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HONESTY AND COURAGE CAN ERADICATE TUBERCULOSIS

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FIVE million or more persons die every year from tuberculosis. Five hundred thousand die in India alone.

In the Philippines over 35,000 deaths occur annually, one every fifteen minutes. Over a million more have tuberculosis, and the population is only eighteen million. In the slum areas, children below 2 years old are 80 per cent positive, and between 3 to 4 years of age, 100 per cent.

In Poland one out of every ten persons has active tuberculosis. Similar or worse conditions exist in many parts of the world. In many areas mortality rates from 500 to 800 per hundred thousand are reported.

In the September issue of the *National Tuberculosis Association Bulletin,* Perkins stated there were over 500,000 persons in the United States with active tuberculosis, more than one-half of whom are not known; the exact number could be larger. Certainly the tuberculosis decline is lagging far behind other communicable diseases, yet we are told tuberculosis is under control.

In the United States, case-finding programs, hospitalization, isolation, and treatment are among the best in the world, but about 50,000 die here every year. Moreover, our country contains only 5 per cent of the world's population and cannot be isolated. The world is getting smaller. It can now be circled in about three days. The tubercle bacillus knows no boundary lines. Thousands of our citizens travel all over the world and people from other countries are coming into ours. In many places, certificates of health against smallpox, typhoid, etc., are compulsory, but for tuberculosis there are no barriers.

In the past year I have traveled about 75,000 miles by air visiting Asia and Europe, as well as Hawaii, the Philippines, South and Central America, and have had definitely impressed upon me that nothing worthy of being called tuberculosis control exists. My pilgrimage, plus my intimate association with this disease for many years, has convinced me that if we are ever successfully to combat it, we must approach the problem with a much broader vision than we have in the past. Some of my observations I should like to leave with you today.

Presidential address, Thirtieth Annual Meeting of The American Association for Thoracic Surgery, Denver, Colo., April 15, 16, 17, and 18, 1950.

In poverty stricken India people live in cubbyholes, often with cows, goats, manure, etc., and under such crowded conditions that they sleep in rows. Much malnutrition exists, and hygienic conditions are nonexistent. There are only 127 beds for tuberculosis in the large city of Delhi, and 7,500 in all of India. With hopelessly inadequate numbers of hospital beds, surgeons, and medical men, proper treatment is absolutely impossible.

In Japan, the badly overcrowded housing, the hygienic conditions, poverty, and malnutrition are almost as bad. Some good surgery is done, and there are some good hospitals, but most of the treatment of tuberculosis consists of ambulatory pneumothorax at medical centers. They have a center for every 100,000 persons. I found that only 60 per cent of the patients treated had positive sputum when pneumothorax was started, and only 50 per cent were converted by treatment. All of these are living at home infecting others.

In China, with the Communists overrunning most of the country, no official figures were available, but I was told by Chinese doctors that in many parts 30 to 50 per cent of the population have tuberculosis. There are only 300 beds in all Hong Kong. The Minister of Health told me that most patients got well while at work and without treatment in a period of about six months. I leave this with you without comment.

In the Philippines I was told by Dr. Arguellis, to whom I am indebted for considerable statistical material, that the mortality rate is about 170 per 100,000 in rural districts, and about 270 per 100,000 in Manila proper. There are some good hospitals there, but it is economically impossible to adequately care for tuberculosis.

In Siam there are only a few fifty-bed hospitals. The same story of poverty, bad sanitation, etc., exists. No attempt is made to control tuberculosis. Ambulatory pneumothorax again is the principal treatment. The mortality rate, I was told, was 275 per 100,000, but it is no doubt higher.

In Egypt proper facilities simply do not exist. Estimates on mortality rates varied from 200 to 300 or over per hundred thousand. I left Egypt with only the knowledge that little or nothing is done for the tuberculous except ambulatory intra- or extrapleural pneumothorax, and as in other countries abroad, some streptomycin for the rich. I am sure nobody knows what the real situation is, and it was my feeling that they do not care.

When Hitler came to power in Germany he threw out many of the best doctors who were not Nazis. When we took over, we threw out all the Nazis. There are many doctors there who have had only nine months of college education. Shortly after our occupation, efforts were made toward the management of tuberculosis in British, American, and French Zones, but when Clay and Hawley took over, I am told, the medical personnel representing the United States was cut from 174 to 7. In October, 1949, we had no doctor in either Berlin or Bremen. In fact, there was no longer a Department of Health. This had been put under welfare and education, and instead of doctors, there was an influx of ministers, teachers, movie actors, etc. I am informed that McCloy has made it possible for Col. Lundeberg and Col. DeForrest, Dr. Benning, and others who represent us in Germany, to again encourage active measures.

Statistics there are practically worthless. Tuberculous persons get increased rations and German doctors are willing to cooperate and diagnose tuberculosis where it does not exist. Their decrease in mortality rate is, in my opinion, partly due to few post-mortems, and change in the classification of deaths. One such classification is senility. How many of these died of tuberculosis is anybody's guess. A prominent German doctor stated to me that there were 25,000 active cases living at home in Berlin alone, with the consent of the authorities, because tuberculosis was not considered communicable in the adult stage. From 70 to 90 per cent of the cattle there are infected. Milk is sold on the streets out of pails. It is also skimmed and fed to calves, hogs, etc. Therefore, a good percentage of these now have the disease. With fraternization going on between our troops and the German girls, tuberculosis is quite a problem for us in Germany. Dr. Esmond Long stated that every American soldier contracting tuberculosis there costs the United States government $30,000. In Germany, as in most countries abroad, streptomycin and para-aminosalicylic acid (PAS) have been used mostly for meningeal and miliary tuberculosis. TB(1) in Germany has been used in less than 10,000 persons, and the results are not convincing. It is used mostly for bronchial, intestinal, and glandular tuberculosis.

In Copenhagen, excellent conditions exist. One-quarter of the whole population is x-ray or tuberculin tested every year. Everybody is examined, therefore, every four years. Their mortality rate of 34 per hundred thousand is among the lowest in the world, but tuberculosis is still the great killer there. In Rumania, Czechoslovakia, and Austria they report the use of an antigen called tuberculomucin, but its real value has not been established.

In Italy, France, England, and Ireland, the conditions are better than they are in Central Europe, but still very bad. Ambulatory pneumothorax is the national pastime. In Italy, Dr. Pasluci, Dr. Monaldi, and others are excellent surgeons, but a proper program of tuberculosis control does not exist.

In Switzerland, where the conditions should be ideal, the mortality rate is still about 67 per hundred thousand. They have good hospitals and doctors, but thousands there are still dying from this disease.

In South and Central America as in all of Europe and Asia the treatment of tuberculosis is not much more than a gesture. Ambulatory pneumothorax is the only treatment that can be used on a large scale. Time and space prevent a detailed report on all the countries I have visited, but, in a general way, their problems are the same and tuberculosis eradication is still a dream of the long distant future.

President Roosevelt was certainly ill advised when, a number of years ago, he said, "Now that we have tuberculosis under control, we must begin on cancer." One wonders whether, when we discover the cause of cancer, we shall be as apathetic and lethargic in applying our knowledge to treat this disease as we are with tuberculosis.

There is no need to mention the great strides made in the surgical treatment of this disease. It is rather its improper use upon which I should like briefly to dwell. Surgery plays only a small part in the over-all picture of tuberculosis eradication, but it, together with antibiotics and other measures now em-

ployed for salvage, will be for many years to come an essential and integral part of our program. The millions of persons now living, and the millions more to follow who may contract this disease, however, should be our greatest concern. For these we are doing very little. We, as surgeons, are really working on the wrong end of the line, trying to overcome the ravages of a communicable disease that should not exist.

We have all been lulled into a sense of false security by the repeated statements that tuberculosis is on the decline or is "under control." We go on our way embellishing techniques or substituting some new bizarre, and often ridiculous, measures which accomplish less than the ones they were intended to supplant. In my recent world tour, I saw and heard of many such procedures. These are frequently used also in this country.

Pneumothorax is rapidly being discarded as a procedure of choice. Its many complications of fluid, empyema, frequent inability of lung re-expansion following its use, together with the inability to determine the condition of the lesion in the collapsed lung, impossibility of knowing when to discontinue it, etc., have convinced most observers that it should be virtually abandoned. It is still used routinely, however, in some places, often being carried on for years with the patient at home, with positive sputum under ineffective collapse. The same is true of pneumoperitoneum.

I have discussed intrapleural pneumothorax at length because the same complications that follow its use are also encountered in the surgical procedure, extrapleural pneumothorax. When the extrapleural space is maintained by air, these complications are about the same as just described, but many surgeons are not satisfied with this debacle and fill the space with all sorts of foreign bodies. Those most frequently used are Gomenal, paraffin, and Lucite balls. Gomenal sometimes develops into a pus poultice. Many years ago I had two patients drown following its rupturing into a bronchus. Paraffin may also rupture into the bronchus or become infected, and frequently does. Lucite balls, from pressure and necrosis, sometimes rupture into the mediastinum, the other hemithorax, the neck, or any place available. At Duke University years were spent digging out these balls, but today many surgeons are still using them routinely. The use of these procedures is haphazard, unscientific, inexact, and inexcusable. We have all seen even small cavities change in position, but not in size, under a 90 per cent collapse with pneumothorax or thoracoplasty. How, therefore, can anybody without Divine guidance know how much paraffin or how many Lucite balls will be necessary to cause cavity closure. Furthermore, once they are put into the space, they obscure the x-ray examination and one cannot tell whether cavities are closed or not. If they are still open, further attempts to close them might be extremely hazardous. Nature, however, apparently rebels at the presence of foreign bodies, and seeks to eject them in one way or another. There are some few isolated cases, with extensive collapse in the contralateral lung and low respiratory reserve, with a small cavity high up in the apex of the other lung, where a small pack might be excusable, but their routine use should be abolished.

Our best results are usually found following thoracoplasty. Tuberculosis is a systemic disease, and therefore when it seems probable that thoracoplasty can accomplish the desired results, it is preferable to resection. There are numerous lesions not amenable to it, however, such as tuberculous bronchiectasis, stenotic bronchi with diseased lung beyond, coin and round lesions, and parenchymal lesions that cannot be differentiated from carcinoma. In numerous other conditions in which resection might be preferable there is a great difference of opinion. I hope this may be standardized as much as possible.

The greatest number of lung resections are done for the group of patients whose cavities remain open after thoracoplasty. I should like to discuss this group in more detail. Cavities still remaining open after this procedure are often due to bad thoracoplasties, and ridiculous embellishments of it. The use of small or multiple incisions, working in the dark to dig ribs out of a tunnel, failure to remove transverse processes, the use of all sorts of temporary packs between stages to overcome failure to remove sufficient lengths of ribs overlying the cavity are the most frequent causes of failure. If a good clean thoracoplasty, done under good vision, is performed, with the removal of all transverse processes including the first, and the complete removal of at least the first three ribs to the cartilages including the first cartilage from behind, and the remaining ribs far in front, there will be fewer anterior stages necessary, and a marked reduction in the number of residual cavities that require resection. After a bad thoracoplasty with cavities still remaining, we are confronted with the difficult decision of either doing several stages of revision, plus probable removal of more ribs, or of resecting. The patient has, by this time, been subjected to a lot of fruitless and unnecessary mutilation after which resection and death sometimes occur needlessly because proper surgery had not been done in the first place. The patient's respiratory reserve will, of course, require some modification of this ideal procedure.

Some surgeons use an anterior stage as the first procedure. Most cavities are situated posteriorly. If a thoracoplasty is properly done from behind, this stage is often not required. Some surgeons use it routinely after two or three posterior stages, regardless of the location of the cavity, or that an insufficient number of ribs have obviously been removed, with the cavity plainly visible posteriorly, directly under the unremoved ribs that are holding it open. By this time the rebridged bone, in the upper decostalized area, is so firm that an anterior stage is practically useless.

The Monaldi operation and cavernostomy have been practically discarded throughout the world, except for symptomatic relief or preparatory to thoracoplasty. In my travels I found only Monaldi himself advocating his procedure in preference to thoracoplasty, resection, etc. In Vienna, Denk is very partial to cavernostomy, but he was the only one I found who favored it. However, there are still some few surgeons who are using these procedures routinely in America.

I find reports of permanent paralysis, following crushing of the phrenic nerve, varying from 5 to over 20 per cent, depending upon the technique used. In some clinics, the nerve and sheath were macerated by 7 or 8 crushings; others

tied silk tightly around the sheath to make identification easier on a second crushing. Many other insults to the nerve and sheath have been perpetrated. Actually there is necessity for only one crushing of the nerve with a fine forcep and severing of small accessories. If the accessory nerve is a large one, it only should be crushed in my opinion. If small incisions and careful dissection are used I believe permanent paralysis will occur in not much more than 1 per cent. With recrushings and those done in conjunction with pneumoperitoneum, the percentage will be somewhat higher.

Streptomycin, PAS, etc., have in this country completely revolutionized the surgical treatment of this disease, but so much has been written on this subject that I shall not discuss it here. Waksman's recent book contains a chapter on the subject which I wrote.

It has been determined, however, that patients with tuberculous cavities, become resistant to streptomycin much earlier than those without them. It is imperative, therefore, that with cavitation some form of collapse be given simultaneously with streptomycin. In unilateral lesions, phrenic operations and thoracoplasties are the procedures of choice, but in bilateral lesions, pneumoperitoneum may be utilized until one side becomes stable, and it can be determined what permanent procedure, if such is necessary, may be performed.

In spite of surgery and our present antibiotics, however, we are not getting tuberculosis under control, for no matter how many we salvage the host of new victims are forever surging onward with a horrible toll. The hoped for benefits from case finding and hospitalization are rarely achieved for, in most or all places, such scarcity of hospital beds exist that it sometimes appears futile to find active cases when little can be done about them when they are discovered. This condition will always exist in most parts of the world. After hospitalization has been accomplished many patients leave against medical advice and go back to their homes, again spreading tuberculosis to all with whom they are in contact. The stupid requirements for nurses' training also adds to our difficulties. Thousands of patients with positive sputum roam the streets awaiting admission to sanatoria, which is denied them because of deficient nursing personnel. Case-finding programs are usually haphazard, sporadic affairs carried on in the most densely populated areas, and in schools, with a great bulk of the population not reached.

It is argued that in the United States with its relatively low mortality rate further measures are unnecessary. However, about 50,000 die of tuberculosis here every year and 500,000 or more have active disease. The incidence of tuberculosis seems to me to be of more significance than death rates; and we have no proof that the incidence is on the decline. Death rates fluctuate with economic conditions, wars, facilities for isolation and treatment, inherent and acquired resistance, etc., and cannot be an accurate guide to incidence. The examination of millions of draftees in the last war should have caused a tremendous decline in both mortality and incidence. Lack of hospital beds for active cases, however, counteracted much of the expected results. Many individuals also with known disease refused to be hospitalized during this period, because of high wages paid for labor, and remained at work, living with their families spreading

disease until it was too late for treatment. This practically nullified the results of this mass survey. In the last few years the use of streptomycin, PAS, and surgery have caused a drop in death rates. Many whose deaths have been retarded by these measures, however, will die later and cause an upswing in mortality rates. In the war-torn countries of Europe, the recent reduction in death rates is only apparent, not real. Many individuals who under normal conditions would have lived through the peak of the high death rates of 1945 and 1946 died prematurely from lack of heat, food, light, etc., causing an upswing in mortality rates. Following their deaths there would obviously be a drop in death rates, for most of the very ill individuals were gone and there were left those with early lesions, and disease in those persons who had sufficient resistance to overcome all these hardships. The mortality rates may soon turn upward again unless some other methods are employed to combat the disease.

Let us suppose, however, that our present methods are sufficient and we can actually rid our country of active tuberculosis. Negative tuberculin reactions and lowered resistance increase as active tuberculosis decreases so we would then develop a race of individuals like the Eskimos, Indians, and Negroes who because of lack of contact with tuberculosis have little resistance to it. It would not be long before this new race would die from tuberculosis like rats caught in a trap created by us. Many observations seem to confirm the probability of this occurrence. One of the most interesting of these occurred on the Island of Bornholm, where the incidence of tuberculin negative individuals was the highest in Denmark. When these persons went to other countries, or areas where tuberculosis was more prevalent, and returned, an alarming rate of active tuberculosis was found among them. This continued until tuberculin negatives were converted to positive before leaving the island. We cannot completely stop the constant flow of people to and from other countries. The more we decrease the incidence of tuberculosis in one country, or parts of it, therefore, the greater is the need for protection to tuberculin negative individuals. Unless we use vaccination as in smallpox, diphtheria, etc., there is, in my opinion, no hope of ever obtaining this protection, without which the eradication of tuberculosis is impossible. We have such a vaccine available, but through ignorance of its efficiency, misunderstandings regarding its harmlessness, prejudice, jealousies, lethargy, and apathy, its use has been neglected. That vaccine is B.C.G.

There can be no question at the present time as to the efficiency and harmlessness of B.C.G., but its development has been a slow process. When Koch discovered the tubercle bacillus in 1882, the conquest of tuberculosis was thought to be within our grasp. He found that a guinea pig, already tuberculous, was resistant to a second tuberculous infection. The original infection ran its usual course, but a second inoculation produced only a local reaction, and healed rapidly. This is Koch's phenomenon. Healed lupus also produces protection against tuberculosis. These discoveries made it quite clear that increased resistance to and prevention of tuberculosis could be accomplished if a safe method were discovered to produce it. Tuberculin was tried at first. Many workers also tried dead tubercle bacilli, but all were disappointed with the results. Experimental work, however, is still going on with dead bacilli, and also with the

vole bacillus of wells. The use of live tubercle bacilli was then started. All sorts of experiments were made and conflicting reports appeared in literature. It was not until Calmette and Guérin in 1908, using the Nocard's bovine strain of the tubercle bacillus from the udder of a cow, that real progress was begun. At the start of these experiments toward the attenuation of the live bacillus, it was so virulent that 3 mg. injected into calves produced death in 5 to 6 weeks. However, after 30 passages on glycerine bile potato medium every 25 days, it became innocuous for calves. Eleven years after the start it became innocuous for guinea pigs which have practically no resistance to tuberculosis. In 1924, Calmette declared it a "Virus Fixe" which would remain avirulent. This was accomplished after 230 subcultures of the strain had been made. To insure this avirulence constant assaying of cultures is necessary. In 1927, Petroff published his work and claimed he had grown a virulent variant called "S" from Calmette's B.C.G. culture as well as the "R" which was avirulent. The political and personal squabbles and jealousies that followed between men and nations were disgusting and are too numerous to mention. Some supported Calmette and others Petroff; others had views of their own. Much confusion existed, but Calmette, Guérin, and their followers remained firm in their belief and vaccination of human beings continued. In 1930, the Lubeck disaster occurred which shocked the world and did a great deal to destroy confidence in B.C.G. So much confusion existed then and still persists that a detailed report of the incident I feel is necessary.

Early in 1930, 249 infants were vaccinated in the town of Lubeck, Germany. The vaccine used was a culture of B.C.G. from the Pasteur Institute. Later 73 infants died. Criminal proceedings were started and all vaccinations were stopped. Investigators found first that the strain from which the vaccine came was avirulent when it left the Pasteur Institute, and to this day it has remained so. A vaccine made from the same culture had been given to infants, in another city, at the same time and there were no untoward results. Cultures were made from autopsy material and the organisms grown were of the human type. B.C.G. is from bovine tubercle bacillus. In the laboratory at Lubeck there was a human culture from Kiel. When the Kiel culture was grown on boullion it gave a green color which never occurs from B.C.G. Ampules of the vaccine as given at Lubeck were grown on boullion and the green color occurred. Cultures from autopsy material also turned green, so it was the Kiel culture used by mistake that caused the deaths and not B.C.G., for as stated B.C.G. does not produce the green color. The court so decided and declared B.C.G. blameless.

When Calmette died in 1933, the use of B.C.G. was practically discontinued. The Scandinavian countries, however, as well as some others, retained their faith in Calmette and continued its use. Gradually it was started again elsewhere. Not one report of untoward results or suggested virulence has been reported in the last twenty years. It is now accepted in most of the countries of the world. The worry today is not that the use of the vaccine is hazardous, but rather that it might not be virulent enough to cause sufficient resistance and immunity to tuberculosis. In one instance 400 times and in another 2,000 times

the usual dose was given by accident with no ill effects. The liquid form loses some of its potency if too long a delay occurs between its manufacture and its use. Dry vaccine can be transported with less need for haste.

B.C.G. is just now coming into its own. The numbers of controlled vaccinations in each country, however, are naturally relatively small. In all groups, however, the morbidity and mortality rates were markedly reduced and no complications followed its use.

In India I was told by both Dr. Benjamin, Tuberculosis Adviser to the Government of India, and Dr. Mani of the World Health Organization in Delhi that because of the lethargy of the United States and England regarding its use the doctors are skeptical of its efficacy and its popularity in India has been seriously retarded.

In Japan the mortality rate, in 1945, was 289 per hundred thousand. In that country as in others vaccination is now compulsory. Under General MacArthur and Brigadier General Sams the mortality rate has been markedly reduced. Thirty-one million B.C.G. vaccinations have been given there with not one untoward result. In the vaccinated group the reduction in mortality has been 88 per cent. This was done under the badly overcrowded and unhygienic conditions.

In Copenhagen B.C.G. vaccination has been carried on since 1927, but its use was carried on slowly and with great care. At first various small groups were vaccinated with proper controls, etc., but in 1947, mass vaccination was begun. Three hundred thousand vaccinations have been done to date, 150,000 of which were in the last two years. Statistics for large groups therefore are not yet available. In the well-controlled groups, however, some startling figures can be obtained. The most striking of these was in an underground shelter in a Jutland school where by chance the most favorable conditions for evaluating B.C.G. were present. There were three groups of children; 105 of whom had positive reactions from contact, 106 were positive by vaccination, and 94 tuberculin negative and not vaccinated. They were all underground, no light, no ventilation, the same food, etc., and had as a teacher a person with active tuberculosis. An epidemic of tuberculosis broke out and a check-up revealed that in the 105 children positive from contact 4 developed tuberculosis. In the 106 positive by vaccination 2 developed mild tuberculosis. In the tuberculin negative group of 94 not vaccinated, 70 developed tuberculosis. Dr. Tonderlund in Copenhagen stated that vaccination will cause an immunity in 70 to 90 per cent and will last from 4½ to 5 years. If tuberculosis does develop in those vaccinated, it is usually of a milder form. They have found also that patients with positive tuberculin reaction from contact develop tuberculosis 8 to 1 over those positive from vaccination. This is because many contact positives already have active disease which will show up later. This will not be true in a controlled vaccinated group.

It is impossible to dwell at length on the results of the large number of persons vaccinated throughout the world, but I shall give you just a brief summary of some of them. They are, of course, all in well-controlled groups.

In Sweden about 500,000 persons have been vaccinated. In 1945, Anderson and Belfrage reported vaccination of 10.6 per cent of the population of Gothenberg, Sweden, where the mortality as a whole was 68 per hundred thousand, but no deaths from tuberculosis occurred in the vaccinated groups.

In Orebro, Sweden, Malmos reported 22,413 vaccinations with no deaths in the vaccinated group, and only one case of tuberculosis developing in those vaccinated.

In Bores, in the same country, Torwell reported 19,000 vaccinations by 1947, and the mortality rate was 1 to 19 in the vaccinated group as compared to those not vaccinated.

In Norway, more than 400,000 vaccinations have been done. Heinbeck reported that in controlled groups the morbidity and mortality in the vaccinated persons was from one-fifth to one-tenth in the nonvaccinated. This was after 23 observation years.

In Bergen none of the persons vaccinated between 1937 and 1946 died of tuberculosis although the mortality of the city was 78 per hundred thousand.

In Brazil 164,000 were vaccinated in Rio de Janiero alone up to 1946. Orlando de Assis stated that the number of deaths in the newborn infants living in tuberculous families varies from 8 to 30 per cent. In the vaccinated groups it was 2.2 per cent.

In Argentina 500,000 vaccinations were done and Gomez reported the mortality in the vaccinated group was one-sixth of those not vaccinated.

In Russia millions of vaccinations have been reported and great claims are made of the results, but as no one believes the Russians anyway, and because I was refused permission to enter the country to observe their work, I shall omit their figures.

In Uruguay over 200,000 vaccinations have been done and the mortality rate is five to six times higher in nonvaccinated than in the vaccinated controls.

In Columbia 26,800 were vaccinated up to 1948. In one group the morbidity was 1.1 per cent in vaccinated group and 15.1 per cent in the nonvaccinated group.

In France 2,000,000 persons were vaccinated up to 1948. All report decreased mortality in vaccinated groups.

In Greece 34,279 were vaccinated in Athens and Pireus. In one control group no deaths from tuberculosis occurred in those vaccinated while 10 per cent died in the nonvaccinated.

In Algeria they vaccinate everyone every three years without taking tuberculin tests. In all these vaccinations as with all the 50 million now given there were no ill effects following its use.

The surprising thing is that B.C.G. is not used more extensively in the United States for it is in this country where some of the most competent and experienced bacteriologists and investigators of B.C.G. are working, and where some of the most carefully supervised experiments on its efficacy and harmlessness were undertaken.[1] The most important of these studies were made by Aronson and Palmer, Park, Rosenthal and Birkhaug.

Dr. Park, of New York, reported 690 vaccinated and 755 controls all hailing from tuberculous families, carefully analyzed and followed for ten years. The mortality rate was one-fourth as high in those vaccinated as in the controls. Dr. Camille Cayley, who worked with Dr. Park for twenty-three years, stated that when Park died he was convinced that analysis of small groups would not properly demonstrate the effectiveness of B.C.G. and advised mass vaccination.

Aronson and Palmer made a study of B.C.G. on the North American Indians beginning in 1936. There were 1,551 vaccinated and 1,457 controls. They were followed for eleven years. There was about 80 per cent reduction in the mortality rate in those vaccinated. Aronson now directs a B.C.G. laboratory at Phipps Institute in Philadelphia.

In Chicago under Dr. Rosenthal a rigidly controlled program was conducted in several groups. Two of these have been observed for thirteen years. *First:* Newborn infants living in areas where the mortality from tuberculosis was up to 300 per hundred thousand. *Second:* Newborn infants in which tuberculosis was present in the household. The mortality and morbidity were reduced in all groups. In Group 1 there were seven times as many deaths in the control group as in those vaccinated. In Group 2 there were no deaths in the vaccinated group and four in the control group. Rosenthal now manufactures B.C.G. at the Tice Laboratory in Chicago under The Research Foundation, which graciously supplies it to many states, including Michigan.

Dr. Konrad Birkhaug directs a B.C.G. laboratory at Albany, N. Y., which furnishes B.C.G. for all New York state. He formerly directed a laboratory at Bergen, Norway, for ten years. He stated that vaccination confers approximately 80 per cent protection against tuberculosis and is absolutely essential to tuberculosis eradication.

These laboratories could furnish a safe vaccine for all the United States. Its indiscriminate manufacture and use cannot be condoned.

It is, of course, understandable that many countries should have been reluctant to embark on a program of vaccination while so much controversy was going on, but now that B.C.G. has been universally accepted as absolutely harmless and does confer immunity up to 90 per cent or over, there can no longer be any valid reason for it being withheld. Limited experiments are no longer necessary.

Vaccinations should begin at birth in every country of the world. When individuals again become tuberculin negative they must be revaccinated and the process kept up throughout their lives, giving some meaning to the shopworn expression "from the cradle to the grave."

The United Nations, the United Nations International Childrens Emergency Fund, World Health Organization, International Congress on B.C.G., the American Trudeau Society, etc., have all sanctioned the use of B.C.G., but we with our ostrichlike attitude and restrictions on its use are retarding its effectiveness. Our United States Public Health Service, who must know the world-wide effectiveness and harmlessness of B.C.G. for the last twenty years, still wishes us to continue experimental work on a small scale. They recommend that it be used first on doctors, nurses, and hospital employees, and in areas

where tuberculosis is most prevalent. Obviously they consider it harmless and effective, for otherwise they could not suggest that their colleagues, nor any group, be used as guinea pigs. It is certain that with its use some person in contact with tuberculosis will develop the disease before vaccination has time to become effective. This event might erroneously be blamed on B.C.G. and is likely to induce timidity in official circles.

We spend billions to avert wars and billions to fight them, yet the suffering and loss of life from these conflicts are infinitesimal compared to the ravages of this disease for which we do so little. Tuberculosis is not being eradicated any place in the world. Let us have the honesty to accept the futility of our present methods alone, and the courage to embark immediately on a program of extensive B.C.G. vaccination, without which, tuberculosis will present the same problems a thousand years from now as it does today.