From public health institutions in industrialised countries, TB was reported to be the sixth most common occupationally acquired infection among laboratory workers. It has been estimated that health professionals are two to nine times more likely to contract Mycobacterium Tuberculosis than the general public.

Information is limited about the risk of TB transmission to health care workers in countries with a high HIV prevalence, in particular in Sub-Saharan Africa. A study carried out in Malawi found that the rate of TB infections among nurses working in medical and TB wards was 6,600 per 100,000 - nearly 40 times higher than the case notification rate among the general population in Malawi in 1994 (180 per 100,000). This underlines that the relative risk of health workers acquiring Tubercle Bacilli in specific settings can be up to 40 times greater than that of the general population.

Figure 1: A medical assistant in Thailand is examining a TB patient (by Farmer, BMJ, 1997)



Prevention of nosocomial infections is not only a major concern for managers of health care facilities, but it is also an ethical obligation. Rates of

transmission in health services appear to be higher, if the diagnosis of tuberculosis in hospitalised patients is delayed, when patients do not receive adequate therapy or where there is unrecognised drug-resistance. In the following, practical advice is given that is reasonably effective and can be implemented in low income countries. Furthermore measures are discussed in respect to diagnosis and treatment of infectious TB patients and environmental control in order to protect health workers.

DIAGNOSIS AND TREATMENT OF INFECTIOUS TB PATIENTS

The most cost-effective method of interrupting the chain of TB transmission is the rapid diagnosis and treatment of infectious patients. There are several ways of insuring as early a diagnosis as possible with the least possible risk of transmission of infection to others.

- adherence to criteria for suspected pulmonary tuberculosis (suggested by the national TB control programme or respective TB authorities);
- investigating TB suspects as outpatients, i.e. that all suspects are screened by one office; helpful is the use of an outpatient card register and a laboratory sputum register;
- decreasing delays in sputum collection and delivery of results to hospital wards: one possible solution to these delays is to appoint a ward officer, who follows an explicit list of duties;
- decreasing delays in laboratory smear microscopy; most hospital laboratories stain sputum smear using the Ziehl-Neelsen method and examine for acid-fast bacilli using light microscopy; central hospitals can speed up the diagnosis of pulmonary TB by investing in a fluorescent microscope;
- improving the safety of sputum smear microscopy for laboratory workers: the exterior of sputum containers may be contaminated; laboratory workers should therefore clean the outside of such containers with a suitable disinfectant before opening and processing them; a matter to improve the sensitivity of sputum smear diagnosis has been successfully tested in Ethiopia, putting household bleach in the sputum and concentrating the bacteria by centrifugation;
- isolation of infectious TB patients: patients with suspected pulmonary tuberculosis can be kept together in one area of the ward, that is screened of from other sections, particularly those occupied by patients with known and suspected HIV/AIDS infection; it is particularly important that infectious patients are isolated from those most susceptible to tuberculosis, e.g. immuno-suppressed patients and infants; after treatment, immuno-competent patients with drug-sensitive tubercle bacilli following a shortcourse chemotherapy rapidly become non-infectious (this occurs in about two weeks); to increase safety, it is preferable to continue to isolate all smear-positive patients until they have become sputum smear-negative;
- use of short course chemotherapy for smear-positive, pulmonary tuberculosis: short course chemotherapy is much more effective and after two months of therapy, 90 % of patients become smear-negative, irrespective of HIV-sero status; short course chemotherapy should be used wherever possible for all smear-positive pulmonary TB cases.

ENVIRONMENTAL CONTROL

One of the most effective measures to reduce TB transmission in health care settings is the improvement of ventilation.

- TB wards and other high risk areas in the hospital: the wards should have plenty of light, many windows that open to the outside and doors to the other parts of the hospital that are kept closed most of the time; exhaust vents that move air from wards to the outside are useful, but may be too costly for many health care institutions; the same principles apply to outpatient clinics and to rooms in which sputum induction procedures are carried out; ultraviolet light has a germicidal effect on tubercle bacilli, its effectiveness in reducing TB transmission has not been confirmed in practice. UV-lights are also expensive, require proper maintenance and are potentially harmful if not installed properly;
- for working conditions in laboratories: clear guidelines are suggested by WHO and the IUATLD which should strictly be followed.

PROTECTING THE HEALTH CARE WORKER

First of all, it is important that health care workers must know about tuberculosis and about the risk of transmission in health care settings. It can be presumed that knowledge about TB is generally very low. Training and continuous education are a first priority. The measures outlined below should then be considered for personal protection.

- HIV-infected staff should avoid working with TB-patients and TB-specimens: if a health care worker is known to be HIV-seropositive, he or she should be removed to other, safer areas within the hospital; due to stigma and discrimination, voluntary testing may be difficult; another approach is to advise health care workers who exhibit some of the clinical features of symptomatic HIV-infection, to request transfer from high risk environments;
- face masks: special face masks, called HEPA masks, ensure protection against TB by filtering out droplet nuclei of diameter one to five micrometer; however since each mask costs US$ 5 to US$ 7, no low income country could afford to use them for widespread TB control in health care settings; standard surgical masks have been developed to prevent the exhalation of particles; while they are effective in doing so, their efficacy in preventing the inhalation of droplet nuclei containing tubercle bacilli of diameter one to five micrometer is less than 50 %; the use of such masks by TB-patients with a productive cough who are being transferred to other parts of the hospital for investigation such as chest radiograms, may help to reduce transmission of the disease; routine use of such masks by staff or ward visitors is not generally recommended, although they may be of some help for staff supervising coughing procedures;
- patient cough hygiene: educating patients to place a hand in front of their mouth when coughing and ensuring that coughing patients are examined with their heads turned away from the health worker, are hygienic measures of unproved benefit, but which are simple to implement;
- screening of health care staff for infection and disease: tuberculin skin testing at regular intervals is controversial because many workers do not comply with screening requirements, the prevalence of true positive tests is low, and in consequence, the cost per case of tuberculosis prevented is high; therefore surveillance of health care staff in areas of high TB prevalence by regular tuberculin testing is probably of little value, because many health care workers will already have a positive skin test; regular screening using chest radiographs every six to twelve months is also probably not cost-effective; the most cost-effective way of screening therefore is to follow rigorously the guidelines for screening TB suspects recommended by IUATLD and WHO, and to treat health care workers as soon as active tuberculosis is confirmed;
- use of BCG-vaccine: in low income countries, the majority of health care workers will have received BCG-vaccine at birth; the questions then arise whether re-vaccination with BCG confers additional protection against tuberculosis, and whether BCG vaccination of adult, HIV-positive individuals is safe. WHO discourages the use of BCG re-vaccination on the basis of lack of evidence for additional protection and concerns for safety; BCG-vaccine can safely be given to children without symptomatic HIV-infection, but it should be withheld from children with clinical AIDS or with symptomatic HIV-infection; at present, BCG-re-vaccination as a means of preventing TB in health care workers cannot be recommended;
- use of Anti-TB drugs like Isoniacid for preventive therapy: trials have shown that Isoniacid given to HIV-infected persons, significantly reduces the annual rate of TB; Isoniacid preventive therapy may rarely be associated with hepatitis; the risk of complication is generally low, although it is greater for persons over 50 years of age, and for those who are heavy drinkers; at present, WHO and the IUATLD hold that there is insufficient information to recommend implementation of Isoniacid preventive therapy for co-infected persons, as one of the components of TB-control strategies in programme settings world-wide. Research is on the way to evaluate feasibility and cost-effectiveness.

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TUBERCULOSIS IN CHILDHOOD: DIAGNOSIS, PREVENTION AND THERAPY

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INTRODUCTION

WHO estimates that there are 8 million new cases of tuberculosis worldwide each year (AHRTAG Child Health, special supplement 1996). However, this statistic is based primarily on the number of new confirmed cases of smear-positive, infectious pulmonary tuberculosis (TB) in adults. There are no comparable global epidemiological statistics on the occurence of TB in childhood, only some national studies were conducted in industrialised societies.

Another aspect is the fact that the disease presents with a different clinical picture in children. *Mycobacterium tuberculosis* can rarely be identified in their sputum or gastric secretion. This complicates the diagnosis of primary pulmonary tuberculosis in childhood. Of the 3 million people who die each year as a result of tuberculosis, 170,000 are children. The primary cause of death in this age group is the so-called dissemination of the disease leading to meningitis and miliary tuberculosis. Children up to the age of 2 years are especially at risk. The following factors further the spread of tuberculosis:

- high rates of prevalence, especially in the southern hemisphere, with a large reservoir of tubercle bacteria carriers;
- increasing poverty with attendant consequences (confined living space, poor standard of hygiene, malnutrition, etc.);
- absence or inadequacy of TB control programmes;
- spread of HIV infection.

COURSE OF INFECTION

Paediatricians distinguish between three phases in the development of tuberculosis:

- **Exposure** means that a child is living in close and continuous contact with a member of the household or neighbour who is suffering from infectious pulmonary tuberculosis.
- **Infection** is usually aerogen by inhalation of droplets infected with tubercle bacteria contained in the sputum of the sick person the child gets in contact with.
- **Outbreak of the disease:** depending on the quantity and virulence of the tubercle bacteria that are inhaled as well as the efficiency or inefficiency of the child's immune system, either the infection can be overcome or it leads to a manifest outbreak of the disease. Young children and people with a weakened immune systems are at particular risk of the disease breaking out.

Tuberculosis is primarily caused by the *Mycobacterium Tuberculosis*. Another species of the bacteria, *mycobacterium bovis,* may also cause the disease in countries where herds of cattle are infected. In some tropical countries *mycobacterium africanum* may be the cause. Every age group is susceptible to mycobacterial infections. However, pregnant women, children under the age of 6 years and adolescents are at a particularly high risk. In children already infected with HIV an outbreak of TB can lead to a serious 'dissemination' of the disease – which is nearly always fatal.

In the fight against tuberculous in childhood the first phase (exposition) and the second phase (infection) are especially important. Studies have shown that up to 40% of exposed, untreated infants living in close contact with a person who is suffering from infectious pulmonary tuberculosis develop manifest tuberculosis themselves within

1-2 years (cf. *Pedriatr. Infect. Dis. J.* 1995, 14:445-70).

PREVENTIVE MEASURES

The following preventive measures can be taken to control tuberculosis in childhood:
The BCG vaccination (Bacillus Calmette-Guerlin) is included in the WHO expanded immunization programme (EPI). It should be administered to new-born infants as soon as possible in high-incidence regions. However, the vaccination cannot prevent infection with *Mycobacterium Tuberculosis.* It only stops the 'dissemination' of the disease. Nevertheless, this saves some 50% of infants from the dissemination of tuberculosis disease, especially meningitis tuberculosis. The protection by BCG - vaccination is estimated to be effective for 5-6 years.

There is a small risk that in children co-infected with HIV, BCG vaccination can lead to a progression of HIV infection. Fatal consequences are possible. According to WHO however, this causes no change in the recommendation to administer BCG to all newborns in settings where the prevalence of tuberculosis is high. In the control of childhood tuberculosis, the emphasis should be placed on finding exposed and infected children. Such children can be saved from an outbreak of the disease by a 6 to 9 months' prophylactic treatment with INH (Isoniazid). The option of INH prophylactic treatment (3 months only) applies also to neonates exposed to tuberculosis through the mother suffering from infectious pulmonary tuberculosis.

DIAGNOSIS AND CLINICAL PRESENTATION

Usually, there are no clinical symptoms during the phases of exposition and infection. Therefore the Mendel-Mantoux tuberculine test (an intracutaneous injection of 5 Units highly purified tuberculine - PPD) is especially valuable in identifying infected children. A positive reaction to the tuberculine test consists of an erythema and induration (hardening) of the skin at the area of injection. The reaction is assessed by measuring the diameter of the induration. After prior BCG vaccination the reaction to a tuberculine test is more difficult to assess and requires specific criteria. In a high-incidence region an induration measuring more than 10 mm in diameter indicates a concurrent or previous infection or TB disease. Prior BCG vaccination may lead only to indurations smaller than 10 mm in diameter. However, in children infected with HIV an induration of 5 mm or more is evidence of TB infection or disease.

A negative reaction to the tuberculine test (no visible reaction) does not exclude the possibility of infection with *Mycobacterium Tuberculosis* or even an outbreak of the disease. Apart from premature testing in the pre-allergic phase, diseases that weaken the immune system, such as measles, whooping cough, miliary tuberculosis, meningitis tuberculosa, malnutrition, HIV-AIDS, or a previous cortico-steroid therapy can all be causes of a failure to react.

Tuberculine testing should have the following consequences:
A positive reaction in exposed children who do not show clinical symptoms indicates a probable infection. Such children should be given a controlled course of prophylactic treatment with INH (Isoniacid) for 6-9 months.
Children with clinical symptoms who show a positive reaction should be examined by a doctor in order to confirm or exclude the diagnosis of TB. This is done according to clinical criteria, including an X-ray of the lungs (thorax) if at all possible. The results of these examinations indicate whether prophylactic or curative treatment is necessary. A presumed outbreak of tuberculosis in a child can be confirmed by the following clinical criteria:

1. positive tuberculine test (A negative test result does not exclude the possibility of an outbreak of TB.);
2. stunted growth, arrested weight or weight loss;
3. two or more bouts of fever, when other diseases have been ruled out;
4. coughing or asthma-like symptoms for longer than 2 weeks;
5. swelling of the lymphnodes without accompanying pain;
6. swelling of the joints and/or deformation of the spine;
7. swollen belly;
8. malnutrition, no marked improvement within 4 weeks of proper nutrition.

The clinical criteria 2-5 as well as 8 may also indicate HIV infection. The question arises whether laboratory examinations are necessary to diagnose tuberculosis. The adult patient with an infectious pulmonary tuberculosis hosts a quantity of tubercle bacteria in his/her sputum which can be identified by microscopy as acid-fast rods. However, in the case of children the microscopic examination of sputum or gastric secretion rarely produces results. Primary pulmonary tuberculosis emerges rarely as infectious tuberculosis in childhood. And when it does, there is a very small quantity of bacteria.

TREATMENT OF TUBERCULOSIS IN CHILDHOOD

DOTS – the Short Course Directly Observed Treatment - is the key to successful treatment. (Tab 1)

The duration of treatment has been considerably shortened and patient compliance improved through the introduction of various antituberculotic drugs killing tubercle bacteria or preventing their growth. These get to both the extracellular and intracellular bacteria populations. The most effective drug in reaching the extracellular and intracellular bacteria is rifampicin. Pyrazinamide is especially effective against intracellular mycobacteria, which have a weaker metabolism but are crucial in the way the disease develops over a long period. INH (isoniazid), streptomycin and ethambutol are also particularly effective against the intracellular bacteria. All antituberculotics have side-effects. These are partly dependent on the dose administered, which is not always calculated carefully for children (Tab. 2). Ethambutol, which is often used to treat adults, should not be given to children under the age of eight, for it is difficult to diagnose *nervus opticus neuritis,* a possible toxic side effect .

Curative treatment consists of an **Initial Phase** of 2 months, followed by a **Continuation Phase** of 4-6 (at most 9-12) months, depending on the severity of the disease. *Meningitis tuberculosa, miliary tuberculosis and tuberculosis of the bones and joints* require a 9 - 12 months of treatment. This is also the case with children suffering from tuberculosis who are also infected with HIV. The length of treatment is the same for adults and children. But the number and choice of drugs are different.

Children should be treated during the Initial Phase in hospital, if possible. Depending on local circumstances, the Continuation Phase consists of providing the drugs daily or intermittently (i.e. 2 to 3 times per week, provided correct intake can be controlled and monitored). Pulmonary and extrapulmonary cases are treated the same way.

In treating tuberculosis in children, at least 3 synergistic effective antituberculotics are usually necessary. In the case of *meningitis tuberculosa*, streptomycin is also administered as a fourth drug for the first four weeks in the initial phase of treatment. In treating tuberculosis in adults, the most important target is to eliminate the bacteria as quickly as possible. This can usually be done with four drugs. Thiacetazone, which in some regimens is administered in combination with isoniazid (INH), should not be given to patients infected with HIV as it has serious dermatological side-effects (*dermatitis bullosa*).

The direct costs of 'short course treatment' for a child are between US $17 and $30 for the initial phase, depending on what drugs are used. The follow-up phase costs lie, on average, between US $30 and $40, depending on the length of treatment. With intermittent therapy the costs of treatment can be reduced by almost half. The prophylactic treatment of young children with INH (isoniacid) for 9 months costs about US $6.
(These figures are based on the UNICEF price list of 1994.)

FUTURE OUTLOOK

The most important aspect of any successful tuberculosis treatment or prevention programme is observation by a responsible medical practitioner or health worker. It also demands a well organised and continuously monitored control system. Under such optimal conditions, conversion rates of 95% with a relapse quota of just 5% can be achieved.
Such management could prevent development of multiple-drug-resistant TB and, thus, increase the cure rate in childhood TB. In addition, it would help to save financial ressources as well as drugs for TB treatment which are known to be insufficiently supplied already.

Table 1

Short-Course Chemotherapy for Drug-Susceptible Tuberculosis - Pulmonary and Extrapulmonary - In Infants and Children

INITIAL PHASE DURATION 2 MONTHS

Isoniazid (INH)	5 - 10 mg/KG body weight/day	maximum dosis 300 mg
Rifampicin	10 mg/KG " " " "	600 mg
Pyrazinamid	25 - 30 mg/KG " " " "	1500 mg
Streptomyin	20 - 30 mg/KG " " " "	750 mg

CONTINUATION PHASE DURATION 4 - 6 (9 - 12) MONTHS

A: Daily under directly observed therapy

Isoniazid (INH)	5 - 10 mg/KG body weight/day
Rifampicin	10 mg/KG " " "

B: Intermittend treatment = 2 or 3 times weekly under directly observed therapy

Isoniazid (INH)	15 mg/KG body weight 2 or 3 times/week
Rifampicin	10 mg/KG " " "

Table 2

ADVERSE REACTIONS of ANTITUBERCULOUS DRUGS

ISONIAZID	**INH - HEPATOPATHY** **PERIPHERAL NEURITIS** **(by inhibition of pyridoxin utilization)** **Prevention: Vit.B 6 10 -15 mg/day**
RIFAMPICIN	**HEPATOPATHY** **Orange coloration of urine and secretions** **Gastro-intestinal irritations**
PYRAZINAMID	**HEPATOPATHY** **Increase of urine-acid >7 mmol/l** **Treatment:Allopurinol 100 mg/kg /day**
ETHAMBUTOL	**OPTIC NEURITIS** **(early diagnosis :red-green color discrimination)**
STREPTOMYCIN	**DEAFNESS (N. acusticus, N.vestibularis)**

TB DURING COMPLEX DISASTERS

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While public health professionals were very restrictive in the past to encourage TB treatment in ongoing emergencies and in unstable refugee settings because of their awareness of increasing drug resistance in such situations, two factors had somehow forced them to change their general rejection : the growing number of unqualified and uncoordinated TB-treatment centers of all sorts of NGOs in emergencies in the absence of integrated control aspects and the growing prevalence of HIV-infected people with a high susceptibility to TB disease after infection.
Mission hospitals often carry a special burden, when dealing with TB in disaster areas.

HEALTH CONSEQUENCES OF DISASTERS

The socioeconomic situation continues to worsen in many countries in the South and in Eastern Europe, most severely in countries with frequent natural disasters, followed by migration and unorganized resettlement of large numbers of people and in countries affected by long lasting wars and civil wars accompanied by a vicious circle of general poverty and human destitution.

Most people in such situations either share their homes and their food with migrants or refugees from other regions or are migrants and refugees themselves, in more or less organized camps or community shelters or scattered in private houses or temporary shelters, either in the countryside or in overcrowded towns.

TB, A SPECIAL THREAT IN LONG-LASTING DISASTER SITUATIONS ESPECIALLY IF LINKED TO HIGH HIV-PREVALENCE

In these conditions many essential factors for a healthy environment are missing, like enough water of acceptable quality, appropriate sanitation, shelter that protects from adverse climatic conditions, appropriate and accessible nutrition for people in need, essential health care provision, to name but the most urgent ones. As a result communicable diseases may spread rapidly, first of all kind of diarrhea, respiratory infections and other droplet infections like measles and parasitic infections, especially when refugees come into contact with malaria without efficient immune response from past infections. Combined with malnutrition these infections can considerably reduce the immune competency and susceptibility to further diseases when coming into contact, especially where contact is facilitated by crowded living conditions. This is most relevant in high prevalence migrant or refugee populations. HIV-infected people have a 25% chance to develop TB after infection[1], while non-HIV-infected people have only a 10% chance.
Therefore we must assume that with longer stays in the circumstances described above the spread of TB may increase dramatically in many of the worlds actual major disaster areas.
TB in such situations is also a threat for the hosting community, if they live in close

[1] Kessler, C.; Tuberculosis control in refugees. A focus on developing countries. Diss. University of London 1995.
World Health Organization: The HIV/AIDS and tuberculosis epidemic. Implications of TB control. 1994. WHO/TB/97.221.

contact with refugees or migrants, under poor conditions and especially if the prevalence of HIV-infection is high among them.

Only rarely do refugees enter a well organized and wealthy country like those from Indochina to the USA[2] or asylum seekers from Eastern Europe in the West. The prevalence of open TB is significantly higher in refugees from Indochina and from Eastern Europe compared to their host countries, because they represent the prevalence of TB of their country of origin.[3] However, our higher-quality living conditions, nutritional standards and health systems have continuously reduced TB-prevalence in our communities in spite of the influx of TB infected and diseased refugees.
(This fact may change in future with further development of MDR-TB[4] and HIV-prevalence in communities (e.g. New York, Bronx.)

Most migrants and refugees from complex, long lasting emergencies, on the other hand, enter neighboring countries with economic problems and people's health status similar to their own and where TB and HIV might be on an increase. The movement of people and their weak health status make the situation worse. As a consequence WHO documents report for 1996 word-wide TB infection in every third person and around 3 million deaths due to TB, more than from any other disease.

Especially in situations of temporary resettlement and lack of political commitment and security, treatment of TB, which has a duration of 6-8 months, is a risky endeavor. Qualified, supervised and appropriately equipped laboratories are rare with low coverage.
In many countries drugs of any kind are not prescribed but freely available in stores or on market places, also those for TB-treatment. TB patients often buy their drugs as long as their money lasts and they feel very sick. Therefore, poor people are especially at risk to interrupt treatment. This situation not only poses the threat of relapse and drug resistance for the individual, but he/she might also spread the resistant bacilli to others. Then, this is a real threat for the community as a whole.
Poor people might even sell their drugs if DOTS[5][6] is not strictly applied as soon as their health condition improves in the presence of other felt priority needs. Even health personnel might feel tempted to earn money by selling drugs if their salaries arrive irregularly and are widely insufficient to cover daily requirements.
The same might happen where relief agencies are not sufficiently well organized before they start a TB control program, not familiar with professional health and public health standards and not aware of the danger of MDR-TB. Many only see the individual patient, wish to help as soon as possible in a curative manner in order to reduce individual suffering, and start treatment without considering the consequences and

[2] International Organization for Migration (IOM) Tuberculosis Working Group: Outcome of second-line tuberculosis treatment in migrants from Vietnam. Tropical Medicine and International Health 1998;3:975-980.
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[3] Deutsches Zentralkomitee zur Bekämpfung der Tuberkulose. 22.Informationsbericht. 1996.
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[4] Multiple Drug Resistant TB

[5] Directly Observed Therapy Short-term

[6] Kumaresan, J.A. et al.: Tuberculosis control in Bangladesh: success of DOTs strategy. International Journal of Tuberculosis and Lung Disease 1998; 2 (12): 992-998

planning the months ahead. In disasters people tend to think more of today than of tomorrow. Thus while caring for the sick patient they easily forget about their responsibility towards the community and the still healthy people at risk of infection and disease.

THE AIMS OF TB-CONTROL WHICH SHOULD NOT BE COMPROMISED

The aim of every TB intervention has to be first of all **the complete cure of all patients under treatment.** This is difficult to be achieved if the onset of such program is done in a hurry. Only when the first emergency measures are already effectively applied, the refugee community is registered and organized, essential health services are provided and acute communicable diseases under control (estimated or known death rate less than 1 in 10 000 people per day.[7]) the time has come to consider TB intervention. A TB control program has to be regional oriented and best integrated into other health activities. The amount of drugs needed for the whole treatment of a certain, estimated number of patients (this number afterwards is limiting the acceptance of more new patients and has to be kept in mind) have to be available, the staff at the site and the funding secured for at least one to two years ahead.

It has always be considered that in case of security problems, evacuation of staff and new movements of people are likely to happen. This will most probably interrupt treatment and increase the danger of drug resistance for the individual patient and for the community. Often, security is difficult to judge at the beginning of an emergency and frequently also still at a later stage (like in Sierra Leone, DRCongo or Angola). Extremely carefully informed decisions have to be made in every special circumstance before a program is started which should never be led by sentimentality alone. Too dangerous are the consequences of interrupted and failed treatments.

Secondly the **reduction of TB transmission** is a goal. This means early detection of open TB cases through information of the community, anti-discrimination campaigns and appropriate diagnostic (laboratory) and treatment capabilities (DOTS). Both have to be organized and in place before the start of TB control activities, otherwise the help might reach an individual patient but the disease continues to spread rapidly in the community.

THE BURDEN OF TB FOR MISSION HOSPITALS IN DISASTER AREAS

In church related health activities we often find one typical scenario in war areas:
Mission hospitals, in former times only part of the overall health system in a region, have to serve for a waste area, as the country suffers severe destruction during war and civil war. National resources are used for other priorities and as people flee from danger, structures break down. National health centers are closed when staff no longer receive their pay or medical supplies run out. Control programs are usually the first to come to an end. The only centers which continue to function in such situations are often only those belonging to church, run by high motivated religious congregations and funded by foreign donors. As they were engaged in TB-diagnosis and -treatment in the past they continue usually without questioning.
TB-patients bear down on these few remaining centers from far and wide. Many of them walk through the countryside for sev-

[7] World Health Organization: Tuberculosis control in refugee situation. An inter-agency field manual. 1997. WHO/TB/97.221.

eral days. The consequence is that the church health institution has more work than it can cope with. More TB-patients than usually have to remain for treatment as their homes are too far away for them to return to the center every day or to continue treatment elsewhere near-by. Thus they have to find or have to be given accommodation. In these circumstances, the result of becoming such a "draw-factor", is: provision of water and sanitation are generally inadequate, the accommodations quickly become overcrowded, and food supplies are insufficient. These factors in turn create a general health threat and can lead to the outbreak of acute communicable diseases in addition. (In these situations donor agencies are requested for more funding, so that TB-buildings, hospital beds for TB-patients and the overall TB curative capacity can be increased. In future and as soon as the security situation allows, this can hinder a flexible and quick adaptation and a more appropriate public health response because hospital beds will be left empty, which is often embarrassing for the staff and perhaps misinterpreted as a decrease in service quality by donors. This will result in a long lasting high dependency from external funding with all the difficulties implied.)

In complex disasters the reduction of health services and long distances often means that patients seek help too late[8]. Many of them will have infected already many of their contacts and the number of those who die when they eventually reach the remaining church center will be high. This creates even more stress for the staff and more fear of TB, more denial, less early intervention and more discrimination towards TB patients in the population.
While mission institutions are predominantly located in rural areas a similar scenario may also occur when humanitarian aid agencies are forced by local political authorities to restrict their activities to the towns (Ethiopia under the regime of Meguisto Haile Miriam) or if the towns are relatively more secure due to external military presence (Sierra Leone, Liberia with ECOMOG forces).

A POSSIBLE INTERVENTION STRATEGY (AN EXAMPLE FROM THE NORTH OF UGANDA)

Besides meanwhile well documented and advocated rules and recommendations for the running of TB-control programs by WHO and other authors the quite often found situation described above needs special attention.
In Uganda, Lwala Hospital[9], Soroti district, with a still insecure and uncertain situation between 1987 and 1990 with a totally destroyed district health system a **"centrifugal approach"** was successfully applied: In 3 different health centers, deserted by insecurity, situated in different directions on a circle of around 20 km and more around the mission hospital were made "satellite" health centers of the mission hospital especially qualified to diagnose and treat TB. In addition TB-diagnosis and TB-treatment was supported and supervised by the mission hospital in the district state hospital after negotiations with the national authorities. In all centers microscopically discovered TB (which means highly infectious open TB) was given priority in the absence of radiology and culture. Treatment was only given under strict observation of health workers and after counseling the patient and his /her family in the presence of the health worker in charge, responsible for the fol-

[8] Krumme, B.: Tuberkulose. In: Bekämpfung von Infektionskrankheiten in der Humanitären Hilfe, Missionsärztliches Institut / Caritas international, Würzburg 1997

[9] Financed mainly by "German Emergency Doctors" and partly by "TB - Association Würzburg"

low-up of the patient as well as in the presence of a community leader.

Health promotion in the community and creating awareness for early TB-symptoms were effectively undertaken by cured patients after training during treatment, preferably by teachers. Attractiveness of presenting in one of the centers in case of symptoms was increased by food aid to patients and by supporting small-scale income generating activities (mat making).

In a situation were the funding of the TB program was secured by foreign donors this methodology helped effectively to improve early treatment and the compliance of patients and their cure.

This example might stimulate early awareness and the initiative of adapted intervention strategies in similar situation like in actual Angola and in many other complex disaster areas.

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