THE PRINCIPLES OF TUBERCULOSIS CONTROL IN MOROCCO

Report presented by French Residency General, Morocco

Comparative study of the different methods for the application of health techniques at present known, stressing:
- the reasons giving rise to their use
- the voluntary participation of the populations concerned
- the expenses associated with their application
GENERAL

Morocco was formerly thought to be free from tuberculosis and its climate was considered particularly healthy. This was only a legend and the first doctors who arrived observed the presence of the disease.

Tuberculosis is neither of recent nor of European origin in Morocco.

For this reason, although for many years the main concern of the public health service was to deal with the large scale epidemics of typhus, plague, smallpox and malaria which broke out in this huge territory where communications were still badly organized, nevertheless the danger of tuberculosis was not neglected.

Tuberculosis control was first entrusted to the Moroccan League Against Tuberculosis, a voluntary, subsidized body set up in 1924.

Continuing the work commenced in 1921, thanks to the lead given by Madame LYAUTEY, when the two first dispensaries were opened at Fez and then at Casablanca, the Moroccan League opened in succession new centres at Rabat, Marrakech, Meknès and Mogador.

However, during the two following decades special economic and social factors led to a disturbing increase in the morbidity rate, thus changing the picture of tuberculosis endemicity.

Consequently, just after the second World War, the Health Department took over the whole preventive and curative organization, leaving to the Moroccan League against Tuberculosis only welfare work for tuberculosis sufferers and educational propaganda, which aspects were moreover the original aims of the Organization.
I.  DEFINITION OF TUBERCULOSIS CONSIDERED AS AN INFECTIOUS DISEASE

The prevention of tuberculosis is based on the evident fact that the coming together of the bacillus and the human organism is necessary for development of the disease. It may be concluded therefrom that the best way to make prophylaxis effective is to prevent this encounter; this is not a mere truism. In fact those two great scourges, plague and typhus, were not eliminated by fighting against the causal agents of these diseases; nor by strengthening the defences of the body. These diseases were overcome only when the cycle was broken, i.e. encounter between the microbe and the human organism prevented.

The same problem has not been solved as concerns tuberculous infection and its mode of propagation. At the risk of coming into conflict with certain conceptions, it may even be said that the way in which the encounter takes place is still unknown. The inhalation hypothesis, which is favoured by the majority, still remains a hypothesis. In a recent study on primary infection in 1951-1952 (Revue de la Tuberculose), KOURILSKY has stressed the inadequacies of the theory, concluding as follows:

"The clinical equation: primary tuberculous infection = pulmonary inoculation lesion = airborne inoculation, is a striking formula which was of very great service in its time . . . It cannot be accepted today in this unmodified form and it may even be regretted that it has restricted the concept of tuberculous infection to airborne infection, without having solved the problem of the vector of infection."

Consequently there is no available method of acting directly, on the bacillus and on the organism, to prevent them coming together.

In view of these conditions, tuberculosis control should employ the two other preventive methods:

1. Control of reservoirs of infection
2. Increasing the resistance of the host.

but:

(a) Since man probably constitutes the essential element in the reservoir of infection, the elimination of this reservoir is complicated by the fact that there is no common feature shared with the other contagious diseases (with the exception of leprosy). These diseases are acute, following a rapid and violent course, whereas tuberculosis is a chronic disease whose evolution is often long, capricious, subject to relapses and recidivation at long intervals. Consequently, whether the attempt is made to eliminate this reservoir by cure or by isolation, difficulties are encountered which are often insurmountable due to the length of, or failures in treatment.

(b) As concerns the defence of the host, this is also complicated, since in addition to individual factors of resistance, doctors and hygienists have long stressed the importance of many social factors which govern the resistance of the organism to tuberculosis.

Despite these reservations, these two procedures should be studied in turn; they should above all be combined if good results are desired, since, without opposing one another, they have different aims. In point of fact:

- the elimination of the bacillus would amount to the disappearance of tuberculosis as an infection;

- the defence of the organism tends on the other hand to decrease the appearance of tuberculosis as a disease.

However, although authors may agree in separating these two concepts, i.e. tuberculosis as infection and tuberculosis as disease, on the clinical level, they are only too frequently confused on the preventive level. Nevertheless, everyone is aware that a mild infection is an effective way of combating the disease.
Should it not then be recognized that prevention should deal, not so much with the problem of infection as with methods which will safeguard the individual, whether infected or not, from tuberculosis as a disease?

Tuberculosis prevention is thus much less specialized than it was thought to be when the Koch bacillus was discovered, and all narrow interpretations of it are doomed to failure, since:

- efforts directed against the bacillus alone are not in accordance with the complex nature of the facts;
- defence of the host is illusory if no attempt is made to avoid massive and repeated contacts.

These two concepts should complement one another in any effective form of prophylaxis.

The complex nature of tuberculosis control explains the considerable effort and enormous sums called for. A single example will suffice to show up the difficulties encountered:

- in 10 years typhus practically disappeared in Morocco (28,000 cases in 1942, 10 in 1951);
- 50 years were necessary in a country of nine million inhabitants as advanced as Holland to decrease tuberculosis mortality from 200/100,000 to 20/100,000.
II. DATA NECESSARY FOR ESTABLISHING A WELL-PLANNED TUBERCULOSIS CONTROL PROGRAMME

A. Environment

After this brief survey, we shall study the economic and social conditions explaining the incidence and clinical course of tuberculosis in Morocco, which conditions represent the environment in which a tuberculosis control programme must be established.

There has been a considerable increase in the population of the country, this rising from 3,600,000 inhabitants in 1921 to nearly 9,000,000 in 1950. At the same time, migration from the countryside to the towns has been exceptionally pronounced, since in about 30 years nearly 1,000,000 uprooted people from the rural tribes have endeavoured to find a place in modern life.

This migration, in conjunction with historical factors and, above all, the rapid industrialization of the country, is bringing about an extraordinary concentration of the urban population, which is crowded together in unhealthy dwellings, thus increasing the population density of certain urban quarters up to the highest possible extreme (more than 1,200 inhabitants per hectare in the old part of Casablanca).

Such migration also brings about constant mixing, and among such populations who are new to city life, often anergic, transplanted, unadapted and forced to live under precarious conditions - complete lack of the most elementary rules of hygiene, malnutrition, promiscuity - the sudden interaction of all these factors largely explains the rapid and grave development of tuberculosis because of the massive, direct and repeated infection to which these people are inevitably exposed. Moreover, such cases, detected at too late a stage and developing rapidly in the weakened organism, will most usually be cases of open tuberculosis with abundant bacilli and therefore highly contagious.

To these factors in the spread of the disease must also be added the difficulty of applying preventive and therapeutic measures.
In fact, although the advanced Moroccan can be and is, treated like a European, i.e. undergoes rest cures, antibiotic treatment, hygierno-dietetic treatment and collapse therapy, nevertheless the obstacles encountered among the less advanced elements must be recognized. It is difficult to get them to submit to rest cures, they are lacking in perseverance, behave very rashly and will not agree to separation from their families. In the case of women, difficulties are often caused by strict religious and social customs and as concerns children, it is in most cases impossible to take them away from the family environment.

Such incomplete treatment, often interrupted too soon, explains the large number of patients whose condition has been improved but not cured and who therefore remain agents of infection for a long time.

However, these conditions are still those most frequently encountered. They will improve with time, but it can be realized how they complicate the work and how they make the results of treatment uncertain and prophylaxis illusory.

Finally, in recent years the development of medical technique has resulted in a constant increase in the cost of medical treatment. Among the Moroccans (as among the Europeans), the treatment of tuberculosis is almost always out of proportion to the financial resources of the patient, rest cure and cessation of work often amounting to nothing more than deprivation pure and simple of income.

Still not advanced enough to understand the need for prevention and for sickness insurance, the Moroccan is almost always taken unawares. However, if in these circumstances the State is to make suitable provision for the free treatment of tuberculosis, there is a risk that such treatment will be achieved only at the expense of other preventive measures.

Tuberculosis control therefore raises manifold problems which overlap and influence one another. This should be borne in mind in applying control measures.

B. Surveys

A preliminary necessity for any tuberculosis control programme is as precise a knowledge as possible of the extent of the scourge which is to be combated, of the population groups most severely affected and of the geographical areas where the activities planned should attain a maximum.
No hygiene or preventive work can dispense with statistics.

Unfortunately:

- because of its duration, the relapses and sometimes the difficulty of diagnosis, tuberculosis is a complaint which by its very nature already raises difficult statistical problems.

- To this must be added the absence of compulsory notification and of registers of births, marriages and deaths, so that only a very approximate idea can be formed of mortality in general, rendering the work of the dispensaries in evaluating apparent morbidity extremely complicated.

Thus there is a total lack, which will continue for some years to come, of statistical data from which precise conclusions might be drawn.

Under such conditions how can the necessary information be obtained and what can be deduced from the data actually available?

(1) Tuberculosis mortality cannot be judged from the official figures, which are too much subject to error.

In fact:

- statistics are established only for towns constituting municipalities and it is still impossible to ascertain the proportion of deaths from pulmonary tuberculosis in the "bled";

- present data therefore indicate only the probable order of the figure and merely confirm what could be deduced from other investigations namely:

   (a) the greater incidence of pulmonary tuberculosis among the Mohammedan population;

   (b) the high mortality rate in the towns, a rate in the neighbourhood 250/100,000 in large cities like Casablanca and Rabat.

   It would also be very interesting to know the mortality by sex, by age, by race, by social status and above all, according to the districts inside the towns - between the traditional "médinas" and the "shanty towns" ("bidonvilles").
Indeed, it is possible that in the "bidonvilles" where the majority of the population consists of rural elements who have recently arrived, the mortality will be found to be higher, but the morbidity lower than in the "médinas".

What remains to be done is to make a study of the case fatality rate. This latter indicates, in effect, the gravity of the disease since it answers the question "Out of 100 cases of tuberculosis, how many deaths occur by the end of a certain time?". It can contribute valuable information on the necessity for, and the value of, certain measures such as systematic case-finding, but considerable precaution is called for in its interpretation.

(2) **Tuberculosis morbidity** is defined by the number of new cases during a definite period in relation to the population in which they arise.

In the absence of compulsory notification, the only information which can be used is that given by the dispensaries.

However the figures supplied have no significance when taken by themselves. They are of value only when they can be related to the number of inhabitants dependent on the dispensary and if special factors are taken into account, factors outside the incidence which it is proposed to measure, such as:

- the coverage,
- the rapidity, and
- the quality of the case-finding carried out in the dispensary.

This statistical study of information coming from the tuberculosis dispensaries calls at the present time for examination of the monthly reports sent to the Central Service.

The introduction of a new form of report is now being studied in Morocco, bearing in mind the need for simple but complete nomenclature.

As things are at present, it would seem difficult to ask the centres for more detailed information.
Moreover, a method involving statistics established by the dispensary and brought together by a central body does not appear desirable. It would seem preferable for the central organization to collect and compare the cards made out, and to compile the statistics therefrom. But this raises the problem of organizing a central card index and dealing with the cards mechanically, which would call for:

- the establishment of a detailed nomenclature for the clinical forms of tuberculosis;
- large financial resources.

Nevertheless, only a central card index periodically brought up to date would make it possible to know, in addition to the crude morbidity rate, the corrected rates taking into account variables such as sex, age, race, occupation, etc., which rates are very important in making it possible to state whether an increase or decrease in new cases is due to any given cause.

(3) Endemicity, which relates to the total number of patients, is different from morbidity, which is concerned only with fresh cases. It is important to know the endemicity, since it indicates the "potential of infection" of a region or a country.

In France the accepted method of evaluating this figure is to multiply the number of annual deaths by a coefficient in the neighbourhood of 7 (20 in Sweden, 11 in Yugoslavia, 10 in Switzerland and 4 in Germany).

The endemicity is, in fact, a function of:

- new cases
- deaths
- cures

According to figures at our disposal, the number of persons suffering from tuberculosis living in Morocco may be put at roughly 50,000-60,000.

Of course, such an estimate has no statistical value but nevertheless it is sufficient to indicate the gravity of the problem and to show the extent of the preventive measures necessary.
(4) The tuberculin reactor rate

Under these conditions the extent of tuberculous infection represents the best source of information on tuberculosis epidemiology in Morocco.

Although it has not been shown that there is a close connexion between the tuberculin reactor rate and tuberculosis morbidity, nevertheless it has so far constituted an important characteristic of tuberculosis epidemiology.

It makes possible, if not an overall survey, at least precise surveys of limited but fairly large communities which may be suitably selected.

It has already been used on a large scale in Morocco before and during the 1949 BCG campaign. It was then applied in a very satisfactory manner so that prior data is available for comparison with subsequent surveys.

What information can be gathered from the above?

In 1948, after a study based on more than 15,000 subjects forming part of various communities, Drs. GAUD and MAGE showed that the tuberculous infection rate had not appreciably increased since 1934, neither in the towns nor in the countryside:

in rural areas, for example, the figures were:

In 1934: 40 to 65% positive skin tests below 15 years of age
60 to 75% " " " above 15 "

In 1947: 40 to 60% " " " below 12 "
50 to 75% " " " above 12 "

They noted in addition:

- that the turning point of the skin test definitely occurred in the towns after only a short time.
- that there was a relatively high percentage (40%) of negative skin tests among adults in the rural areas.

The statistical results on the tuberculin tests carried out in connexion with the BCG campaign clarified and confirmed these ideas. They indicated the earliness and the extent of infection in the urban areas.
However one might also be tempted to conclude that if morbidity increased considerably in 15 years, whereas the infection rate remained more or less constant, control measures should be directed above all against the social factors which favour the disease.

But can surveys be organized on the basis of the tuberculin reactor rate?

The answer is "yes", this can be done during a fairly long period. but it is to be foreseen that the development of systematic BCG vaccination will rapidly falsify the results. The only possible remaining method of survey will then be:

(5) Systematic radiological case finding by mass radiography, rapid action being taken to follow up the results and bacteriological confirmation being obtained whenever possible.

Until it is possible to obtain valid information (better functioning of the dispensaries, education of doctors and of the population, regular notification, the results of the civil register which has just been established in Morocco), it would seem that the types of enquiry possible are the following:

- large scale, directed sampling among certain categories of the population such as:
  - urban school children
  - school children in the "bled"
  - the "shanty towns" ("bidonvilles").

This enquiry would comprise:

- tuberculin tests followed by vaccination if necessary
- radiography
- bacteriological confirmation of suspects
- possibly identification of the bacillus concerned among certain groups of the "bled" population.

Too much stress cannot be laid on the importance of statistics, in particular for tuberculin tests relative to a population as a whole. Such statistics make it possible in fact to determine an essential datum, i.e. the risk and speed of infection under certain given conditions, and consequently the possibility of directing radiological case finding towards those groups most exposed to danger.
FEATURES OF TUBERCULOSIS IN MOROCCO

There is no need to deal at length here with the various clinical aspects of tuberculosis in Morocco. Many authors have already described the special course followed by the disease among North Africans (Gaud and Mage - Maroc Médical No. 28).

(1) In the child

Primary infection occurs at an early stage; it is often pathological (more than 10% of pathological primary infections among Moroccan Moslems in the urban areas). It is very deadly before school age, (60 to 70% of aggravated cases or of deaths between 0 and 5 years of age, as against 15 to 20% after 10 years of age). Consequently children in particular must be protected.

(2) In the adult

Tuberculosis is characterized by:

- the extent of the lesions present when the case is detected,
- the high risk of further development of the disease.

This explains why cures are rare, as well as the existence of a large number of tuberculosis sufferers whose sputum abounds in bacilli and who constitute dangerous agents of infection. These latter are all the more numerous in that the discovery of modern methods of treatment (streptomycin, isonazide, P.A.S.) has certainly led to a fall in mortality in recent years, without however any real increase in the number of cures. Consequently there has been a definite increase in the reservoir of infection and the morbidity rate.

TO SUM UP:

- The mortality rate is not known with any accuracy, but is probably not very high for the country as a whole although very pronounced in the urban centres which constitute veritable epidemic foci.
- There exist forms of pulmonary tuberculosis which are, above all, grave at the outset. Chances of cure have so far been very small but have nevertheless increased with new methods of treatment.
- Finally, lesions are recognized and treated at an increasingly early stage as case-finding advances and further general progress is made in this field.
III PROPHYLACTIC METHODS

Part 1 - Special Techniques

A Prevention of Infection

Case-finding is of particular interest in Morocco, but before studying the subject it is necessary to define the very different operations which the term "case-finding" now covers.

There are:

(a) **individual case-finding** examinations carried out from time to time in the dispensary or in the physician's consulting rooms;

(b) **systematic case-finding** which may be:
   - either **selective or planned**
   - or **indiscriminate**

The planned case-finding concerns both the individual at various stages of his social life (pre-marital examination, pre- or post-natal examination, recruitment examination, etc.).

   and particularly **selected communities**, such as:

   - the administrations
   - the school and university groups
   - the large private groups (banks, railways, etc.);

(c) **indiscriminate case-finding** is a mass operation covering the whole of the population or a very large population group.

(a) **Individual Case-finding and the role of the Tuberculosis Control Dispensary**

Individual case-finding is essentially the function of the dispensary which, in Morocco, remains one of the main organs for the control of tuberculosis.
Immediately after the second World War, a committee of experts examining the many problems of tuberculosis control, estimated that the point of departure in such control must always be a well-organized system of dispensaries capable of themselves effecting diagnosis and the treatment of several thousands of patients.

Long experience has shown that in this country active treatment - ambulatory or nearly so - can give good results; this has been particularly apparent during recent years.

Many cases which in other countries would be sent to a sanatorium can be treated in the dispensary either immediately or after a very short period of hospitalization in an urban phthisiological centre (for the pneumothorax operation or for the cutting of adhesions, for example). This short period of hospitalization can also be put to good use for the administration of some antibiotic treatment. This system has the advantage of being acceptable to the Moroccans and of facilitating the treatment of a great number of patients, with very many of them passing through the urban phthisiological centres.

Finally, it is thanks to the unceasing propaganda efforts of the dispensaries that the Moroccan populations attend these consultations more and more readily. Sufficient proof of this is given in the increasing number of patients attending the Casablanca dispensaries where figures have passed from:

2,364 in 1942

to 16,732 in 1952

and to more than 25,000 in 1952.

The dispensary is an inexpensive case-finding and treatment establishment which also studies, as thoroughly as possible, the social milieu and completes its work by distributing assistance to tuberculous persons and their families. It is certainly the best means of observing the evolution of tuberculosis morbidity.

There are at the present time 15 centres which constitute a solid weapon in the campaign against tuberculosis. It is, moreover, the intention of the Health Administration to open at least one in each town in Morocco.
(b) **Systematic case-finding**, which is a more recent development, is particularly indicated for Morocco since the results are definitely better than in France. Tuberculous lesions have been found in from 20 to 30 persons per 1,000, and in some instances the rate has reached 50 per 1,000.

Consequently:

- a large number of infection foci have been eliminated;
- every year an increasing number of lesions are detected at an early stage and are, therefore, more easily and rapidly cured;
- the population as a whole benefits greatly from the education provided by such mass examination.

Nevertheless:

(1) The cost is high, seeing that in France it is estimated that the cost of a detected case requiring treatment is about 100,000 francs (taking into account additional examinations).

This financial aspect cannot be overlooked particularly when a "limit of effectiveness" is reached after several consecutive examinations.

(2) It must be borne in mind as far as Morocco is concerned that:

- there are organizational difficulties in a moving, unstable population which is not civilly registered;
- it is absolutely essential to be able to control and follow up results immediately.

It is for this reason that up to the present the planned examinations have been confined to limited groups of persons with a fixed abode likely to draw the greatest benefit from the measures, i.e. the administrations where case-finding examinations are carried out every two years, and the schools where it is annual.
Up to this year the method used was that of radioscopy, the method of choice for collectivities of this kind where the periodic "netting" is supplemented by recruitment or appointment or post-vacation examinations.

The Health Administration recently equipped a truck with a 7 x 7 radiophotographic apparatus which it is intended to use in the large case-finding operations in the "bidonvilles", in the factoriess, and in rural areas.

It should, however, be borne in mind that case-finding is not an end in itself: it contributes to prophylaxis only in so far as it is possible:
- to isolate infectious cases;
- to give early treatment to detected cases.

The problems which it raises are, therefore, linked to the more general and always worrying problem of the placing and rapid treatment of tuberculous persons.

B. ISOLATION

(a) In Hospital Establishments. The isolation and treatment of all cases of active tuberculosis represent for many the only effective prophylaxis and, therefore, the most urgent task. The problem could be solved by the rapid construction of simple centres put up close to the population agglomerations and to the existing centres, where patients could be isolated and treated. Although this system is certainly the least costly, the hospitalization of tuberculous persons is nevertheless still very expensive (in 1950, the cost of installing a bed in Algiers on this system was estimated at 500,000 francs). In addition, certain criticisms, or at least reservations, must be made with regard to this system.

An increasing number of persons suffering from infectious tuberculosis are in a fairly good general condition and, therefore, sometimes able to be active up to a certain point. It would, therefore, be as infectious cases only that they would benefit from beds, which are after all an expensive installation, and which could be more usefully placed at the disposal of more serious cases.
Above all, however, if the isolation is to have a prophylactic effect there
must be sufficient buildings in which to isolate a very large number of patients.
According to the figures given, 10,000 to 12,000 beds would have to be provided, and such
a programme cannot be envisaged, seeing that in addition to the mere putting up of
the buildings themselves, which might cost from 5 to 6 milliards, the enormous
proportions of the daily budget to cover the functioning of centres in which 10,000
tuberculous persons would be lodged, fed and treated free of charge has also to be
considered.

There is another final argument, i.e. the lack of specialized personnel. It
would, therefore, not be in the interests of tuberculosis control to fail to point out
that such a project cannot be realised. This amounts to an affirmation that
hospitalization of tuberculous persons cannot be envisaged from the prophylactic
viewpoint, but only from the therapeutic angle.

The Health Administration has for some years been making a considerable effort
in this direction. Morocco already possesses 1,500 specialized beds for tuberculous
patients, more than 1,000 of these being reserved for Moroccan Moslems. It is
contemplated that about 1,000 new beds will be provided in 1953, bringing the total
hospital facilities up to about 2,500 beds.

However rapid the increase in hospitalization capacity may be, it will never meet
the demand and cannot constitute the only and final solution to the problem of
prophylaxis.

Our efforts must be directed towards obtaining sufficient hospitalization
facilities for the treatment of curable cases with a certain margin making it possible
to receive the serious cases which are often encountered in the dispensaries and
whose condition demands immediate admission - very often less from the point of view
of the tuberculosis than from the viewpoint of their general miserable physiological
condition.

The problem of persons suffering from tuberculosis in a form too serious to
respond to treatment is the same as that which exists in connexion with the
increasing number of chronic cases of the disease in other countries, and for which
no satisfactory solution has yet been found.
(b) Isolation in the home. In the light of the new methods the question of "private" treatment of tuberculous persons must be reconsidered on account of:

- the simplicity of the measures, which make effective prophylaxis possible - simple rules of elementary hygiene inculcated by health education;
- the extension of the practice of BCG vaccination which effectively protects children even in contaminated surroundings;
- the ever increasing use of antibiotics which diminish - to an appreciable extent - the risks of infection.

The "private treatment" solution cannot, unfortunately, be adopted in Morocco owing to:

- Moroccan housing conditions in the towns;
- the absence of social security benefits providing gratuitous treatment in the home for 3 years with half wages;
- the fact that "private treatment" is carried out on the basis of a thorough investigation made by the social service into the individual and family living conditions, the habits of the infected person, his resources and his compliance or non-compliance with the prescribed rules.

This method can be applied to advantage in a few cases only such as ex-combatants, 100 per cent disability, many of whom fulfil the necessary conditions and for whom a special social surveillance service is at the present time being organized.

C. PREVENTORIA AND TUBERCULOUS CHILDREN

The division of hospital establishments for children into sanatoria, preventoria, aeria, colonies, is illusory and useless as far as Morocco is concerned. Preventoria are established on the supposition that before being infectious, tuberculosis is an "inactive" disease which, although more or less dangerous for the patient, is harmless for those around him. Can we prevent tuberculosis from becoming active? This would be prophylactic action. "The preventorium is, therefore, an establishment for convalescence from the initial, curable and uninfectious attack of tuberculosis ...... the
cure in a preventorium of these generally discrete lesions being desirable in order to prevent phthisis".

But - apart from the fact that such establishments are extremely costly - the regulations exclude active cases of pulmonary tuberculosis from preventoria. Where must the line be drawn between active and inactive cases? According to the works of LESNE, Mlle DREYFUS-SEE, POULSEN, ANDERSEN, etc. we know that the bacillus is often found in the gastric fluid of children suffering from radiologically visible primo-infection and even in those whose only symptom is a positive cuti-reaction. It will be seen, therefore, that there is no longer the gap which distinguished the infectious sanatorium cases from the non-infectious preventorium cases.

It is for this reason that today there are aeria and preventoria. Unfortunately, primo-infections (in Morocco as in other countries) are often illogically assigned owing to incomplete medical history.

For tuberculosis control among children we today, therefore, envisage the organization of:

- a dispensary specializing in diagnosis of infant tuberculosis and responsible for the placing of the children
  - in treatment establishments, or
  - in observation establishments for those in serious danger of infection, the milder cases remaining, for lack of better provision, in the home under surveillance after vaccination.

It must be admitted, however, that these provisions are still somewhat theoretic in Morocco.

There are at present nearly 1,000 preventoria beds and the immediate results obtained in these establishments are excellent. All children benefit from them.

The most urgent problem is still the removal of the children from the risk of infection and from the conditions in which they live.

Preventoria are, however, costly establishments and the economical solution is to be found in the school - the school under supervision, which can provide the education and protection which families are unable to supply.
In spite of the efforts of the Public Education authorities, a great deal still remains to be done in the field of school attendance in Morocco. Unfortunately, there is a certain indifference on the part of the parents who "desire only that their children shall know something of the Koran and consider the rest superfluous" (Adam).

In order to educate the children and protect them, it is first of all essential to convince the adults of the necessity for school attendance, or to make it compulsory.

This would call for a costly and difficult programme but it must not be forgotten that the community spends 6 to 10 times more on the treatment of tuberculous persons than on the prevention of tuberculosis in children.

D. THE "OEUVRE GRANCHER"

This undertaking, so fruitful in France, encounters insurmountable difficulties in Moslem communities and cannot be considered as a preventive organization of any importance.

E. CONTROL OF BOVINE TUBERCULOSIS

The exact role of bovine tuberculosis in the epidemiology of the disease in Morocco is not known, but this is an aspect of prophylaxis which cannot be ignored.

The rules imposed with regard to milk in the towns and the increasing use of milk pasteurized by supervised organizations, are important practical steps in the direction of prophylaxis.

Part 2 - Protection by Means of BCG Vaccination

This is still the best measure for the protection of healthy persons and children.

Nevertheless, its application in Morocco calls for close and thorough study in regard to the methods of vaccination and the method of dealing with late reactions.

It is still too early to evaluate the efficacy of the campaign undertaken by UNICEF in 1949 and 1951.
This was commenced in Morocco in April 1949; nearly 3,000,000 persons were tested and more than 1,800,000 were vaccinated.

The subjects tested and vaccinated were selected from among the population groups which are probably exposed to the greatest risk, i.e.

- children;
- poor adults who emigrate from the rural areas towards the towns attracted by the hope of good wages and a new life.

The campaign was continued in 1952 and the first vaccinations carried out in 1949 in the Marrakesh region were completed.

In 1953, a new vaccination system is being organized:
- mass vaccination by mobile teams in the rural areas and in the "bidonvilles";
- creation of permanent vaccination centres in the principal towns of Morocco.

It would be superfluous to discuss here the value of BCG; its efficacy and innocuity are no longer in question.

However, although it is an excellent method of general prophylaxis, BCG has its limitations:

(1) **The duration of protection is limited**, and fairly frequent re-vaccination is necessary if effective and enduring protection is to be obtained. The following factors must, however, be taken into consideration:

- the cost is becoming heavier (in Morocco a minimum of 100 to 150 francs per subject vaccinated must be calculated);
- with the techniques at present used (scarification or intradermal vaccination) a relatively specialized personnel is essential, and the country needs this personnel in the treatment centres;
- it is becoming less and less readily accepted, and the possibility of hostility on the part of the population and, unfortunately, on the part of certain physicians, cannot be neglected - quite apart from the difficulties of arranging mass assemblies, for which careful preparation is necessary;
the possibility of considerable local reaction makes repetition of intradermal vaccinations undesirable.

(2) Its application is theoretically limited to anergic persons.

There will, therefore be least action among the persons most affected by tuberculosis, among the groups in which the tuberculosis rate is precociously high.

Nevertheless, it is not the primo-infections - even the severe cases - which raise the morbidity curve in a country. Primo-infection is only one of the aspects of tuberculosis epidemicity. It is above all the mass and repeated re-infections of adolescents and adults which bring the tuberculosis mortality and morbidity figures to such a high level.

This being so, if the tuberculosis figures are to be brought down substantially, the protection of allergic persons is as urgent as that of children and anergic persons.

This is in fact the aim of the present work of ASSIS in Brazil with his new system of mass vaccination by the buccal method.

Taking as the point of departure his experiments with concomitant vaccination in which he observed a desensitization to tuberculin in nearly 50% of cases, but without loss of immunity (on the contrary), he is endeavouring to extend his vaccination to allergic persons.

It is very difficult to evaluate the protective effects of this method; this experiment demands extreme care, and although it is too early to judge its efficacy, it can already be affirmed that it is innocuous.

In view of the almost insurmountable difficulties in finding other means of protection, it would seem reasonable to try it.

Buccal vaccination is, in fact:

- easily and rapidly administered and does not require very highly specialized personnel;
- readily accepted by the populations.

There is, however, one disadvantage, i.e. we do not know its present cost, particularly in view of the necessity for a special installation for the manufacture of the considerable quantities of vaccine used.
In addition to the 16,000,000 vaccinations carried out in 1949/1951 under the auspices of UNICEF, the campaign in Japan - the largest in the world - is also instructive. It has been organized by the Japanese authorities alone since 1940, and particularly since 1949.

From 1944 to 1950 more than 43,000,000 persons were vaccinated.

From 1935 to 1946 tuberculosis mortality in Japan rose from 180 to 282 per 100,000.

From 1947 to 1950 the figure fell again to 147 per 100,000.

This decrease, which is attributed by the Japanese authorities partly to:
- modern treatment methods, and partly to
- BCG vaccination,
demonstrates the extent of the effort needed.

WHAT CAN BE HOPED FOR AS A RESULT OF THE CAMPAIGN AGAINST THE BACILLUS?

Opinions are divided.

Although some speak of the value of the work accomplished, others maintain that the campaign against the bacillus costs more than the results justify. Although there is an undoubted regression in tuberculosis, it is to be attributed more to the development of therapeutic methods and to the higher level of health education among certain peoples than to the "extravagant prophylactic methods" the application of which has "not given appreciable results" (Legendre).

It is difficult to arrive at conclusions since in all countries where tuberculosis is in marked regression the various methods we have been studying have developed side by side with the improvement in social conditions.

In fact, tuberculosis control forms a whole which must be undertaken or rejected en bloc.

It is at least permissible to conclude with Fischel that "prophylaxis of infection, however necessary and desirable, plays only a secondary role in the control of tuberculosis. Environment is a determining factor and it is essential to organize at the same time environmental protection".
IV. GENERAL MEASURES

A. ENVIRONMENTAL PROTECTION

This is a very complex problem.

In order that certain prophylactic principles may emerge, we will touch briefly, but in a critical manner, on housing, exhaustion, under-feeding, which are the most frequently encountered social factors.

(1) Housing

We will not insist upon the significance of the slum factor in towns whether they be "mellahs", "medinas" or "bidonvilles". A number of studies have been made on this subject, emphasizing that all the conditions favouring the propagation of tuberculosis are present: overcrowding, promiscuity, lack of ventilation, water, hygiene—all factors which predispose to mass and repeated infection and lessen the resistance of the organism.

Obviously, in these conditions there is only one possible prophylaxis, i.e. the elimination of such habitations.

Nevertheless, we would here stress the point that it is not only housing conditions which make slums. In Paris it is easy to find very healthy families living in shanties in the outlying districts, and persons infected with tuberculosis who inhabit comfortable apartments. It has been proved that the responsibility lies often with the families themselves, and that in two adjacent habitations one will be light and clean and the home of a healthy family, while the other will be in a dirty condition and tuberculosis instals itself side by side with the unwashed and lazy family. In this case, the problem is one of education and not of housing.

Let us suppose that the whole of a population is decorously housed. Have the principle risks been eliminated?

The reply is given by FISCHEL who gives examples of his experiences in certain British and American districts. The slums were destroyed and their inhabitants reinstalled in comfortable houses. The statistics showed that tuberculosis morbidity had become higher than it was when the families lived in the old slums.
In Paris, modern houses were constructed at the time of the "H.B.M." (Cheap Housing) Act and tuberculosis took up residence there immediately.

The house has been aired, but by putting a man's house too far away from his work, by making him pay a higher rent which will necessitate restricting other expenditure, the stress has simply been placed on another aspect of his poverty.

The slum problem which is urgent in Morocco, has also been present in Europe and America. We would like to see Morocco spared the disillusionment of the other towns. The organization of housing is one of the chief matters with which the Protectorate is concerned. A considerable effort has been made to eliminate the "bidonvilles" and to re-house thousands of families, but if we want results we must not content ourselves with the organization of housing from a purely architectural point of view. All progress in housing conditions must be accompanied by a lowering of rents or by a raising of salaries.

(2) Exhaustion

Although reference to the hard labour in great factories has become classic, there should be some clarification on this subject.

It is impossible to qualify the organization of industrial work as dangerous. According to the statistics, it is even less dangerous than agricultural work. In fact, the work itself is less important than the "working conditions". If there is danger, this exists when there is conflict between the task to be performed and the organism of the worker, that is to say, when a man is asked to perform a task for which he is not fitted. "Sickness and pathological accidents are observed principally among the occasional workers". The conflicts may, moreover, not be purely physiological, and RIETER & SIEBECK of Berlin insist on the "psychological attitude to unaccustomed work". There is no doubt that workers who have become adjusted to the task they perform are very much more resistant to disease.

These conditions of disequilibrium are all present today among Moslems in Morocco.

In addition there is:
(3) Underfeeding

This is a predisposing factor in tuberculosis - as the economic conditions of the last war unhappily demonstrated. Numerous surveys have shown that the Moroccan's food is not sufficient for the energy expended and this lessens the resistance of his organism. All these circumstances form facets of the same problem, which is one of poverty pure and simple.

What is the conclusion?

The campaign against slums is useless.

The distribution of food is also futile.

The only effective remedy against these social factors is the general improvement of living standards.

Is this all?

No, there is another factor which is independent of all the circumstances due to poverty and which may be more important in the urban milieu where tuberculosis is more frequent, and more serious. It is:

(4) Maladjustment to Surroundings

Tuberculosis among Moroccans presents some striking analogies with tuberculosis among the black people. It is superfluous to repeat that Moroccans, like the black people, are particularly exposed to serious forms of the disease with a high evolutive potential. Nevertheless, it is also a well-known fact that the "natives bear tuberculosis well in their villages" and the same phenomenon is observed in Morocco. "In the towns cases of cured reinfection of tuberculosis are very rare. In the 'bled', some tuberculous persons recover" (Gaud & Mage).

On the other hand, in all Moroccan towns morbidity and mortality are lower among the Jewish population than among the Moslems in spite of at least equally unfavourable living conditions. It is that "here again, as Bezancon has written, we have the pre-eminent influence of change of surroundings and life in relation to incidence and gravity of tuberculosis".
The mass of the urban population of Casablanca is undoubtedly maladjusted. It is not difficult to imagine the disequilibrium of these rural people who emigrate and pass rapidly from agrarian and archaic conditions to XXth century industrial conditions. Whether he is allergic or not, the individual thus transplanted, maladjusted, disorientated and often placed in miserable living conditions, will be particularly exposed to tuberculosis infection.

This concept is extremely interesting since if it is difficult to combat poverty en bloc, it may perhaps at least be possible by regulating migration towards the towns, and by more rational occupational guidance, to guard effectively against this disequilibrium.

B. HEALTH EDUCATION

Apart from the general measures for which the living conditions call, it is certain that there can be no effective combating of tuberculosis without health education of the population and of the individual.

There are two different aims to be achieved:

(1) Education of the present population, which would require a vast propaganda campaign for the diffusion and, above all, the repetition of a certain number of simple, fundamental rules.

How can this propaganda be carried out?

First and foremost through the films and radio, which are costly methods but certainly the most effective and reach the greatest number of people.

This propaganda would seek, above all, to diffuse elementary information on hygiene by explaining the disastrous consequences of spitting, the importance of cleanliness in the home however poor and bare, the dangers to which children are exposed and the need for sending children to school.

On a smaller scale, there should be more posters and more instructions in dispensaries, hospitals and infirmaries, for the disciplining of persons suffering from the infectious tuberculosis.
Finally, an excellent method of educating adults in towns is "the organization of leisure" which favours and develops sports activities.

This propaganda could be easily carried out in the towns, and with much greater difficulty in the rural areas where, however, the dangers are less. It could considerably improve the results of tuberculosis control. Nevertheless only:

(2) the education of children and the younger generations can provide an effective remedy for the total ignorance among Moroccans with regard to the most elementary rules of hygiene. Tuberculosis control must be begun in the schools, and in this field teachers play a predominant role.

The ravages of tuberculosis will be gradually reduced as and when we can banish ignorance, enlighten the people with regard to the dangers, and create an environment which will resist infection.

C. LEGISLATION AND SOCIAL ASSISTANCE TO TUBERCULOUS PERSONS

The Social Security scheme in France imposes a heavy burden on the community and some even maintain that the burden is disproportionate to the country's possibilities.

Can a social security organization be set up in Morocco? There are many obstacles, the chief of which is that such a system can only be set up in a rich and high evolved country where each citizen by his work and output contributes to the general prosperity. Morocco is far from having reached this stage.

Nevertheless, a considerable effort has been made to give social assistance to persons suffering from tuberculosis:

- the public authorities have introduced legislation granting long-sickness benefits to tuberculous officials for a period of 3 years;

- private organizations have created a social assistance Fund which has so far made it possible to pay a two-thirds wage for one year to workers suffering from tuberculosis.
It is still true, however, that the majority of patients do not benefit from these provisions. The great mass of tuberculous persons obtain assistance only from private organizations such as the "Lique Marocaine contre la Tuberculose". The budget of this organization, which exceeded 50 millions in 1952 is almost entirely devoted to assistance in this field and it constitutes a veritable public service.

GENERAL CONCLUSIONS

It must be recognized, as Berthet has written that "prevention of tuberculosis does not consist only in mass radiological examination. It consists essentially in the effort we make to maintain a better physical and moral balance in man".

The fact is, we repeat, that tuberculosis control is a complex whole.

The difficulty, in the face of all the multitudinous exigencies of this prophylaxis is more the preparation of a well-balanced programme compatible with the financial means and resources in personnel, than the application of this or that isolated measure.

The programme must, however, be constantly readjusted as the country develops and adapted to the new conditions.

Prophylaxis of tuberculosis demands great effort:
- on the part of hospitals and dispensaries, against detected cases of tuberculosis;
- in case-finding and BCG preventive vaccination;
- on the part of the State for the improvement of the general well-being.

It also demands a great deal of faith, and love of mankind.