



THE PUBLIC HEALTH ASPECT

of

TUBERCULOSIS PROBLEM

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by

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INTRODUCTION

Tuberculosis is an ancient malady. Early Egyptian mummies show evidences of chronic tuberculosis. Hippocratis and Avicenna were familiar with the symptoms of the disease. Tuberculosis is not an inherited disease but it seems probable that there are inherited genetic differences in susceptibility to infection. Francis Sylvius (1671) believed that the tubercles in a consumptive lungs were produced from some invisible glands in the organ. P.Desault (1733) a physician of Bordeaux maintained that these tubercles were new productions rather than an enlargement of something pre-existing. Laennec (1781-1826) was tuberculous himself, said that tubercle is really a disease and that consumption is tubercle of the lungs. Bayle considered that the disease was essentially a discrasia or diathesis. Nearly every one including Virchow (1865) regarded it as a constitutional condition and nearly no one believed that tuberculosis was a communicable disease. The infectivity of the disease was proved by the French military surgeon J.A.Villemin (1868) and he was able to inoculate human tuberculous material in rabbits all of which showed tuberculous lesions some months later. These results were extended and confirmed especially by Hüssell (1879) and Salomonsen (1879), and from that moment the belief in a specific virus as the cause of the disease became fixed and the search for it began.

It was the Great Robert Koch (1882) who discovered the organism and gave it the name tubercle bacillus. Koch was the first to emphasise the great importance of inhalation of human tuberculous sputum as the dominating element in the transmission of the disease in man.

It is only after Koch has discovered the causative agent of tuberculosis, that our knowledge about the disease is placed on a really firm foundation.

Koch and his Co-worker Schütz found in 1901 that bovine and human tubercle bacilli were not identical and Koch considered that if bovine bacilli were pathogenic for man at all, it must be a relatively rare event. From that time on the attempt to prevent the infection began. The results are really good because the mortality per year in countries raising campaigns against the disease is much less than before. The only defect in any campaign against tuberculosis is the absence of an effective specific remedy. But let us hope that a specific drug will be discovered for the cure of this disastrous disease.

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To discuss the problem of prevention a complete knowledge of epidemiology and modes of infection is necessary.

In this paper I am discussing these two points briefly giving the most important points.

EPIDEMIOLOGY OF TUBERCULOSIS =

The tubercle bacilli are found wherever civilized human beings congregate. This is due to the fact that consumptives expectorate sputum containing bacilli. It has been estimated that the number of bacilli discharged daily in the sputum of a single patient with advanced phthisis is as great as the number of human beings on earth (Fishberg). Undoubtedly very few escape infection with the tubercle bacilli especially those living in large industrial cities. I do not mean by that that all people have tuberculous disease; but I mean that the bacilli have entered the body. Thus tuberculous disease is always preceded by infection but ^{not} necessary every infection causes tuberculosis. Autopsies made with a view of ascertaining traces of tuberculous lesions, both active and healed showed over 90% positive in people living in contact with civilization. Those who live primitively naked in fresh air and exposed to sun presented virgin soil.

The newborn infant is practically free from tuberculosis. This indicates that infection, if occurs, always takes place after birth. Fishberg says: "The younger the individual infected with tuberculosis, the more likely he is to be killed by the disease, while the older the individual the less is he likely to suffer from acute and progressive disease." Most authors believe that infection takes place up to twelve years of age. It may take place after that if the patient is a virgin soil. By tuberculin test it has been found that every few adults living in cities ~~who~~ do not react to tuberculin. Pollak found that 96% of children under four years of age in Vienna are infected.

The danger of tuberculous infection depends on the length of ^{time} a child or a virgin soil has been exposed to the infection. The advance and severity of the disease depend on the dose of tubercle bacilli that gain access to the lung.

Tuberculosis appears not to be a racial problem. Any human race when first meeting with tubercle bacilli is as vulnerable as others. It is only after the race has been exposed to the disease for some generations, that it acquires some resistance against it. In fact it is a disease of all countries and all races; but its greater or lesser spread is determined by social, economic and climatic conditions and above all by the presence of tubercle bacilli.

In well to do communities living in hygienic dwellings with enough food for adequate nutrition, children show weak tuberculin reaction and sometimes absence of reaction. On the other hand children of poor communities show much more positive reaction both in number of cases and intensity of reaction. Poverty also brings congestion and overcrowding and increasing chances for massive infection. Vitality is suppressed and resistance decreases because of insufficient and improperly prepared food. There is an interesting fact noticed in the statistics and that is the decline in mortality rate from tuberculosis due to the improvement of sanitary and hygienic condition under which the bulk of the people live at present.

TUBERCULOUS INFECTION.

To prevent tuberculosis we must know definitely the modes of infection. The source of the bacilli causing this terrible disease in

infants and children appears to be the tuberculous man and woman who expectorate millions of organisms capable of entering healthy persons and causing the disease. Tuberculosis also is transmitted by drinking raw cows milk infected with bacilli.

CHANNELS OF ENTRY:

1. Inoculation into skin and mucous membrane: Although the transfer of germs from hand to hand and from hand to mouth is very difficult to avoid, yet the skin of all organs appear to be the least vulnerable to tuberculosis. Lewondowsky says: "The skin is not a culture medium for the tubercle bacillus, it does not permit it to grow and proliferate." So one can confidentially say that infection through the skin is hardly of any importance.

2. Infection by inhalation: The fact that sunrays, kill tubercle bacilli and render them a-virulent, would largely exclude infection through sputum deposited in streets and large bright sunny rooms. But in the case of poor consumptive living in a poor dwelling without proper sun rays. ~~Without proper sunrays~~ and proper ventilation may deposit sputum that remains virulent for long periods. The most important way to infection is the droplet infection. The moist droplet eliminated by a consumptive while speaking coughing or sneezing may be inhaled by a person near by. The droplets evolved during that undoubtedly contain numerous bacilli, which remain floating in the air for a time, (At a distance of one meter or less droplets can pass from the consumptive mouth to be inhaled directly ^{ly} from a person about this distance from the patient. Children and babies of tuberculous mothers are the most vulnerable because they carry the crying child very close, coughing

in his face and trying to sooth him by kisses and the infection passes directly to the little open mouth. The severity of infection depends on the dose thus inhaled.

3. Infection by Injestion: is second to inhalation method of infection in frequency. The baccilli enter with food especially raw milk and cream through the mucous membrane of digestive tract as it is very rare to find unbroken mucous membrane. The entrance is through the tonsills and small intestins especially the ileum thus resulting in tuberculosis of the cervical glands and the intestinal glands. Behring says that tuberculosis in adults was usually acquired during childhood from injestion of raw infected cows milk.

4. Germinative or placentar infection: very rare as autopsies of newborns of consumptives show no focci in the body of the new born.

PREVENTION OF BOVINE TUBERCULOSIS

This type of tuberculosis affects children more than dults. 12% of tuberculosis under five years of age is of bovine origin. In adults bovine strain of the organism very rarely causes pulmonary tuberculosis; but it causes tuberculosis of bones and lymph glands. The glands mostly affected are the cervical chains and the abdominal gland as the portal of entery is through the tonsils and intestines. The infection results from feeding on infected cows milk, cream, cheese and butter. So the prevention of this type consists in:-

1. Prevention of bovine tuberculosis.
2. Reduction of the risk of human infection from milk containing tubercle bacilli.

Prevention of Bovine Tuberculosis:

Any cow that excretes tubercle bacilli is infectious. Udder tu-

berculosis is ^{one of} the most important means for the spread of the disease to human beings through drinking raw cows milk. Also it furnishes a very important means in infection of calves suckled from a cow suffering from udder tuberculosis. A cow with pulmonary tuberculosis can also infect human beings by leaking its udder or by blowing in the milk during milking or by some of its nasal excreta passing to the milk. Prevention of cow to cow infection is very important, 'This infection takes place in farms with cows closely packed in unsanitary sheds which are insufficiently and badly ventilated. To my mind cows are especially susceptible to the disease because of the strain in production of a calf every year, inadequate nutrition coupled with the heavy drain involved in the daily production of very large quantities of milk over long periods. The place where cows live should contains adequate ventilation and adequate lighting and cows should not be crowded in sheds. They must be given nourishing food including a liberal amount of proteins.

In 1917 the U;S.A. Federal Government introduced a method for eradication of tuberculosis in cows. It is known as the "Accredited herd plan". The main principles are the testing of herds with tuberculin, slaughter of the reacting animals, assistance from public funds as regards free tuberculin testing, the payment of an indemnity for slaughter reactors and official recognition of herds that have become accredited under the plan. The system is a voluntary one and is not compulsory upon cattle owners. Under this plan the separate herds are accredited as free from tuberculosis and they are maintained free by annual testing with tuberculin. The modified accredited area plan deals with areas. The extent of the area is determined by the

Federal and State authorities. An area is designated when the entire number of reactors is less than $\frac{1}{2}\%$.

To me this eradication method is excellent where the tuberculin reactors among herds do not exceed 5-7%. If the reactors are say, 20 - 40% the method is inapplicable, because the eradication of such a percentage would cause a milk famine and a marked rise in price of milk.

An important point is to maintain herds free from tuberculosis. To do this healthy animals should be separated from tuberculous ones. Also the rearing of healthy non infected stock is necessary. All udder tuberculosis should be slaughtered; and the herd is then divided into infected and non infected, the infected group is transmitted to another farm, while the non infected group is kept alone and tested with tuberculin every six months. The rearing of healthy stock includes the separation of the young calves from their infected mothers and care is taken so as no infection will gain access to them.

Governments should issue some laws as regards to the Prevention of infection. The following may be of help.

1. Any cow suffering from tuberculosis of the udder should be slaughtered.
2. Open cases with advanced pulmonary tuberculosis should be destroyed.
3. Cows ematiated with tuberculosis should be eradicated.
4. Any farmer that disobey preceeding items is punished in the name of the law.

Veterinary inspection should be carried every six months. Open cases should be detected and destroyed.

The making up of a healthy herd requires in fact an efficient veterinary control and a good cooperation from the farmers and herd owners. Bacteriological and microscopic examinations must be carried on respiratory excreta of herds to detect open cases.

REDUCTION OF HUMAN INFECTION FROM MILK:

I. COLLECTION OF MILK: Should be carried under the most hygienic conditions. Persons that collect milk, or milk the cows, or transport it must be free from tuberculosis and their sputa must be negative for tubercle bacilli. Milking should be done in special clean rooms especially prepared for that purpose; to prevent the possibility of manure carrying bacilli from passing to the milk. Milk is received in very clean sterilized pails with small mouths. After milking; milk should be chilled and kept at 10°C. temperature far from dust and dirt.

II. CITY DAIRY: This should be built according to hygienic requirements made by the department of health and approved by the health officer before use. All apparatus, such as tanks, clarifiers, separators, pasteurizing and bottling machines should be very clean and sterilized by steam. Bottles should be sterilized before filling and delivered as prompt as possible to the consumer. All milk should be pasteurized before being sold as a compulsory procedure.

PASTEURIZATION OF MILK: is essentially a process of treatment by heat that results in destroying of any pathogenic organisms so that milk keeping is rendered easy and favorable. Pasteurization consists in heating milk to 60°C. for twenty minutes followed by rapid chilling at 10°C. and kept as such till it is delivered to the consumer. Milk must be certified or graded. Grade "A" milk is that taken from herds

free from tuberculosis and examined every quarter of a year with tuberculin. A bad thing about it is that the producer cannot always find a market for his certified or graded milk at his increased price. Frequent dairy inspection must be made by the health inspector.

TECHNIC OF DETECTION OF UDDER TUBERCULOSIS:

Forty to fifty cc. of milk is taken from the suspected udder and centrifuged at a rate of 3000 for 15 minutes. The cream is removed. The precipitate in the tube is mixed with 2 cc. of the milk centrifuged and injected in the medial aspect of the tibiofemoral articulation subcutaneously (of a guinea pig). Then examine for enlarged glands after 2-3 weeks. The test is good and positive even if the sample contain only 6 bacilli. The animal also dies in 2 months. Be sure it did not die from intercurrent disease other than tuberculosis.

CREAM AS SOURCE OF INFECTION:

When infected milk is centrifuged, the tubercle bacilli are carried up with the cream. Much cream is consumed raw as fresh cream and often by children.

THE GOVERNMENT AND TUBERCULOSIS

Every government should look at tuberculosis problem as one of its main goals. Tuberculosis is a preventable disease and the negligence in measures against the spread of infection results in unnecessary death of millions every year. The eradication of this slow deadly disease should be a big responsibility to every government. The work should be put in well trained hands of officials aided by all helpful

governmental and social agencies. To my mind the protection of the life and health of people is more important than the security of property. But unfortunately all governments especially our Eastern ones indulge with all their powers and means in political problems leaving the health problem in the hands of few unexperienced, untrained, ^{persons} who give little attention to the tuberculous problem. They are seeking independence from foreign countries and not seeking independence of the deadly tuberculous germs that are doing their work slowly but surely and efficiently in the human victim. It is a shame to have tuberculosis in such a country as the Lebanon with its wonderful climate, its fresh air and bright sunshine. Governments such as the British, German, and others are doing great efforts to overcome poverty which undoubtedly is the most important factor in the spreading of the disease; and when the time comes when they overcome poverties, it will be the end of tuberculosis in these nations.

By this I do not mean that a government should take the work alone; this will be practically impossible to eradicate the disease. What I mean is that the government should be the guiding hands - through authorities - to lead humanity to better understanding of the nature of the disease. Unfortunately these guiding hands are not available, not because of absence of authorities but because of negligence from the part of the government. This point is especially seen unfortunately in Egypt, more than any other Near Eastern country. All the government forces are directed towards politics and only politics, while 85% of the inhabitants are still drinking water directly - without any sanitary cleaning - from the Nile and its tributaries. Well these 85% are sick with Belharzia and Ancylostoma, that lowers the resistance of the people

to a terrific extent and making the poor farmer a good field for tuberculosis and for tuberculous germ to act slowly - but efficiently and surely.

A government should look after health destroying conditions and improve them. There should be forced improvement in schools, in housing conditions, prisons, reformatories, workshops and factories and in most of the many organised efforts of recent means of civilization. Industrial crimes pave the way to poverty and tuberculosis. Poverty leads to tuberculosis and tuberculosis begets poverty. All strata of the nation should fight against tuberculosis whose roots has gone deeply in all our social and industrial organisation; aid^{ed} by official control in the sense of directing and organising the work for its prevention. So the most important ^{part} in the combat lies in the co-operation of all the country forces against this enemy. From one end the government official, directing and organising and from the other hand, the general practitioner and inhabitants doing their best to follow the organisation and take the necessary means for help and contribution.

No one can doubt that tuberculosis is more difficult to control than a typhoid or small pox epidemic. The chronic nature of the disease and the mild symptoms it presents at the beginning make it difficult to be discovered or suspected in its early condition. A patient may go on actively infectious for years without the least suspicious of being infectious from the part of the community amongst which he lives.

As difficult it is; results in countries organising campaign against tuberculosis are encouraging; and it is now the time to our Oriental Nations to awake and to look seriously to the problem. The

method to be used by the government will vary with conditions as they exist in different cities. The predisposing cause may be faulty work-shops condition or may be inadequate home conditions. Irrespective of that the method used to be of any value must be based on the knowledge of the cause and method of dissemination, a knowledge of how to prevent the cause and a continuous, persistent application of the remedy. A government must take a prominent part in education of the public on the subject of tuberculosis and to create in them an active interest in the campaign against it.

A health officer and his assistants, can instruct school children, mother's clubs ---- etc. in the simple ordinary means that nature has given us and to teach them that sunshine, fresh air, nutrition and rest though uncostly yet they are the only available ^{means} to prevent and to cure the disease.

If all the money and time and effort now devoted to the care and cure of active cases are devoted to prevention, the end of tuberculosis as a world scourge, would be in sight. The work of the government lies in two principles

1. Proper provision must be made to permit municipal, state or any other government body to raise money for the fight of tuberculosis.

2. Prevention of spread of infection. Reporting of cases by physicians must be mandatory.....

As for raising money, it is beyond the scope of this paper to discuss.

As to the prevention government should develop a system for notification. The following suggestion may be of help:

(a) All, hospital, clinics, orphanages, jails, infirmatories, must report to the government every case of tuberculosis coming under their care.

(b) All cases of tuberculosis admitted should be segregated until the government can provide a place for the sick in one of the sanatoria.

(c) There must be in hospitals a proper provision for segregation of all tuberculosis cases admitted for treatment of some intercurrent illness

3. All hospitals, clinics, orphanages, jails and infirmatories should adapt efficient hygienic means for collection and destruction of sputum or other infected discharge from the body.

Unsuspected inspection by the health officer to these institutions to see if the previous points are regarded or not.

Care must be taken that establishments like orphanages, schools infirmatories, hospitals etc. should not be crowded. The building must be examined by the health officer ^{before} because it is licensed for the purpose it is built for. This last point should be emphasised because many institutions are so crowded, that proper cleanliness and adequate care are very difficult to maintain.

Government should have efficient supervision over public places as cinemas, theatres, cafés, clubs etc. so as to be sure that the sanitary and hygienic conditions are adequate.

SPECIAL TUBERCULOSIS CLINICS:

These are the most important means a government can do to prevent tuberculosis. These clinics are established for the early detection of cases, dispensing of medical advice and treatment and

education of the family about this disease. The educational possibilities of tuberculosis can be carried by a special nurse, through her the gospel of prevention can be carried into homes. These clinics are very essential factors in any effecting scheme looking towards the control of tuberculosis.

The city if big as in the case of Cairo and Alexandria is divided into districts; government or municipal clinics occupy some of them while phylanthropic or other societies clinics occupy the other ones. In such clinics patient will get specialised attention and adequate searching inquiry into past history, family history and present invironment, coupled with a thorough physical examination. This will result of course in far more accurate diagnosis of early and doubtful cases.

In no one direction does the preventive side of clinic work better and more efficient than among the children of tuberculous families. Advice should be given to the parents of such children to make them realise the fact of tuberculous infection. This advice is carried efficiently by the special nurse. The cooperation of different social agencies and the inhabitants of the district is very necessary for the success. After detection of the case, the patient is sent to the sanatorium to have his adequate and ellaborate treatment; then his family is instructed by the nurse. I suggest the following points to be stressed:

1. Mode of infection and susceptibility of young children to get the disease.
2. Use of nature's efficient prophylactic means
 - (a) Good food, nutritious and rich in vitamins.
 - (b) Rest and avoidance of exhaustion.
 - (c) Sunshine.
 - (d) Fresh air.

3. She should teach them to notify the clinic about any member of the family ^{who coughs} for a period longer than two weeks.

4. To make them understand that tuberculosis is a disease that can be easily cured if the case is discovered early.

5. To teach them the proper disposal of sputum.

6. To make them understand that tuberculosis if not treated early results in the long life misery and a sure end of long course of disability.

Thus after the case is treated in the sanatorium, on returning to his family, patient will find a better understanding of the nature of prevention of the disease.

Another function of the nurse is to keep family health records. These records are very important and in them every member of the family should have a place in which is mentioned whether he is negative or positive sputum, if he is positive to tubercun. or not..

One of the most important points is the management of the of tuberculosis after discharging from the sanatorium as cured or disease arrested. He should be examined from time to time and he should be instructed as to the line of work he should follow in his new life.

These clinics must be gratis, and this is very well seen by the fact that all tuberculous patients or at least the majority of them are poor.

Every clinic should be supplied by an X-Ray machine for better and early diagnosis.

OPEN AIR SCHOOLS:

Open air classes should be organised and established by the

government under the supervision of the public health department and should be directed by a physician or at least supervised by a physician. Such schools are made for the benefit of children in the early stages of the disease and for the children^d consumptives who were undoubtedly exposed to the infection, but no symptoms or signs in them showing the activity of the disease. The purposes of these schools are two:-

1. To supply educational knowledge to such children regarding their ability and state of health.

2. As a sanatorium for treatment; and here comes the work of the physician and the nurse. Such schools should contain all the requirements of a sanatorium.

Classes should be held in fresh air outdoors in sunshine. Short periods of study and long periods of rest are required. Good food, rich in vitamins, well cooked and easily digested.

Control over other schools is necessary. The time of study during the day should be fixed by the government; to prevent exhaustion of children in study as it is the case in many schools.

TUBERCULOSIS AND UNEMPLOYMENT PROBLEM:

Governments should pay great attention to the problem of unemployment. It results in poverty and poverty in turn results in tuberculosis.

Food handlers should be regulated. Open cases must be detected and isolated.

VILLAGE COLONIES:

This institution has been created by Sir Varier James in England. These colonies to my mind are good for the convalescents from tuberculosis and they may be adapted by governments. After the patient

gains his health completely in such a colony he can return to his family. In the colony the convalescent patient finds a work suitable to his condition of health. And after the disease is arrested completely he can be sent back to his original work.

and
GOVERNMENT OF PHYSICAL CULTURE:

Physical culture in a country is a marvellous means in the prevention of tuberculosis.

Gymnastics should be carried on in schools, reformatories, jails, prisons.....etc. to build up strong bodies, that will be able to resist infection. Athletic clubs should be encouraged by governments. Special propaganda is necessary for the spread of athletics.

PARKS, GARDENS, PLAYFIELDS:

Must be established in every city. These present, marvellous means for recreation and rest.

EARLY DIAGNOSIS OF TUBERCULOSIS

It is of the utmost importance to the community that tuberculous infection in individuals be recognised and proper treatment instituted long before the characteristic symptoms appear; in the worker while he is at work, in a child while he is at school....etc. The school physician, the factory physician and the special clinic physician are the three important factors in early diagnosis in a community. Early diagnosis means a better chance of recovery. It means prevention of infection of others and longer period of usefulness of experienced men. J. Arther Meyers in his book "Tuberculosis of infants and children" says, "Fifteen years ago it was frequently stated that 80% of patients who came to physicians for diagnosis could have their disease detected

by careful study of the symptoms, and the finding of râles over one or both upper lobes and the detection of tubercle bacilli in their sputa. Today this statement is absolute. Any physician would be ashamed to report that 80% of his cases were diagnosed after symptoms and physical signs were present and tubercle bacilli were recovered from sputum. All these are late manifestation in chronic pulmonary tuberculosis and the disease is easily diagnosed long before they appear in majority of cases." So early diagnosis can be made by routine Physical examination, tuberculin test and X-rays. Even X-rays may fail to show early tuberculosis. The failure of X-ray to show early lesions, may be due to the lesion being so very intimately blended with other shadows such as those of heart and vessels, mediastinum, liver or thickened pleura. This is especially true in children. Again J. Abther Meyers says " An X-ray examination that proves negative does not rule out tuberculosis. We have seen infants die of miliary disease or meningitis within a month or less from the time the X-ray film appeared negative. One must not overlook the fact that the T.B. lesion both in the paranchyma and the hilum may be so small that no visible shadows are cast on the film."

By this I do not mean that we should over-look the X-ray as being an important early diagnostic measure, but I mean that it may fail sometimes. The real early detection is done by a really good physical examination, made by a specialist aided by tuberculin test and X-ray of the chest and here comes the work of the special clinic.

TUBERCULOSIS IN CHILDREN AND ITS PREVENTION

Tuberculosis is much more serious in children than in adults. The

younger the child the greater the danger of infection. The greatest predisposing causes are poor state of nutrition and an infected environment which reduces the resistance to infection. Many children might be saved from tuberculosis if parents knew that preventing the infection is the most important protection against the disease. Two types of tuberculosis in children exist:

1. BOVINE TYPE:

On drinking raw milk from an infected cow. The bacilli penetrate the tonsils and the intestines and settle in the glands, bones, and even the lungs (in 10-12% of children Tbc).

2. HUMAN TYPE:

Intermittant contact of a child to an open case of tuberculosis as well as constant contact to such cases results in infection of the child. If a consumptive mother nurses, feeds and handles her child, there will be great opportunity to get the infection. Sometimes the person responsible for the infection is an old grandmother who has had the cough for years and is not suspected to have tuberculosis. Any child who is over tired, who loses in weight or fails to gain over several months or who has frequent colds and cough and begins to look run down should be taken for a doctor for thorough examination.

PREVENTION OF INFECTION IN CHILDREN:

1. Parents should keep children away from any person who has the disease or who might be suspected of having it. If one of the parents is sick, the only absolute safety is to remove it from danger—either the child must be removed from the home and sent to a relative in the country or to send the sick parent to a sanatorium. Separation

must be just after delivery and the infant is given B.C.G. Vaccine
(Please read chapter on B.C.G. in this paper.)

2. Every cows milk given to a child up to the age of two years at least should be boiled; and cod liver oil should be given.

3. A child who is not well and who does not gain in weight over a period of two - three months should be submitted to thorough examination.

4. Children should be examined by a good doctor once a year.

5. The habit of kissing children is a bad one. Parents are advised against it.

6. Great care is to be taken and exercised in selecting domestic servants and nurses for infants. Nurse should be examined carefully by a physician before admitted.

PREVENTION OF PRE-INFECTION:

Bacilli infecting a child remain dormant within the body and cause no disease. If resistance has been decreased by malnutrition or intercurrent disease, notably measles and whooping cough and typhoid or pneumonia, they are activated and cause disease by metastatic auto-infection. So children are to be guarded against such endemic diseases. During convalescence from these diseases, the child is to be given special care because at that period its delicate body is susceptible to tuberculous infection. It should be given adequate nourishment and kept outdoors the greater part of the day.

PREVENTION IN ADOLESCENT:

Hyper-reactors to O.T. should be protected from contact with consumptives. Adults who had shown positive O.T. in childhood or infancy should not be given the freedom to stay late at night. They should have enough amount of sleep and not to be exhausted during the

day in such a period of rapid growth.

IMMUNIZATION WITH BCG. VACCINE.

In 1906 Calmette and Guerin started to attenuate a virulent strain of tubercle bacilli taken from a tuberculous udder of the cow by culturing them on media of potato soaked in bile for thirteen years with 230 transplantations; then they cultured it on potato media soaked in glycerol broth. This culture did not cause progressive tuberculosis in laboratory animals. It was designated as BCG.

In 1921 Weil-Hallé first administered the vaccine by mouth to an infant exposed to tuberculous grandmother. There was no untoward symptom. Since then it has been widely used for vaccination of infants in almost every country. In some countries vaccination is now carried out on older children and adults who have negative tuberculin reaction. Calmette found that the morbidity and mortality in France and outside France among children who were vaccinated with BCG. was less than that among the non vaccinated (Revue de la Tuberculose, Oct. 1931). Dr. Querangal of Brest found that mortality among children of the poor districts of the city vaccinated with BCG. by mouth is only 7.3% while that among non vaccinated children of the same community is 17.7%. This result is taken from the statistics of "Hopital Maritime de Brest." (Revue de la Tuberculose, Nov. 1935.)

Calmette recommended the vaccine to be administered by mouth in newborn infants in three doses of 10 mgm. each at intervals of 48 hours and that the vaccination be completed within the first ten days of life. The administration of vaccine per oral route is limited to infants within the first 10 days of life because it is claimed by Calmette

as well as by other investigators that the intestinal mucosa becomes impermeable to absorption of the vaccine after ten days from birth. The vast majority of investigators agree with Calmette that the BCG. Culture is so attenuated that it is no longer capable of producing progressive generalised tuberculosis whether injected or given by mouth provided that it is prepared as prescribed by Calmette. The results of carefully American studies on children exposed to cases of tuberculosis indicate that the mortality from this disease during the first six years of life is lower and the X-ray demonstrable pulmonary lesions are fewer among those who have been vaccinated with BCG vaccine than among non-vaccinated children under the same hygienic conditions. The percentage of positive reaction to O.T. is certainly higher among those vaccinated subcutaneously and intracutaneously than among those vaccinated by mouth.

SUBCUTANEOUS VACCINATION WITH BCG.

Calmette used 0.01 - 0.02 mgm. subcutaneously. This results in deep seated abscess which may have difficulty in drainage.

INTRACUTANEOUS METHOD:

Wallgren advocate an optimum dose of 0. mg of BCG. He found that it gives 93% positive skin tuberculin reaction. The local lesion usually suppurates after one month and heals after 3 months. The drainage nodes also suppurate. So a method was needed where the vaccine is easily applied so as to afford a wider application. There should be no gross local lesion and no lymph node suppuration. So to fulfill these requirements Rosenthal advised:

The Multiple Puncture Method:

It consists of 35 tangential needle pressures through a drop of vaccine (one cc. = 5 mg. BCG) applied to the lateral aspect

of the left arm (approximate dose 600,000 bacilli). This method gave 99-100% positive skin reaction to old tuberculin in infants in an environment free from tuberculosis, tested three months and one year after vaccination. Control infants did not react to O.T. It causes no growth lesion (local),no suppuration of lymph nodes - no appreciable scar, easily administered and smaller doses of vaccine administered.

TUBERCULIN TEST

The simple fact that a patient reacts to tuberculin does not mean that he is suffering from tuberculosis; however it means that he has been infected with tubercle bacilli at some time in his life and as a result,his body cells have been rendered sensitive to tuberculo-protein. There are certain conditions under which sensitization may disappear temporarily as in cases of exanthemas,influenzal infection, malnutrition and rapidly spreading tuberculosis with extreme decrease in resistance. In cases of healed foci, the body cells may not react to the normal dose of tuberculin, but react to higher doses. So the requirement for diagnosis is that the dose be sufficient to call out the reaction. "The local reaction in the skin, conjunctiva and other tissues" says Pottenger, "in itself means only infection without regard to activity of disease."

Tuberculin test is one of the most important factors in the diagnosis of tuberculosis in children. A positive tuberculin reaction in a child of less than six months old has [^]gave significance because such infection is usually followed by a fatal course. In the second half of the first year,the fatal course is frequent. It is especially

desirable to apply the test to infants born into families in contact with tuberculosis. In such conditions make your test at three months after birth and repeat it at six and nine months.

DOSE OF TUBERCULIN: 0.001 mg. - 0.1 in children
0.100 mg. - 1.0 mg. in adults

The dose is given intracutaneously in the medial surface of the forearm. The readings are as follows.

- + When there is an edematous area not exceeding 10 mm.
- ++ When redness and edema measures 10 to 15 mm.
- +++ When area of redness and edema had exceeded 15 mm.
- ++++ When there is necrosis in the skin.

The value of the reaction for diagnosis diminishes with the increasing age. Adults between 20 - 30 show 100% positive reaction. So this reaction shows infection but not necessarily that reacting individual is tuberculous.

It has been shown that if a person does not react to 0.01 mg. of O.T. because he is not sufficiently sensitive to it, 100 times as much (1 mg.) may be given in re-injection without danger of causing severe reaction.

VON PIRQUET TEST: One drop of 1/10 dilution of O.T. is put on the inner surface of the forearm and scarify through the drop. The intra-cutaneous test is much more accurate and sensitive.

PURIFIED PROTEIN DERIVATIVE OF TUBERCULIN:

0.00002 mg detect majority of cases. If patient does not react 250 times the dose in re-injection can be given with safety. This dose shows the highly sensitive cases. If it fails use the dose 0.005 mg.

TREATMENT WITH TUBERCULIN: Tuberculin is used in treatment of tuberculosis nowadays. I refer the reader to Textbooks on treatment of the disease.

EDUCATION AS A PREVENTIVE MEASURE

It is one of the most important means in establishing a campaign against tuberculosis. One should teach the common people that it is a curable, communicable and preventable disease. Without the cooperation of the people any campaign educational or otherwise cannot be of any benefit. The educational program I suggest is the following:

I. Teachings to the consumptive.

II. To teach people how to resist infection and avoid it.

III. To raise in the public an interest towards the subject and to excite their curiosity.

1. By cinema films.

2. Lectures and articles in newspapers.

3. Pamphlets.

4. The visiting nurse.

IV. Class room Education.

TEACHING TO THE CONSUMPTIVE: There are number of things a consumptive should know about himself. He should know something about tuberculosis in order that he can appreciate the slow way in which recovery takes place. He should know that medicines are useless and the only thing to cure is rest, food and sunshine. One should excite in him that his children are exposed to the same misery through his negligence. The followings

are good points to teach:

1. He should know how tuberculosis is spread to others. He should be instructed that taking care of all infected discharge and covering his mouth whenever coughing, sneezing, talking and laughing will lessen the danger of his giving the disease to others. He should not spit except in the cup containing the necessary antiseptic to kill the bacilli.

2. He must ^{keep} himself in his room with windows open to admit sunrays and fresh air to kill bacilli in droplets floating in the air.

3. Not to allow children to enter his room for any reason.

4. To eat in his own dishes and to drink from his own cup.

5. To avoid crowded places as cinemas, theatres, cafés ..etc.

6. He must be taught to cultivate in himself a calm, kindly philosophy of life. Worrying, anger and excitements are bad.

TEACHING TO THE PUBLIC TO RESIST INFECTION AND TO AVOID IT:

The degree of spread of this disease in a community or a city does not measure the standard of medical practice but in fact it is an index of the private and public hygienic habits and conditions of the community. It is the barometer of the wrong living and defective sanitary conditions. The physical constitution necessary to resist the invasion of tuberculosis is both an individual and community problem. The community should be taught that the essential and necessary prophylaxis against tuberculosis is to dwell and labour in clean surroundings with an abundance of fresh air and sunshine, supplemented by a good wholesome nutritious diet rich in vitamins and proteins. The layman should be educated in lines of elementary principles and facts

related to tuberculosis and methods of its infection. The poor and labouring classes should be taught in regard to improvement in living and housing conditions. One should excite in him a perfect realization of individual responsibility for his own as well as for public health. He should be taught that children as delicate they are; are the most susceptible to get the infection and he should know how to protect them against it. He should realise the fact that every chronic cougher should be isolated in a special room. He should realise also that notification of such a case to the public health department or to the special clinic is not only of great benefit to the patient but also of great benefit to himself and to his children.

RAISING AN INTEREST IN THE PUBLIC AND EXCITING THEIR CURIOSITY:

To my mind, the physician and the health officer are not capable by any means to establish an adequate campaign against the disease without the co-operation of the public. To raise the interest in the public is really a difficult problem especially in the Near East where ignorance is spread to a great extent. As examples to raise the interest the followings may be tried:-

1. Cinema films showing

- (a) How infection is transmitted from a consumptive to a healthy.
- (b) The result of infection on the health of the victim.
One can picture the life history of a consumptive on the screen. This will create the fear of getting the disease and subsequent precautions ^{against} to get it.
- (c) History of tuberculous patient admitted to sanatorium and cured emphasizing that early treatment is the best hope for recovery.

2. The curiosity can be excited by lecturing to them about the disease in a simple language they can understand. The lectures can be held in mosques, churches, clubs, cafés or cinemas.

Lecturing should include, notification of cases, modes of infection, how to avoid infection, healthy hygienic house living. Uses of sunshine, fresh air, cleanliness -----etc.

Articles in news papers stressing the above points.

3. Pamphlets: stressing the above points.

4. The visiting nurses: these can do wonders in the prophylactic campaign. The visiting nurse is the means of contact between physician of the clinic and the family of the patient. She is the tuberculosis teacher. She explains to the family the danger of contagion. She persuades the apparently well members of the family to come to the special clinic for physical examination and to have regular anti-tuberculous treatment. If patient is treated at home she must see the equivalent of sanatorium treatment carried ^{on} out. She must see that the strictest ^t hygienic ~~rule~~ is maintained to stop further spread of contagion within households. By her expert advice she will help the family to maintain the good living conditions necessary in treatment and prevention. For that she must have tact and patience, great understanding and internal vigilance.

CLASS ROOM EDUCATION:

(a) In elementary schools: these pupils usually have little appreciation of the physical methods by which communicable diseases are spread. The subject can be touched through stories in which ^{they} are highly interested.

(b) In high schools: pupil should know what is the di-

sease and how to prevent it. As a community problem it should be studied in civics, science and social studies. In visits to community agencies as public health department, a tuberculous sanatorium a factory or a sanitary dairy, these will be a natural occasion for a discussion of tuberculosis as a problem that should be solved in human beings and in animals.

VILLAGE WELFARE SERVICE AND TUBERCULOSIS EDUCATION:

People carrying this enterprise must have in their program the problem of tuberculosis. Poor farmers living in bad hygienic conditions in their villages know nothing about the disease. The simple means of hygienic life should be taught, methods of prevention---etc. Such education should be directed more to the bovine type of tuberculosis; how to protect the cows, how to milk, the clean utensils --etc. which has been mentioned under bovine tuberculosis.

PERSONAL HYGIENE:

There is no evidence whatsoever to show that tuberculous infection takes place before life begins; and although it is difficult to control it absolutely; I do not see why every man of us cannot keep himself strong enough to resist the infection. Here I am suggesting ^{nine} ~~eight~~ good points to be followed:-

1. Have fresh air, sunshine and exercise daily.
2. Live in bright clean rooms.
3. Eat good food and drink pasteurized milk.
4. Get plenty of sleep and rest and do not get overtired.
5. Wash your hands always before eating.
6. Take care of your general health and keep your weight near average.

7. Have a health examination by a good doctor every year.
8. Keep away from all cases of tuberculosis: unless you are caring for a patient and in that case take every precaution which the doctor advice.
9. Avoid alcoholics because
 - (a) It decreases body resistance and increase susceptibility to disease.
 - (b) It is a cause of poverty and poverty begets tuberculosis.

One must not spit in the street or in common places as cafés, clubs ---- etc. One must have the hygienic habits of coughing and sneezing. One must eat from his dish and drink from his cup.

PREVENTION OF TUBERCULOSIS IN COMMUNITY ESTABLISHMENT:

HOUSING CONDITIONS: Nowadays it is well known that tuberculosis is found just as often in little towns and county districts as well as in big cities where many people are crowded together. It is a catching disease and wherever an active case is present, there is always the danger of infection in the house. If such a case is present, it should be isolated in a special room or in a sanatorium if available. In county districts a little cottage can be made for the patient near the house of the family. Any method that will increase the distance between a tuberculous patient and other people will reduce the spread of the disease.

CARE OF TUBERCULOUS CASE AT HOME TO PREVENT THE SPREAD TO OTHER members of family. Unfortunately in large parts of the world especially in the Near East, there is not such provision for hospital and sana-

torium beds for the care of all tuberculous patients. So many cases are to be treated at home.

The rooms in which patient is isolated must be bright, sunny and well ventilated with lots of windows away from noise and trouble. It must not be crowded with furniture and must be cheerful^{because} of the long course of the disease. The room must be all to himself. There should be a good supply of small soft clothes or tissues for the patient to use when coughing and a paper bag where he can put these after once using. They should be burnt every day and should never be handled by anyone without washing his hands thoroughly afterwards. The patient should have a tray on which he can have his meals. Once every day his forks, knives, spoons and dishes are boiled and returned to patient's room. This tray must be kept apart from the family supply so as the infection cannot be spread by this way.

A sputum cup can be used with strong antiseptic as phenol. The inside strong paper is burnt with the sputum after use.

No children by any means are allowed to the patient's room whatever the cause is. As to adults, they are allowed to the room in times when the patient is not in the rest period.

It is of the most importance to keep the patient's courage up and to make him cheerful. Female patients can knit or do anything they like. Male patients are allowed to carve with a knife-----etc. and as the patient progresses, the occupation should be changed as to suit him in his present conditions.

Food given to the patient should be nutritious, rich in vitamins not heavy on the stomach and easily digested. Cod liver oil is necessary. The plan made by the doctor for prevention should be fol-

lowed carefully and all family members must be under the care of the physician. Babies and children must be immunized against tuberculosis (See section on BCG Vaccine).

Any person who is in contact with a patient must scrub his hands with soap and warm water after every time he or she is in contact with the patient. Such a person should be advised to put a long apron while in the patient's room, then to take it off when the work in the room is finished and the apron is left in the patient's room. Patients' clothes should be boiled and washed alone.

If the room is vacated, every linen in it must be boiled, the mattress and pillow should be outdoors in the sunshine for few successive days. Things such as ~~thermometer~~, bottles wollen blankets are boiled, then soaked in antiseptics, then washed with soap and water and left to dry. The room itself and the bedstead are washed with warm water and soap and left open for several days so as sunrays and fresh air can enter. Or the room can be fumigated with formaldehyde gas.

PREVENTION IN SCHOOLS:

Schools must be built according to the most hygienic conditions. Rooms must be large, well ventilated, bright, sunny and must not be crowded by pupils. Recreation facilities and outdoor play must be encouraged. Every school employee should have a yearly health examination and any active tuberculous case is excluded from any contact with the pupils. Tuberculin test is done for all pupils, and small children have to be examined regularly and weight records are kept. So any one of them whose health is such that others may be endangered is excluded from school until his condition is satisfactory. All milk used in schools must be well boiled before use. Tuberculosis education

should be carried on in schools as mentioned on other part of this paper.

PREVENTION IN ORPHANAGES---etc.:

Essentially the same as in schools.

CHILDREN LABOUR REGULATION:

In fact this is a government work, children should not be allowed to any work that ^{their} general physique cannot endure. This causes exhaustion and decreases the resistance to infection. Laws must be legislated for such purpose concerning the age of the child and the type of work.

LOW WAGES AND LONG HOURS OF WORK: tripled by high cost of living nowadays are one of the most important causes that predispose to tuberculosis. A worker exhausts his natural forces and consequently decreases his resistance for little amount of money that hardly can provide the poorest kind of food and the necessary shelter for himself and his family. In spite of the low wages, unemployment is wide spread ^{abroad} ~~above~~ the world. The number of hours of work must be fixed by the government.

FACTORY CONDITIONS:

Workers must do their job under the most hygienic conditions. The factories must be ventilated especially where gases injurious to human system notably the lungs are evolved as byproducts. The humidity in factories must be avoided because it prevents perspiration; thus body temperature becomes very high. Also dusts should be removed, hours of work should be fixed -----etc.

So these conditions, which make for better living, better personal hygiene, higher standard of nutrition, more hygienic dwelling, greater amounts of air and sunshine - ^{about} ~~the~~ hours ^{of work} and protection of the

workers, all increase the natural vitality of the people and at the same time decreases the danger of spreading infection.

TUBERCULOSIS AS A SOCIAL AND ECONOMIC PROBLEM:

Every citizen whatever his work is, owes some duty to the society according to his abilities. The preacher, the teacher, the social leader, the good citizen, the layman must move up to the army of defence against the disease. As I said before without help of all strata of population in the country; physicians and health officers can do very little.

In fact the financial loss resulted from loss of lives, invalidism, medical and nursing expenses, public and private sanatoria and religious organizations is much more costly, than the finance necessary for organizing the campaign against the disease. It is only a thorough and a proper conception of civic duty on the part of such leaders in thought and action in community, that the public sentiments can be aroused. There must be a new understanding of the elementary principles pertaining to healthful life in homes, schools, factories and workshops and a new vision of the beauty attaching to cleanliness of public buildings, streets, factories, stores and homes.

Society should look at a consumptive as a member who through mischief has acquired misery and slow long sufferings. One might ask what is the duty of such a society towards an invalid member; and this question would undoubtedly bring the whole social problem of tuberculosis.

DUTY OF SOCIETY TOWARDS TUBERCULOUS MEMBERS:

1. Notification of the case to the health center and arrangement must be made to transfer the patient to any sanatorium. The good

to the patient is from the point of view of cure and to the society from point of view of prevention.

2. Another important duty, is to supply his family with the necessities of life while the patient is under treatment especially when the family is poor.

3. After discharging of the patient from the sanatorium the society must help him to find a work suitable for his present new life.

Organization of Anti-Tuberculous Societies:

Here I am trying to suggest a scheme for organization of an institution for a country like Egypt. All of us know that Egypt is divided into provinces and each one of these contains towns and villages.

A big city is divided into districts and each district will have a society. A small city will have only one society. Every few villages are considered as a small city consequently one society is organized. For each province a sanatorium must be established by the societies in the given province; of course by the help of the government.

The cabinet of each society should be from the notable people of the district. The members should have civic personalities and should be social leaders in their communities, so as people can follow them. Every society should have a doctor as an active member and to him the medical organization of the campaign is left. The work of the society is the following:

1. Raising the funds necessary for the campaign.
2. Establishing a sanatorium with the help of other societies in the province.
3. Giving instructions to patients and families.
4. Organizing special tuberculosis clinic in each district.

5. Educational Campaign.
6. Taking care of patients' families during treatment in sanatoria.
7. Finding suitable work for the patient after his disease is arrested.

FUNDS NECESSARY FOR THE CAMPAIGN:

1. Government should help by giving annual amount of money.
2. Subscriptions and gifts from the rich people of the districts.
3. Interprises like the plaster interprise in Egypt which is carried now for other purposes.
4. A day should be assigned and called the tuberculosis day in which people give the price of a sunday meal to the society for combating the disease whose roots has gone very deeply in the human society.

WOMAN SOCIETIES: These form an efficient troupe in the army of the campaign. Well trained ones can pay visits to families in the districts for advice and their charming personalities will help a good deal in the success.

MARRIAGE AND TUBERCULOSIS: The danger of transmission of the disease to the other partner is negligible. The partner has undoubtedly been infected during childhood and re-infection is not likely. Whether he or she will develop tuberculosis depends on factors other than intimate association with a tuberculous partner. It is interesting to cite the following lines from Metchnikoff "At the age of 23" he says, "I married a young lady of the same age who was attacked by grave pulmonary tuberculosis. Her condition of feebleness was such that it was necessary to carry her in a chair in order

to mount the few steps which led to the church where our marriage to be celebrated. My wife died of tuberculosis after four years of sufferings. I passed the greater time by her side in the greatest intimacy without taking any precautions against the contagion; nevertheless in spite of the conditions, which were especially favourable for catching the disease, I have remained free from tuberculosis and that during forty four years since my marriage." The danger in fact is that of infecting the children after birth.

ECONOMIC PROBLEM OF TUBERCULOSIS:

Tuberculosis in industrial countries causes great loss in the efficiency of work. Long hours of work and exhaustion coupled with poor nourishment and tripled with improper sanitary conditions break the resistance of the strongest man and give big chances to bacilli laying dormant in a focus in the lung to thrive and destroy the tissue. This will increase the efficiency of the workers who are unfortunate to get the disease. Early detection of the disease in a worker or an employee is of great importance to himself, his co-worker and his employer. For the workers I suggest societies to look after them having the same program as in previous societies.

From the standpoint of prevention of tuberculosis among workers, the best plan would be the application of medical examination to all new employees for the purpose of eliminating any existing disease and determining their physical fitness for the given task. The examination is repeated at certain intervals or whenever suspicious signs arise. Every big firm must have a doctor especially for the firm. He will take care about the health of the workers and the hygienic conditions of the firm like ventilation -----etc.

The workers must be compelled by the employer to have life in-

surance against tuberculosis.

WORK FOR PATIENTS DISCHARGED FROM SANATORIA:

With the rich and prosperous people it is very easy. But with the workers it is a different problem. Patients may go to their ordinary vocation provided they know how to take care about themselves. Under supervision, and with careful observation of the ordinary rules of healthy life, they very often avoid relapses. Most authors agree that cured patients do best on returning to their old vocation for which they have been trained and at which they can earn the most with the least possible effort. Changes of vocations to single easy ones is accompanied by low wages which may not be enough for adequate nourishment for himself and his family which results in lowering the resistance, worrying and the relapse. "It is also a fact" says Fishberg "Only rarely considered by medical men that the artisan has usually adopted his organism to his peculiar accupation".

We must not forget that convalescing tuberculous patient should be kept from hard muscular exertion if relapses are to be avoided. One must put them under medical supervision for several months after beginning to work and if they show any sign of danger or of damage to their constitution especially fever, dyspnea, tachycardia -----etc. they must stop before it is too late. Cured patients must not be allowed to work in dusty trades such as pottery and earthenware manufacture, copper, iron, lead and steel manufacture, stone cutting or cigarette making -----etc. When we put in our minds that a patient with cured tuberculosis almost always harbours virulent tubercle bacilli in the cicatrized area of his lungs; we can understand that the irritating dust may at any time flare up a dormant lesion in new activity.

Many people advocate farming for cured patients, but to me, it is not ideal especially in our countries where farmers have long hours of hard labour for a small pay; and food that does not satisfy the city dwellers. For this class of cases, there are many simple vocations in the city which are much better than farming example of these are, watchman, ticket agent, motor-men ----etc. Outdoor easy work for a convalescent is good provided there is no exertion ~~on~~ⁱⁿ muscular fatigue.

SANATORIA AND TUBERCULOSIS.

The sanatorium has been one of the most important factors in the decline of both infection and mortality. It has cured numerous patients and returned them to their homes, not as invalids but as instructors with ^a great understanding of the nature of tuberculosis and the measures necessary for the prevention of the disease. They have also gone home as wage earners to work and support their families. Thus preventing others from getting tuberculosis as a result of what otherwise would have been a decreasing standard of hygiene and nutrition. Some authors believe that the educational side of a sanatorium is the most important side, but to me the isolation of the infective cases from their families and the cure of many whereby they are prevented from being a source of infection to others is of the greatest importance in the campaign of preventing the spread of the disease.

Another important factor is the specialist who carries out the treatment successfully, as this requires knowledge, skill, patience and tact. Other factors are the determination of the patient to get well, the confidence in the program ordered by the doctor and the loyalty to follow it.

The properly conducted sanatorium is in fact a heaven of rest for the tuberculous patient. It separates him from the noisy world and gives him rest of body and rest of mind. It shields him from the great responsibilities and care of home and work. Every one connected with the sanatorium must encourage the patient and strengthen his determination to get well.

When the patient first enters the institution, the measures taken are appreciated very much. This appreciation is often forgotten when he feels better and gets tired of isolation and inactivity which are against the human nature.

This is beyond the scope of this paper to discuss fully the treatment in a sanatorium but the following is a brief discussion of the subject.

REST CURE: Nature makes a strong effort at repairing the affected lung. This noticed beyond any doubt on inspection of the chest in a case of tuberculosis. The affected lung moves less deeply than the normal one. Physical rest during active tuberculosis exerts a beneficial effort on the patient by putting up a more efficient defence. Rest causes the minimum amount of toxins to be liberated from the active foci and it favours localisation of infection and prevention of spread to other parts of the lung. It calls for minimum food requirements and holds, the demands for food within the limits of the patients digestive ability. Rest decreases the patients symptoms and the toximia of tuberculosis.

Physical rest is also important to be regarded as it is possible to be in bed and still not rested. Many tuberculous patients through harmful emotions such as fear, unhappiness and pessimism, keep their

physiologic activities going on. By this the activity of their nervous and endocrine systems are disturbed to such an extent as to increase their metabolic rate, quickens their pulse and may interfere also with sleep and digestion. From the above discussion one can easily notice that if patient is properly nourished, rest is the most important single remedy that is employed in the treatment of tuberculosis. There is no greater danger to a a tuberculous patient than to exercise during the activity of the disease, as it cause spread of foci in the lung and increase the toxemia. Exersion should be avoided particularly when the disease first shows activity.

Exercise is only desirable when the active stage has disappeared completely; then it is desirable for the patient to change from his continuous forced rest to a carefully prescribed amount of activity. This activity is only considered when the physician is sure that there is no longer activity in the lung. It is dangerous to attempt starting exercise too soon before the lesion in the lung has healed, or when the lesion has healed, exercise is pushed too far. The exercise should be graded and it is of the atmost importance after patient has been cured to prepare him to normal surrounding activity and work.

FRESH AIR : The beneficial or harmful effect of air depends on three things:

1. The amount of movement: which carries^l the patient fresh air after taking away the bad one. If the movement is too much, it will decrease the body temperature unless the patient is well covered.

2. Degree of humidity: This is important because if it is high, perspiration is diminished and body temperature elevated especially when air is stagnant and this has a bad effect on the body.

3. Degree of heat: when high, prevents the body heat from dissipation by convection. So patient prespires to get out CO₂ and water excreted through sweat glands. If a high degree of heat is accompanied by a high degree of humidity and stagnant air, one can easily see the harmful effects on the human organism.

That is why mountain climate has been chosen an ideal in building a sanatorium. It is beyond question that air is pure in the mountains. The absence of massed population assures freedom from air contamination. Humidity is also less. Air in the mountains is cool even during the summer especially in regions 4000 feet or above the level of the sea. Moreover this high altitude increases the activity of hematopoetic system.

DIET: Basal metabolism in pulmonary tuberculosis has been found to vary from normal to 25-30% above normal during the period of elevated temperature. This increased metabolism requires increased food intake but in both acute and chronic cases the digestive capabilities are much less and appetite diminishes because of toxemia.

A daily diet of 100 grams of proteins, from 80 - 100 grams of fat and from 400 - 500 grams of carbohydrates would probably meet the daily requirement of an average tuberculous patient. Animal proteins derived from eggs, meat, milk, cheese are of course more easily digested ~~more~~ than proteins derived from plants. Fats are furnished in their best and most available forms in butter, cream and egg yolk. Cod liver oil and halibut liver oil are also of great value, both for the fats and the vitamins content. Carbohydrates are best given in vegetable forms and fruits because they carry with them cellulose in varying amounts which because of its bulkness, become of value in exciting peristalsis. They also supply vitamins in varying proportions

and mineral salts which are dispensible.

Vitamin A seems to be essential to the normal functions of the glands of the body, including the digestive glands, it is found in mammalian liver, milk fats, egg yolk, leaves of plants and C.L.O. Vitamin B is necessary and of value in tuberculosis too for its special action on motor nerves of the body. Vitamin C is necessary because it may prevent haemorrhage and Vitamin D which regulates the calcium metabolism. On the whole diet must be nutritious, rich in vitamins, not irritating, not heavy on the stomach and easily digested and should not be forced as that decreases the appetite.

LIGHT TREATMENT: There seems to be a close relationship between the sun's energy and calcium metabolism; for we know that blood calcium is increased in seasons and places where sunlight is shiny.

Sun's rays should not pass to patient through glass because it looses much of its short waves by absorption. Light passing through open window; no doubt is responsible for some of the good effects produced by an open air life. The radiant energy from the sun is probably the most important and the most natural of all stimulants to the physiologic activity of the body. Light affords a stimulus without which no human body can live, and the person who is ill, will profit of its benefits according to his ability to utilize the rays.

The exposure of tuberculous patient to sunlight will improve the condition of the skin and thus aiding in eliminating heat and waste products which are given off from the body surface. Both light and air exert a stimulating effect on the nervous system which has a

tendency to improve the body metabolism. The time of exposure is to be fixed by the treating physician, according to the need of the patient.

In places and seasons when exposure of patients to the direct sun rays seems difficult and even sometimes inadvisable; the patient will have the benefit of radiation by being exposed to light emitted by scientifically constructed lamps; the ultra-violet lamps.

DRUG TREATMENT: For tuberculosis no drug can be used with benefit as far as the tuberculous lesion goes. Drugs are only used for symptomatic treatment. As for calcium, there is a great controversy in opinions about it; some believe in it while others say it is useless.

SURGICAL TREATMENT: The main aim to surgical treatment in tuberculosis is to give rest to the diseased lungs. The operations for that purpose are the following:

1. Artificial pneumothorax.
2. Oleothorax.
3. External pneumothorax.
4. Cutting adhesions and apicolysis.
5. Operations of the phenic nerve.
6. Thorocoplasty.

C O N C L U S I O N

Tuberculosis is a communicable, preventable and curable disease.

The problem of prevention of tuberculosis should be considered as a social and even a national problem. There should be a co-operation in the work between the government, different phylanthropic and social agencies and the common people, & great propaganda against the

improvements

disease, in community establishments together with efficient scheme of tuberculosis education. Sanitary housing and factory conditions should be improved together with compulsory life insurance for workers. Dispensaries and special tuberculosis clinics provided with X-rays and tuberculin will help in early diagnosis. There should be an efficient compulsory system of notification of cases and sanatoria for treatment and isolation. Great attention to the prevention of infection in infants and children should be taken; together with vaccination of all babies with BCG Vaccine. There must be a post graduate course in tuberculosis in every school of medicines. Anti-tuberculous societies must be encouraged by the people and the government. Prevention of bovine tuberculosis and infection of milk and milk products must be considered. The whole problem needs better understanding, better treatment and greater care than what is taken now.

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