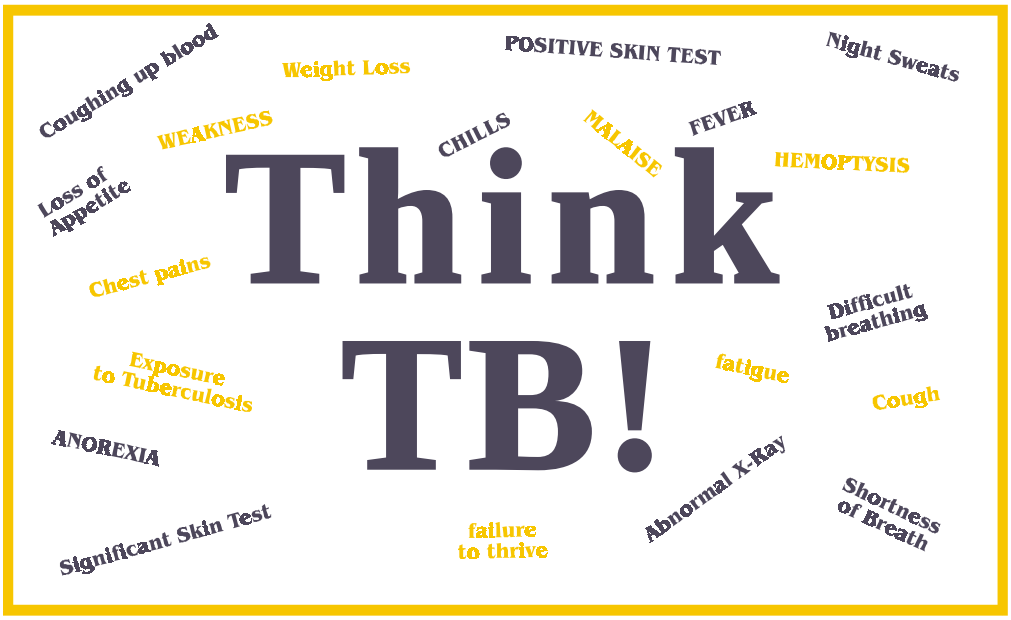
TB Notes 2000

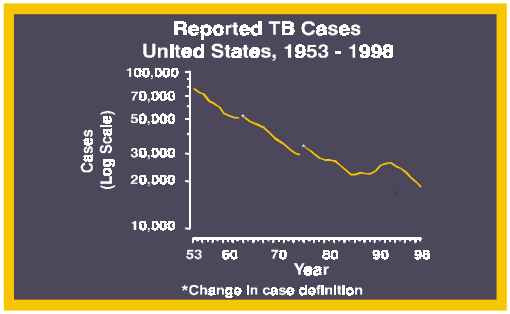
Christmas Seal Campaign, 1945.



Recognize possible signs and symptoms of tuberculosis. Early diagnosis and treatment reduces spread.

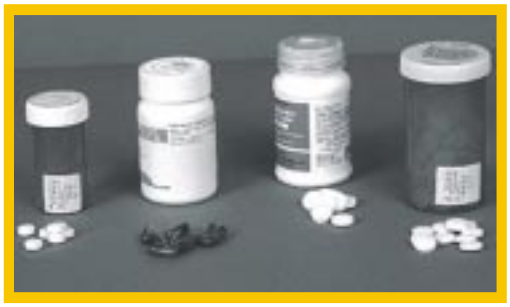
Tent colony for TB patients, TB sanitorium, Colorado Springs, Colorado.

Dr. Robert Koch, discoverer of the tubercle bacillus, the cause of TB.



TB cases reported annually in the U.S. from 1953, the first year of national TB surveillance.

Community x-ray screening campaign.



Drugs used to treat TB disease. From left to right: isoniazid, rifampin, pyrazinamide, and ethambutol.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

DEPARTMENT OF HEALTH & HUMAN SERVICES Public Health Service

Centers for Disease Control
and Prevention (CDC)
Atlanta GA 30333

TB Notes
No. 1, 2000

Dear Colleague:

This has been planned as a special issue to commemorate "TB Control at the Millennium." We wanted to take the occasion to note what has been accomplished in TB control over the years, and to look forward to the challenges of the future. Our focus is mainly on progress made in this country, since that is our charge and our responsibility, but one cannot talk about TB control without talking about the important work of researchers and workers in other countries, and therefore we have included articles about international efforts as well.

In this issue you will find information about the history of the interaction between mankind and *Mycobacterium tuberculosis*; the many accomplishments of our partners in TB contol; the past and present activities of the Division of TB Elimination (DTBE); a timeline of some of the highlights of TB control over the past century; educational materials available from DTBE; and photos of historical people, places, events, and memorabilia that we believe you will find interesting.

I also take this opportunity to thank all who answered our invitation to contribute articles to this very special issue. I have both learned immensely from and thoroughly enjoyed these various contributions.

Please feel free to share this with individuals and organizations with an interest in TB control. We have printed extra copies to be able to accommodate requests for additional copies.

Kenneth G. Castro, MD

A Century of Notable Events in TB Control

A Glimpse at the Colorful History of TB: Its Toll and Its Effect on the U.S. and the World

by Dan Ruggiero
Division of TB Elimination

In their 1969 book *Tuberculosis,* Lowell et al. tell us that "Tuberculosis is an ancient disease with a lineage that can be traced to the earliest history of mankind . . . In the last millennium it has been universally distributed among all branches of the human race."

Phthisis (from the Greek word to waste away), scrofula (swellings of the lymph nodes of the neck), the white plague (the TB epidemic in Europe during the 18th century), consumption (progressive wasting away of the body), TB (the presence or products of the tubercle bacillus) are all words for tuberculosis marking a specific point in history. Each has a significant connotation and meaning to millions of people about a disease that has afflicted humans from the dawn of history and continues to ravage mankind in large numbers. During World TB Day 1999 it was reported that an estimated one billion persons died of the disease worldwide during the 19th and early 20th centuries alone. This invisible enemy continues to challenge man's knowledge and mock his efforts; the "Captain of the men of death" continues to march forth leaving behind a trail of human misery, economic chaos, and death. What is the origin of this invisible predator that even today has been able to adapt and survive by fending off the many remedies and cures that the best minds in science have placed before it?

The tubercle bacillus, the organism that causes TB disease, can be traced as far back as 5000 BC when archeologists found evidence in human bones of the existence of TB. Evidence was found in ancient Egyptian mummies which showed deformities consistent with TB disease. Paleontologists have concluded that the disease must have been prevalent in that part of the civilized world.

Evidence of TB in ancient human bone

Evidence of TB appears in Biblical scripture, in Chinese literature dating back to around 4000 BC, and in religious books in India around 2000 BC. In ancient Greece Hippocrates mentions TB around 400 BC, as does Aristotle, who talked about "phthisis and its cure" (ca. 350 BC).

It was widely believed that European explorers, sailors, and the settlers who followed Columbus to the new world brought with them many infectious diseases, among them TB. However, paleopathologists suspected that TB existed in the New World before 1492, based on ancient skeletons and bones that contained lesions resembling those caused by TB. Evidence to that effect was found in 1994, when scientists reported that they had identified TB bacterium DNA in the mummified remains of a woman who had died in the Americas 500 years before Columbus set sail for the New World.

The TB epidemic in Europe that came to be called the "Great White Plague" probably started in the early 1600s and continued for the next 200 years. The epidemic reached its peak in western Europe and in the United States in the late 1700s and early 1800s. In early 19th century England, TB was so pervasive a killer that it dwarfed other dreaded diseases like cholera and typhus. So common and so little understood was TB that death from the disease was accepted as inevitable. TB in the early 19th century may have accounted for one third of all deaths. Death from TB

was clearly evident in the literature of the time in the writings of John Keats (1795-1821) in the *Ode to a Nightingale,* of John Bunyan (1628-1688) in *The Life and Death of Mr. Badman,* of Charles Dickens (1812-1870) in *Nicholas Nickleby,* and of other famous writers of the time.

In 1720, in his publication, *A New Theory of Consumption,* the English physician Benjamin Marten was the first to conjecture that TB could be caused by "wonderfully minute living creatures," which, once they had gained a foothold in the body, could generate the lesions and symptoms of the disease. He continued that "It may be therefore very likely that by an habitual lying in the same bed with a consumptive patient, constantly eating and drinking with him, or by very frequently conversing so nearly as to draw in part of the breath he emits from the Lungs, a consumption may be caught by a sound person . . . I imagine that slightly conversing with consumptive patients is seldom or never sufficient to catch the disease." For a physician living in such an early era, Dr. Marten showed much medical insight.

Robert Koch

In 1882, at a time when TB was raging through Europe and the Americas, killing one in seven people, a German biologist by the name of Robert Koch presented to the scientific community his discovery of the organism that caused TB. It was called a tubercle bacillus because small rounded bodies (tubercles) occurred in the diseased tissue and were characteristic of the disease. Through his many experiments with the organism, Dr. Koch worked on developing a cure for TB. Koch was able to isolate a protein from the tubercle bacillus that he tried as an immunizing agent and later as a treatment for TB; in both cases it failed. However, the substance, now called "old tuberculin," was to be later used as the screening tool (tuberculin skin tests) for identifying people and animals infected with tubercle bacilli.

A further significant advance came in 1895 when Wilhelm Konrad von Roentgen discovered the radiation that bears his name. This allowed the progress and severity of a patient's disease to be accurately followed and reviewed.

Another important development was provided by the French bacteriologist Calmette. Together with Guerin, he used specific culture media to lower the virulence of the bovine TB bacterium, thus creating the basis for the BCG vaccine still in widespread use today.

TB in America during the colonial period was accepted as a scourge of humanity that was common to the poor and rich alike. The first available mortality figures from Massachusetts in 1786 indicated 300 deaths per 100,000 population. The peak mortality figure reached in New England was 1,600 per 100,000 in 1800. With the industrial development, the epidemic traveled to the Midwest in 1840 and to the West in 1880. Though the disease occurred in blacks at a lower rate than in whites before the Civil War, the increase was massive among blacks after the war, when emancipation and urbanization created an ideal atmosphere for transmission of TB. The American Indians and Alaskans were the last American populations to become affected by the TB epidemic.

At the turn of the century it was estimated that 10% of all deaths in the United States were due to TB. By 1904 the TB death rate for the United States was 188, by 1920 the rate was 100 per 100,000, and by 1955 the rate had decreased to less than 10 per 100,000 people per year.

The TB sanatorium movement, which was started in Germany by Dr. Hermann

Brehmeris in the 1850s, did not take hold in the United States until after 1884. Edward Livingston Trudeau, a physician who recovered from TB disease, started a sanatorium in Saranac Lake, New York, based on the European model of strict supervision in providing fresh air and sunshine, bed rest, and nutritious foods.

"Little Red," first cottage for tuberculous patients at Trudeau Sanatorium.

As infection control measures took hold in large urban centers of the country, TB patients who could not be treated in local dispensaries were removed from the general population and placed into sanatoriums. Soon a great movement was underway to build TB sanatoriums. By 1938 there were more than 700 sanatoriums throughout the United States, yet the number of patients outnumbered the beds available.

For those households in which the adults could not be placed in a sanatorium, children were removed from infected parents and placed in preventoriums that were created for children.

A milestone in the history of TB control in the United States occurred in the autumn of 1893, when the New York City Board of Health called on Dr. Hermann Michael Biggs, the Chief Inspector of the Division of Pathology, Bacteriology, and Disinfection, for a report on TB. In the report, Biggs stated that TB, which was responsible for more than 6,000 deaths in New York City in 1892, was both communicable and preventable. Some of the recommendations made to the Board in his report were the need to

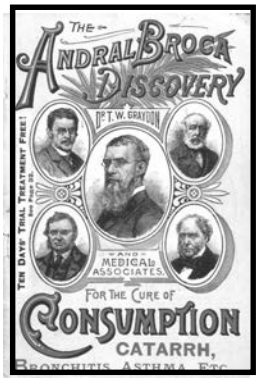
1) educate the public of the dangers that the disease posed to the person and his/her contacts,
2) properly dispose of and immediately destroy sputum or the "discharges from the lungs" of individuals with disease,
3) have all physicians of pulmonary cases report such cases to the health department,
4) have health inspectors visit the families where TB exists and deliver proper literature and take specific measures to disinfect the areas as may be required,
5) obtain and submit sputum specimens to the laboratory for analysis, and
6) create a consumptive hospital to care for indigent patients.

The Board adopted most of the recommendations made by Biggs, including the creation of "The Consumptive Hospital." These recommendations created a storm of controversy among the medical community. Many private doctors objected to the mandatory reporting, believing that it violated physician-patient confidentiality. Because of the resistance from the medical community, reporting practices were not fully implemented for several years. In the end, Biggs' recommendations to the Board and their implementation in New York City created the model for TB control pro-

With no drug therapies, past TB suffers like these in 1953 were isolated in sanatoriums.

grams that was emulated by other health departments across the country and laid the groundwork for a campaign called the "War on Consumption."

During the first part of the 20th century, great emphasis was placed on improving social conditions and educating the general public about good hygiene and health habits. If you went to public school anytime between 1900 and 1930, you got the TB message, which said essentially that spit is death. In hospitals it was common to see signs that read "Spit Is Poison." Notices were plainly printed in public places and government buildings that stated "Do Not Spit on the Floor; To Do So May Spread Disease."



In the 1920s, when fresh air and bed rest did not secure improvement in the patient's condition, physicians sometimes performed surgery or collapsed one of the lungs (pneumothorax). During this time there were many other "sure-cure" remedies being advertised by many firms and physicians.

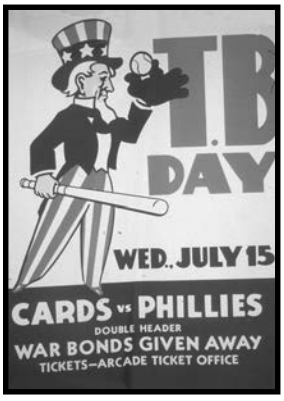
In 1902 at the first International Conference on Tuberculosis held in Paris, Dr. Gilbert Sersiron suggested the adoption of the Cross of Lorraine, used by the Knights of the First Crusade, as the symbol of a new movement, a crusade for good health against sickness and death, and against TB. The double-barred cross was adopted as the international symbol for the fight against TB. This symbol was later adopted in 1904 in the United States by the forerunner of the American Lung Association.

It was not until the turn of the century that private voluntary groups in the United States joined the fight against TB. In April 1892, Dr. Lawrence F. Flick organized the first American voluntary anti-TB organization, the Pennsylvania Society for Prevention of Tuberculosis. The organization was instrumental in helping organize free hospitals for poor consumptive patients in Philadelphia. In 1902, Dr. S. Adolphus Knopf of New York was one of the men responsible for the movement that launched the Committee on the Prevention of Tuberculosis of the Charity Organization Society of New York City. The aim of the committee was to disseminate information that TB was a communicable, preventable, and curable disease. The Committee advanced the movement for hospitals, sanatoriums, and dispensaries for consumptive adults and children. As a result of his focus on the need for a national TB association, in 1904 a voluntary health agency was organized under the National Association for the Study and Prevention of Tuberculosis, later renamed the National Tuberculosis Association (NTA) and now known as the American Lung Association.

To fund the activities of the many local affiliates, the Association adopted a method that was originated in Denmark in 1904 by Einor Holboll, a Danish postal clerk, who sold Christmas Seals. In 1907, many TB sanatoriums had sprung up all around the country; most were small and make-shift. One in Delaware was in such urgent need of funds that it was going to have to close unless $300 could be raised. Dr. Joseph Wales, one of the doctors working at that sanatorium, contacted his cousin, Emily Bissell, to help raise the money. Emily was a welfare worker in Wilmington, Delaware; she was also active in the American Red Cross and had fund-raising experience. After reading an article about the Christmas seals in Denmark, she created a design, borrowed money from friends, and had 50,000 Christmas seals printed. The seals


Emily Bissell

were sold for a penny each at the post office. She worked hard to make the campaign a success, personally presenting the idea to all sorts of groups and officials, including the Philadelphia *North American* newspaper, emphasizing how buying Christmas seals would help children and adults with TB. The idea took hold, and by the end of the holiday season, $3,000 had been raised — 10 times the amount she had set out to raise. By 1946 at least 10 million people were purchasing seals or giving to the Christmas seal fund. The Christmas seal campaign was so widely advertised on buttons, milk caps, postcards, school booklets, billboards, book marks, rail and bus passes, etc., that it permeated many aspects of social life. The National TB Association said at that time that "No nationwide program has rested for so many years on so broad a base made up of millions of small gifts."



Then, in the middle of World War II, came the final breakthrough, the greatest challenge to the bacterium that had threatened humanity for thousands of years: chemotherapy.

In fact, the chemotherapy of infectious diseases, using sulfonamide and penicillins, had been underway for several years, but these compounds were ineffective against *Mycobacterium tuberculosis*. Since 1914, Selman A. Waksman had been systematically screening soil bacteria and fungi, and at the University of California in 1939 had discovered the marked inhibitory effect of certain fungi, especially actinomycetes, on bacterial growth. In 1940, he and his team were able to isolate an effective anti-TB antibiotic, actinomycin; however, this proved to be too toxic for use in humans or animals.

Success came in 1943. In test animals, streptomycin, purified from *Streptomyces griseus*, combined maximal inhibition of *M. tuberculosis* with relatively low toxicity. On November 20, 1944, the antibiotic was administered for the first time to a critically ill TB patient. The effect was almost immediate and impressive. His advanced disease was visibly arrested, the bacteria disappeared from his sputum, and he made a rapid recovery. The new drug had side effects — especially on the inner ear — but the fact remained, *M. tuberculosis* was no longer a bacteriological exception; it could be assailed and beaten into retreat within the human body.

A rapid succession of anti-TB drugs appeared in the following years. These were important because with streptomycin monotherapy, resistant mutants began to appear within a few months, endangering the success of antibiotic therapy. However, it was soon demonstrated that this problem could be overcome with the combination of two or three drugs.

Although there were some attempts at providing guidance on TB control measures through publication and conferences, the federal control of TB did not occur until the mid-1940s, when the 1944 Public Health Service Act (Public Law 78-410) authorized the establishment of a TB control program. On July 6, 1944, the Surgeon General established a Tuberculosis Control Division in the Bureau of State Services of the Public Health Service (PHS). Doctor Herman E. Hilleboe was appointed medical director of the new division. The Public Health Service provided supplemental fiscal support to state and local health departments for TB control activities through formula grants and special grants-in-aid. These grants were to assist states in establishing and maintaining adequate measures for prevention, treatment, and control of TB and focused greater attention on the need for case finding.

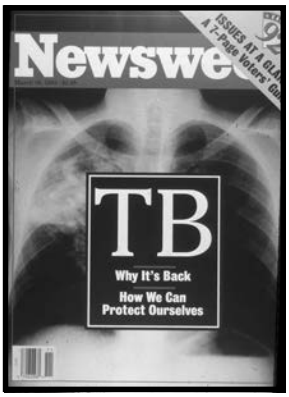
In 1947, the PHS organized and supported mass x-ray screening in communities with populations greater than 100,000. Over a period of 6 years more than 20 million people were examined; the program ended in 1953.

The mobile x-ray vans continued to be used in the communities into the mid-1960s. It was common use to show well-known figures such as Santa Claus posing for x-ray pictures, stimulating the population's compliance with being tested.

A new era was advancing with the introduction of TB drugs, resulting in a declining morbidity. The mainstreaming of TB treatment to general hospitals and local community clinics reduced the need for and dependency on sanatoriums. In 1959 at the Arden House Conference, sponsored by the National Tuberculosis Association and the U.S. Public Health Service, recommendations were made for mobilizing community resources and applying the widespread use of chemotherapy as a public health measure along with other case-finding activities under the control of public health authorities. With the natural decline in disease and the introduction of chemotherapy in the 1940s and 1950s, TB disease started to take on a dramatic decline in the United States. Morbidity declined at a rate of about 5% per year until 1985, when 22,201 cases were reported in the U.S. for a case rate of 9.3 per 100,000 population. By 1970, only a handful of sanatoriums still remained in the United States and by 1992 there were only four TB hospitals with 420 beds providing care.

Between 1953 and 1979, along with the declining morbidity came declining funding from state, local, and federal agencies responsible for TB control. The cutback in TB control programs across the country left a dismantled and frail public health infrastructure, too weak to ward off the emergence of a new epidemic wave that was brewing. Little did the experts know that a new illness that was first observed among gay men in New York City and San Francisco (HIV/AIDS) would have a dramatic impact on TB morbidity.

The mid-1980s and early 1990s saw an increase in TB morbidity. It was not long before the country started to see TB and HIV coinfections as well as cases with multidrug resistance. Facilities with poor or no infection control measures experienced numerous nosocomial outbreaks, and there were high death rates in hospital wards and correctional facilities throughout the country.



The unprecedented media coverage of TB, a disease barely noticed for more than 20 years, gave rise to increased funding by state, local, and federal agencies for TB control activities. With the infusion of funds came the task of rebuilding a national infrastructure to control TB and the introduction to TB control programs of a concept that was old, yet new: that of directly observed therapy (DOT), in which the TB patients ingest or take their therapy in the presence of a health care worker.

As the numbers of TB cases continue to decline in the United States, nearly half of the new cases reported are occurring in people who have immigrated to the United States. In 1998, of the 18,361 cases reported in the United States, 7,591 or 41.3% occurred in foreign-born persons. Most of these persons came to the United States from countries where TB is still endemic (e.g., Mexico, the

Philippines, Viet Nam, China, and India). While the United States continues to bring its TB problem under control, it must be realized that the United States is not an island unto itself, isolated from the rest of the global community.

In 1993, the World Health Organization declared TB a global emergency. Approximately 8 million new cases and 2-3 million deaths occur each year around the world from TB. In an effort to reduce TB morbidity and mortality worldwide, we must share our expertise, successes, and failures, if we are to move toward national and global TB elimination.

We have the power to relegate this ancient enemy to the confinement of laboratory vials and store it in a deep freeze. As we journey into a new century and a new millennium, we will face new opportunities and challenges and write new chapters in the history of TB. Will we learn from the past? Will we develop and use new technology to the utmost efficiency? Will we utilize our resources prudently, and share information with our neighbors? Will we devote our energies and talents to the elimination of our common enemy? How long will it take us to accomplish our goals? How many more lives will be sacrificed to TB? The answer to those questions rests in each of us who works in TB control.

In 1956, the Minnesota Tuberculosis and Health Association encouraged school children to be Knights of the Double-Barred Cross and to pledge ". . . to do everything . . . to overthrow the enemy, TB." Are we willing to take the same pledge today?

Where We've Been and Where We're Going: Perspectives from CDC's Partners in TB Control

Changes I've Seen in TB, 1949 - 1999

by William W. Stead, MD, MACP
Former Director, TB Program
Arkansas Department of Health
Professor of Medicine Emeritus, UAMS

When I took a junior staff position with the TB Service at the Minneapolis Veterans Hospital in July 1949, under Drs. J.A. Myers and W.B. Tucker, I had no interest in TB. In my spare time I worked with Drs. Richard Ebert and Don Fry in the physiology of emphysema. The TB dogma at the time was that primary TB occurred in childhood and almost never became serious except in infants. TB in adults was the challenge and was said to be caused by catching a new infection on "previously sensitized tissues."

I lived with this paradigm until 1953 when I was recalled by the army as the Assistant Chief of the TB Service at the Fitzsimons Army Hospital in Denver. We had an 80-bed ward full of young men returning from Korea with what was then called "idiopathic pleural effusion." Because of the occasional need to explore one of these, we learned that such effusions were due to soiling of the pleura by a small subpleural lesion of primary TB in the lower half of one lung (*Am Rev Tuberc Pulm Dis*, 1955).

My real immersion in TB came in 1960 at Marquette University as Chief of the Pulmonary Disease Section of the Milwaukee County Hospital/Muirdale TB Sanatorium. This was 3 years after the death of my 83-year-old father, whose autopsy showed cavitary TB in the right upper lobe and active renal involvement. I felt pretty sure he had not been reinfected, because there were old scars on the screening chest x-ray (CXR) done on admission to the extended care facility 3 years earlier

and all patients were x-rayed annually to screen for TB. It seemed pretty evident that his TB was due to reactivation of some of those old scars.

So, I sought the help of my four older siblings (including Eugene, who is 10 years my senior and at the time was Chairman of Medicine at Duke). We were able to piece together a likely scenario. Dad's father had died of "consumption" in 1890 when Dad was a healthy 15-year-old. In 1902 he had some illness of which we had no details except that a doctor had suggested that Dad sleep out-of-doors as much as possible. Later, as a traveling salesman over four southern states, he would sleep in a tent at the edge of whatever town he happened to be in at dusk. Eugene traveled with him some summers and attests to this story.

I can recall that Dad commonly "hawked and spit" a greenish-yellow sputum. Gene recalled that he required frequent massage of a "boggy" prostate gland and that he had a number of episodes of painless hematuria, all of which suggested chronic renal TB. Finally, in 1941 a sister returned home with a pre-school son who at age 6 developed an illness with a cough, positive tuberculin skin test (TST), and abnormal CXR. He was confined to bed for 6 months. At the time Dad was not suspected as the source. Two of my siblings and I had positive tuberculin tests. Mother remained well but I have no information on her TST.

With this scenario suggesting a long and largely healthy life with TB, I began to question the dogma of adult TB being due to an exogenous reinfection. Fortunately, the Sanatorium had vast numbers of old CXRs, some back to glass plates. With these I was able to find old scars in a fairly large percentage of our active cases of TB and published two papers on the natural history of TB in man (*Am Rev Respir Dis,* 1967, and *New Engl J Med,* 1967).

At about the same time we showed that primary TB in adults can produce the full spectrum of pulmonary lesions seen in cases of reactivated TB (*Ann Intern Med,* 1968).

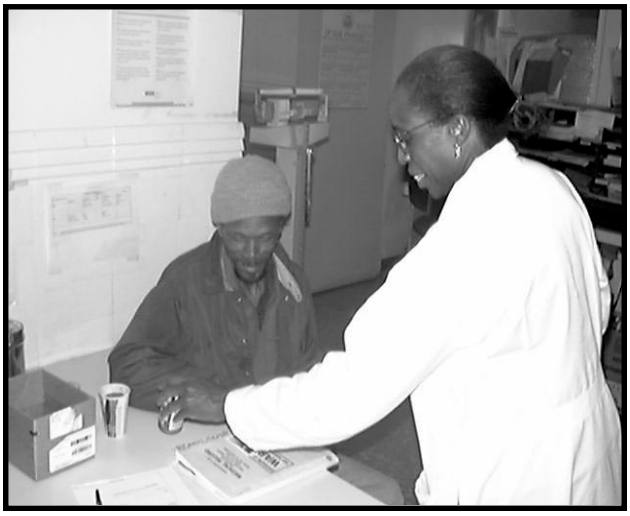
It was not until the 1970s as TB Controller for Arkansas that I really began to understand TB. In 1976 we encountered an outbreak of TB in our state prison with evidence that it had been going on for at least 5 years. Ten active cases among 1,500 inmates gave an incidence of 667/100,000 vs 21 in the state at large that year. We found about 100 TST converters, evenly split between black inmates and white inmates (*JAMA*, 1978). At the time I did not realize that there were about 1,000 white and only 500 black inmates. So, I missed the difference in their infectibility. I held a monthly Chest Clinic at the prison for 8 years to screen new inmates for TB and to see that TST reactors got INH therapy.

My next shock came in 1978 when we found an outbreak at a nursing home. I was not surprised at finding a case of TB in a nursing home, because most of the population would be TST positive from living through the 1920s and 1930s when TB was so common. Hermione Swindol, PHN, argued that it would spread and she proved to be right. What I did not know then was that healthy elderly people often outlive their TB germs and the TST reverts to negative. Only 15%-20% of new admissions were TST positive, leaving 80%-85% susceptible to a new infection. We found 60 converters, 10 of whom had active TB (*Ann Intern Med,* 1981).

Because of these findings we got the 225 nursing homes in Arkansas to do two-step TSTs on all new admissions not known already to be positive. Twice a year they report TSTs of their new admissions and update the data on other residents. At first I kept the records in a Radio Shack TRS80 Model 1 computer. I now have demographic, skin test, and TB data on 115,000 nursing home residents from 1984 through 1998 *(Int J Tuberc*

Lung Dis, 1998). Only 5%-10% of admissions to our nursing homes are TST positive now.

Perhaps the principal discovery that has come from these data is that there is a significant difference in innate resistance to TB infection between whites and blacks. In addition, study of our TB case data base from 1976-1997 shows that blacks with active TB are 50% more likely than whites to be sputum-smear positive and thus highly infectious.



I am now preparing a paper to show the important public health implications of such a difference in TB risk. While health departments routinely try to identify all close contacts with infectious cases of TB, a particularly great effort should be made among the African American and Native American contacts because of their greater risk both of infection and of becoming infectious. It is important for such reactors to take the full course of chemoprophylaxis to prevent development of TB and further spread. This applies especially to exposures in close living quarters, i.e., dormitories, nursing homes, shelters, and prisons.

It has been an interesting half century. The best part was the quarter century in public health in Arkansas from 1973-1998.

TB Control in New York City: A Recent History

by Paula I. Fujiwara, MD, and
Thomas R. Frieden, MD, MPH
Current and former Directors of the
NYC TB Control Program

Many of the tenets of modern TB control were developed more than a century ago in New York City by Dr. Hermann Biggs, a physician working for the Department of Health. These included the policies of free, high-quality sputum examination, the mandatory reporting of cases, health department supervision of isolation and treatment, education of the public regarding TB, and the fostering of a social movement for control of the disease. The City's TB control program waxed and waned over the next 100 years, with the lowest number of reported TB cases in the city occurring in 1978.

During the 1980s, the rapid rise in TB was fueled by the human immunodeficiency virus (HIV) epidemic; growing poverty, homelessness, and incarceration rates; and immigration from countries with high TB prevalence. In this context, the infrastructure of TB control had been dismantled, the victim of a one-two knockout punch of a fiscal crisis in the City and a change to a system of block grants for federal funding. One long-time employee, when asked how it felt to see the increase in cases year after year, said, "We thought that's just the way it was." Staff were trapped in a cycle of reporting cases, starting treatment on those they could locate, but losing many of them. Staff knew they should be searching for the lost patients but were distracted by the overwhelming number of new infectious cases. Citywide, less than half of the patients completed treatment. Repeated warnings from experts and panels did not lead to increased concern or funding.


NO ONE IS SAFE

It was not until 1991 that TB got the attention it warranted. The first alarm was a series of nosocomial outbreaks of multidrug-resistant TB (MDR TB) in various hospitals in New York City. The second alarm was the announcement of the results of a month-long citywide drug resistance survey, which revealed that 19% of all *M. tuberculosis* cultures in New York City were resistant to isoniazid and rifampin. Remarkably, half of all patients with positive cultures had been treated before, many of them for months. These patients represented a failure of the system to ensure that patients were reliably treated, and fully one third of these patients had MDR TB. By comparison, a nationwide survey during the first quarter of 1991 showed that only 3% of all cultures were multidrug-resistant (with New York City accounting for two thirds of the cases), a proportion similar to that in New York City just 7 years earlier, in a 1984 survey.

Phase I: the battle

Dr. Karen Brudney, an astute clinician with international experience in TB control who had worked with Dr. Karel Styblo in Nicaragua, called the City Health Department to report that she suspected that drug resistance was increasing. Dr. Brudney had written highly publicized (and accurate) articles highlighting the dismantling of the TB control infrastructure in New York City and documenting that in Central Harlem, only 11% of patients started on treatment completed the treatment. In 1991, one of the authors (TF), then working at the New York City Department of Health as an Epidemic Intelligence Service Officer, conducted the citywide survey of drug resistance mentioned above in response to Dr. Brudney's concern. Working in one of the Department's chest clinics since 1990, he had seen the TB problem first-hand. Margaret A. Hamburg, who was the Commissioner of Health at that time, appointed Dr. Frieden the Director of the Bureau of TB Control (changed in September 1999 to the NYC TB Control Program). At the height of the epidemic in early 1992, in a meeting with the entire staff of the Program, Dr. Frieden surprised staff by stating that he was "proud to be part of the organization that would control TB in New York City." The basic tenets of the program were developed: the patient is the VIP, directly observed therapy (DOT) is the standard of care for TB treatment, laboratories need to be supported and monitored, completion of treatment is the report card of how well the program is performing, and every staff member is accountable for his or her performance. Against considerable barriers, doctors, nurses, outreach workers, and other staff were hired, chest clinics were opened on Saturdays and evenings, and the TB Program became a significant source of income for the Department of Health through improved billing practices. TB control doctors and nurses even performed new employee physicals so staff could be hired without the typical months-long delays. The TB program had the crucial and unwavering support of Commissioner Hamburg.

At every opportunity, it was emphasized that outreach workers were "modern public health heroes." The TB Program worked on multiple fronts, simultaneously striving to improve the medical care of TB patients, promote standardized treatment guidelines, expand surveillance, improve laboratories, expand social services for TB patients, control outbreaks in hospitals and correctional facilities, encourage and conduct epidemiologic studies, educate and

train doctors and other staff, and delineate the proper use of increasingly restrictive measures against TB patients, including detention. After a visit by Dr. Karel Styblo to New York City, the TB Program implemented a cohort review process, in which the Director personally reviewed every one of the thousands of cases for treatment details and completion. The outcome was a steep increase in completion rates and, beginning in 1993, a steep decline in the number of reported TB cases. More impressive was the even sharper decline in the number of reported cases of MDR TB, from 441 cases in 1992 to just 38 cases in 1998. Cases of TB in US-born persons decreased from 2,939 in 1992 to 700 in 1998.

Phase II: new frontiers

After completion rates increased, cohort review meetings began to include information on contact evaluation and preventive treatment. The efficacy of this process was recognized when, in 1998, the NYC TB Control Program was honored as one of 25 finalists, out of a field of more than 1,300 nominees, for the prestigious Innovations in American Government Award, given by the Ford Foundation and the Harvard School of Government.

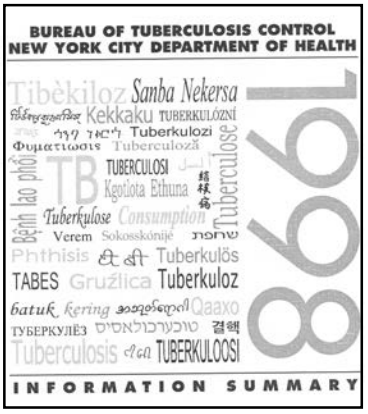
After TB case completion rates improved, program staff began to concentrate on treatment of patients with latent TB infection (LTBI), especially those at high risk of developing TB disease, such as the HIV-infected, close contacts, recent immigrants from TB-endemic countries, and persons with evidence of "old" TB. A unit to monitor treatment of immigrants and refugees was created, and an expanded contact investigation unit evaluated cases of TB in workplace as well as congregate and school settings. Treating those who "only" have TB infection rather than disease has been in many ways even more difficult than treating those with TB disease. It has been difficult to convince people to take medications when they do not feel sick. The City's health code does not allow (nor should it) the TB program the same powers to use increasingly restrictive measures against the patients who do not take treatment for LTBI. Some physicians in New York City, including many trained outside of the country, do not believe that treatment for LTBI is important, and pass this belief on to their patients.

Facing the next century, one of the program's biggest challenges is to improve completion of treatment for LTBI while at the same time effectively treating the more than 100 new cases of TB that arise every month.

Phase III: New York City in the context of global TB control

During the late 1980s and early 1990s, HIV fueled New York City's TB epidemic. This masked the slower rise in the number of cases in persons born outside of the United States. In 1997, the percentage of cases in foreign-born persons in New York City exceeded the number of cases in United States-born persons for the first time in recent history. The rise in cases in the foreign-born has created new challenges. Bicultural and bilingual staff have been hired. People's fears that the TB control program is connected to the Immigration and Naturalization Service must be quelled. People from Ecuador, the Dominican Republic, Puerto Rico, and Mexico may share a common language, but have disparate beliefs about TB transmission and risk. It is not possible to have a one-size-fits-all approach to identifying patients, encouraging them to present for evaluation and treatment of TB disease or infection, and helping them adhere to treatment. TB control activities must be specifically tailored not only to the patients, but also to those who provide their care. When patients move back to their country of origin, New York City's program staff communicate with patients' health care providers to ensure that adequate treatment continues. It is not unusual for staff to call Costa Rica, Pakistan, Mexico, or the Ivory Coast to glean information on treatment completion in order to "close the loop" for cohort reporting!

What is the role of New York City in the global fight against TB? Many people migrate to places such as New York City to better their economic lot, and many of these people come from areas of the world where TB is endemic. New York City's TB cases represent a microcosm of TB around the world; in 1998, these cases came from 91 countries, led by China, the Dominican Republic, Haiti, Ecuador, India, and Mexico. In some instances, people (including those with MDR TB) come to New York City specifically to be treated, having heard of the program's success.



One of New York City's contributions to the global battle against TB is to support international colleagues' TB control efforts, to advocate for more funding for these programs, and to be gracious hosts and teachers when officials from different countries visit to learn about New York City's success. In 1900, the TB control program of the New York City Department of Health, under the leadership of Herman Biggs, was an international model. Today, New York City's experience provides global hope and evidence that even in the context of an HIV epidemic and a high rate of multidrug resistance, the battle against TB can be won and the disease can be controlled.

Not by DOT Alone

by J. Michael Holcombe, MPPA, CPM
Mississippi TB Controller

Mississippi proved directly observed therapy (DOT) to be a great tool toward TB elimination. However, DOT is not a programmatic cure-all, a stand-alone solution, or the proverbial yellow-brick road. Not what you expected to hear from Mississippi, is it?

We know that DOT is the best way to treat TB. It might not always be the most convenient or the easiest, but with the correct drugs, dosing, monitoring, and delivery, it is unsurpassed at present. When it comes to DOT and its impact, we must remember the Chinese proverb, "Hear and forget; see and remember; do and understand."

With full implementation of universal DOT on a statewide basis in the mid-1980s, TB program performance indicators began to improve. Patients' sputum converted faster, reducing the potential period of infectiousness; a greater percentage of patients completed therapy; a greater percentage completed therapy in a timely manner; the number of patients acquiring drug resistance decreased rapidly; the number of program admissions for inpatient care dropped dramatically; the average length of an inpatient stay dropped; and the number of new TB cases began to fall. The reduction in morbidity allowed more time for contact follow-up, the expansion of targeted testing, and the implementation of directly observed preventive therapy in select high-risk populations. This increased the number of patients on preventive therapy and the percentage of patients completing preventive therapy.

To further support the strengthened efforts, laws were modified to improve our ability to protect the public from patients who fail to cooperate with treatment or isolation, and rules were changed to improve reporting. We placed emphasis on outpatient care and privatized elements of the program best and most efficiently provided by private providers — radiology services, for example — to expand availability, improve quality, and ameliorate cost.

Many told us universal DOT could not be done; a few said it *should* not be done. But we continue to truly believe DOT is the best service we can offer our patients and the public. We believe DOT offers the surest and best chance for a timely cure. Why should we treat anyone with less than what we believe is the best we can offer? Their future is our future.

True, Mississippi has made great strides in TB control. But we've made those strides not by DOT alone.

Each and every one of those great strides was made by everyday people: nurses, aides, clerks, outreach workers, doctors, disease intervention specialists, and volunteers — hard working, dedicated, and passionately devoted individuals who were, and are, determined to make a difference one patient, one facility, one community at a time.

From the establishment of our sanatorium early in the century through its demise and the rise and continuing refinement of our outpatient treatment delivery system, public health nurses have made most of those great strides possible. Usually, the nurse comforts, educates, and gives hope to the distressed patient who has been notified of exposure or disease. The nurse confronts and calms the angry, hostile, and all-too-often dangerous patient who has given up and no longer cares about himself or others. The public health nurse persists through heat or snow, wind or rain, dogs, gangs, or alligators and finds the patients and persistently guides, cajoles, or bribes them through treatment. If, along the way, that means baking a few extra cookies, making an extra trip after work to deliver a home-cooked meal to a homeless or lonely patient, buying an extra can of soup or a chicken for an impoverished patient while grocery shopping, or taking the time to put a grubby little 4-year-old on the lap and reading a story in hope of making the treatment seem a little more palatable . . . that's nothing special. That's just the way DOT happens: good people doing good things. No bells, whistles, or wreaths of laurel — just another great stride taken in silence and out of public view.

Public health nurses, of course, don't work in isolation or independently. Without a doubt, each stride is made easier by the clerk who greets the patient kindly and patiently, then helps expedite the visit. Each stride is made easier by the outreach worker who helps ensure each dose of medication is ingested and each appointment is kept. Physicians who take time from their busy practice to conduct regular clinics at the health department also make each stride easier, more sure, and more purposeful. And the advances in science, the effective anti-TB drugs available, and the emerging technology for more rapid and accurate diagnosis have been and are unquestionably essential to the progress we have made.

Yes, DOT has been a vital tool for ensuring progress and managing cost. We used it as the fulcrum to move Mississippi from a deepening rut and to change the direction of TB control. But, DOT was only part of the plan. Progress cannot be achieved by DOT alone. DOT requires achievement goals; community support; good legislation; adequate infrastructure and funding; a dedicated, determined public health field staff; and the strong support of administration.

Baltimore at the New Millennium

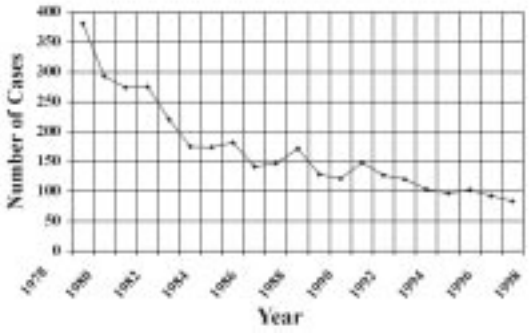
by Kristina Moore, RN, and
Richard E. Chaisson, MD,
Professor of Medicine, Epidemiology,
and International Health
Johns Hopkins University

Mr. C, a Baltimore City resident, knows he was diagnosed with active pulmonary and lymphatic TB in May 1999. He receives his TB treatment through the Baltimore City Health Department (BCHD)/Eastern Chest

Clinic (ECC) by directly observed therapy (DOT) in his home on Mondays and Thursdays. Provided he does not miss either of his twice-weekly intermittent supervised doses (TWIS) of TB medications, he receives two $5 food coupons on Thursdays to fortify his nutritional intake. If Mr. C needs to come into the ECC for a clinician evaluation, his transportation is provided by BCHD. A nurse outreach team manages Mr. C's case. His case manager is a registered nurse and his DOT manager is a licensed practical nurse. Mr. C's case is reviewed by the nurse team weekly and by a BCHD clinician monthly. As a result of contact with Mr. C, his family and friends have all been offered TB screening evaluations and follow-up, free of charge. Mr. C is also participating in a national TB research protocol, one that is evaluating the efficacy and safety of a rifabutin-based treatment regimen for HIV-related TB. His BCHD/ECC clinician is also his HIV care provider at the Johns Hopkins Hospital HIV Clinic.

What Mr. C may not know is that the comprehensive care he is receiving through the BCHD took years to develop, research, and refine. He also may not know that as a result of the once innovative, now national standard of care he is receiving, the Baltimore TB case rate is at the lowest level ever recorded, and that the resurgence of TB that occurred elsewhere in the US between 1985 - 1992 did not affect Baltimore (see graph).

Baltimore City's Reported Tuberculosis Cases By Year 1978 - 1998



In Baltimore, DOT was the brainchild of the late Dr. David Glasser, Baltimore City's Director of Disease Control/Assistant Commissioner of Health. Implemented in 1978 for high-risk clinic TB patients, DOT was expanded in 1981 to a community-based, citywide program. As a result, between 1978 and 1992, TB case rates in Baltimore declined by 81%, and the city's national rank for TB dropped from second in 1978 to 28th in 1992, despite the emergence of an HIV/AIDS epidemic. Cases and case rates have continued to decline to a record low of 84 cases (13 per 100,000) in 1998.

Baltimore's declining TB case rates are also attributable, in part, to another of Dr. Glasser's novel approaches to TB control. In the mid 1970s he convinced Baltimore's City Council to pass an ordinance mandating pharmacies to report any issuance of antimycobacterial drugs to the BCHD. Pharmacy reporting led to improved TB case reporting, improved treatment regimens, and an increase in DOT through BCHD managed cases. These treatment and management improvements also explain, in part, Baltimore's low incidence of drug resistance (5.9% in 1998), and high incidence of treatment completion (96.5% in 1997).

Yet another of Dr. Glasser's foresights was to develop an outreach and liaison program with the City's methadone maintenance clinics. Recognizing injecting drug use as an important risk factor for TB, Dr. Glasser implemented a TB screening and preventive treatment program at the city's methadone clinics. By the mid-1990s, BCHD had bridged TB efforts with nearly all of the city's drug treatment programs.

Dr. Glasser's ideas laid the foundation for the hard-working members of Baltimore's TB program, who have continued to build upon his TB control legacy through the years. Baltimore has implemented additional innovative TB control strategies in the last two

decades. The development of liaisons with Maryland Department of Health and Mental Hygiene, Maryland Division of Corrections, and private providers has improved case reporting, case management, case follow-up, and case prevention efforts. Forging a treatment, prevention, and research collaboration with nearby Johns Hopkins University's (JHU) Center for TB Research has also contributed to improved BCHD TB control measures. BCHD/ECC's Medical Director, clinician staffing, and radiology support are all provided through a contractual agreement with JHU. In addition, this cooperative relationship has resulted in several exciting TB research projects, including neighborhood-based TB screening, TB prevention studies in injection drug users, and DNA fingerprinting studies. BCHD and JHU have also collaborated to form a contract site for the TBTC (Tuberculosis Trials Consortium).

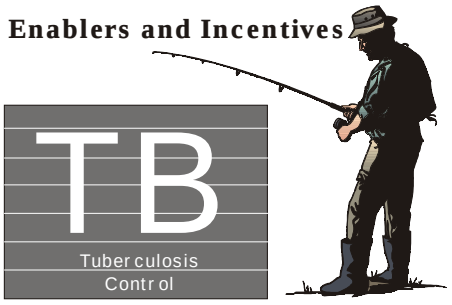
The challenges for Baltimore City TB Control in the new millennium will involve continuing the successful case reduction efforts of the past century through new initiatives. A main priority will be focusing efforts on the treatment of latent TB infection (LTBI). Efforts to evaluate the possibilities of even shorter course therapy and additional treatment options for both active cases and LTBI will also be paramount. Another key interest will be participating in the efforts to develop a more efficacious TB vaccine. All of these new initiatives will depend upon the development of national and international collaborative networks in TB research. For TB elimination to finally take its place in history, a global approach is an absolute necessity.

As the new millennium begins, Baltimore City TB Control is ready to join the world in meeting its challenges. Patients like Mr. C will continue to benefit from the dedication of a City Health Department committed to the ultimate goal: treating the last case of TB.

From Crickets to Condoms and Beyond

by Carol Pozsik, RN, MPH
South Carolina TB Controller

It's history now but people still chuckle about the story of the man who was given crickets for fishing as an incentive when he couldn't be located to take his TB medications. Clearly, fishing was more important that his TB treatment. His public health nurse recognized that it was going to take an unusual motivator to get him to meet her for directly observed therapy, and thus was born the story of the crickets given to the fisherman. It wasn't the first time that nurses or other health care workers had given incentives to encourage patients to comply and it certainly wasn't going to be the last. For TB nurses in South Carolina, incentives and enablers became something that they could not do without. The concept has spread nationwide, and is now an accepted intervention in the treatment of TB infection and disease.



For many years the American Lung Association of South Carolina (ALASC) had given money for patient needs to the State Tuberculosis Sanatorium. As the sanatorium population dwindled in 1981, the Executive Director of the Lung Association began to wonder how the Patient Needs Funds could be used to help TB patients who were not in the hospital. It was at that time that the fisherman's TB nurse approached the ALASC and appealed for funds to provide incentives to more patients who needed them. That was the beginning of the use of incentives and enablers in the South Carolina TB Program.

At first some of the nursing staff resisted the idea of using incentives. Change was difficult to accept; about that same time, the program was also starting what was then called SIT (supervised intermittent therapy), and is now called DOT (directly observed therapy). Some nurses could be heard griping about "spoon-feeding" the patients. (Translated, this meant that they felt that the patients should take total responsibility for their treatment, and that the nurses shouldn't have to give them anything to get them to be responsible.) For some staff, it was all too much: asking them to not only watch patients take their medicines, but then, asking them to give the patients small gifts as well — it was just more than they could bear! However, as time wore on, these same nurses became zealous about doing DOT and giving incentives. (In fact, one nurse fell and broke her leg during the course of giving DOT and, in spite of a compound fracture, she demanded that the ambulance drivers take her on to her next two visits so she could complete her DOT rounds.) Those big hearts in the TB nurses were hooked and the concepts of DOT and incentives really took hold. Soon everyone in South Carolina was using DOT and the stories of the incentives that were used were told and the success rate of completion of therapy got better and better.

In those early days the incentives were simple: juice, hamburgers, chicken snacks, fruit, candy, even condoms. Today, the staff have moved to more sophisticated incentives such as smoke alarms for fire protection in substandard housing and swimming lessons for underprivileged children. TB nurses and DOT workers have big hearts and they dig deep to personalize the incentives and enablers for their patients.

Dr. Dixie Snider, former Director of CDC's Division of TB Elimination, knew about the success of the incentives and enablers program in South Carolina and gave us encouragement to publicize the stories about incentives and DOT in order to educate other TB programs, so that they might begin to use incentives. With the help of the ALA of South Carolina, the booklet *Using Incentives and Enablers in a Tuberculosis Control Program* was published. The book gives the history of incentives and helpful advice about their use. Still popular after many printings, the book continues to help TB workers in their use of incentives both in the United States and in other countries. TB workers and others love to hear the stories and see the pictures of real patients with their caregivers. The pictures give a real face to TB and give encouragement to new staff in the program that they too can be successful with incentives. Whenever I am asked to speak about improving compliance, naturally I also talk about the importance of using incentives and enablers to make our work easier, but more importantly to bond the caregiver with the patient in a trusting relationship.

The successful use of DOT and DOPT in South Carolina could not have ever happened without the use of incentives. Who would have thought that something as unscientific as a red bridle for a mule, a cold drink on a hot day, a pair of warm socks, or an old overstuffed chair would contribute significantly to the successful treatment and prevention of TB in the United States?

The Denver TB Program: Opportunity, Creativity, Persistence, and Luck

by John A. Sbarbaro, MD, MPH, FCCP
Professor of Medicine and Preventive Medicine
University of Colorado Health Sciences Center

Four words — opportunity, creativity, persistence, and luck — summarize the successes of Denver's TB program.

For decades, Colorado had been a mecca for the victims of TB. However, along with the demise of the sanatorium era, Denver's TB control program had progressively deteriorated. As in other large cities, the insured

disappeared into the private sector, while the poor and those from the street continued to be housed for months upon months on a forgotten floor of the public hospital.

In 1965, Denver was awarded a CDC TB Branch grant, which included the assignment of one of the CDC's first six TB medical officers. The project award was designed to enhance the city's decimated TB clinic. However, the standard of treatment, 24 months of daily INH and PAS, presented a daunting obstacle to the ambulatory treatment of a large population of chronic alcoholics and disadvantaged, socially isolated inpatients. How to treat effectively yet compassionately was the question.

A little-noticed report in a foreign journal provided an answer. In Madras, India, the British Medical Research Council (BMRC) appeared to have successfully treated patients with high doses of INH and streptomycin given intermittently over one year. The regimen made sense scientifically and programmatically. If directly administered throughout treatment, the opportunity for cure would be maximized and a concerned public assured that these ambulatory patients did not place the community at risk because they were receiving adequate treatment ("chemical isolation"). Fortunately, at that moment there was no local health department authority to say "no" and the regimen was implemented, although modified to include a three-drug intensive phase and an 18-month two-drug continuation phase.

The uniqueness of this treatment approach spawned widespread changes in Denver's ambulatory TB program. The resultant emergence of one-to-one relationships between nurses and patients led to a major role expansion, with nurses encouraged to function more independently, including reading x-rays and determining which standing treatment orders to implement. By early 1966, both DOT and the nurse-directed TB clinic had indeed arrived in the US. And what nurses do, they document — every action and every outcome — and with that documentation, Denver's ongoing research program was established. Innovation, when measured, becomes meaningful clinical research. A long list of skilled TB nurse specialists such as B.J. Catlin, Jan Tapy, and Maribeth O'Neill not only provided care to thousands of patients but served as the cornerstone for Denver's contributions to the scientific and social understanding of TB control.

However, organizations either continue to grow or they die, and growth requires change. As new knowledge emerged and new drugs became available, so did new opportunities. Fortunately, the arrival of Mike Iseman early in the program and subsequently of Dave Cohn ensured that no opportunity would pass unnoticed. Program components were evaluated for cost-effectiveness and community impact. Denver was amongst the first to eliminate the mobile chest x-ray in favor of selected population skin testing; to focus on the effect of inducements and enforcement on patient compliance; and to create a meaningful role for community outreach workers. New short-course DOT regimens were developed and tested; screening programs were evaluated; the effect of TB drugs in infected human macrophages documented; and "molecular epidemiology" was applied to a long-standing database and a freezer stored with isolates of mycobacteria.

The emergence of HIV stimulated new questions, new initiatives, and an opportunity to further build upon 30 years of close working relationships with, and support from, the CDC. Denver's long history of integrating federal, state, and private grants into a single local program encouraged its early inclusion in multicenter national studies sponsored by CDC and the National Institutes of Health

(NIH). Strong academic ties with the University of Colorado's Health Sciences Center, collaborative teaching at the National Jewish Medical and Research Center, consultation with the IUATLD and WHO, and membership on ACET provided expanded opportunities to share the "Denver experience" and to learn from colleagues throughout the world.

During these years, the recruitment of Denver's retired TB "greats" such as Gen. Carl Temple and Drs. Roger Mitchell and Jack Durrance to work regular hours each week in the clinic ensured that the knowledge of the past would not be forgotten in the excitement of the future. Unhappily, their days of contribution have passed, but the camaraderie established between physicians, nurses, and clinic staff produced an environment in which professional creativity continues to flourish. Challenging existing beliefs and methods has become standard operating behavior. The entrance of Randall Reeves and later of Bill Burman ensures that it will continue, highlighted by their scientific leadership in the TB Trials Consortium.

The underlying philosophy driving the Denver TB Clinic is perhaps best summarized in two quotes from a 1970 publication, "The Public Health Tuberculosis Clinic, Its Place in Comprehensive Health Care" *(Am Rev Respir Dis* 1970;101:463-465):

> In the private sector, "even with the best intentions of the physicians and staff, the actual responsibility for care rests with the patient. In TB control, the responsibility for care rests with the clinic."
>
> "...the clinic is the best way to husband the meager resources of personnel and money and the only way to fix responsibility on the providers of service rather than on the recipients... "

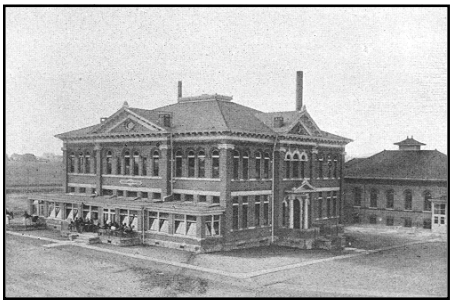
Denver's TB program was, and is, based upon the principle that it is responsible for curing the patient. In the long run, the persistence of that belief is the true foundation of Denver's success.

National Jewish: The 100-Year War Against TB

by Jeff Bradley and
Michael Iseman, MD
Director, National Jewish Medical and Research Center
Denver, Colorado

National Jewish Medical and Research Center, which celebrated its centennial in 1999, is known today for its expertise in a wide array of respiratory, immunologic, allergic, and infectious diseases. At the time of its founding, however, it had a single purpose: the care of impoverished victims of TB.

The need for a TB hospital became acute in Denver in the 1880s. In those days, people believed that the dry climate of the high plains on which Denver is located would cure tuberculars (i.e., persons with TB disease). Consequently, many TB sufferers spent their last dollars coming to Colorado. By the 1890s, it was estimated that one out of every three residents of the state was there for respiratory reasons.



Old National Jewish Hospital

In Denver, TB patients were literally dying on the streets. Boarding houses often banned "lungers," as they were called, and many of them were too sick to support themselves. A woman named Frances Wisebart Jacobs recognized the need for a TB hospital and, after

joining forces with a young rabbi, the two raised enough money to buy some land and erect a building, which was ready for patients in 1893. Unfortunately, however, Denver was hit with the Silver Crisis that year, and there was not enough money to open and run the hospital.

This setback convinced the organizers that they should expand their fundraising efforts beyond Colorado. The thinking in Denver was that, since patients came there from all over the nation, people all over the United States should help support the hospital. They turned to B'nai B'rith, a national Jewish service organization, and contributions came in from across the country. The building finally opened in 1899 as the "National Jewish Hospital for Consumptives."

National Jewish was the first hospital in the nation to focus exclusively on indigent TB patients. As expressed in a singular motto, this philosophy was "None may enter who can pay, none can pay who enter." From day one, National Jewish was non-profit and non-sectarian.

The hospital opened with a capacity of 60 patients; the goal was to treat 150 patients per year. This was made possible by putting a 6-month limit on patient stays. Furthermore, National Jewish only accepted patients in the early stages of TB. At least that was the plan. In reality, however, several chronic sufferers were admitted, and after a few months, the 6-month limit was lifted.

The treatment at National Jewish was in line with the protocols at other turn-of-the-century TB sanatoria: plenty of fresh air, lots of food, moderate exercise, and close scrutiny of every aspect of patients' lives. The inhabitants of National Jewish, thus, could expect to sleep outside — or with their heads outside — every night, and were all but stuffed with food. In 1911, for instance, the annual report records that National Jewish spent $3,631 on eggs — roughly equivalent to $62,000 today — for just 120 patients.

In 1914, National Jewish erected a building for the study of TB; this was the first place in which research on the disease was done outside of a medical school setting. Other advances included the nation's first self-contained facility for treating children with active cases of TB and work on anti-TB drugs such as isoniazid (INH) in the early 1950s. Later in that same decade, doctors at National Jewish came up with a new protocol for TB that included abandonment of bed rest and a substitution of physical activity; use of microbiological assay measurements to determine the proper dosage of INH; and combined drug therapy using streptomycin, INH, and para-aminosalicylic acid.

As TB gradually came under control in the United States, National Jewish expanded its mission to include asthma and other respiratory diseases, but maintained a strong presence in TB. Research continued on better drugs, and the institution expanded its education efforts. In 1963, the 1- to 2-week TB control course was offered for specialists from all over the world, a course that is still offered today. Indeed, over the past 20 years, nearly 5,000 physicians and nurses have visited Denver for the course.

Rifampin, the most widely used drug for TB today, was tested at National Jewish in 1970. Two years later, federal funds established a state-of-the-art laboratory to study difficult TB cases. This helped establish National Jewish as a highly specialized center for drug-resistant TB and atypical mycobacterial infections.

Today, National Jewish continues to be a steady contributor in the fight against TB. The hospital offers compassionate care to victims of MDR TB, often providing treatment for the poor at no charge. Leading pharmaceutical companies collaborate with National Jewish to test new drugs. Perhaps

the greatest contribution of National Jewish is in education. In addition to the TB course, the hospital maintains a Mycobacterial Consult Line, a free service whereby physicians anywhere in the world can call up and receive advice from our specialists. Over the past 5 years this service has responded to over 2,000 calls annually.

At the opening of National Jewish back in 1899, the president of the institution, speaking of TB in the exalted rhetoric of that day, declared that it was his dream for the hospital "that its doors may never close again until the terrible scourge is driven from the earth." Now, at the time when the World Health Organization estimates that one out of every three people in the world is infected with TB, those doors are still open.

Earthquakes, Population Growth, and TB in Los Angeles County

by Paul T. Davidson, MD
Los Angeles TB Controller

In the late 1960s, Los Angeles County built a state-of-the-art TB hospital. Most of the 1,300 or more persons being diagnosed with new cases of this disease each year were spending many months in the hospital before receiving treatment as outpatients. The Sylmar earthquake of 1971 essentially destroyed the hospital and propelled the County into considering other approaches to managing this disease. Some patients were transferred to Rancho Los Amigos Hospital, a long-term rehabilitation facility. The majority were referred to the over 40 Public Health Centers then in existence throughout the county. This began what has since become a largely outpatient system for the follow-up and care of TB patients. Six county hospitals have continued to diagnose and treat many TB patients. Liaison nurses assigned by the TB Control Program facilitate the transfer of these patients to the Public Health Clinics. Approximately 25% of TB patients are diagnosed and followed by the private health sector.

During the past 30 years there have been numerous changes in Los Angeles County that have impacted upon the TB problem. A dramatic increase in the population has occurred. Many of the new residents are immigrants from countries where TB is prevalent and in many cases increasing in incidence. By the end of the 20th century nearly 75% of all the new cases in Los Angeles occurred in the foreign born. Poverty and homelessness have been a persistent social and cultural factor supporting continued spread of TB. By the late 1980s, the emergence of HIV infection and disease contributed to the number of TB cases, reaching a peak of 15% of all the cases being HIV positive in 1991.

In the 1980s efforts were increased to fight the TB problem among the homeless. A satellite clinic in the Skid Row area of downtown Los Angeles was established. This clinic depended on outreach workers to find and transport patients to the clinic for directly observed medication and medical management. Because many of the homeless still defaulted on treatment and spent repeated episodes in the hospitals, a pilot project funded by the State of California was instituted. It provided housing and food incentives to the homeless in Skid Row in exchange for taking medication and completing TB treatment. The results were dramatic, with better than 95% of the participants completing therapy and the number of hospital days being much reduced. The program was eventually funded by the County and extended to other areas where homelessness is also a problem. This program continues, and the number of TB cases among the homeless is declining more rapidly than the overall number of cases.

In the late 1980s an HIV/TB program was established to provide liaison with HIV providers. Screening guidelines for TB were established regarding admission of HIV patients to hospitals, hospices, and other congregate living facilities. The liaison nurse essen-

tially case-managed all known HIV/TB cases and helped to facilitate their care throughout the healthcare system. To date, there have been no known outbreaks of TB in any of the health care facilities within the County. Today the HIV/TB liaison program continues to work closely with the many early intervention clinics where TB testing is a standard of care for all patients.

The 1990s have been a time of rapid influx of both federal and state funding for the elimination of TB. This allowed the implementation of a number of new programs. Directly observed therapy (DOT) is now the standard of care and in 1998 more than 75% of public health clinic patients were on DOT. The TB Control Program has contracted with a number of community-based organizations (CBOs) to screen high-risk persons for TB and provide preventive therapy. This has resulted in thousands of persons being screened and given preventive therapy who otherwise would not have been reached by the health department. A project to screen homeless persons for TB by using a mobile radiology unit detected dozens of cases of TB that were treated earlier than otherwise, preventing further transmission of infection to this vulnerable population. This helped to accelerate the decline of TB disease in the homeless. An MDR unit was established to monitor and consult on every MDR patient in the county whether under private or public care. The percentage of such cases has been kept below 2% of the total cases for many years. Most of the cases that do occur come into the county from other locations already with MDR. Most of them are successfully treated while remaining in Los Angeles County. The Public Health Laboratory for the county was given personnel resources and the latest technical equipment to better serve the needs of the TB control programs.

The State of California has been very active in addressing many of the problems that have hindered TB control. For example, a law is now in place that requires health care facilities to obtain permission from the local health officer or TB controller before any person suspected or diagnosed with TB is discharged. The health officer can refuse discharge if the follow-up plan is inadequate or the patient continues to be a threat to the public health of the community. Another law establishes a process for the legal detention of patients with TB who represent a threat to the public health. The State has also appropriated money to pay for the detention of TB patients and also to pay for housing of the homeless. Los Angeles County has taken full benefit of these actions. The Surveillance Unit at the TB Control Program and the Liaison nurses at the county hospitals have been given the responsibility for approving hospital discharges under the Director's supervision. The County, with the help of State funding, has recently opened a Southern California regional center for the detention of TB patients at one of our county facilities. This facility can also provide long-term skilled nursing care for any TB patient needing it and the services of a drug and alcohol treatment center.

An earthquake of another nature occurred in 1995. The Los Angeles County Department of Health Services faced the possibility of bankruptcy. A huge, complicated reorganization of the department resulted. TB services as well as all public health services were condensed into 11 locations throughout the county where previously there had been more than 30. This created trying times, but fortunately TB cases were not lost. On the other hand there was a significant drop-off in the number of patients being screened and placed

on preventive therapy. In addition, the Public Health Programs and Services Division of the Department of Health Services has continued to undergo extensive reorganization, redirection of priorities, and change of leadership.

The 20th century has clearly ended with a period of constant change. One can only predict that the new century will continue in the same mode, possibly as the norm. In the meantime, the number of TB cases continues to decline, to an all-time low by the turn of the century. Hope, tempered by the reality of a huge problem with TB in the world as a whole, suggests that the goal of elimination of TB can be reached in Los Angeles County during the early decades of the 2000s.

TB in Alaska

by Robert Fraser, MD
Former Alaska TB Controller

TB is probably a relatively new disease in the Alaska population that was introduced by early explorers and other newcomers to the territory of Alaska. One of Captain Cook's mates died of TB at the time of his voyage in 1786 to Alaska. By the early part of the 20th century, TB was widespread in the villages of Alaska, and treatment options were very limited. Attempts at isolating individual family members in the home was the major treatment available. In the late 1940s a small TB hospital was opened in Skagway. In the early 1950s coordinated efforts by the Bureau of Indian Affairs and the territory of Alaska were directed to this major public health problem.

In a large land area like Alaska with poor transportation, case finding was a major challenge. In the early 1950s the territory of Alaska operated three health boats that visited coastal communities and communities along the Yukon River. These ships carried x-ray facilities, a physician, a dentist, and public health nurses. By the mid-1950s most communities had "bush" air service, which enabled portable x-ray facilities to be taken into communities and chest x-rays taken. Hospital facilities also improved with the availability of the facilities at the old naval base in Sitka, which was turned over to the Bureau of Indian Affairs, and the construction of a new hospital facility for the Bureau of Indian Affairs, which opened in Anchorage in 1953. At the same time, medication effective against *M. tuberculosis* became available, with streptomycin available in 1946, PAS in 1947, and INH in 1953. These treatment modalities permitted the effective treatment of TB.

In the mid-1950s the TB reactor rate among children in rural Alaska was about 50% in school enterers and approached 90% in the third grade. Deaths from TB in some years approached 500, and thousands of residents of Alaska awaited hospitalization for treatment of their disease. The initial studies using INH to prevent TB were effectively carried out in a number of villages in the Bethel area of Alaska, demonstrating better than 80% effectiveness in preventing the development of TB in infected individuals. The results also raised the possibility of treating people with active disease outside of the hospital. Subsequently most patients with TB had been treated in Alaska with either no hospitalization or short hospitalization followed by outpatient treatment.

As the incidence of TB fell, supervision of the infected individuals in smaller communities was possible using traveling x-ray technicians and the identification of problem communities was done on the basis of tuberculin testing. Tuberculin testing programs were imple-

mented in selected age groups in the schools. Review of immigrants coming to Alaska from Southeast Asia and South America allowed public health personnel to identify and treat active disease, thus minimizing the spread of TB into Alaska.

Effective treatment of TB has increasingly required directly observed therapy, or DOT, for successful management of the disease. Many communities in Alaska have few tuberculin reactors among school age children, but there still remains a significant reservoir of individuals who have had TB infection in the past and who may potentially develop disease, posing a challenge for public health. How to identify new cases of TB at a time when concern for the disease has diminished and how to provide direct administration of medication to infected individuals in remote areas are continuing challenges.

As Alaska enters a new century, there is a potential to eliminate TB from the population and there is also the potential that the disease will remain a chronic problem. The new century will pose new challenges with diminished public awareness of TB, and with HIV infections in rural communities complicating the problem.

CDC and the American Lung Association/ American Thoracic Society: an Enduring Public/Private Partnership

by Fran DuMelle, MS
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The origins of the American Lung Association (ALA) and the American Thoracic Society (ATS) and of their collaborations with the CDC lie within the anti-TB movement of the late 1800s and early 1900s. The potential value of an organized voluntary society constituted of both physician and lay members was recognized in the late 1800s and marked by the founding of the Pennsylvania Society for the

Prevention of Tuberculosis in Philadelphia in 1892. Twelve years later, in 1904, under the guidance of many of the luminaries of American medicine at that time — Osler, Trudeau, Welch, Janeway, Knopf — the National Association for the Study and Prevention of Tuberculosis (NASPT) was founded. Although the NASPT was largely composed of physicians and other health professionals (only two laymen were included on its first 29-member board of directors), its mission was public education and public policy, not clinical care or research.

In 1918 the NASPT changed its name to the National Tuberculosis Association (NTA), a name it retained for the next 50 years. Because the organization was progressively involving itself in a broader range of activities, in 1968, after considerable discussion and debate, the name was changed to the National Tuberculosis and Respiratory Disease Association (NTRDA). After being burdened with this unwieldy name for 5 years, the NTRDA became simply the American Lung Association in 1973.

In 1905, a year after NASPT was chartered, a subgroup — the American Sanatorium Association (ASA) — was formed by physician members of NASPT who, for the most part, were directors of TB sanatoria. This group was focused on the science of TB and on the clinical care of patients with the disease. Although comprising initially only sanatorium-based physicians, the ASA subsequently became more inclusive, with membership open to all physicians and researchers in the field. In 1939 the name of the ASA was

changed to the American Trudeau Society, honoring Edward Livingston Trudeau and recognizing the broader interests of the members. Finally in 1960 the name was again changed to the American Thoracic Society (ATS) in keeping with the evolution of the medical specialty area from pthisiology to pulmonology, including TB and the whole range of respiratory disorders.

The involvement of the ancestral ALA and ATS with organized TB control efforts in the United States began well before there was even a United States Public Health Service (USPHS), let alone a CDC. In fact, a major activity of the NASPT was promoting the establishment of public health departments with TB control programs in every community in the country. Lawmakers were urged to support such programs and to use taxes to make care for TB free to all patients. Thus, from its inception, the progenitor of the ALA had as its core mission advocacy for effective TB control and accessibility of clinical services for patients with the disease.

Among the factors recognized as limiting the ability to mount a countrywide TB control program were the lack of data describing the magnitude of the disease and the absence of any assessment of the availability of facilities for the care of patients with TB. The first of these voids was filled by an analysis conducted on behalf of the Charity Organization Society (COS) of the City of New York by Miss Lillian Brandt in 1903. This report, "The Social Aspects of Tuberculosis, Based on a Study of Statistics," compiled the data available for the US and presented in a systematic fashion both the scale and complexities of TB in the United States in the early 1900s.

Miss Brandt also provided the initial collection of data describing existing facilities and programs for patients with TB, "A Directory of Institutions and Societies Dealing with Tuberculosis in the United States and Canada." This survey, which served to highlight the dearth of facilities for TB, was jointly funded by COS and NASPT, and was the first project of the new society. Subsequent editions of the "Directory" were funded and published entirely by NASPT and provided the focus for the society's major advocacy program: to increase public funding for TB and to have TB control programs in all departments of public health. In 1916 the NASPT adopted a resolution stating that participation of the federal government in TB control is "desirable and necessary" and that the "proper federal agency for the purpose is the US Public Health Service." A bill providing that a division of TB should be set up in the US Public Health Service was introduced in the House of Representatives in 1916. This plan was not realized, however, until nearly 30 years later, in 1944.

In 1961 the federal government instituted the funding of state programs that were designed to support community-based outpatient care efforts, to shift TB control away from inhospital treatment. Funding increased progressively through the 1960s but declined precipitously in 1970 as federal support was shifted to block grants. By 1973 there were no categorical funds for TB control at the CDC. After several years' experience with block grants, it was clear that the states were spending few or none of these funds for TB control.

It was logical, therefore, that when the ALA opened its first full-time government relations office in Washington in 1980, among its first priorities was funding for TB control. In fact, the first victory logged by the fledgling office, under the leadership of long-time ALA and ATS employee Robert Weymuller and its legislative counsel Harley Dirks, was the Congressional authorization of the "Project Grants for Tuberculosis for Preventive Health Projects" (replacing block grants). This bill restored categorical funds for TB control to the CDC in 1980 after an 8-year hiatus. Following this success, the ALA/ATS proceeded with an intensive advocacy campaign to secure funding — $1 million in FY1982, a significant

amount in 1982 dollars. Throughout the 1980s the ALA/ATS continued to advocate for increased funding for the CDC, but it was not until 1993, after the resurgence of TB in the US had peaked, that funding increased dramatically.

The success in gaining increased funding for TB was facilitated by having in place the Advisory Council for the Elimination of Tuberculosis (ACET), an advisory group to the CDC that was specifically authorized by Congress as a result of ALA/ATS lobbying efforts. Among the first tasks of the ACET was the development of the Strategic Plan for the Elimination of Tuberculosis. This plan, plus the newly-created National Coalition for the Elimination of Tuberculosis (NCET), provided new energy and focus for the advocacy efforts, and funding levels grew to their current level of approximately $120 million by 1995.

The creation of NCET harkens back to the early days of the ALA and its activities in community organization. NCET was formed at a time when TB cases were increasing and there was rising concern about drug resistance, yet public apathy and Congressional inaction continued. The goals of ALA in fostering the creation of NCET were nearly identical to the goals of the NASPT almost 90 years earlier: increasing public awareness of TB and advocating for adequate public funding of control programs. As noted above, NCET played an important role in the intensified response to the resurgence of TB in the 1990s. In 1998 NCET reevaluated its role and structure and is focusing on advocacy at the state level for funding and for ensuring an appropriate legal framework for TB control, while not abandoning it national activities.

Both the ALA and the ATS have concerns with international, as well as domestic, TB control — concerns that are consistent with the traditions of the organizations, with current epidemiologic realities, and with the increasing international focus of the CDC. Soon after its founding, the NASPT became involved in international activities, hosting the sixth International Congress on Tuberculosis in 1908. True to its origins, the ALA currently is an important constituent of the International Union Against Tuberculosis and Lung Disease (IUATLD). Additionally, the ALA and the ATS are founding partners of the Stop TB Initiative, together with the CDC, the World Health Organization, the World Bank, the IUATLD, and the Royal Netherlands Antituberculosis Association. The Initiative is a global partnership to accelerate TB control worldwide and in part is a product of the successful efforts of the ALA/ATS in advocating for funding of international TB control through the US Agency for International Development.

An illustration from *Huber the Tuber,* a book about tuberculosis written and illustrated by H. A. Wilmer, MD, and published by the National Tuberculosis Association in 1942.

At the first annual meeting of NASPT in 1905, two committee reports were read, "Early Diagnosis" and "Clinical Nomenclature." These reports, which served to define the state of the art on one hand and standard terminology on the other, set the pattern for future activities of both the NASPT and ASA. The Society's journal, the *American Review of Tuberculosis* (subsequently the *American Review of Tuberculosis and Pulmonary Disease*, then the *American Review of Respiratory Disease*, and now the *American Journal of Respiratory and Critical Care Medicine*) was first published in 1917. The first issue carried an article, "The Classification of Pulmonary Tuberculosis," which was the first of an ongoing series of statements entitled "Diagnos-

tic Standards and Classification of Tuberculosis" (first so-named in 1920). The "Diagnostic Standards" document continues to provide important guidance to TB control efforts in the US. The most recent revision has just been completed.

In addition to the "Diagnostic Standards," the early ATS developed expert opinions, presented in the form of committee reports, on various clinical, research, and public health aspects of TB. Obviously, because there was no TB control agency within the federal government until 1944, when the Division of TB Control was established, these reports were not collaborative ventures but were, nevertheless, intended to guide the public health aspects of TB. Although persons employed in various federal agencies were members of some of the committees, there was no official USPHS representation (at least none identified in published committee reports) until 1943 when, in the "Report of the Committee on Tuberculosis Sanatorium Standards," it was noted that a Dr. Sharp was representing the USPHS. Additional involvement of the ATS with the Division of Tuberculosis Control was noted in the "Report of the Committee on Postgraduate Medical Education" in 1946. Dr. Herman Hilleboe, the first director of the Division, requested suggestions for the training of medical officers in TB control and asked for the committee to review courses that he had outlined.

In the same year the Committee on Rehabilitation (of patients with TB) reported that the USPHS, the NTA (and ATS), and the Federal Office of Vocational Rehabilitation would jointly provide a team to study rehabilitation programs in the US. Also in 1946, the NTA and ATS, together with the USPHS and the American Hospital Association, developed an informational package describing how hospitals should conduct mass radiography screening ("Report of Committee on Tuberculosis Among Hospital Personnel"). These sorts of collaborations continued on a more or less informal basis through the 1950s and early 1960s. In the 1960s there were several instances in which the ATS specifically endorsed USPHS reports (the US Public Health Service Task Force Report on Tuberculosis Control; the USPHS Recommendations on the Use of BCG Vaccine in the United States.)

It was not until 1971 that the first formally acknowledged joint ATS/CDC statement was published (Preventive Treatment of Tuberculosis: A Joint Statement of the American Thoracic Society, National Tuberculosis and Respiratory Disease Association and the Centers for Disease Control). Since that time joint statements have also been published on BCG vaccines (1975), eradication strategies (1978), short-course chemotherapy (1980), TB control (1983), treatment and prevention (1986, 1994) and diagnostic standards and classification of TB (1990). Currently, there are three joint statements: "Diagnostic Standards and Classification," and "Targeted Testing and Treatment of Latent Tuberculous Infection," both of which have been revised recently, and the "Treatment of Tuberculosis" that is now undergoing revision.

Although the historical and ongoing collaborations between the ATS and the CDC are exemplified most clearly by the formal joint statements, the interactions go well beyond these activities. Staff of the Division of Tuberculosis Elimination are active and valued members of the ATS, participating especially in the programs of the Assembly on Microbiology, Tuberculosis, and Pulmonary Infections, and assuming leadership roles in many of the Assembly's undertakings. Likewise ATS members, both as Society representatives and as individuals, are regular participants in a variety of CDC activities, including serving in advisory roles, contributing to training courses, and conducting program evaluations (often organized by state ALAs).

It is striking to note the degree to which the current collaborations of the ALA and the

ATS with the CDC Division of Tuberculosis Elimination are consistent with the goals and activities of their forebears and adhere to traditions established early in the lifetimes of the organizations — to support and advocate for scientifically sound, publicly funded, government-based TB control.

The *Un*usual Suspects

by Lee B. Reichman, MD, MPH
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TB people have always been an "in" group. They always tend to talk to each other, and meet at their own meetings such as the International Union Against Tuberculosis and Lung Disease, the American Thoracic Society, and the National Tuberculosis Controllers Association. Before 1992, if you went to meetings of other groups (the Infectious Diseases Society of America, the American Public Health Association, the American College of Physicians, the European Respiratory Society to name a few), there was precious little TB, if any, on the program.

But TB docs aren't the only ones who treat TB, and since TB remains a serious global problem, they shouldn't be the only ones concerned about TB.

TB in the United States is now in a downward spiral. Even though TB in the world remains rampant, in the United States TB rates are down 7 years in a row including 1999. But, paradoxically, during this period of decline, interest in TB seems to have markedly increased, and such interest apparently has increased outside the parochial TB community. This to my mind is the factor that is reinvigorating TB and TB control worldwide. It leads me, on the basis of present evidence, to humbly suggest that the salvation of TB control in the world as well as in the United States will only occur when the players are no longer exclusively from that "in" group. The new outside players could be characterized as *un*usual suspects.

In the past I've been very publicly critical of the WHO's ex-Global Tuberculosis Programme staff for all too often going it alone, but I'd like to now commend them and their successes, tentatively at least, for adopting and leading more of a team approach to deal with worldwide TB. And their leadership in the "Stop TB" Initiative, which necessarily requires partnerships, will hopefully be one more important (if seriously overdue) example. There is now increasing evidence that they have reached out to many other "unusual suspects." In March 1998 WHO called together an Ad Hoc Committee on the Global TB Epidemic (the London conference). This certainly isn't big news. However, the Ad Hoc Committee of 19 consisted not only of physicians; more importantly, it included several unusual suspects: the Commissioner of the Securities Commission of Jordan, an economist from Zambia, a civil service administrator from India, a nonphysician university professor from Indonesia, and others. When this group called on heads of state, parliamentary leaders, finance, planning, and health minsters, as well as the Director General of WHO, each to exercise his or her own pivotal role, it certainly carried more weight than the opinions of a cadre of self-serving TB doctors and nurses, TB controllers, or TB researchers. And when the committee called upon governmental leaders to address TB as an issue outside the health sector which, if not dealt with properly, must increase costs for the labor force and reflect negatively on tourism and foreign investment, it also carried important influence. When they suggested that TB should be handled as a *defense* program rather than a *social* program, such a theme stood a better chance of success than if broached by the usual interested parties.

For several years many in the TB community have pleaded with USAID to get involved in international aspects of TB control, if only because of the realization that this is the best way to control TB in the United States, where increasing numbers of cases (now 42% in 1998) are in the foreign-born. But it wasn't until Ralph Nader's Princeton Project 55 (unusual suspects, to say the least) got involved, that USAID made a commitment to worldwide control of TB and properly made the United States a significant donor nation in the global fight against TB.

In a similar vein, the Public Health Research Institute of New York and the Open Society Institute (the George Soros Foundation) — again, at least for TB, unusual suspects — were able to get Russia to mount significant TB involvement in Russian prisons, which will necessarily require prison as well as civilian DOT, something that WHO and CDC had been unable to do for years.

The recognition that DOTS works in drug-sensitive cases but may amplify already existing drug resistance and that MDR TB can be effectively treated by tailored second-line regimens was made not by TB physicians, but by Partners in Health, a group from Harvard University specializing in anthropology and human rights, and which has led to acceptance by WHO of the so-called DOTS Plus movement (tailored treatment of MDR TB).

We stand at a crossroads. Some of the players have now acknowledged that teamwork and partnerships are needed to realistically deal with TB. A fresh look at a thorny problem by unusual suspects can have lively and useful results.

In 1992 at the National Commission on AIDS, Joseph A. Califano, Jr., who had been President Jimmy Carter's Secretary of Health, Education and Welfare, warned that the conjoined epidemics of AIDS, TB, and drug addiction form the most frightening threat to public health America had ever faced. He likened the link of the three epidemics to Cerberus, the mythological three-headed dog guarding the gates of Hell!

Mr. Califano, another unusual suspect as far as TB is concerned, would likely be pleased to know about the progress made in TB domestically since introducing his metaphor, but global TB still remains a major problem.

I'd like to suggest that the proper approach to dealing with the global TB epidemic is also three-headed; however, not a Cerberus, but a three-headed or three-pronged thrust into the 21st century, reflecting a new collaboration between usual and unusual suspects.

I think we all must agree that government, whether it be WHO, CDC, or individual ministries of health, cannot do the job alone, and it is hoped that they will continue to reach out meaningfully both for advice as well as assistance. Nongovernmental organizations such as IUATLD, ALA/ATS, or KNVC (Royal Netherlands TB Association) cannot do this job alone either, and need to include academe and foundations, which are unusual suspects. But the third prong, previously totally neglected except as a source of donations and therefore a very unusual suspect as far as TB goes, is commercial industry!

Industry is the one potential player that has usually demonstrated the ability to create and maintain an infrastructure, motivation, expertise, and perhaps most importantly, an ability to get things done. They get things done, to my mind at least, because they are in it for profit, and profit still seems to be a stronger motivation than "doing good."

In 1996 at the Lancet conference and then in 1997 at the IUATLD annual conference in Paris, I castigated industry. I asked why, currently, the most widely used diagnostic test for TB infection was introduced in 1880. I also asked why there was essentially only one drug

company trying at that time to license a new drug with admitted TB indications.

At that time I stated that drug companies don't sit with us at the TB table because as public corporations they must ask, "What's in it for us?" To a great extent, if we want them with us, there must be something in it for them beyond "doing good," a virtue that shareholders and financial analysts probably understand less well than even politicians.

I'm not the only one suggesting this. In *Business Week*, April 6, 1998, the cover story stated: "Still, TB, like malaria, attracts fewer resources than other infectious diseases. And it's not hard to figure out why. . . There's been the least effort to develop new anti-infectives (against these diseases) because of the inability of the population in the most affected areas to pay. That's just one reason the war with microbes may never be fully won. Companies and nations need to launch — and maintain — effective campaigns not only against strep and flu but also against the scourges that ravage far too many of the world's people. Only then would we have a chance of relegating these killers to the pages of our history books."

So in response, we need to define strategies to allow drug and technology companies to be full prospective players, along with government and nongovernment organizations, academe and foundations. Let's find out what they need and want, and then let's provide *them* with incentives and enablers; let them promote their wares as well as promote our needs. And let's let them earn a fair and proper profit for what they do.

Many years ago, the IUATLD Council (I think it was 1979 in Brussels) held an extensively prolonged discussion over whether the *Bulletin of IUATLD,* the predecessor to the *International Journal of Tuberculosis and Lung Disease,* would be irreparably corrupted if it accepted paid advertising. But TB control is too fragile and important to attack with only the usual suspects. Adding unusual suspects as full participants, such as nongovernmental organizations, academe, foundations and industry, is the only way we can ever implement and carry out the global plan, rectifying the continuing worldwide embarrassment and danger of TB.

In 1955, soon after the introduction of widespread use of TB drug therapy, Professor James Waring at Colorado pointed out in *JAMA* that TB was unique in that, essentially, it stayed around and spread until it was properly treated. In other words, it doesn't go away.

The global situation with TB reminds me of the man who advertised FRAM Oil Filters on television several years ago. In that commercial, a scruffy garage-mechanic type approached the camera holding an oil filter in one hand and a burned out car engine in the other. He stated: "Last week the owner of this car could have had a new FRAM Oil Filter for $4.95. He decided not to buy it. Today he has to buy a new car engine for $1,275.00.

"You can pay me now. . . or you can pay me later."

The Model TB Prevention and Control Centers: History and Purpose

by Elizabeth J. Stoller, MPH
Former Director, Francis J. Curry National TB Center
and Russ Havlak
Former Assoc. Dir. for Special Projects, DTBE

On January 22-23, 1992, a conference on multidrug-resistant TB (MDR TB) was held at CDC in Atlanta. Part of the strategy outlined in the resulting *National Action Plan to Combat Multidrug-Resistant Tuberculosis* was to establish centers of excellence for treating difficult-to-manage TB cases, especially MDR TB cases. The *Plan* also called for developing a cadre of health-care professionals with expertise in the management of TB and MDR TB

through training. In 1993, the CDC Division of TB Elimination released a request for proposals for Model TB Prevention and Control Centers as a competitive supplement to the Surveillance, Prevention, and Control/Elimination cooperative agreements. The federal funds appropriated to support emergency TB grants were targeted to the 13 states and cities that had reported the largest numbers of TB cases in 1992.

Model TB Centers were to be located in high-incidence urban areas. The recipient health department was required to utilize a current, or establish a new, relationship with a school of medicine or public health for Center operation. The Centers were to provide

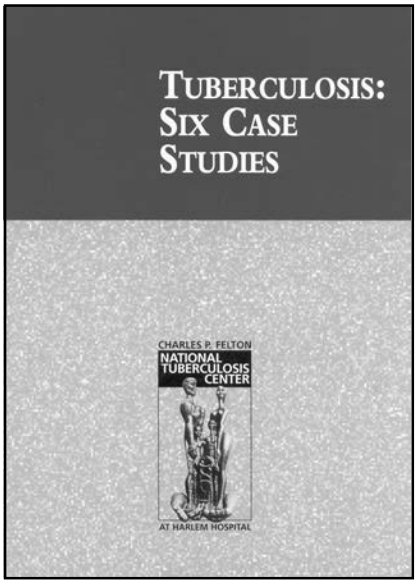
1. Comprehensive, coordinated state-of-the-art diagnostic, treatment, prevention, and patient education services for TB cases, suspects, contacts, and recipients of preventive therapy (treatment for latent TB infection);
2. Innovative approaches for ensuring adherence with drug therapy and for carrying out other prevention and control activities; and
3. Training for all levels of health care workers providing TB screening, prevention, and control services within the targeted area.

Three sites were selected for Model Center awards: Newark, NJ, New York City, NY, and San Francisco, CA.

The New Jersey National Tuberculosis Center is located at the University of Medicine and Dentistry of New Jersey, serving Newark and Essex County. The New York City operation is located at the Harlem Hospital Center, and serves Central and East Harlem. The San Francisco Center is operated by the TB control program of the San Francisco Department of Public Health, and includes the surrounding Bay Area counties as the target area.

The programmatic emphasis of each Center was designed to address the needs of each respective target area. New Jersey developed an integrated approach to managing high-risk urban populations through interdisciplinary teams and a nurse case management model, telephone information services for health care professionals and the general public, and a comprehensive training program. The Harlem Center featured enhanced clinical services, a clinic-based DOT model, and training of house-staff and community physicians. The San Francisco program was designed to replicate local successful program components in surrounding jurisdictions in the target area, as well as offer enhanced regional surveillance, laboratory and institutional "hazard evaluation" services, clinical and epidemiologic consultation services, and a comprehensive training program.

In 1997, Kenneth Castro, MD, Director, Division of TB Elimination, CDC, called a meeting of the Model Center principals to discuss a change in programmatic emphasis for the Centers. While the expectation was that activities would continue, efforts should be made to "capture" the outcome of each major effort in some sort of enduring product. This would allow other TB Control programs in the nation to make use of the strategies and tools developed, tested and/or perfected by each of the Centers. The Centers were asked to redesign their programs in accordance with the new directive and submit proposals with exhibits organized under three headings: State-of-the-Art Care, Training, and Innovative Activities. Effective January 1998, the Centers shifted into "product" mode. In less than 2 years, the Centers have developed and disseminated the following innovative program products:



Harlem:

- Six case studies to be used for training physicians in clinical management of TB infection and disease
- Improving Treatment Completion for Latent Tuberculosis Infection among Health Care Workers, a guide for employee health services and chest clinics
- Tuberculosis Training for International Medical Graduates, a guide for residency program directors, health administrators and TB control programs
- Social Support Services for Tuberculosis Clients, a guide to help providers establish and enhance social support services

New Jersey:

- A TB School Nurse Handbook
- Guidelines for a School-Based Directly-Observed Therapy Program
- Tuberculosis Preventive Therapy Database for patient tracking and outcome evaluation
- TB drug treatment pocket card for clinicians
- Standardized patient scenarios

San Francisco:

- A series of guidelines on institutional infection control measures
- A videotape on engineering methods for institutional *M. tuberculosis* prevention
- A CD-ROM on patient management
- A searchable database of TB training and education resources from throughout the US and international programs
- A software program (TB Info) for real-time program data analysis

The three Centers have undertaken several collaborative efforts, including the development of a national strategic plan on tuberculosis training and education; a national satellite broadcast series for health care providers; and print-based educational materials for civil surgeons and panel physicians. Collectively, the Centers have provided training to tens of thousands of health care providers and the public health workforce, and consultation to providers from a broad range of practice settings.

The Centers continue to operate in response to the needs of the programs in their respective target areas and, with guidance from the CDC, the National TB Controllers Association (NTCA), and the National TB Nurse Consultant Coalition (NTNCC), increasingly in response to the needs of the nation. These Centers are designed to meet your program needs: be sure to contact them for assistance or for resources.

Francis J. Curry National Tuberculosis Center (San Francisco)
Web address: www.nationaltbcenter.edu
Telephone: 415/502-4600

Charles P. Felton National Tuberculosis Center at Harlem Hospital (New York)
Web address: www.harlemtbcenter.org
Telephone: 212/939-8254

New Jersey Medical School National Tuberculosis Center (Newark):
Web address: www.umdnj.edu/ntbc
Telephone: 973/972-3270

My Perspective on TB Control over the Past Two to Three Decades

by Jeffrey Glassroth, MD
Prof of Medicine, Univ of Wisconsin Medical School
President, American Thoracic Society

In 1975 case rates for tuberculosis (TB) in the United States were in double digits per 100,000. Increasingly, those patients were individuals with serious social problems. A major concern at CDC that year was the screening for TB of newly arriving Vietnamese refugees; the treatment of active cases was provided, and notification to local health departments of latently infected individuals was undertaken. There was also concern about the quality of immigrant screening done overseas, but the major focus of "imported" TB was along the border with Mexico. Monitoring of TB drug resistance, particularly primary resistance (i.e., among persons not previously treated), was pursued and, reassuringly, indications were found that these rates were generally stable and low, particularly with respect to rifampin. A major treatment study was beginning and it would help to define the role of rifampin in so-called "short-course chemotherapy," meaning 9 months of daily treatment as opposed to the standard of 18-24 months that existed at the time. "TB Today!," an intensive educational program that provided essential knowledge to TB control staff from around the country, presented material on TB microbiology and diagnosis that emphasized the (then) state-of-the-art methods; a description of classical microbiologic techniques that had changed little in the near-century since Koch described the tubercle bacillus. Also taught in the course was a segment on optimizing the use and interpretation of the tuberculin skin test for identifying TB infection. A study was about to begin to assess the importance of skin test boosting when sequential tuberculin tests were applied. Much of what was underlying those efforts with tuberculin skin testing actually reflected concerns and frustrations with the use of isoniazid (INH) for treating latent TB infections, so-called TB prophylaxis. On the one hand prophylaxis was effective but, on the other hand, it came with a risk of side effects, most notably hepatitis. The challenge was to identify, via skin testing, the persons most likely to derive benefit from INH and least likely to be harmed by it; a classic benefit/risk "equation." BCG vaccination, though widely used outside the US, was rarely used here, because of perceived limited effectiveness and problems with skin test interpretation.

The intervening quarter century has seen remarkable changes with respect to TB but, in some ways, little has changed. A number of years ago, then–CDC Director Dr. James Mason urged that CDC's TB unit not think in terms of TB "control" but of "elimination." The name of the unit changed to reflect this new, more ambitious mission. Indeed, in the US, after some years of rising rates, TB rates are again falling and are a fraction of what they were 25 years ago. However, in many ways the challenges to TB elimination in the US are greater today than a quarter century ago. Worldwide, TB prevalence is increasing, and today over 40% of cases reported in the US are "imported" in the person of immigrants from high-prevalence countries. The worldwide TB burden is fueled by HIV infection, an entity unknown in 1975, which facilitates every aspect of the natural history of TB from transmission to disease. In recognition of this, and to more efficiently combat these interrelated public health problems, the TB division at CDC is now administratively "housed" with the HIV division. Moreover, CDC has dramatically increased its worldwide collaborations to assist in efforts at containing TB abroad.

Rifampin is now well entrenched as a cornerstone of treatment, and several related

rifamycins have come into use. Short-course therapy has been further abbreviated to a standard of 6 months' duration by adding pyrazinamide during the first 2 months of treatment. Moreover, the proven efficacy of intermittent treatment has facilitated the widespread use of directly observed or supervised therapy ("DOT") as a means of improving adherence to treatment and is a major factor in treatment success. Unfortunately, drug resistance has become an additional issue contributing to treatment problems. Moreover, resistance is increasingly a problem with the rifamycins (almost unheard of 25 years ago), and outbreaks and sporadic cases of multidrug-resistant TB (MDR TB) represent a major concern for clinicians and public health officials alike.

Perhaps nowhere has change been more dramatic than in the area of diagnostics. Although skin testing is fundamentally unchanged, the microbiologic approach to TB diagnosis has been revolutionized by the application of molecular biologic techniques. Thus, laboratories are now capable of obtaining genetic material from small numbers of tubercle bacilli in specimens, amplifying or multiplying that material, and then testing the resulting "soup" for specific segments of DNA or RNA that are unique to TB. Refinements of these techniques also permit the identification of resistant strains in some cases and the tracking of outbreaks or mini-epidemics, and help us better understand the epidemiology of the disease as it currently exists. Such techniques hold the very real promise of rapid, highly sensitive, and specific diagnostic tests for TB disease. Powerful tools indeed!

Preventive treatment of latent TB infection still emphasizes the use of INH. However, because of occasional concerns about resistance to INH, and also in an effort to reduce the time required to complete a course of preventive therapy, other regimens — particularly those using rifampin — have been increasingly used and shown to be effective (though more costly) alternatives to INH. Although additional studies have documented the limitations of BCG vaccination, there is increasing interest, in the US and abroad, that through the technical developments of recent years, more effective vaccines are feasible. Given the worldwide problems I have noted, application of a truly effective vaccine would be a logical strategy for dealing with this disease.

So what has happened in TB in the last 25 years? Lots of change and technologic development but fundamental challenges remain. Worldwide the number of cases is rising and treatment is becoming more difficult in some regions. In the US, numbers have declined but current cases often require more resources and sophistication to treat than they did even just a few years ago.

History of the IUATLD

by Donald A Enarson, MD
and Annik Rouillon, MD
International Union Against TB and Lung Disease
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The International Union Against Tuberculosis and Lung Disease (known to its members as "the Union") is the only international voluntary organization dealing specifically with TB. It is very special in terms of its structure, membership, and diversity of activities.

Roots of the Union, 1867-1914

TB was presented as a communicable disease in the first international conference of medicine specialists convened in Paris in 1867.

Conferences specifically addressing TB followed in Paris in 1888, 1891, 1892, and 1898. The 1899 conference took place in Berlin and, for the first time, official representatives from both governments and nongovernmental agencies were present. The independent developments of sanatoria (1854), the discovery of the bacillus (1882), the opening of TB dispensaries (1887), the development of the voluntary movement (1890), and the organization of periodic conferences called for a centralized agency for coordination and communication. The Central Bureau for Prevention of Tuberculosis was formalized in Berlin in 1902, and the double-barred cross was adopted then as its symbol. Periodic international conferences systematically addressing clinical, research, and sociological aspects of TB were held until the outbreak of the First World War in 1914.

Establishment of the Union, 1920-1939

In 1920, a conference on TB was convened in Paris in which 31 countries participated, including Australia, Bolivia, Brazil, Chile, China, Colombia, Cuba, Guatemala, Japan, Panama, Paraguay, Iran, and Thailand, in addition to those of Europe and North America. In an impressive procession, delegates one by one pledged "to agree on the means to fight TB, to make a consensus on the strategy, to jointly apply the most effective weapons to combat this common enemy," thus establishing the International Union Against Tuberculosis (IUAT) in its present form. It was conceived as a federation of national associations (130 by 1999). Ten international conferences followed until 1939.

In order to supplement the routine reports of the conferences, a regular publication was commenced in 1923. In this prewar period, the Bulletin included administrative reports and statistics (subsequently compiled by WHO) as well as information on the strategy and policies for the fight against TB and results of numerous surveys on specific aspects of the disease and the campaign. The Bulletin continued publication until mid-1940, the final editions containing the main reports to have been given at the 11th conference planned for Berlin in September 1939, the very month when the Second World War commenced.

Relaunching of the Union, 1946-1961

At the first reunion of the Executive Committee after the war in 1946, the IUAT recommended to the planners of the future World Health Organization "establishment of a strong Division of Tuberculosis." Official relations with the WHO were then established which continue to the present time.

The first postwar conference in 1950 in Copenhagen, with participation of 43 nations, was followed by a series of conferences, with the 29th world conference in Bangkok in 1998, when 105 countries participated. Conferences outside North America and Europe were held in Brazil in 1952, India in 1957, and Turkey in 1959. During this period a series of international symposia were also organized, generally in Paris, addressing a variety of topical issues such as TB in Africa, strain variation in BCG, radiography for TB, new drugs, and the role of voluntary agencies, among others.

In order to strengthen the administration of the growing agency, a post of full-time Executive Director was established in 1952. A system of quotas was devised for membership contributions. Over many years, the American Association has continually maintained a high quota share. Fees were also levied from individual members. In 1951, scientific committees were commenced and met annually for intensive discussion of the emerging strategy for the fight against TB. In 1953, regions were established in order to remain close to where the needs are. In 1958, the first international collaborative clinical trial for treatment of any disease was undertaken, with a total of 17,391 patients from 17 countries evaluated for drug resistance. This was followed by a

collaborative controlled clinical trial starting in 1960, to evaluate the efficacy of chemotherapy in previously untreated patients. In this period, the IUAT contributed to annual international courses on TB control sponsored by WHO in Istanbul, Prague, Rome, and Caracas.

A global view 1961-1978

In 1961, at the suggestion of the Executive Director, Dr. Johannes Holm, the Mutual

Assistance Program was launched to encourage transfer of technology, resources, and information from industrialized to newly independent countries, through the agency of national associations in the developing countries. This was followed by travelling seminars in Africa and in Eastern and Middle East regions, and by field projects in Mali, Sri Lanka, Peru, and India, among many others.

In this period, the scientific committees continued to focus on the strategy for TB control. Some examples of the activities follow. In 1961, two international collaborative studies evaluated the test characteristics of 1,099 films read by 90 readers from 7 countries and WHO. A subsequent study evaluated sputum smear microscopy. Starting in 1965, an international collaborative study on tuberculin skin testing evaluated 75,000 children in 21 countries. Further controlled clinical trials addressed the issue of previously treated patients and daily self-administered versus intermittent supervised regimens. In 1968, a survey evaluated adverse reactions to BCG vaccination, with over 10,000 events analyzed. Also in 1968, *A Technical Guide for Sputum Smear Microscopy* was published; the 5th edition of this guide was published in 1999.

In 1965, the Tuberculosis Surveillance Research Unit was established under Dr. Karel Styblo. It developed an index to evaluate infection and its trends, clarified the natural history of the disease (including transmission probabilities and risk factors), and estimated the impact of control measures. In 1969, in collaboration with the then–Communicable Disease Center of the United States and seven member countries in Eastern Europe, an international trial of preventive chemotherapy for fibrotic lesions of the lung in 25,000 individuals was commenced and was evaluated over 5 years of follow-up. In 1973, it was proposed that the mandate of the IUAT be extended to include other lung diseases. However, the name of the organization was not changed to reflect this extension until 13 years later.

In 1975, Dr. Halfdan Mahler, Director General of WHO, publicly acknowledged the crucial role played by the IUAT in the fight against TB. In early 1976, 18 NGOs (nongovernmental organizations) responded to IUAT's invitation to consider jointly the role which NGOs may and should play in primary health care (PHC) programs. The resulting position paper was presented at the joint UNICEF / WHO International Conference on PHC in Alma Ata in 1978.

Modeling the global fight against TB, 1978-1991

In 1978, in response to a request from the Minister of Health of Tanzania, the IUAT proposed the establishment of a National TB Program under the direction of the government and with support and coordination of the IUAT. This proposal was the basis of a new program of Technical Assistance of the IUAT and became the basis in 1979 for the first edition of the TB Guide. Such assistance eventually extended to nine low-income countries and became the basis of the current DOTS Strategy of the WHO.

In 1981, the IUAT became the first organization to adopt a policy that its meetings be designated "non-smoking" conferences. In 1982, the Koch centenary was celebrated at the 25th conference in Buenos Aires, where the Koch Medal of the IUAT was awarded to Drs. Johannes Holm and Wallace Fox. That same year saw the establishment of World TB Day on March 24 each year, following a proposal by the Mali Association. In 1984 the IUAT was officially registered with USAID, a very rare privilege for a non-US agency. The IUAT officially changed its name in 1986 to the IUATLD to reflect the inclusion of other lung diseases in its mandate. In 1987, a delegation from the IUATLD visited WHO to encourage it to consider the problem posed for TB by the emergence and spread of HIV infection that had been noted in the collaborative projects.

In 1989, the Burden of Health Study carried out by Harvard University was pivotal in demonstrating the cost-effectiveness of the IUATLD model, which was instrumental in convincing planners and policymakers to adopt the strategy as a part of the general health services.

A global fight, 1991-present

The principles of the model National TB Program, outlined on the occasion of the retirement of Dr. Styblo in 1991, were subsequently enumerated as the "DOTS" Strategy, promoted as the official policy of the WHO. In that year, the international TB training course of the IUATLD was first held in Arusha, Tanzania, to illustrate the principles of the model program. From 1993 to 1996, the training and technical support activities of the IUATLD were extended from a largely African base to represent every region of the world. In 1996, the IUATLD entered into a formal agreement to provide training fellowships with support from the International Fogarty Foundation.

By 1998, field activities involved 10 countries in the Eastern Region, 5 in the Middle East, 10 in Africa, 15 in Europe, 8 in Latin America, and 2 in North America. The network of courses in management included Tanzania, Benin, Nicaragua, and Viet Nam, and the courses on research methods included Turkey, Kenya, South Africa, Mexico, Chile, Argentina, Brazil, Peru, Malaysia, and China. During this period, more than 1 million patients with TB were cared for in the context of the collaborative programs of the IUATLD. In 1998, the IUATLD joined with the WHO and other international partners to form the "Stop TB" Initiative in the hopes of extending the model to all countries of the world.

These activities were made possible thanks to funds entrusted to the Union from richer associations and by governments of a number of affluent countries.

Characteristics of the IUATLD

The distinguishing qualities of the IUATLD, besides its universality, its spirit of solidarity, and its tolerance, are its continual striving for quality and its independence. Thanks to these, it provides the international community with an invaluable asset, namely, its pioneering role in devising and encouraging or testing innovations. It provides a neutral platform for international collaboration, exchange of information, friendship, mutual esteem and education, and a reduction of prejudice. It maintains not only a program of scientific conferences and publications but also a program of action for health in the community, comprising technical assistance, education, and research. Dr. Gro Harlem Brundtland outlined the future in the following statement to the 51st session of the World Health Assembly in Geneva in 1998: "We must reach out to the NGO community. Their reach often goes beyond that of any official body. Where would the battle against leprosy, TB, or blindness have been without the NGOs?"

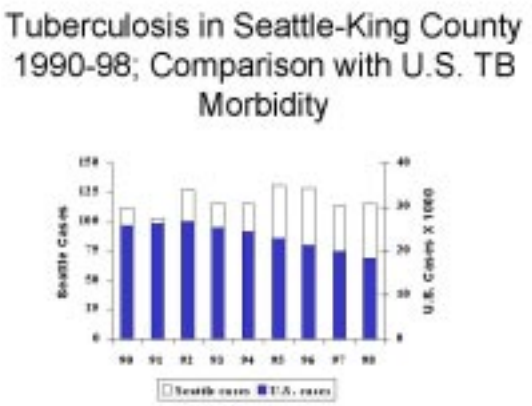
Thoughts about the Future of TB Control in the United States

by Charles M. Nolan, MD
Director, TB Control Program
Seattle-King County Dept of Public Health

It is gratifying, isn't it, to be back on the pathway toward TB elimination. I guess it's true that we who work in TB control had more prominence and visibility in the recent era during which TB was resurgent; a declining public health problem is never very newsworthy. Still, speaking personally, the satisfaction of watching the regular declines in US TB morbidity each year since 1992 exceeds the cheap thrill of being interviewed by local TV news personalities about the looming threat to our community of resurgent TB.

But what does the future hold for TB controllers? Will we continue to see our efforts rewarded by predictable declines in TB case numbers and rates into the indefinite future, until we finally arrive at our goal, the elimination of TB from the US? Even though we are good people, working toward a noble cause that we deserve to achieve, I submit that this optimistic view of an inevitable future decline of TB in the US is not necessarily our destiny. I fear that as we continue to work against TB in its current epidemiological expression in the US, we may be destined to reach a point at which the force of TB control is balanced by the force of the disease in our population. In that scenario, with neither opposing force having the upper hand, TB morbidity in the US will not continue to decline but will become level.

I am emboldened to hypothesize, in the absence of new factors in the equation, a forthcoming equilibrium between TB and TB control in the US, and a stabilization in the TB incidence rate in the US, because that is precisely what has happened in recent years in my community. The accompanying figure portrays the numbers of TB cases reported in



Seattle-King County, Washington, and in the US from 1990 through 1998. Even though the numbers of cases represented in the two jurisdictions differ dramatically, the trend is unmistakable; during a period in which the TB morbidity in the US declined by 35%, that in Seattle-King County remained basically stable.

(If annual incidence rates rather than case numbers had been presented, the trends would have been the same).

Here is my explanation for the trends shown in the figure. At the national level, we are now reaping the harvest of reinvesting in good TB control. We have secured the necessary funding and have applied those funds strategically throughout the country to strengthen surveillance and case finding, to expand directly observed therapy for TB cases in order to increase completion rates and reduce acquired drug resistance, and to stop nosocomial transmission and other pockets of current transmission of TB.

Speaking in terms of a theory of TB control, our investment has allowed us to regain the ground that was lost during the resurgence by applying to their best advantage our current tools (this fact was noted in a *JAMA* editorial written in 1997 by Drs. Bess Miller and Ken Castro of the Division of TB Elimination). In that sense, the drop in cases and case rates nationally represent a reduction in "excess morbidity" that arose during the time when the national infrastructure was weakened in relation to the strength of the dual epidemics of TB and HIV, increased immigration from high-prevalence areas, and person-to-person transmission of TB, including nosocomial transmission.

Some places such as Seattle, however, did not experience the full power of the TB resurgence. For example, we were only modestly impacted by the HIV/TB phenomenon, with rapid person-to-person spread of disease, and MDR TB. Our infrastructure had not been dismantled, and we experienced less excess morbidity in those bad days. In the decade of the 1990s, however, even though we believe we have a good program structure, a talented staff, and funding sufficient to allow us to do good TB control work, we have failed to effect a meaningful reduction in TB morbidity in our community. In other words, we appear to have reached an equilibrium with our target disease, given its current epidemiological pattern in our community. This experience is the basis for my suggestion that it is possible that the nation as a whole will also reach such an equilibrium point, once its excess TB morbidity has been "mopped up." When that point may be reached, and at what level of morbidity, I of course cannot say.

I don't want to leave the impression that we have passively accepted the current *status quo* in Seattle. We are aggressively attempting to disrupt the equilibrium between TB and TB control by learning more about the epidemiology of TB in our community and by increasing the effectiveness of our community-based TB control plan. For example, in our community, persons born outside the US account for 70%-75% of cases, and RFLP survey data suggest that nearly all of our cases in foreign-born persons arise through reactivation of latent infection, including persons who have received preventive therapy. This information suggests that we need to expand treatment of latent TB infection in high-risk foreign-born persons; to accomplish that, we have established a Preventive Therapy Partnership Program with a number of health care facilities that provide primary health care to high-risk foreign-born persons. Also, given that we regularly see TB occur in foreign-born persons who have received preventive therapy in the past, we are reevaluating the traditional approach to preventive therapy, and have secured funding to develop new approaches to increase the uptake and completion of preventive therapy by newly-arrived immigrants and refugees.

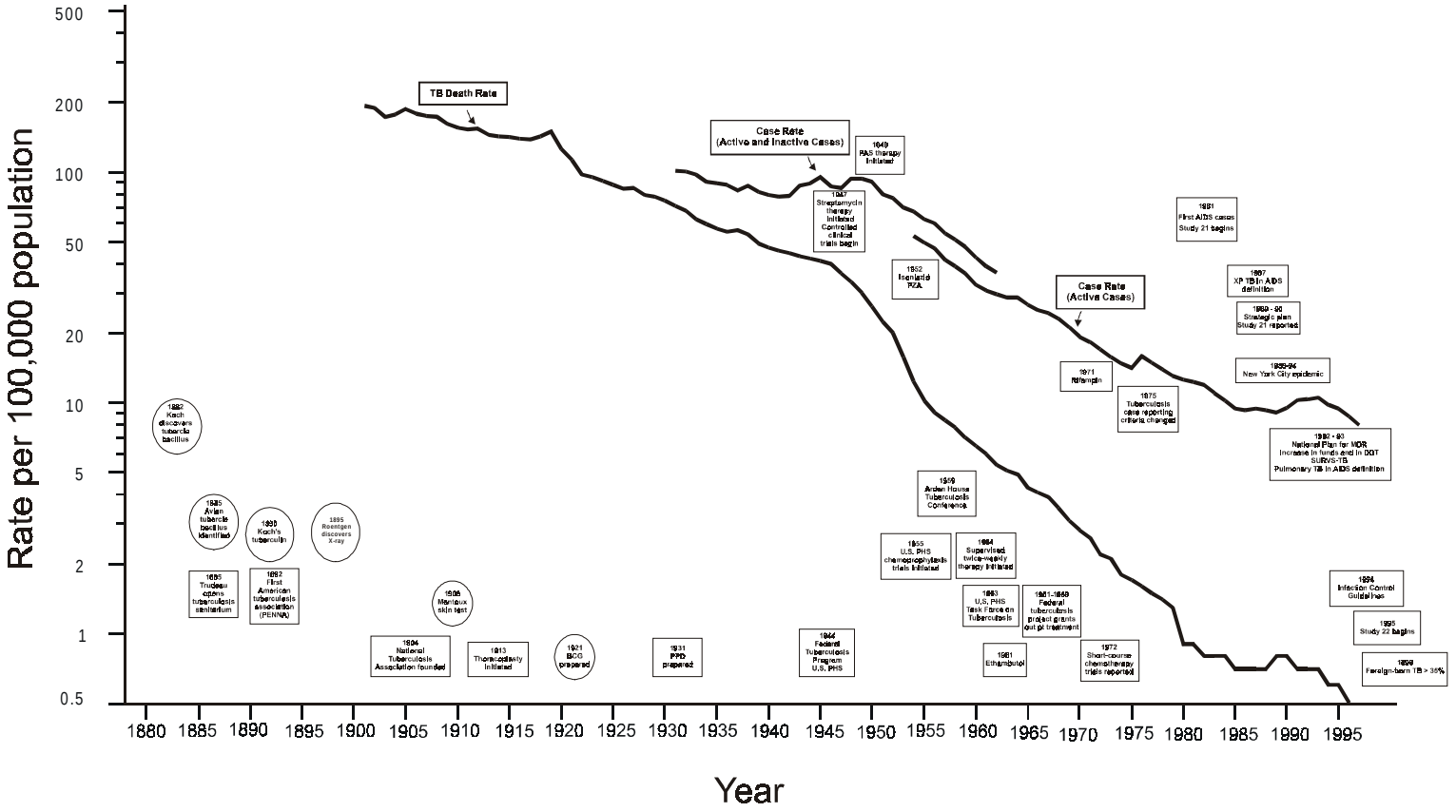
Should the nation encounter such a "mud hole" in the road to TB elimination, similar strategies will be required to move beyond it. ACET, in its recent publication, *TB Elimination Revisited: Obstacles, Opportunities, and a Renewed Commitment,* has made several practical suggestions, including the need for

every locale and/or state to understand the unique nature of its own TB problem, in order to apply current tools for TB control to their best advantage. The establishment of new partnerships to reach locally-identified high-risk groups is another important new concept.

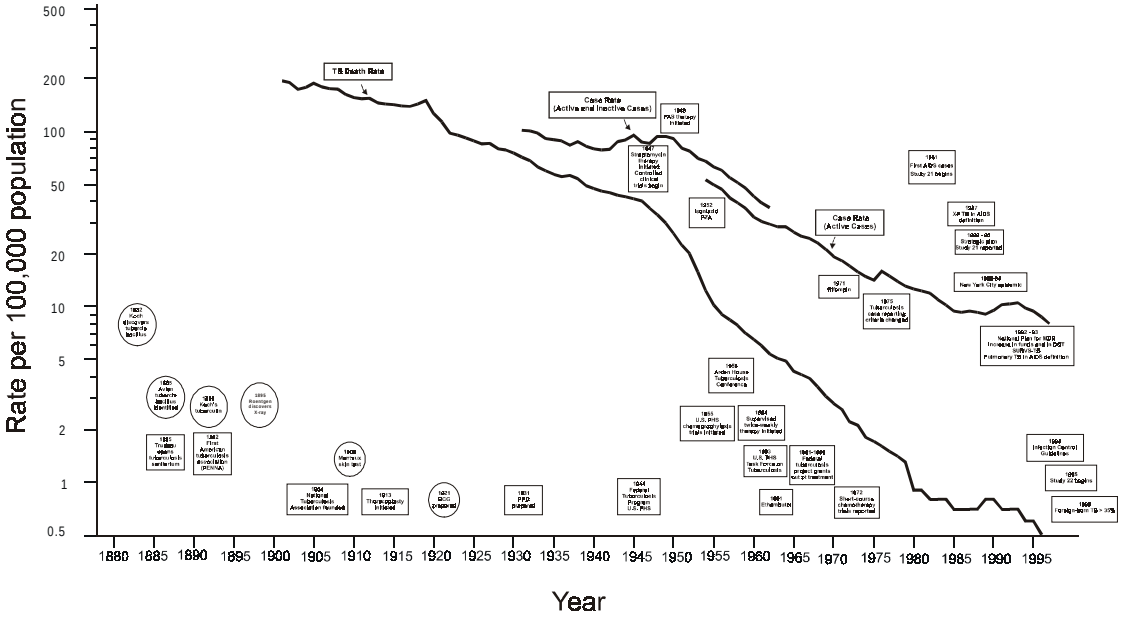
Another way that an equilibrium between TB and TB control may become tipped in favor of TB control is by the introduction of new tools for the diagnosis, treatment, or prevention of TB. This point was also made by Dr. Miller and Dr. Castro in their *JAMA* editorial. Consider, for example, the advantage of being able to identify, among a population of 100 persons screened and found to have positive tuberculin skin tests, the handful that are destined to develop TB in the future, and to offer treatment only to those who are truly at risk, rather than to the entire cohort. Likewise, based on forthcoming ATS/CDC recommendations, we now have a range of options for treatment for latent TB infection, which should result in more effective use of that preventive intervention. Finally, given the events of the past year, with burgeoning interest in a TB vaccine on the part of the US government, private philanthropic organizations, and the pharmaceutical industry, the notion of a TB vaccine at last (in the immortal words of Ken Castro) "passes the laugh test."

Even as Seattle's current impasse with TB has served to motivate us to redouble our efforts, to think creatively, and to engage new partners in our struggle, I am confident that, should our trend become a national one, the nation will be equal to that challenge. "The man (or woman) who is tenacious of purpose is not shaken from his firm resolve by the tyrant's threatening countenance."
Horace, 23 BC.

A CENTURY OF ADVANCES IN TUBERCULOSIS CONTROL, UNITED STATES



A CENTURY OF ADVANCES IN TUBERCULOSIS CONTROL, UNITED STATES



Where We've Been and Where We're Going: Perspectives from CDC

Early History of the CDC TB Division, 1944 - 1985

by John Seggerson
Associate Dir. for External Relations, DTBE

In 1944, Congress passed the Public Health Service Act, which authorized grants to the states for TB control and established the "Division of Tuberculosis Control," then located in Washington, DC. At the time of the creation of the TB Division, TB drugs were not available, and the primary method of TB control was the isolation of persons with active disease in TB sanatoria where they were "treated" with healthful living, bed rest, calorie-laden meals, fresh air, sunshine, and sometimes with surgery and/or collapsed lung therapy.

PHS mobile x-ray unit

From the beginning of the 20th century, the National Tuberculosis Association (later the American Lung Association), and its state and local affiliates, played a major role in establishing and supporting the TB sanatorium movement in the US. During the post-WW II period and into the 1950s, TB associations and health departments employed small-film x-ray units to conduct TB screening in general populations, with one x-ray unit often screening as many as 500 persons per day. The screening did not effectively cover large city populations and by 1947, the PHS Division of TB Control was operating mobile x-ray unit teams in some 20 cities of more than 100,000 population which participated in this PHS big city program. By 1953, after some 20 million people had been x-rayed for TB, the program was discontinued owing to declining yield and high cost. Many health department and TB association community x-ray screening programs were also discontinued, although some continued until the late 1960s.

In 1959, a group of nationally recognized TB experts was convened in Harriman, New York, to review the status of US TB control, and they issued the "Arden House Report," which recommended the eradication of TB with effective treatment programs to cure disease and prevent spread. The Arden House group also recommended isoniazid treatment of latent TB infection based on extensive PHS chemoprophylaxis trials.

In late 1960, the PHS TB program, by then renamed the "Tuberculosis Branch," was transferred from Washington, DC, to Atlanta, to what was then called the Communicable Disease Center. The TB research activity remained in Washington for the time being, then was also transferred to Atlanta in the early 1970s.

In the 1960s it became increasingly obvious that long-term hospitalization of patients with active TB was no longer necessary because of the availability of effective chemotherapy, and the TB Branch began to advocate that patients receive most or all of their care on an outpatient basis. The sanatoria began to close, with most of them being closed by the end of the 1970s. It has been estimated that the closing of the sanatoria represented a savings of more than $400 million to state and local governments.

In 1963, in response to a special Surgeon General's Task Force report on TB, categori-

cal TB grant programs were established and funds were utilized to address the two newly emerging major challenges in TB control: establishing outpatient TB control services and designing ways to effectively identify and treat TB and asymptomatic latent TB infection. Long before the hospitals all closed, sanatorium clinicians began lowering the hospitalization period from the entire treatment period of 18-24 months gradually down to only the first 6 months or less. This meant that patients with uncomplicated TB were treated on an outpatient basis for up to 18 months. There literally were no outpatient clinic programs in most of the country; and in many places, when patients were discharged to outpatient care, they had to return frequently to the sanatorium for outpatient exams and medication refills. Public health nurses had for years been doing routine contact investigations in the field, but most health departments did not have the outreach staff needed for all these TB patients suddenly being treated on an outpatient basis. Acquired drug resistance due to outpatient treatment lapse became an important problem. So as TB sanatoria began to increasingly discharge patients early, health departments had to provide both the TB clinics and the follow-up staff needed to ensure completion of treatment and preventive therapy. The TB branch consulted with health departments in this undertaking which included establishing or improving TB registers needed to effectively monitor and track TB treatment and follow-up for TB patients.

INH had been introduced in 1952, but its prevention possibilities were not realized until Edith Lincoln in New York noted that children with primary TB treated with INH had a much lower incidence of serious TB complications. She suggested controlled trials to look at the possibility of using INH as preventive therapy for TB. Soon, the controlled trials conducted by TB Research Section staff (Shirley Ferebee, Carol Palmer, George Comstock, Lydia Edwards, and others) and other institutions began demonstrating that INH could be effectively and inexpensively used to prevent TB infection from progressing to disease. In the mid-1960s, the TB Branch began to promote and fund the implementation of the "Child-Centered Program," which prioritized the screening of school children to identify TB infection and ensure that identified children completed a preventive course of INH. Part of the "Child-Centered Program" was a concerted effort to conduct "cluster testing" or follow-up of contacts to children with TB infection to identify the infecting "source case" and also to identify other infected children who may have been exposed to and infected by the same source case.
In addition to providing health department categorical funding to help address these challenges, the TB Control Branch and the ALA's American Thoracic Society regularly updated and widely disseminated guidelines for the diagnosis, treatment, prevention, and control of TB.

Almost since its inception, the TB Branch had collected, analyzed, and reported national morbidity, hospitalization, and screening data, and has also provided consultative staff to support and review TB prevention and control efforts at the state and local levels. During the early 1960s, the TB Branch also began working with health departments to establish the TB program management reports to evaluate the effectiveness of TB prevention and control efforts. Program management reports continue to be an important component for evaluation of national, state, and local TB prevention and control efforts. Don Brown managed this activity from the early 1960s until the mid-1990s. A new concept in the type of assistance provided by the TB Branch was initiated in the mid-1960s with the assignment of CDC TB Public Health Advisors to assist health departments in the operation and evaluation of TB prevention and control programs. The TB Branch also began recruiting and assigning TB Medical Officers to health departments for 2-year periods. These Medical Officers, along with CDC Public Health Advisors, began

working as a team with state and local TB Controllers and their staff. These assignees were in effect "on loan" to the health departments and operated as state or local employees, although they were subject to frequent transfer by CDC among the health departments. By the mid-1960s, almost every state plus Guam and Puerto Rico had a TB project grant (Wyoming did not).

The number of TB Medical Officers began to decline after 1967 as recruitment became more difficult and the categorical grants were phased out. However, Public Health Advisors continued to be requested and effectively work in health department TB programs where they were supported by Partnership for Health and later prevention block grants. The Advisors and TB Medical Officers had a major impact on TB control in the areas where they were assigned and afterwards. After serving in the field, many of the TB Medical Officers continued on in public health and national TB leadership. Larry Farer and Dixie Snider started as TB Medical Officers in Utah and Oklahoma, respectively, and both later went on to become directors of the TB Division. There is a long list of other former TB Medical Officers who continued in leadership roles in TB including current ATS president Jeff Glassroth, John Sbarbaro, Phil Hopewell, Tony Catanzaro, and others. The last of the original TB Medical Officer field group was Eric Brenner. (The concept of field Medical Officers was revived on a smaller scale in the early 1990s and continues today.) The TB Branch in the late 1960s and early 1970s also supported a number of "Clinical Associates" who were not PHS medical officers but worked like "TB fellows" in pulmonary training and were assigned to key institutions. For example, Mike Iseman was assigned to Harlem Hospital under Julia Jones. These clinical associates were basically pulmonary fellows working in pulmonary clinics who concentrated on TB and worked in the TB clinics. Lee Reichman was also a TB Branch Clinical Associate, as was Ray McDonald, who works in New Jersey with Dr. Reichman.

No early history of the TB Division would be complete without a mention of the "TB Today!" course, which was conducted by the TB Division from the late 1960s until the early 1990s. The course evolved from courses taught at National Jewish Hospital in Denver and Battey Hospital in Rome, Georgia. Seth Leibler directed the development of this course, working closely with the Director, Al Holguin, and Don Kopanoff, who later served as the TB Division's Associate Director for External Affairs. Later the course was implemented by Ginny Bales, now CDC Deputy Director for Program Management, and Kathy Rufo, now Deputy Director of the Diabetes Translation Division; they were all essential to the design and early conduct of this course. Later, Barbara Holloway (currently Deputy Director of the CDC Epidemiology Program Office) directed the course. It was designed for key TB program managers including physicians, TB Controllers, TB nurses who had management responsibilities, and other TB program managers. The course was presented in a workshop format with heavy emphasis on program evaluation and management by objectives. The attendees worked through the course using their own program's TB morbidity and program evaluation data. They developed objectives for their program based on their unique problems, and developed strategies for achieving the objectives. They went back to their programs and began to implement the plans and achieve the objectives. Many of the TB Controllers from that era will testify the course changed their whole approach to TB from a perspective of clinical management of TB patients to one of managing programs and effectively supervising people. Since the late 1960s, nearly every state and major city TB Controller and head TB nurse has attended the course, which has been revised over time.

The 1970s were belt-tightening times for TB

control staff at CDC and across the nation. The last of the special TB project grants were phased out by 1973. The TB Research Section was transferred from Washington to Atlanta with Jerry Weismeuller as Chief, but many of the TB Research Section staff retired or moved on to other positions rather than move to Atlanta. In 1974 the TB Branch again became the TB Division. In 1976, Larry Farer became Director of the TB Division and Dixie Snider became Chief of the Research Branch. John Seggerson came to CDC as the Chief of Field Services in late 1977, replacing Larry Sparks who had served there before going to the CDC Washington office and later serving as Executive Director for NIOSH and then as Deputy Director of NCIPC. Jerry Brimberry worked as a TB consultant with Larry Sparks and later moved on to Executive Officer of the Diabetes Field Services Branch. The last of the original TB Medical Officer field assignees, Eric Brenner, left the field for Atlanta and the TB Division in 1978. In the late 1970s and early 1980s, the role of the TB Division program consultants was enhanced and they became the lead contacts with health department TB control programs for the Division, establishing ongoing contact and close working relationships between the Division and the field. A long parade of very effective and motivated TB program consultants moved through the Division and on to higher level positions: Charlie Watkins transferred to the regional offices and then to CDC Chief of Regional Affairs; Wilmon Rushing became one of the first CDC AIDS officials and moved up to the NCID Associate Director for Management; Willis Forrester became Chief of Field Services for the AIDS program; Chris Hayden became Chief of the TB Communications and Education Branch; Mack Anders headed the TB Division field staff; George Rogers is the PHS Deputy Regional Health Administrator Director (Chicago), and Carl Schieffelbein is the current DTBE Associate Director for Special Projects. (The current DTBE Field Services Section Chiefs, Joe Scavotto and Greg Andrews, were also DTBE program consultants.)

1980 was an especially difficult time for TB programs when the block grants were completely phased out for a short time, there were no categorical TB grants, and TB program managers had to scramble to cover lost resources. This was a tough time also for TB Division Public Health Advisor field assignees, some of whom had to accept assignments in other programs, while many stayed on in TB field assignments where local health departments were able to cover their salary costs with state or local funds under the Intergovernmental Personnel Assignment Act. Things began to look up again in 1981 and 1982 when categorical TB project grants were again funded, although initially on a very small scale. Since the TB Medical Officer field assignee activity had been phased out by 1978, the Division began recruiting physicians and other scientists from the EIS officer group for TB Division medical posts beginning with Rick O'Brien, George Cauthen, Ken Powell, Bess Miller, Hans Reider, and Alan Bloch, who were the first of this respected group.

The TB individual case report was introduced in the mid-1980s, enhancing the national TB surveillance system. Nonetheless, through the late 1970s and early 1980s, many TB programs increasingly felt the impact of cutting resources that began in the early 1970s. The first documented outbreak of drug-resistant TB occurred in 1976 and 1977 in rural Alcorn County, Mississippi. TB-related resources and infrastructure continued to deteriorate in most areas, and in the early 1980s, HIV/AIDS began to affect TB, at first in Florida and then in the New York City metropolitan area and elsewhere. Because of the decline of the infrastructure, many health departments were simply unable to cope with the emerging TB-related problems associated with AIDS, along with increasing numbers of foreign-born TB patients and other problems having an impact on TB. By the mid-1980s the long-time decline in the Nation's TB morbidity trend

ended and outbreaks of MDR TB in hospitals, prisons, and other institutions were underway.

The following articles by the lead staff of DTBE's branches and programs will provide a more current perspective on division activities.

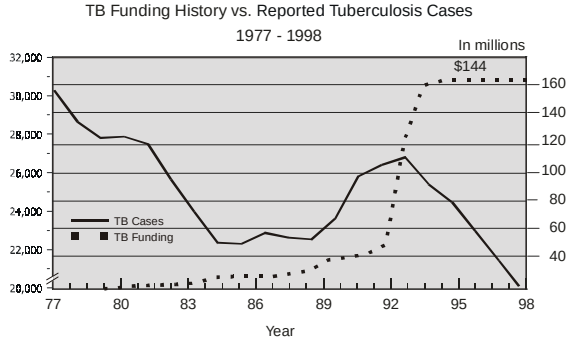
CDC Funding for TB Prevention and Control

by Patricia Simone, MD
Chief, Field Services Branch, DTBE
and Paul Poppe
Deputy Director, DTBE

Federal fiscal support for TB control began with the passage of the Public Health Service Act, which was created to assist states in establishing and maintaining adequate measures for the prevention and control of TB. To enhance case-finding activities, the 1955 Appropriation Act (Public Law 83-472) directed federal grants with local matching funds to be used only for prevention and case-finding activities. In 1961, Congress provided for project grants that were to be used for improving services to known TB patients outside of hospitals, examination of contacts, and diagnosis of suspects. In December 1963, the Surgeon General's task force issued a report recommending a 10-year plan to enhance the federal role in national TB control through increased grants for services for unhospitalized cases and inactive cases, contact investigations, school skin test screening, and hospital radiograph screening programs. By 1967, there were 82 TB control programs in the United States, with federal appropriations of $3 million in formula grants and $14.95 million in TB project grants.

However, in 1966 the Public Health Services Act was amended, changing project grants to block grants. These new grants did not require that any funds be used for TB control, and many health departments eventually redistributed the funds to other programs. While categorical TB appropriations were restored in 1982, there were very modest amounts of federal funding (approximately $1 million to $9 million per year) available for TB control until fiscal year 1992.

Despite an overall decline in funds being spent for TB control, the number of reported TB cases continued to decline nationally through 1984. However, from 1985, the number of cases began increasing and continued to rise through 1992. Recognition of the outbreaks of multidrug-resistant TB, the high mortality associated with TB in HIV-infected persons, and transmission to health-care workers resulted in strong recommendations for enhanced funding for TB prevention and control programs and more stringent infection control practices. In fiscal year 1992 the appropriation was increased to $15 million from the previous year's funding of $9 million. It increased again in 1993 to $73 million, when Congress appropriated $34 million for the continuation and expansion of the TB cooperative agreements and $39.2 million in emergency funds for use in the areas of the country most heavily affected by the increased cases. Congress appropriated yet another increase for categorical TB grants in 1994, and the appropriation for TB project grants was increased to over $117 million. In addition, approximately $25 million in redirected HIV funds have been available for TB control activities each year since 1992, for a total of over $142 million in funding for CDC for TB-related activities. As a result of this infusion of funding, TB program infrastructures have been rebuilt and the results are evident with six consecutive annual decreases in the number of reported TB cases in the United States.



Since 1994, however, CDC has received approximately level funding for TB-related activities. The Tuberculosis Elimination and Laboratory Cooperative Agreement was revised for FY2000 to ensure prioritization of the core TB activities (completion of therapy, contact investigation, surveillance, and laboratory) for all TB programs, with separate funding provided on a competitive basis for targeted testing and treatment of latent TB infection for high-risk groups in programs demonstrating good performance on the core activities.

Federal funds are intended to supplement the state and local activities for TB control and prevention, and in many states, federal funds represent only a small fraction of the total funds available to the TB program. However, in many other states, federal funds represent the majority of TB funding available. Furthermore, some areas are actually reporting a reduction in their state or local TB funding. Yet the level of federal funding is expected to again remain the same in fiscal year 2000 and 2001, which will result in a decreased amount of available funds when inflation factors are applied. Although cases have declined since 1993, the case rate of 6.8 per 100,000 in 1998 is still far short of the target of 3.5 per 100,000 by the year 2000 set by CDC, and aggressive TB prevention and control efforts must be sustained to continue on a successful course to elimination. This will require the continuation of our current efforts and the development of new or increased funding initiatives at every level, including federal, state, and local.

The Advisory Council for the Elimination of Tuberculosis (ACET) published "Tuberculosis elimination revisited: obstacles, opportunities, and a renewed commitment" in the *MMWR*, August 13, 1999/Vol. 48/No. RR-9, and also stated the need for additional resources to fully implement effective elimination strategies. In addition to fiscal resources, ACET recommended building a stronger advocacy at every level of government as well as engaging new partners at the local level, and strengthening coalitions by revitalizing the National Coalition for the Elimination of Tuberculosis (NCET) to garner more private support, and strategically utilizing the media to inform the general public and legislators regarding TB.

Managed Care and TB Control – A New Era

by Bess Miller, MD, MSc
Associate Director for Science, DTBE

After the TB sanatoria were closed during the 1960s and 1970s, typically both clinical care and public health functions for TB control were carried out in the health department setting. However, during the past three decades, there has been an increasing trend toward the provision of clinical care for patients with TB by the private sector. By 1998, about 50% of the care for patients with TB was provided either partially or totally by the private medical sector. More recently, the managed care transformation has increased this movement of patients with TB away from clinical care in health department settings. Patients with TB may be enrolled in managed care organizations as a result of coverage under employee benefit plans, privately purchased insurance policies, or as a result of enrollment in Medicaid or Medicare programs. The Omnibus Budget Reconciliation Act of 1993 (OBRA) permitted states to extend Medicaid coverage to persons with TB, and some states have used this legislation to enroll such patients in their Medicaid programs. In addition, as part of overall Medicaid managed care restructuring, a few states have expanded coverage to include previously uninsured persons. The vulnerable populations among the newly insured are likely to include persons at high risk for TB. The shifting of care of patients with TB into managed care plans, with the emphasis on management of costs, has raised new concerns in the public health community with regard to the ability to maintain adequate community TB control as well as to provide optimal management of

patient care in light of these changes.

A survey of state and big city TB controllers conducted in collaboration with the National TB Controllers Association in late 1997 revealed the following: 1) health departments are still acting as the traditional provider of TB clinical services in most areas of the country; 2) in some areas, however, managed care has changed the way TB clinical services are being delivered (examples of these new arrangements included managed care organizations as providers of clinical services to their enrollees with TB, health departments acting as members of managed care organizations provider networks, and health departments acting as non-network, fee-for-service providers to managed care organizations); 3) health departments are providing the majority of public health services for TB patients who are enrolled in managed care organizations (contact tracing, providing directly observed therapy, and returning lost patients to care); 4) many managed care organizations are using their own or other private laboratories to process TB specimens, rather than state laboratories; and 5) in many areas, health departments are not being consistently reimbursed for providing TB services to patients with private insurance coverage or Medicaid coverage.

The pioneering industrial social worker Lee Frankel envisioned insurance as a powerful means toward improving the lot of the underprivileged. When he was hired by the Metropolitan Life Insurance Company, he established MetLife's Welfare Division. Frankel's early work centered on the prevention of TB, the "white plague" that accounted for 20 percent of all death claims. He realized that public education was the key. In 1909, 10,000 MetLife agents delivered Frankel's pamphlet A War Upon Consumption *to millions of urban poor, who are most at risk for TB (source: Metropolitan Life Insurance Co. Web site).*

During the past several years, there have been a number of symposia addressing the impact of managed care on TB control, which were conducted at national meetings of the American Public Health Association, the National TB Controllers Association, and the Centers for Disease Control and Prevention. In these symposia, a number of themes have emerged, including the urgency of ensuring quality care for TB patients by health care providers with expertise in treating TB; continuous treatment and completion of therapy with the use of DOT; use of laboratories with expertise in mycobacteriology; timely reporting of cases to the health department and initation of contact investigations; development and use of performance measures to monitor patient care and "public health performance"; and systems to ensure ongoing dialogue between health department staff and managed care organization providers.

At the same time, there is recognition that the delivery of health services through managed care organizations presents opportunities to public health leaders, including improved access to high-risk populations for preventive services and to health care providers for training and education on best practices. In addition, the administrative data systems of managed care organizations may provide opportunities for improved surveillance and evaluation of quality of care. The Division of Tuberculosis Elimination has collaborated with Harvard Pilgrim Health Care, a large mixed model health maintenance organization in New England, to review the use of administrative data systems to augment tuberculosis surveillance and the use of pharmacy records to assess the management of tuberculosis. (Please see "Supplementing tuberculosis surveillance with automated data from health maintenance organizations." Yokoe DS, Subramanyan GS, Nardell E, Sharnprapai S, McCray E, and Platt R. *Emerging Infectious Diseases* 1999; 5:779-787, and "Using automated pharmacy records to assess the management of tuberculosis." Subramanyan GS,

Yokoe DS, Sharnprapai S, Nardell E, McCray E, and Platt R. *Emerging Infectious Diseases* 1999; 5:788-791). Administrative data sets provided useful information in both studies.

To assist health departments, State Medicaid Agencies, and managed care organizations in the development of written agreements to ensure the provision of quality patient care and public health TB prevention and control practice, DTBE has collaborated with the Office of Health Care Partnerships of the Epidemiology Program Office, CDC, and with the George Washington University Medical Center's Center for Health Policy Research to develop model contract specifications. (Refer to the article "Tuberculosis control in a changing health care system: Model contract specifications for managed care organizations." Miller B, Rosenbaum S, Stange PV, Solomon SL, and Castro KG. *Clin Infect Dis* 1998;27:677-686.) These specifications can be accessed on the internet at the following website: http://www.gwu.edu/~chsrp.

Early Research Activities of the TB Control Division

By George W. Comstock, MD, DrPH, FACE
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Herman E. Hilleboe was the first Chief of the Tuberculosis Control Division of the United States Public Health Service, with Carroll E. Palmer as director of the Field Studies Section, the unit responsible for most of the Division's research. This review is based largely on perusal of the 70 *Tuberculosis Control Issues*, published during the first week of every month as special issues of *Public Health Reports*. This arrangement continued from March 1, 1946, to December 7, 1951, when *Public Health Reports* changed to a monthly schedule.

The Student Nurse Study was initiated by Palmer, and was supported by the National Tuberculosis Association until the foundation of the Tuberculosis Control Division. During the period from 1943 to 1949, some 22,000 student nurses in 76 schools were given tuberculin tests every six months by a specially trained team. On one of these occasions, approximately 10,000 nurses were also given chest radiographs. Comparison of skin test and radiographic findings showed that many pulmonary calcifications were due to histoplasmosis, that histoplasmosis was concentrated in certain areas of this country, and that many positive tuberculin reactions were due to nontuberculous mycobacteria.

Confirmation of these results came from a research unit established in 1945 in Kansas City, Missouri, to study the epidemiology of histoplasmosis. Two little-known findings deserve emphasis. In two midwestern counties, there was remarkable local variability in the frequency of histoplasmin reactions among cattle. Farms with histoplasmin-positive cattle were interspersed irregularly among those with no reactors. (This marked small-area variability was later found in Maryland among high school students, suggesting that risk factors for endemic and outbreak histoplasmosis are different.)

Studies of tuberculin, histoplasmin, and various nontuberculous mycobacterial antigens reached their peak with the testing of more than a million US Navy recruits from 1958 to 1969. A detailed report of the results of the first half-million tests delineated the extent of these infections in cities, counties, and states. Other important findings were as follows: a) in any area with nontuberculous mycobacterial infections, the larger the tuberculin reaction, the greater the probability that its cause was tubercle bacilli; b) the risk of developing TB after infection was high among underweight persons and low among the obese; c) there was a suggestion that nontuberculous mycobacterial infections conferred some resistance against

TB; and d) there was also a suggestion that social stress increased the risk of developing TB.

A major purpose of the Muscogee County (GA) Tuberculosis Study, started in 1946, was to evaluate the role of mass chest x-ray surveys in TB control. The prospectus and a description of the coverage of the survey and prevalence of TB were included in the first two papers published on this study. Calculation of participation rates was made possible by the population denominator provided by a private census. Basic factors associated with participation and the prevalence among participants were described, as well as reasons for not taking part in the survey. Subsequent papers, building on this foundation, were able to provide information on the incidence of TB among tuberculin reactors and the risks of reactivation among persons with inactive TB, information that has been used to the present time.

The first report of the BCG trials in Muscogee County and Russell County (AL) appeared in 1951. The school children vaccinated in 1947 were retested 6 months later, and many controls and vaccinees were tested with tuberculin again in 1950. Both groups had had less than 5-mm induration to the 100-TU dose of PPD tuberculin in 1947. Although 46% of the vaccinees had 5 or more mm of induration to 5 TU of PPD-tuberculin 6 months later, only 24% of them had reactions this large in 1950; at that time, only 3% of controls had similar reactions. Subsequent follow-up of persons in these trials produced findings that were completely unexpected at the time of their initiation. In contrast to the belief that most TB occurred very shortly after infection and that those who survived this short-term risk were relatively safe thereafter, approximately 80% of TB developed among the initially positive reactors who continued to be at risk. This finding dashed an early hope, namely that the source of a new case of TB ought to be readily found among recent contacts. An unpublished finding involved the first 56 cases among survey participants who did not have a known case in the household. Some 13,000 possible contacts were identified (relatives, friends, workers in the same factory, school mates, etc.). Approximately 11,000 were examined, with the identification of only one possible but unlikely source case. The facts that so little TB developed among nonreactors (those eligible for vaccination) and that BCG appeared to cause harm among school children and to afford very little protection to older persons were major considerations in the hesitancy to advise BCG vaccination in the United States. Over a 23-year period, there were slightly but significantly more cancer cases among vaccinees than controls, most markedly for tumors of the lymphoid tissues.

Many other studies were carried out by the Field Studies Section during this period. There were numerous reports relevant to mass chest x-ray surveys, then in their heyday, dealing with topics such as x-ray generators, fluorescent screens, films, protection of personnel, and the feasibility of taking photofluorograms without having participants disrobe. The development of standardized fungal antigens, notably histoplasmin, was also an important endeavor. Finally, and far from least important, was the publication of Carroll Palmer's ideas for research that could be done in conjunction with the mass tuberculin testing and BCG vaccination then underway in the International Tuberculosis Campaign.

(Editor's note: Dr. George Comstock conducted the trials in Georgia from 1946 to 1955. He continued to make major contributions to the knowledge of TB and measures to prevent the development of TB. After retirement from the PHS he became the Alumni Centennial Professor of Epidemiology at Johns Hopkins University. Dr. David Sencer, a medical officer, was then assigned to Georgia to continue Dr. Comstock's work. He subsequently rose through the CDC ranks to become the Director of CDC, serving from 1966 to 1977.)

The First TB Drug Clinical Trials

by Rick O'Brien, MD
Chief, Research and Evaluation Branch, DTBE
and George Comstock, MD, DrPH, FACE
Alumni Centennial Professor of Epidemiology
Johns Hopkins University
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The United States Public Health Service (USPHS), together with the British Medical Research Council (MRC) and the US Armed Forces–Veterans Administration Cooperative Trials, played a key role in the development of the chemotherapy of TB.

The first USPHS trial, a placebo-controlled study of streptomycin, was initiated by the Field Studies Section and the Tuberculosis Study Section of the National Institutes of Health (NIH) in 1947, the same year as the much smaller but better known MRC study of streptomycin. In the PHS study, a total of 541 patients with moderate to far-advanced pulmonary TB were enrolled at 14 hospitals and sanatoria throughout the US and Alaska. The published account gives no hint of how this controlled evaluation of streptomycin was saved from being only the series of uncontrolled observations that was initially proposed. Funds for a study of streptomycin in the treatment of TB had been allocated, probably in 1946, to a number of prominent hospitals. When Carroll Palmer heard that there were to be no controls, he was upset and expressed his concerns to Dr. Van Slyke, director of the NIH. Van Slyke agreed with Palmer, and directed that a controlled trial be planned and conducted under the general supervision of the newly convened Tuberculosis Study Section. Dr. Esmond Long, from Phipps Clinic in Philadelphia, was the chairman of the Study Section's Steering Committee. Ms. Ferebee, Chief of the Therapy Evaluation Branch, Field Studies Section, became the study administrator. With some grumbling from those who had lost their streptomycin allocation, a controlled trial was conducted, although without the placebo controls Palmer and Ferebee had wished. All investigators took part in various reviews of clinical and radiographic findings and in committees set up to consider appeals from the protocol, procedures continued in future PHS therapy trials as a way to bring investigators together and give them a real part in major decisions.

The study demonstrated the remarkable ability of streptomycin to reduce mortality and improve clinical status. However, monotherapy with streptomycin led to the development of drug resistance in a significant number of patients. In 1951, the one-year status was reported for the patients given streptomycin: 40% had negative cultures, 5% had died, 17% still had tubercle bacilli sensitive to streptomycin, and 39% had resistant organisms. In another 1951 report, PAS was found to be highly effective in preventing resistance to dihydrostreptomycin (similar in action to streptomycin but with a higher risk of ototoxicity.)

The second USPHS study, begun in 1949 at 11 institutions, randomized a total of 315 patients to either streptomycin or streptomycin-PAS. After 6 months of treatment, over 40% of patients receiving monotherapy developed streptomycin resistance, compared to only 12% of patients on combination therapy.

A major advance in TB treatment occurred in 1952 with the initial report of an MRC study of isoniazid. During the next 2 years, a total of 5,324 patients were enrolled in three USPHS trials (which became known as Studies 1, 2, and 3), examining a variety of combinations of the three drugs. The conclusion of these studies was that the triple combination did not

appear to be more efficacious than the combinations of any two of the drugs. However, the combination of isoniazid and PAS was much better tolerated. Evidence from an MRC study indicated that initial streptomycin did contribute to treatment efficacy in patients with advanced disease. Another MRC study determined that the optimal duration of therapy with these drugs was 2 years.

With the scientific basis for TB chemotherapy firmly established, the PHS turned its attention to the next drugs that became available for clinical study, pyrazinamide and cycloserine. However, initial evaluation of pyrazinamide at much higher dosages than are currently used suggested that the drug was too toxic for use in initial treatment, although it appeared to have a role in the treatment of drug-resistant disease. Subsequently, through a series of elegant studies in Africa and Asia, the MRC defined the critial role of that agent in modern short-course therapy.

While continuing to conduct treatment efficacy studies, the USPHS also embarked on pioneering studies of isoniazid for the prevention of TB in persons with latent TB infection (LTBI). Between 1955 and 1959, nearly 65,000 persons including children with primary TB, contacts of infectious TB patients, patients in mental institutions, and Alaskan villagers, were entered into placebo-controlled trials that demonstrated the efficacy of isoniazid for treatment for LTBI.

In 1960, CDC was given responsibility for TB control and research. However, the research division resisted pressure to move to Atlanta and continued its work from Washington. In USPHS studies 12 to 16, the role of ethambutol as a first-line drug replacing PAS was defined. In 1969, the USPHS began the first of a series of studies of rifampin, ushering in the modern era of short-course therapy. Study 18 found that the combination of isoniazid and rifampin was superior to the best regimen that had been evaluated up to that time. USPHS Study 19 evaluated various dosages of rifampin and found that the optimal daily dosage was 10 mg/kg or 600 mg for most adults.

As rifampin-based short-course therapy became firmly established, support for therapy trials in the US began to wane. Study 20, the first USPHS study initiated after the research division moved to CDC, attempted to duplicate a smaller MRC study of a 6-month regimen of isoniazid and rifampin and found that the relapse rate of 10% was unacceptably high. Study 21, which began enrollment in 1981, was plagued by continuing shortages in financial support such that the study was nearly terminated several times before it successfully completed enrollment. That study confirmed the results found by the MRC and led to the adoption of 6-month therapy in the US. It was not until the resurgence of TB in the US, with the concomitant increased support for TB research, that the capacity of the USPHS to conduct high-quality TB treatment trials was restored.

Current TB Drug Trials: The Tuberculosis Trials Consortium (TBTC)

by Andrew Vernon, MD, MHS
Research and Evaluation Branch, DTBE

The USPHS and the Veterans Administration (VA) have a distinguished history of conducting clinical trials to evaluate new drug regimens for both the treatment and prevention of TB. In 1960, CDC assumed a major role in these studies when the USPHS Tuberculosis Division was transferred to CDC. Subsequently, CDC coordinated a series of

multicenter clinical trials that helped to establish rifampin-based, short-course therapy as the standard for TB treatment. It also conducted studies to provide the scientific basis for preventive chemotherapy, which remains a major component of our TB elimination strategy.

Support for the infrastructure required for these studies gradually diminished, so that the last completed trial, USPHS Study 21, was nearly terminated several times during its course for lack of adequate funding. With the infusion of federal support for TB control and elimination in the early 1990s, CDC established a consortium of clinical investigators for the specific purpose of conducting USPHS Study 22, a trial of once-weekly isoniazid and rifapentine in the continuation phase of therapy for pulmonary TB. This consortium, whose sites include public health departments, academic medical centers, and VA medical centers (VAMC), required both time and substantial financial resources to establish and support, but is now functioning efficiently.

Did you know that...
Aspirin was developed as a cure for tuberculosis? Researchers in Switzerland looking for a cure for TB were excited to discover that one particular compound was able to relieve the fever and pain of TB patients. They subsequently found that it only provided temporary relief, not a cure, and they put the drug aside. The compound was later rediscovered and named aspirin (from A. Karlen, Man and Microbes, Putnam & Sons, NY, 1995).

Currently new drugs and regimens for both TB treatment and prevention, new diagnostic tests, and new vaccine candidates are becoming available for clinical investigation. Concurrently, the challenges posed by the goal of TB elimination are increasing, as global rates of drug resistance increase and as the costs associated with assuring high rates of adherence rise. The consortium now provides a unique and important resource for further clinical studies, and has demonstrated its ability to play an important role in TB treatment and prevention.

The original group of clinical sites included 12 academic centers and health departments (7 contracts issued in 1993, and 5 more in 1994), and 15 VAMCs (funded through a Memorandum of Agreement with the Washington, DC, VAMC). Enrollment into USPHS Study 22 began in April 1995, and continued to completion in November 1998. In 1997 CDC began working with the USPHS Study 22 investigators to develop a structure that would engage more fully the capacities of the study investigators in the work of the group. The TBTC was thus organized, with formal by-laws adopted in 1998. Several working committees were established; these are composed of selected Consortium investigators and coordinators, in collaboration with CDC staff. One committee (Core Science) oversees the scientific program of research, a second (Implementation and Quality) supervises the conduct and quality of ongoing studies, and a third (Executive Affairs) serves as the executive arm of the steering committee. This structure is modeled on the Community Programs for Clinical Research on AIDS (CPCRA), which is supported by the National Institute of Allergy and Infectious Diseases (NIAID).

In 1999 the TBTC underwent a formal external re-competition. New 10-year contracts were awarded to 13 offerors (7 prior TBTC members and 6 new sites). The VA side of the consortium underwent a similar process, and funded 10 VA Medical Centers to continue as members of the TBTC.

The current studies of the TBTC are as follows:

Study 22: Randomized open-label trial to evaluate the efficacy of once-weekly isoniazid and rifapentine in the continuation phase of

therapy for pulmonary TB. Enrollment closed in November 1998 with 1,004 HIV-negative participants. Follow-up will continue through mid-2001.

Study 22 PK Substudy: Substudy to evaluate isoniazid, rifampin, and rifapentine pharmacokinetics in 150 patients enrolled in Study 22. Currently in analysis.

Serum Bank Study: Collection of documented serum specimens from patients with suspected or proven TB, from baseline through the course of therapy. Nearing completion.

Study 23: Single-arm clinical trial to evaluate the safety and efficacy of rifabutin-containing short-course therapy for HIV-infected TB patients receiving HIV protease inhibitors. Aims to enroll 200 patients over 2 years, with 2-year follow-up. Enrollment began in March 1999.

Study 23a: Substudy to evaluate isoniazid and rifabutin pharmacokinetics in Study 23 TB patients with HIV receiving antiretroviral therapy. Enrollment began July 1999.

Study 23b: Substudy to evaluate rifabutin and nelfinavir pharmacokinetics in TB patients with HIV receiving nelfinavir as part of antiretroviral therapy. CDC IRB approval granted in November 1999.

Study 23c: Substudy to evaluate rifabutin and efavirenz pharmacokinetics in TB patients with HIV receiving efavirenz as part of antiretroviral therapy. Enrollment began December 1999.

Study 24: Single-arm study of largely intermittent, short-course therapy for patients with INH-resistant TB or INH intolerance. Aims to enroll 200 patients over 2 years with 2 years of follow-up. Enrollment began September 1999.

NAA Substudy: Study of the performance of several nucleic acid amplification methodologies in the diagnosis and management of active TB. CDC IRB approval granted in October 1999.

Study 25: Phase I-II dose escalation study of rifapentine using same design as Study 22, with patients completing 2-month standard induction randomized to 600, 900, and 1200 mg of once-weekly rifapentine/isoniazid. Expected to demonstrate safety and tolerability of higher doses of rifapentine, which may improve efficacy, prevent acquired rifampin resistance in HIV-infected patients, and permit use of once-weekly treatment in initial phase. Enrollment began July 1999.

Study 26: Trial of short-course treatment of latent TB infection among contacts of active cases, using a 3-month once-weekly regimen of isoniazid and rifapentine, compared to the recently recommended 2-month daily regimen of rifampin and pyrazinamide. Protocol in design.

For further information about the Consortium, please visit the TBTC web site at http://www.cdc.gov/nchstp/tb/tbtc

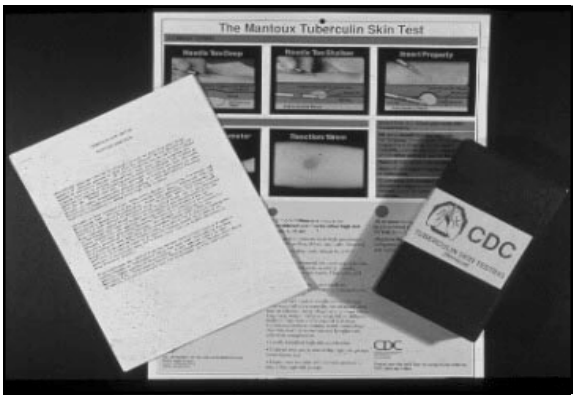
TB Communications and Education

by Wanda Walton, M. Ed.
Chief, Communications and Education Branch

Training and education in TB have changed dramatically over the years. In the not-too-distant past, these efforts were primarily limited to face-to-face classroom instruction

and the distribution of print-based materials. Educational films, then later videotapes, were developed and distributed, but often these materials had a very limited distribution because of the costs of the films and tapes and the limited availability of audiovisual equipment for viewing.

Today, through the availability of technology and reduced production costs, we have a vast array of materials and courses that are distributed through a wide variety of media. Some of the media include print-based curricula with slides (e.g., the Core Curriculum on Tuberculosis); CD ROM (e.g., Tuberculosis: An Interactive CD ROM for



Clinicians); satellite-based courses (e.g., the Satellite Primer on Tuberculosis); videotapes (e.g., the Skin Testing Video); audiotapes (e.g., the TB voice information system); and Internet-based courses (e.g., the Web-Based Self-Study Modules). With the use of satellite-based courses, instructors can simultaneously reach thousands of health care providers in every US state and territory with accurate, up-to-date information. Reduced costs for the reproduction of videotapes and CD ROMs allow for wide-spread distribution of materials. In addition, the Internet allows for distribution of materials and courses to audiences we may have never reached before, both professionally and geographically, at no additional cost after initial production.

Print-based materials are also accessible in a variety of ways. Hard copies can be ordered by mail, by telephone, by fax, or through the Internet online ordering system. Materials can also be downloaded and printed from the Internet. The electronic files of the materials available through the Internet can also be utilized as the basis for adaptation and development of site-specific or population-specific materials.

Another big change in TB training and education is in the methodologies used to influence health care providers' implementation of TB recommendations. In the past, the primary method utilized was information dissemination to increase the health care providers' knowledge of the recommendations. However, we know that information alone is not sufficient to change the practice of many health care providers. In addition to knowledge or information, health care providers must be persuaded to try the new recommendations. This persuasion can occur if the health care provider thinks that the recommendations provide an advantage (is it better than what it's replacing?); is compatible with the current system (no major conflicts created in the current system to implement); is not too complex (how hard is it to do or use?); can be tried beforehand (can I try it before I decide to really use it with patients?); can be observed (can I actually see the result of using this innovation?); and is flexible to being adapted to the current system. After being persuaded that there is an advantage to the new recommendation, health care providers must progress through a decision process (adopt or reject), then to implementation, then to continued, ongoing use of the recommendations. Behavioral theories and models can be utilized to guide the development of educational and training interventions to aid in this progress. Interventions such as academic detailing and the use of opinion leaders can be utilized to facilitate the progress.

For current and future efforts, utilization of

behavioral science and implementation of operational research are essential for developing effective interventions in TB communications, training, and education. With decreasing TB cases in the United States, it becomes even more important to be vigilant, efficient, and effective in our efforts to keep health care providers aware of recommendations, and utilizing them appropriately.

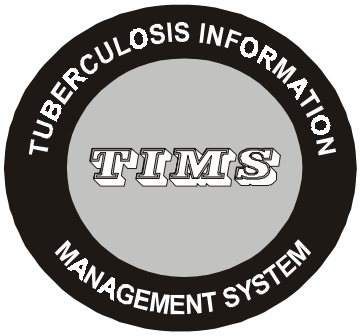
Note: Please feel free to use the DTBE Educational and Training Materials order form included in this issue. Materials can also be ordered from the DTBE web site at http://www.cdc.gov/nchstp/tb

TB Control in the Information Age

by Jose Becerra, MD, MPH
Chief, Computer and Statistics Branch

> "TRS is a computer-based system devised to furnish current information on clinical management of patients and up-to-date statistical summary reports for public health administrative purposes." - Tuberculosis Branch, State and Community Services Division, National Communicable Disease Center, Sept. 1969.

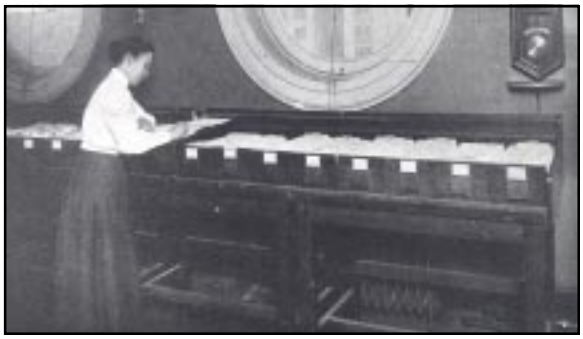
Thus was recorded one of the first iterations of an electronic information management system for the purpose of tracking the epidemiology and clinical management of TB in the United States. The Tuberculosis Record Service (TRS), a mainframe system using punch cards and computer tapes for data processing, was a predecessor of the DOS-based SURVS-TB (Software for Expanded Tuberculosis Surveillance). SURVS-TB, a microcomputer system depending on mailed diskettes for data transfer, and the Tuberculosis Database System (TBDS), a patient management recordkeeping system, were used until 1998 when the Tuberculosis Information Management System (TIMS) was implemented. Regardless of names and versions, TB information management systems pursue the same general objective: the use of meaningful data, that is, intelligence-added data, to perform organizational work and monitor outcomes.



TIMS is an integrated client-server application in Windows, meaning that many users ("clients") may simultaneously access a fully relational database residing in a secure server within a computer network, using the Microsoft Windows graphics user interface. TIMS has replaced the mailing of diskettes with dedicated modem communications for data transfer purposes. Furthermore, TIMS allows the generation of surveillance data from the patient management module integrated within TIMS. Soon, TIMS will also be able to import surveillance data from other systems to completely eliminate the need for double data entry.

However, when TIMS was originally designed, the Internet revolution that nowadays dominates the informatics world was just beginning. The World-Wide Web model, wherein interactive and secure data transactions are conducted using a common viewer or "browser," regardless of the original platform in which an application is developed, poses new opportunities and challenges to the future of TIMS. Among these challenges are 1) the speed with which information technology is being adopted (and abandoned); and 2) the call for fully "integrated" information systems.

The transition of TIMS into a Web-enabled



Old TB recordkeeping system.

application will eventually occur. We can envision a local department of health, with a low-end ("thin") computer and a browser, logging in to a state or regional server to securely send in interactively validated TB data or to browse the results of some descriptive trend analyses. We can also envision a health maintenance organization uploading data on a batch of TB suspects and contacts to be worked up by local health department staff. These data would be subsequently sent to CDC without personal identifiers, using a commonly agreed-upon format. However, the speed with which information technology is changing many times hinders the wise selection of platforms, software development tools, and practices that permit the design of durable and reliable Web-based surveillance systems.

The word integration is trendy nowadays. However, integration is a value-laden term that may mean consolidation to some, as in block grants, while it may mean coordination of efforts to others. TIMS might be considered an integrated system: it integrates patient management with surveillance data. And TIMS will become fully integrated with other information management systems once its data import utilities are completed and a new version is released complying with public health, clinical, and laboratory informatics standards now in development as part of the CDC-wide surveillance integration efforts. The future of TIMS hinges on the assumption that TB will remain a categorically funded program, possibly integrated with other disease-prevention efforts in a patient-centered health care delivery model, but ultimately accountable for its funding. Therefore, TIMS will reflect this funding accountability by protecting TB data integrity and its proper use for program evaluation purposes.

Our organizational mission is to promote health and quality of life by preventing, controlling, and eventually eliminating TB from the United States. Our National Strategic Plan calls for a reduction of the TB case rate to less than one per million population by the year 2010. Therefore, we need to leverage information technology to manage, analyze, and synthesize practical knowledge at the local, state, national, and international level to facilitate the organizational work that will move us closer to that organizational objective.

Data are processed; information is managed; knowledge empowers. Information becomes knowledge, and thus power, when systematically structured and functionally organized for a specific purpose. But there is one crucial premise in this line of reasoning: the existence of an organizational will. An organizational will requires commitment to accomplish a mission, and that commitment begins with a will to know. Once that organizational will is present, and it certainly is present in the TB prevention community, TIMS is and will be ready to facilitate the organizational work that will move us closer to achieve our organizational objectives for the year 2000 and beyond.

Field Services Activities

by Patricia M. Simone, MD
Chief, Field Services Branch

In the early 1960s, with the initiation of categorical project grants, the Tuberculosis Branch moved to Atlanta to join CDC, called then the Communicable Disease Center. In 1974, the Tuberculosis Branch became the

Division of Tuberculosis Control with two branches: the Program Services Branch (which also contained training and surveillance) and the Research Branch. In 1986, surveillance became a separate branch. The Program Services Branch was reorganized into two sections: the Program Operations Section and the Program Support Section. The Program Operations Section was responsible for providing technical assistance and administering cooperative agreement funding to the state and local TB programs. A team of program consultants served as project officers for the project sites, and field staff were assigned to various state and local TB programs to assist with program implementation. The Program Support Section was responsible for training and educational activities as well as program evaluation through information collected in the Program Management Reports.

In 1991, the name of the division changed to the Division of Tuberculosis Elimination. In 1996, the Division of Tuberculosis Elimination was reorganized. The Program Services Branch became the Field Services Branch (FSB). The Program Support Section of the Program Services Branch became the Communications and Education Branch, although the program evaluation activities remained in FSB. The Program Operations Section became two sections, Field Operations Sections I and II, with approximately one half of the project sites covered by each. A medical officer was assigned to each of the new sections to work closely with the program consultants to enhance technical assistance and program evaluation capacity. A third medical officer conducts studies and other activities centered around program evaluation and program operations.

The number of field staff positions grew from a low of 25 in 1980 to over 60 by 1996. In addition to assigning more Public Health Advisors to the project sites for enhanced capacity building, FSB has hired several field medical officers serving as medical epidemiologists and medical directors in various TB project sites. These positions also serve as key training positions to develop TB clinical and programmatic expertise as older TB experts retire. In order to better meet the needs of the larger field staff, the Field Staff Working Group was established to enhance communication between headquarters and the field, and a field staff training and career development coordinator was added to the headquarters staff of FSB.

The last group of persons hired in the Public Health Advisor (PHA) series were recruited in 1993. Through attrition and promotion, the pool of PHAs has continued to diminish without being replenished with new recruits, yet the demand for Public Health Advisors to be assigned to the TB project areas continues. FSB is in the process of completing work on a recruitment and training program for junior-level field staff to be assigned to state and local TB programs.

FSB is looking to the future by continuing to emphasize core TB prevention and control activities, enhancing program evaluation activities to help ensure that programs are as efficient and productive as possible, and working toward TB elimination.

TB's Public Health Heroes

by Dan Ruggiero, Olga Joglar, and Rita Varga
Division of TB Elimination

Tuberculosis is frequently called a "social disease with medical implications." The populations most affected by TB today are urban and poor; they are the medically underserved low-income populations such as high-risk minorities, foreign-born persons, alcoholics,

intravenous drug users, residents in long-term care facilities such as correctional facilities, and the homeless. Active tuberculosis with subsequent spread of infection to contacts poses a significant threat to the community. Practicing physicians, for the most part, focus on the individual patient, and to some extent on the family; public health officials focus on patients as a group, on families, and on the community. So, in controlling TB, who are the real heroes? Who, on a daily basis, deals with the patients, their families, and the health care providers? Who does the leg work required to ensure patients are monitored through completion of treatment, and that contacts are

Nurse crossing roofs to visit patients

identified and evaluated? Public health field workers are the real heroes in the fight against tuberculosis.

Historically, in the United States, community outreach workers have played an important role in waging a successful battle in the war against tuberculosis. Hermann Biggs, in 1896, called for health inspectors to visit homes of TB patients and educate their families on how to deal with those suffering with the disease and how to prevent future cases. In the 1920s and 1930s visiting nurses were climbing and jumping over New York City tenement roof tops to visit TB patients who were being given the "fresh air treatment."

In the 1950s, federal public health advisors were assigned to local health departments to provide technical assistance and treatment guidelines and to assist local health departments with TB surveillance and control activities. In the 1960s New York City hired "lay tuberculosis investigators" to track down noncompliant patients. The workers would visit patients' homes, and as needed, track them to unsavory locations, such as local bars, clubs, and hangouts. Since then, most state and local health departments have hired and trained lay persons and nurses to carry out similar functions and activities. Who are these people that have played an important role in the fight against tuberculosis and why is it that we hear so little about them? They are the backbone of the TB control program, the foot soldiers who are willing to place their lives on the frontline each day in order to do battle against the common enemy - tuberculosis.

TB control programs have used public health field workers with different backgrounds and expertise to monitor patients and assist them in adhering to and completing the recommended course of treatment. Responsibilities assigned to these workers vary by area and degree of complexity. Some workers conduct surveillance activities by visiting hospitals, laboratories, and infection control officials; others provide services out in the field such as conducting home visits or providing DOT, which can put them in risky situations. And even under difficult circumstances, field workers continue doing their work. Field reports document clients and patients directing violent threats and hostile incidents to public health workers. Field workers survive by learning conflict resolution and field safety and by using precautionary measures when conducting their activities. The threat of violence that field public health workers experience while in the line of duty cannot be controlled by detection devices used in office

facilities to provide protection to workers. Although these workers know of the risks involved, they continue to carry out their efforts to control TB in their areas.

Many names have been used to describe the job of these dedicated individuals. Outreach workers, public health advisors, case managers, DOT workers, and epidemiology technicians are some of the titles given to the public health field workers. The heroes of TB come from all backgrounds, education, and ethnic groups. Hiring requirements vary from state to state, and while many have advanced college degrees, others may be from the same population group as the patients they serve and have little or no schooling.

Public health workers have the responsibility of establishing effective communication with patients. The outreach workers are usually the first contact the patients have with the health department and TB programs. The ability of outreach workers to use their interpersonal and communication skills in dealing with patients will set the stage for a positive or negative attitude toward the healing process, and consequently whether the patients will comply with the recommended regimen. Field workers must be culturally sensitive and must understand patients' beliefs, cultures, and environment; in many instances they develop relationships with patients that extend beyond the duration of treatment. Just like the TB heroes at the turn of the century, they bring with them a spirit, zeal, vision, and determination to assist those individuals afflicted with TB disease and infection and to bring about an end to this disease.

The dramatic decrease in the number of TB cases in the US since 1993 could not have been accomplished without the persistent hard work of theses individuals. The success we enjoy today came about, and continues, through the efforts of thousands of outreach workers. Whether it is a public health advisor purchasing pizza out of his or her own pocket to ensure DOT compliance, or a nurse driving long distances to make sure that patients living in rural areas receive their medication or are transported to a clinic or hospital for tests, public health field workers do whatever is necessary to achieve their objective: tuberculosis control.

What do we call these individuals who have been central figures in the tuberculosis control movement for the past 40 years? Public health heroes!

Infection Control Issues

by Renee Ridzon, MD
Surveillance and Epidemiology Branch

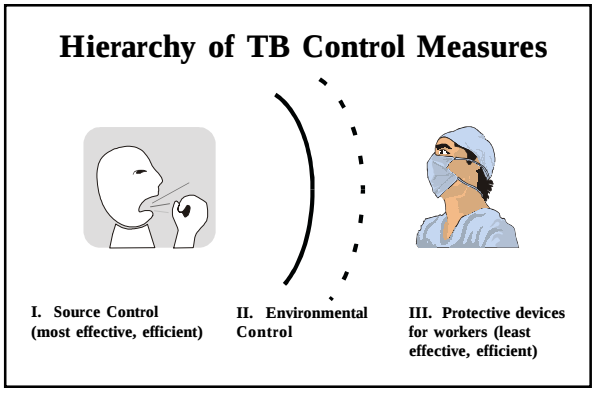
In recent years, transmission of TB within the workplace has received much attention in the scientific and popular press. However, the notion of TB as an occupational hazard is not new, and since the beginning of this century TB has been recognized as an occupational hazard for doctors and nurses. In fact, there have been several studies published in the first part of the 1900s documenting low rates of *M. tuberculosis* infection among medical and nursing students prior to the start of training. After completion of clerkships caring for TB patients, high rates of tuberculin skin test conversions and even cases of TB were seen. Concern about this occupational risk waned, however, with the dramatic fall in the number of TB cases in the US.

With the re-emergence of TB in the mid-1980s, the emergence of multidrug-resistant TB (MDR TB), and recognition of the increased morbidity caused by MDR TB and HIV-related TB, concern regarding TB was reawakened in this country. Media reports about the danger of TB were fueled by a number of published reports regarding explosive outbreaks of MDR TB in hospitals, mostly in New York City, among persons with HIV infection. Concern was further heightened by episodes of transmission of

disease to health care workers caring for the patients involved in these outbreaks.

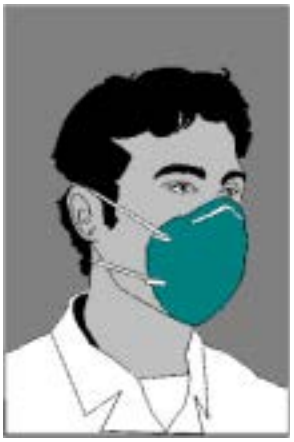
With recognition of the increased risk for TB among persons with HIV infection, in 1990 CDC issued *Guidelines for Preventing the Transmission of Tuberculosis in Health-Care Settings with Special Focus on HIV-Related Issues.* Despite these guidelines, implementation of appropriate infection control measures was incomplete in many hospitals, and some of the published reports of nosocomial transmission documented lapses in or absence of infection control measures in the health care facilities. Because of its legal mandate to ensure that no worker is harmed as a result of his or her work experience, as well as the outbreaks of MDR TB, in 1992 the National Institute for Occupational Safety and Health (NIOSH) recommended the use of powered-air purifying respirators (PAPRs) by health care workers potentially exposed to *M. tuberculosis*.

As a result of the ongoing outbreaks of TB and the NIOSH recommendation for the use of PAPRs, the adequacy of the 1990 guidelines was discussed at a large national meeting convened in 1993. In attendance at this meeting were representatives from multiple groups concerned with nosocomial transmission of *M. tuberculosis*, including infection control practitioners, labor representatives, and occupational medicine practitioners. The meeting concluded that in most of the outbreak settings, the 1990 guidelines had not been adequately implemented, and there was a need for revised and expanded guidelines. In 1993 a draft of the revised guidelines was published in the *Federal Register* for public comment. After a period of comment and public meetings, the report *Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health-Care Facilities, 1994* was published in the *Morbidity and Mortality Weekly Report*. This document contained detailed, comprehensive recommendations for prevention of



nosocomial transmission of *M. tuberculosis*. Included in the recommendations was a hierarchy of controls composed of, most importantly, administrative controls (including assignment of responsibility, risk assessment, development of a TB infection control plan with periodic reassessment, and tuberculin skin testing of health care workers), followed by engineering controls, and then by personal respiratory protection. Personal respiratory protection devices that were recommended for use in the health care setting needed to meet the following criteria: 1) ability to filter particles of 1 micron with a filter efficiency of 95%, 2) ability to be fit tested to obtain a face seal leak of 10% or less, 3) ability to fit different face sizes, and 4) ability to be checked for face-piece fit by health care workers each time the respirator was used. At the time the 1994 guidelines were written, the only respiratory protection device that was NIOSH-approved and met the above criteria was the high efficiency particulate air (HEPA) filter respirators. In July 1995 NIOSH updated its respirator testing and certification requirements to permit the approval of other respirators. Under the updated testing, respirators that contain a NIOSH-certified N-series filter with 95% efficiency (N-95) rating meet the recommendations of the CDC guidelines.

Like NIOSH, the Occupational Safety and Health Administration (OSHA) has a legal mandate for the protection of workers; however, unlike NIOSH, which can only



issue recommendations, OSHA has the capacity to enforce its standards. In 1997, OSHA published a draft TB standard in the *Federal Register*. Following the publication of the draft standard, there was a period for public comment followed by a series of hearings for testimony. Detailed comments were submitted from a CDC committee including staff members of NIOSH, the Hospital Infections Program, and the Division of Tuberculosis Elimination, as well as many other professional organizations. In July 1999, OSHA reopened the docket for further public comment. The OSHA TB standard is currently undergoing revision, and its final content and release date are not yet known.

In order to better understand the risk of transmission of *M. tuberculosis* to health care workers, CDC undertook several studies designed to examine rates of skin test conversions in health care workers. The most comprehensive of these was a study initiated in 1995 called StaffTRAK-TB. This study included over 13,000 health care workers. Data from this study demonstrate a rate of skin test conversions among health care workers of 4.4 conversions per 1,000 person-years of follow-up. For US-born persons, the rate was even lower at 3.2 conversions per 1,000 person-years. From data currently available from studies such as StaffTRAK-TB, the risk of nosocomial transmission of TB appears to be quite low. As a result CDC is considering revision of the 1994 guidelines, especially in the areas of frequency of tuberculin skin testing of health care workers.

The risk of transmission of *M. tuberculosis* in health care settings is a real one. However, the magnitude of this risk depends on many factors such as implementation of administrative and engineering controls, prevalence of patients with infectious TB within the facility, and risk for infection outside of the healthcare facility. All of these factors need to be weighed in decisions regarding recommendations or mandates for TB control measures within health care facilities. As the rates of TB in the US continue to decline, these recommendations will need to be tailored to offer protection to patients and workers within the health care setting, without an unnecessary burden of testing and expense.

A Decade of Notable TB Outbreaks: A Selected Review

by Scott B. McCombs, MPH
Deputy Chief, Surveillance and Epidemiology Branch

The Surveillance and Epidemiology Branch is charged with monitoring TB morbidity and mortality in cooperation with state and local health departments. One of the most fascinating and important parts of our role is to assist our partners in responding to outbreaks of TB when they occur. This article summarizes a cross-section of some of the more notable outbreaks from the 1990s.

Extensive transmission of *Mycobacterium tuberculosis* from a child (Curtis, Ridzon, Vogel, et al. N Engl J Med 1999;341:1491-1495).

Although young children rarely transmit TB, infectious TB was diagnosed in a 9-year-old boy in North Dakota in July 1998. The child was screened because extrapulmonary TB was diagnosed in his female guardian. The child, who had come from the Republic of the Marshall Islands in 1996, had bilateral cavitary TB. Because he was the only known possible source of his guardian's TB, an investigation of the child's contacts was undertaken. Family, school, day-care, and other social contacts were notified of their exposure and given tuberculin skin tests (TST). Of the 276

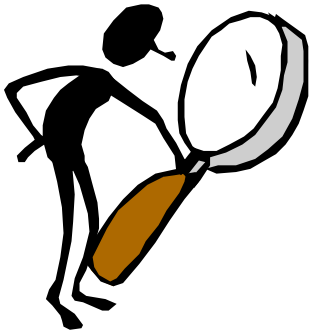
contacts tested, 56 had a positive TST (10 mm induration), including 3 of 4 household members, 16 of his 24 classroom contacts, 10 of 32 school-bus riders, and 9 of 61 day-care contacts. A total of 118 persons received preventive therapy. The 9-year-old patient's twin brother had TB, but was deemed not infectious on the basis of a negative sputum smear. This investigation showed that children with TB, especially cavitary or laryngeal TB, should be considered infectious, and that screening of their contacts may be required.

Spread of Strain W, a highly drug-resistant strain of *Mycobacterium tuberculosis,* across the United States (Agerton, Valway, Blinkhorn, et al. Clin Infect Dis 1999; 29:85-92).

Strain W, a highly drug-resistant strain of *Mycobacterium tuberculosis*, was responsible for large nosocomial outbreaks in New York in the early 1990s. This article is a review of data from epidemiologic investigations, national TB surveillance, regional DNA fingerprinting laboratories, and the CDC Mycobacteriology Laboratory to identify potential cases of TB due to Strain W. From January 1992 through February 1997, 23 cases were identified in nine states and Puerto Rico; 4 of the 23 cases transmitted disease to 10 other people. Eighty-six contacts of the 23 cases were presumed to be infected with Strain W. The authors conclude that Strain W TB cases will occur throughout the United States as persons infected in New York move elsewhere. CDC asked health departments to notify CDC of cases of TB that were resistant to isoniazid, rifampin, streptomycin, and kanamycin. The references for this article include citations for earlier investigation results that have been published, including this next one.

Transmission of a highly drug-resistant strain (Strain W1) of *Mycobacterium tuberculosis*: Community outbreak and nosocomial transmission via a contaminated bronchoscope (Agerton, Valway, Gore, et al. JAMA 1997;278:1073-1077).

In 1995, eight patients with MDR TB were identified in South Carolina; all were resistant to seven drugs and had matching DNA fingerprints (Strain W1). Community links were identified for five patients (patients 1-5), but no links were identified for the other three patients (patients 6-8) except being hospitalized at the same hospital as one community patient. Patients 5 and 8 both died of MDR TB less than one month after diagnosis. Patients 6 and 7 each had one positive culture for MDR TB; specimens were collected during bronchoscopy. Patient 6 had a skin test conversion after bronchoscopy. Neither patient 6 nor patient 7 had a clinical course consistent with MDR TB, neither was treated for MDR TB, and both are alive and well. There was no evidence of laboratory contamination of specimens, transmission on wards, or contact among patients. All four received bronchoscopy in the same month. Observations revealed that bronchoscope cleaning and disinfection was inadequate and led to subsequent false-positive cultures in patients 6 and 7, transmission of infection to patient 6 and active MDR TB to patient 8.



An outbreak involving extensive transmission of a virulent strain of *Mycobacterium tuberculosis* (Valway, Sanchez, Shinnick, et al. N Engl J Med 1998;338:633-639).

From 1994 to 1996 there was a large outbreak of TB in a small, rural community with a population at low risk for TB. Twenty-one patients with TB were identified; the DNA fingerprints of the 13 isolates available for testing were identical. To determine the extent of transmission, we investigated both the close and casual contacts of the patients. Using a mouse model, we also studied the virulence of the strain of *Mycobacterium tuberculosis* that caused the outbreak. The index patient, the

source patient, and one other patient infected the other 18 persons. In five, active disease developed after only brief, casual exposure. There was extensive transmission from the three patients to both close and casual contacts. Of 429 contacts, 311 (72%) had positive skin tests, including 86 documented skin test conversions. The growth characteristics of the strain involved in the outbreak greatly exceeded those of other clinical isolates of *M. tuberculosis*. The extensive transmission of TB in this outbreak may have been due to the increased virulence of the strain rather than to environmental factors or patient characteristics.

A nosocomial outbreak of multidrug-resistant tuberculosis (Kenyon, Ridzon, Luskin-Hawk, et al. Ann Intern Med 1997;127:32-36).

This article details an outbreak of seven cases of MDR TB (in six patients and one health care worker, all of whom had AIDS) that occurred in a hospital in Chicago. The hospital had a respirator fit-testing program but no acid-fast bacilli isolation rooms. All seven *M. tuberculosis* isolates had matching DNA fingerprints. Of patients exposed to *M. tuberculosis*, those who developed TB had lower CD4+ T-lymphocyte counts and were more likely to be ambulatory than those who did not. Of 74 exposed health care workers, the 11 who converted their skin tests were no more likely than those who did not convert to report that they always wore a respirator with a HEPA filter. Transmission of *M. tuberculosis* occurred in a hospital that did not have recommended isolation rooms. A respirator fit-testing program did not protect health care workers in this setting.

Outbreak of drug-resistant tuberculosis with second-generation transmission in a high school in California (Ridzon, Kent, Valway, et al. J Pediatr 1997;131:863-868).

In the spring of 1993 four students in a high school were diagnosed with TB resistant to isoniazid, streptomycin, and ethionamide. A retrospective cohort study with case investigation and skin test screening was conducted in the school of approximately 1,400 students. DNA fingerprinting of available isolates was performed. Eighteen students with active TB were identified. Through epidemiologic and laboratory investigation, 13 cases were linked. Nine of the 13 had positive cultures for *M. tuberculosis* with isoniazid, streptomycin, and ethionamide resistance, and all eight available isolates had identical DNA fingerprints. No staff member at the school had TB. One student remained infectious for 29 months and was the source case of the outbreak. Another student was infectious for 5 months before diagnosis and was a treatment failure. This student subsequently developed additional resistance to rifampin and ethambutol. The initial skin test screening found 292 of 1263 (23%) students tested had a positive TST. Risk of infection was highest among twelfth graders and classroom contacts of the two students with prolonged infectiousness. An additional 94 of 928 (10%) students tested later had a positive TST; 22 were classroom contacts of the student with treatment failure and 21 of these were documented TST conversions. This article documents extensive transmission of drug-resistant TB along with missed opportunities for prevention and control of the outbreak. Prompt identification of TB cases and timely interventions should help reduce these problems.

Transmission of multi-drug resistant *Mycobacterium tuberculosis* during a long airplane flight (Kenyon, Valway, Ihle, et al. N Engl J Med 1996;334:933-938).

In April 1994 a passenger with infectious MDR TB traveled on commercial-airline flights from Honolulu to Chicago and from Chicago to Baltimore and returned one month later. We sought to determine if this passenger infected any of her contacts on this extensive trip. Of 925 people on the airplanes, 802 responded to a request to complete a questionnaire and be screened by tuberculin

skin test. All 11 contacts with positive TST who were on the April flights and 2 of 3 contacts with positive TST on the Baltimore-to-Chicago flight in May had other risk factors for tuberculosis. More contacts on the 8.75 hour flight from Chicago to Honolulu had a positive TST than on the other three flights. Of 15 contacts with a positive TST on the Chicago-to-Honolulu flight, six (four with skin-test conversions) had no other risk factors; all six sat in the same section as the index patient. Passengers seated within two rows of the index patient were more likely to have a positive TST than those in the rest of the section. Transmission of *M. tuberculosis* in this setting involved a highly infectious passenger, a long flight, and close proximity of contacts to the index patient.

The Division of TB Elimination and our partners in state and local health departments have benefitted tremendously from what has been learned from these and other outbreaks. Our continued cooperation, diligence, and timely systematic response to future outbreaks are critical to our eventual success in eliminating TB from the United States.

International Activities

by Nancy Binkin, MD, MPH,
Chief, International Activity and
Michael Iademarco, MD, MPH
International Activity

As the rate of tuberculosis (TB) cases falls in the United States (US), an increasing percentage of TB cases occur among US residents born in countries with a higher burden of TB. The US rate of TB cases is relatively low compared with the rate in 22 high-burden countries where 80% of global TB cases occur and where 62% of the world's population resides. Given the latency period between TB infection and disease, continued immigration into the US, and increasing international travel, efforts to eliminate TB in the US must extend beyond our geographical borders. Recognition of the public health impact of the global TB epidemic led CDC to officially organize an International Activity within the Division of TB Elimination (DTBE) in 1994 as international efforts are part of the overall strategic plan of DTBE.

The mission of the International Activity is, first, to provide leadership and coordination for CDC activities related to improving TB prevention and control efforts among foreign-born persons in the US. Its mission is, second, to contribute to global TB prevention and control efforts by conducting operations research and providing technical support to high-priority countries, i.e., those that have a major TB burden or that are of strategic interest for TB control efforts in the US. Coordination and collaboration with other international public health partners are critical to accomplish our mission.

Immigrants from Mexico, the Philippines, and Viet Nam are the leading contributors to the US foreign-born TB case burden and therefore constitute a high priority for TB control efforts in the US. The aim of International Activity efforts in these countries is to reduce the burden of TB by improving the TB control capacity of the respective national programs, by providing technical assistance and contributing to human resource development.

Historically efforts in Mexico and the Philippines have been hampered by ongoing political and social changes. More recently, however, progress has been made.

Mexico

Because of their proximity and our shared border, persons born in Mexico represent the single largest group of foreign-born persons in

the US with TB. Previously CDC worked with the Mexican government to conduct surveillance of drug-resistant isolates of TB in Mexico as part of a WHO collaborative study. More recently, DTBE has been working with the United States Agency for International Development (USAID) and the National TB program of Mexico to identify areas of potential collaboration as part of a proposed 5-year project to improve TB control. Proposed activities include expanding the number of directly observed treatment, short-course (DOTS) pilot projects, improving operations research capacities, and developing activities to foster public-private health sector collaboration.

Additionally, DTBE has been a participating member of Ten Against TB, a binational initiative developed initially by the Texas Department of Health beginning in 1995. The ten US and Mexican border states have collaborated to reach a consensus on addressing joint issues of TB control through community-based public and private sector partnerships. Along with other partners in the Division and in the health departments of the border states, CDC has also been developing a series of recommendations to improve the diagnosis and management of cases along the US-Mexico border.

Philippines

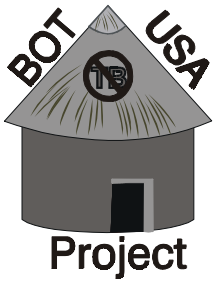
In collaboration with the Department of Health of the Republic of the Philippines (DOH) and the Epidemiology Program Office of CDC, DTBE is providing technical assistance to a USAID-funded project. The objective of this 5-year project is to reduce the threat of HIV/AIDS and other selected infectious diseases in the Philippines. Of those diseases in the Philippines, TB has the most significant public health impact and therefore figures prominently in the project. The broad, cross-cutting nature of the project design addresses the decentralized health care organization in the Philippines. DTBE is working with the DOH to organize and conduct operations research training, expansion of directly observed treatment, short-course (DOTS) pilot projects, and public-private collaborative projects.

Viet Nam

Collaboration with the National TB Control Program of the Socialist Republic of Viet Nam (NTP) has been more longstanding. Since 1996, DTBE has worked with the NTP to improve TB control. Several laboratory quality control projects have been conducted and others are ongoing with the national reference laboratory responsible for southern Viet Nam. In 1997, DTBE conducted a 2-week operations research course for supervisory staff of the NTP and provincial TB managers held in Hanoi. As a result of the course, six protocols were developed on operational topics such as risk factors for treatment failure and for default, reasons for patient delay in seeking initial TB treatment, and knowledge, attitudes, and beliefs about HIV and HIV testing and counseling among TB patients. Each group has been provided with a CDC mentor and funding to conduct the research. The work for one protocol is complete and has been presented by the Viet Namese principal investigator at the International Union Against Tuberculosis and Lung Disease World Congress in Madrid this past September. Other projects are near completion. Based on the success of the operations research course and with support from USAID, DTBE has initiated a 3-year public health practice training program with the NTP.

Botswana

Other DTBE international efforts have aimed



to contribute to the global control of TB and HIV/AIDS co-epidemics. In February 1995, at the request of the Ministry of Health in Botswana, the BOTUSA Project was established as a TB epidemiologic research collaboration located in Botswana. Approximately 25% of the adult population and 75% of TB patients are HIV-infected. The BOTUSA Project activities have focused on improving TB surveillance and electronic reporting, improving Botswana National TB Programme (BNTP) activities through operational research, improving diagnostics through laboratory and clinical research studies, and studying the epidemiology of the disease. At least 17 different formal studies have been completed to date and highlight the tremendous impact of the HIV epidemic on the TB epidemic in the country.

The site is collaborating with WHO and other countries on several projects, including involvement of the community in the care of patients with TB and advanced AIDS, provision of TB preventive therapy to persons living with HIV, and improvement of TB surveillance through the use of a software tool initially developed by BOTUSA and recently adopted by the World Health Organization (WHO) for global application. Through collaboration with the US Food and Drug Administration, the site and DTBE have raised global awareness of the potential for substandard TB drugs in the market through the pilot-testing of appropriate technology for the rapid screening of drugs. Specific research projects completed in 1998 included a spectrum of lung disease study in adults hospitalized with AIDS, an autopsy study to determine causes of death in adults and children dying of AIDS, a validation study of the TB surveillance system, a study of risk factors for TB transmission in the household, and a study of transmission at the population level through the use of RFLP techniques. Another study underway is assessing the malabsorption of TB drugs in patients with TB and HIV, as well as conducting long-term follow-up of these treated patients to determine risk factors for relapse, reinfection, and death.

Strengthening the capacity of laboratory facilities to cope with the ever-increasing demands brought on by the TB and HIV epidemics has been a component of the BOTUSA project. Substantial support in terms of equipment, training, and supplies has been provided to the national TB Reference Laboratory. BOTUSA also serves as an important training site for EIS officers, US medical students, and public health students from UC-Berkeley.

Russia and countries of the former Soviet Union

As a result of a joint Department of Health and Human Services and White House conference, the Russian Federation and the countries of the former Soviet Union have been targeted for CDC TB control technical assistance efforts. The number of TB patients and the levels of drug resistance are increasing at alarming rates. Contributory factors include an inability to financially support the previous infrastructure for TB diagnosis and treatment, the lack of availability of quality drugs, high levels of TB transmission in prison settings, and reluctance to adopt the DOTS strategy as employed in the US and elsewhere and recommended by the WHO. The DTBE, USAID, and WHO are collaborating to institute basic DOTS programs in two oblasts (territorial administrative divisions) that have indicated a willingness to begin the DOTS strategy, and to strengthen DOTS in Ivanovo oblast, where a WHO-supported program was implemented in 1995 but where cure rates remain unacceptably low. A recent study in this second oblast has documented further increases in the levels of multidrug-resistant (MDR) TB. DTBE will also implement

DOTS-plus, the WHO strategy for the management of MDR TB treatment in low-resource settings, in this oblast. In addition, DTBE has been involved in the establishment of a center of excellence for MDR TB in Latvia, which was formerly part of the Soviet Union and which has a successful DOTS program, but nonetheless has one of the highest levels of MDR TB in the world. Finally, an MDR TB training course run by DTBE in collaboration with National Jewish Medical Center was conducted overseas this past year in Estonia for participants from Russia and the Baltics.

The Role of CDC's Division of Quarantine in the Fight Against TB in the US

by Paul Tribble
Public Health Advisor, DQ

The Division of Quarantine (DQ), the oldest organization in the United States Public Health Service, has had a rich and colorful history and plays an important role in the nation's fight against tuberculosis (TB), especially with respect to immigrants and refugees. DQ, which was established by the National Quarantine Act of 1878, was transferred to the Centers for Disease Control

Immigrants of the past awaiting medical clearance

(CDC) in 1967. DQ has had several previous titles, including the Division of Foreign Quarantine and Quarantine Division, and is continuing to evolve with another proposed name: the Division of Global Migration and Quarantine.

United States (US) immigration law mandates an overseas health assessment for immigrants and refugees, with the intent of denying admission to persons with certain diseases of public health significance, physical or mental disorders associated with harmful behavior, drug abuse or addiction, or likelihood of becoming a ward of the state. The conditions, the requirements as to who must be screened, and the examination and tests to be performed are prescribed by the Secretary of the Department of Health and Human Services, with oversight by DQ.

The current list of communicable diseases of public health significance that are considered "inadmissible" are infectious TB, syphilis, lepromatous Hansen's disease, HIV infection, and certain sexually transmitted diseases (STDs). The overseas health assessment, which is valid for 12 months, is carried out by local physicians known as "panel physicians," who are appointed by the US embassy or consulate. In some cases, clinics or hospitals are designated as panel physicians in countries where large numbers of immigrants originate (e.g., Mexico, the Philippines, and Viet Nam). Panel physicians are provided with a booklet of technical instructions concerning the assessment process which, in addition to the TB evaluation, consists of a medical history, physical examination, and screening for physical and mental disorders, substance abuse, STDs, Hansen's disease, and HIV infection.

Panel physicians make their own arrangements for the required radiologic and laboratory tests. Currently, no countries have on-site supervision beyond the local consular officer, except Viet Nam, which has a CDC microbiologist consultant. Panel physicians do, however, receive periodic visits by CDC physicians and microbiologists based in Atlanta. Panel physicians are paid for their services by immigrant applicants on the basis of a fee scale set locally. In the case of refugees, the US Department of State reimburses the

panel physicians for providing the health assessment. Presently, there are approximately 650 panel physicians worldwide.

The TB component of the health assessment consists of a chest x-ray for all persons 15 years of age or older. (Children less than 15 years of age who are suspected of having TB or who have a history of contact with a known TB case are given a tuberculin skin test. Those with a positive skin test must undergo a chest x-ray.) If the x-ray is consistent with active TB disease, three consecutive early-morning sputum specimens are collected for acid-fast staining and microscopic examination. Persons whose sputum smears are positive for acid-fast bacilli (AFB) are classified as having Class A, infectious TB, which is an inadmissible condition for purpose of entry into the United States. Such persons may enter the United States by meeting either of the following two conditions. First, sputum smear–positive immigrants and refugees who successfully complete a recommended course of TB treatment overseas can be medically cleared for US travel; they will have been reclassified as having Class B2 or old, healed TB (see description of TB classifications below). Secondly, they may enter the United States with a medical waiver, once they are no longer infectious, by providing three consecutive negative sputum smears. To obtain a medical waiver, the US relative of the Class A immigrant must complete an application. This is signed by a US health-care provider and is countersigned by the local health department (or signed only by the local health department acting as the health-care provider) at the immigrant's intended US destination, thus guaranteeing that the provider will assume responsibility for the completion of TB treatment. Class A refugees with TB are not required to have a relative residing in the United States, as the waiver is completed by the resettlement agency at the intended site of destination. Immigrants are responsible for paying for their own TB treatment overseas; in the case of refugees, the costs are assumed by the US Department of State.

Applicants whose chest x-ray is consistent with active TB disease but whose three sputum smears are negative for AFB are designated as having Class B1 (clinically active, not infectious) TB. If the initial chest x-ray is read by the panel physician as consistent with old, healed TB, no specimens of sputum need be obtained, and the applicant is designated as

Current immigration clearance process

having Class B2 (not clinically active, not infectious) TB. Both Class B1 and B2 designations are considered significant health conditions, but neither is inadmissible for immigration purposes.

Class A and Class B designations for immigrants are placed on the official immigration documents collected by inspectors of the Immigration and Naturalization Service at one of 295 international airports, land crossings, or ports in the United States; refugees must enter the country through one of eight international airports that are staffed by DQ inspectors. This information is sent to or collected at one of the quarantine stations, where a notification form is mailed to the state or local health department at the intended destination of the arriving immigrant or refugee. Health departments are expected to complete and return the forms to DQ, thus reporting on the outcome of the evaluation. The immigrant or

refugee is informed of the need to be further evaluated for their TB and to report to the local health department as soon as possible after arrival. Persons with Class A TB are required to report to the local health department, present all medical records and chest x-rays from overseas, and submit to the necessary testing, isolation, and treatment until discharged. They risk deportation should they fail to do so. For persons having Class B1 or B2 TB, the health department visit is considered voluntary.

Many health departments in the United States perform active follow-up of arrivals designated as having Class B1 or B2 TB, on the basis of the DQ notification. Studies conducted in the mid-1990s by the Division of TB Elimination, DQ, and health departments in various parts of the country have shown from 3% to 14% of Class B1 immigrants and refugees were diagnosed with TB disease within one year of their arrival; between 0.4% to 4.0% of those with Class B2 TB were diagnosed with TB disease within one year of arrival. Of the remaining persons, many are high-priority candidates for preventive therapy regardless of their age because they are tuberculin skin test positive with an abnormal chest x-ray suggestive of TB disease.

The current overseas TB evaluation procedures described above are based upon the following three principles: 1) the requirements apply specifically to immigrants and refugees, as they are most likely to become permanent US residents; 2) the procedures reduce the importation of active infectious TB that poses an immediate public health risk by denying admission to persons who have positive sputum smears; and 3) they allow those persons with evidence of TB disease but whose smears are negative to enter the United States, where a more complete medical evaluation can be performed and appropriate treatment can be provided under supervision. Forcing immigrants and refugees with noninfectious TB to undergo treatment overseas could prove to be counter-productive, as it may be difficult to ensure that the drug regimens are adequate, and that applicants are regularly ingesting the required medications. In such a scenario, incomplete treatment as well as development of drug resistance may be the result.

The overseas screening process for identifying and treating TB in immigrants and refugees is responsible for the identification of substantial numbers of persons arriving in the United States who have active TB. However, not all cases in newly arrived immigrants or refugees were identified overseas as having suspect TB, which is in part due to several limitations of the screening process. Although panel physicians do function under a contractual agreement with their respective US consulates, they receive no formal training or certification per se. In 1997, a training needs assessment was performed on a sample of panel physicians in a study undertaken by the Division of TB Elimination and DQ. The assessment indicated that, although 98% of panel physicians in the sample understood which immigrants and refugees should receive a chest x-ray, over 60% indicated a need for training.

Presently, efforts are underway to develop self-study training materials for panel physicians to enhance their ability to diagnose and treat TB, and to improve their ability to monitor the performance of contracted laboratory and radiologic services. A training plan will be developed, and self-study materials will be pilot-tested later this year in countries with large numbers of persons who immigrate to the United States and have a high TB prevalence.

The STOP TB Initiative, A Global Partnership

by Bess Miller, MD, MSc
Associate Director for Science, DTBE

Over the past few decades, when we have looked at the agendas of international health

agencies, major donors to the health sector, government health ministries, academia, and civil society, we have wondered, Where is TB? Why is TB on the back burner? The STOP TB Initiative is a global campaign to move TB to the FRONT BURNER.

Why now?

With the arrival last year of the new Director General of the World Health Organization (WHO), Dr. Gro Brundtland, there has been an interest in intensifying the relationship between WHO and its global partners. For a number of diseases, but especially for malaria and TB, WHO has initiated campaigns to join forces with other agencies and donors in the public and private sectors to achieve global health objectives.

Additional factors have added fuel to the sparks of this new campaign. Over the past several years the World Bank has given an unprecedented number of loans to developing countries to strengthen TB control efforts and has established TB as one of its top priority diseases. There has been renewed interest in TB research in the areas of vaccine development, new drug development, and new diagnostics. Large donors such as the Soros and Gates Foundations have shown an interest and commitment to TB control and TB research. The stars are aligned.

In November 1998, at the annual meeting of the International Union Against Tuberculosis and Lung Disease held in Bangkok, Thailand, Dr. Brundtland launched the STOP TB Initiative, a WHO-led global partnership whose mission is to put TB higher on the international public health agenda and to substantially increase the investment in TB worldwide. It aims to increase involvement of international players at all levels, including international health agencies, donor agencies, governments, nongovernmental organizations, professional societies, and community organizations involved in TB at the country level. The focus of the initiative is on the 22 so-called "high-burden" countries which WHO has identified as responsible for approximately 80% of all reported cases of TB in the world. These include India, China, Indonesia, Bangladesh, Pakistan, Nigeria, Philippines, South Africa, Ethiopia (Fed. Democratic Republic of), Viet Nam, Russian Federation, Congo (Democratic Republic), Brazil, Tanzania (United Republic of), Kenya, Thailand, Myanmar, Afghanistan, Uganda, Peru, Zimbabwe, and Cambodia. In addition, countries with extremely high rates of TB, especially those impacted by the HIV epidemic, will be targeted.

The STOP TB Initiative will focus attention on addressing the specific constraints to action on TB identified at the London Ad Hoc Committee Meeting on the Global TB Epidemic held in March 1998. The needs identified at this meeting include political will and commitment, human resource development, a secure supply of quality anti-TB drugs, research, financing, organization and management, information systems, and health sector reform.

The founding partners of the STOP TB Initiative are the WHO, the Royal Netherlands TB Association (KNCV), the International Union Against TB and Lung Disease, the World Bank, the American Lung Association, the American Thoracic Society, and the Centers for Disease Control and Prevention. New partners include UNICEF, UNAIDS, the National Institutes of Health, the Japan Anti-TB Association, the Norwegian Heart and Lung Association, the Canadian International Development Agency,

the Soros Foundation, and the Rockefeller Foundation. Many, many others are joining. The tremendous energy and inspiration these new partners bring to the Initiative cannot be overstated.

Current efforts of the STOP TB Initiative are directed at the following four areas: 1) the creation of a global drug supply facility to provide universal availability of quality TB drugs; 2) the development of a global partnership agreement to catalyze and secure public agreements among donor agencies and high-burden countries on specific steps to be taken to control TB; 3) the co-sponsorship of an initiative to develop new drugs for TB; and 4) the co-sponsorship with the Government of the Netherlands of a Ministerial Conference in March 2000. This conference brought together the ministers of health as well as of finance, development, and planning from the highest burden countries to set the stage for expanded country action against TB across sectors of government and society.

While many efforts are underway at the "global" level, TB control efforts take place at the local level, and it is at this level that we will concentrate future efforts. This past summer, the Initiative sponsored a series of regional workshops with the highest burden countries to identify constraints to TB control at the country level. Suggestions for the STOP TB Initiative made at these workshops included the following activities: 1) expand beyond traditional partners for TB control; 2) strengthen advocacy; 3) develop a social mobilization campaign; and 4) increase operations research in affected countries.

CDC is actively participating in the STOP TB Initiative and is represented on the Steering Committee (Bess Miller, Associate Director for Science and Carl Schieffelbein, Deputy Director for Special Projects, DTBE), as well as the Secretariat in Geneva (Mark Fussell, Public Health Advisor, DTBE).

Yes, TB is on the front burner at last, and we plan to keep it there!

Seize the Moment - Personal Reflections

by Carl Schieffelbein
Deputy Director for Special Projects, DTBE

We all have opportunities during our careers to stand at critical decision points. Sometimes it is clear that these are major events; at other times they appear routine, but subsequently it is seen that they had (or could have had) major impact. During the past 33 years I've had the opportunity to stand at many decision points and now can look back to see where more could have been done, if the opportunities had really been fully utilized. I will outline a few decision points in which I participated and try to share what went well and what I believe could have been done better. I will also outline some of the decisions we will all face in 2000.

Decision point: late 1960s. Closing of the TB sanatoria. Due to advances in treatment, long-term sanatorium care was no longer needed. CDC supported efforts to close TB sanatoriums and move toward an outpatient system. We succeeded in reducing the need for long-term sanatorium care and more rapidly got patients back to their families and communities. The costs of maintaining sanatoria were reduced. However, we did not do well in diverting the funds available as a result of the closings to the support of strong TB outpatient care systems. As cases went down, political will to support TB programs also diminished in the early 1970s. We found that many existing TB control systems were unable to effectively survive when federal categorical appropriations for TB were eliminated in 1972.

Decision point: 1989. *The Strategic Plan for the Elimination of Tuberculosis in the United States.* The plan articulated the goal of defined elimination of TB by 2010. It caught the attention of some advocates and spelled out in broad strokes (still relevant today) the three

critical steps needed. However, we later realized that we talked about the plan only within the "TB family" and with our peers. We were not successful enough in getting influential leaders and policy and opinion makers to commit their organizations to full shared ownership and thus, the necessary advocacy to fully implement *the Strategic Plan* at federal, state, and local levels.

Decision point: November 1991. The rise in TB cases, and the emergence of multidrug-resistant TB (MDR TB). A small group of us met with Dr. Roper (then CDC Director) to discuss a plan of action. It was decided a federal TB Task Force would be created to bring together all HHS/PHS agencies (and a few others) to develop a coordinated response to the MDR TB outbreaks. The Task Force was created and moved quickly, and in January 1992 brought together more than 400 experts to develop the *National Action Plan to Combat Multidrug-Resistant Tuberculosis* (published in April 1992). The *Action Plan* called for a total federal TB budget of $610,280,000, of which CDC's need was $484,000,000. Along with many of our partners, we were successful in getting federal appropriations increased. We were successful in getting enough resources to meet our immediate needs, but not enough to allow the success of our 1989-stated mission of elimination. We had reached out to some new partners in the Task Force and through the National Coalition to Eliminate TB, but again, after the crisis was over, we had not built enough effective community partnerships or new and long-lasting coalitions to help achieve the level of resources needed. Also, while we were in the process of obtaining increased federal funding, we saw many state or local areas reduce the amount of local resources going into TB control efforts. In 1990 the Public Health Foundation reported that 13% of TB funds at the state and local levels were federal dollars. In 1998, however, the National TB Controllers Association reported that 42% of budgets were now composed of federal dollars. We succeeded in making state and local programs too dependent upon federal dollars; this is a concern known all too well by those of us who remember the overnight elimination of categorical federal TB funds in 1972.

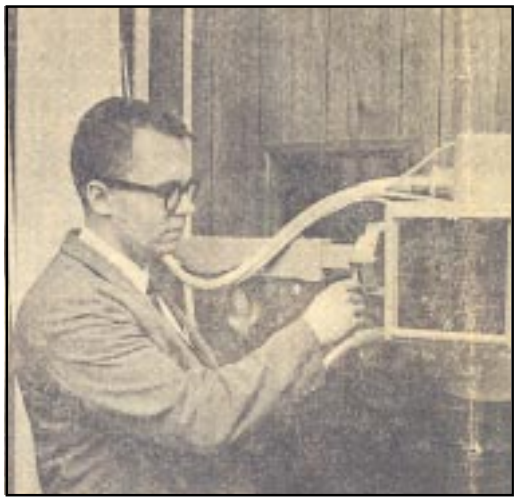
Decision point: March 1998. I had the opportunity to participate in an ad hoc committee of the Global Tuberculosis Programme of WHO, convened in London, to evaluate TB control in the 22 countries that represent 80% of the global TB burden. The committee concurred that most of these 22 countries would not meet their Year 2000 goals. The committee also outlined what was believed to be shared constraints to progress. These included 1) weak political will and commitment towards TB control efforts; 2) lack of adequate funding; 3) inability to hire and keep trained staff; 4) organizational and management issues, such as health sector reform, public and private sector interactions (or lack thereof), and integration and decentralization issues; 5) an inadequate supply of quality TB drugs; and 6) lack of adequate understanding of the magnitude of the problem and of the possibility of successful interventions. I believe all but item number 5 are also continuing threats to our national, state, and local TB programs.

You and I stand at some unique moments of decision in 2000. If each of us does not act effectively, we will have missed some opportunities to move the fight against TB into the final rounds. Some of the decision moments at hand:

- The National Academy of Science's Institute of Medicine (IOM) will issue a report on TB control in the United States. How will you and I use the results to evaluate and strengthen our programs? How will you use the IOM report and local data to secure adequate political will at your state or local level to secure necessary resources?

- The HIV/AIDS and TB epidemics continue to work together to create unnecessary devastation, both domestically and especially in some international communities. Yet we tend to still work mainly within our "TB family." How will we work better with our colleagues in HIV to develop effective collaborations to help those at risk of TB and HIV/AIDS?
- There is growing interest and concern about TB both at the federal level and in many state and local areas. How will you and I create new partnerships and opportunities to build on the existing interest to ensure a firm base for operations and programs?
- The Surgeon General has appointed a Blue Ribbon Committee to look into the development of a TB vaccine. How will you and your TB advisory committees work to support such an effort?
- There are areas of social mobilization and community empowerment that have not been adequately addressed by the TB community. How will we work with not only lung associations, but other partners as well, to mobilize against TB?
- WHO is hosting a "STOP TB" partnership to create a new global campaign against TB. How will you and I support these critically needed global activities and still ensure strong domestic programs?

I am aware there are many, many other decision points that we all will face. Many of these opportunities last for very brief moments of time. I urge each of us to seize those moments, and if necessary move outside our areas of comfort, in order to be able to truly eliminate TB in the United States and see TB control in the world early in this century.



Carl Schieffelbein, in his first TB control assignment (1967), adjusting x-ray equipment

Description of DTBE Training and Education Resources

Resources for Health Care Providers

Automated information systems

CDC Fax Information System. CDC developed a fax information system for health care professionals and others who would like to receive health information by fax. Telephone callers first access the main CDC menu and then select TB-related topics. Designed to answer many routine questions about TB, the system can provide up-to-date information by fax or mail. Callers can choose to receive general information about TB or specific information about treatment, diagnosis, BCG, infection control, or screening. The Fax Information System can be accessed by dialing toll free 888-CDC-FAXX (888-232-3299). To receive a listing of documents available by fax, request document number 250000. The fax sheet may also be viewed on DTBE's Web site at http://www.cdc.gov/nchstp/tb.

CDC Voice Information System. CDC developed a voice information system for health care professionals and others who call for specific disease information. Callers first access the main CDC menu and then select TB-related topics. Designed to answer many routine questions about TB, the system can provide up-to-date information by voice, fax, or mail. Callers who choose to listen to the voice recordings can receive general information about TB or specific information about treatment, diagnosis, BCG, infection control, or screening. Callers who would like written information can choose from a variety of topics and then receive information sheets by fax or specific educational materials by mail. The TB component of the Voice Information System can be accessed by dialing toll free 888-CDC-FACT (888-232-3228), then pressing options 2, 2, 1, 5, 2.

DTBE Home Page. DTBE has a Web site on the Internet. The site provides access to TB-related *Morbidity and Mortality Weekly Reports* (*MMWR*s), educational materials, and guidelines. The DTBE home page can be accessed at http://www.cdc.gov/nchstp/tb/

DTBE On-Line Ordering System. DTBE educational and training materials can now be ordered via the Internet. The on-line ordering system provides a convenient way to order DTBE materials. Highlights of the system include order confirmation via the Internet and, if an e-mail address is provided, order confirmation when the order has been filled. The on-line ordering system can be accessed on DTBE's Internet home page at http://www.cdc.gov/nchstp/tb.

Materials

***Controlling TB in Correctional Facilities* Booklet and Slides - 1995.** This booklet and accompanying slide set, developed in 1995, have been updated in regard to the Advisory Council for the Elimination of Tuberculosis (ACET) statement with recommendations for jails and prisons. It also provides a comprehensive basic reference on TB specifically for correctional facility staff. The booklets are available from each state TB office or the DTBE. Slide sets were distributed to all state and big city TB programs; however, additional slide sets are available for purchase ($75 per set) from the National Technical Information Service (800-553-6847 or 703-605-6000), item number AVA19830SS00. The slide set can also be viewed and downloaded from DTBE's Web site at http://www.cdc.gov/nchstp/tb.

***Core Curriculum on Tuberculosis* Booklet and Slides - 1994.** The *Core Curriculum on Tuberculosis* was originally developed in 1990 with the American Lung Association for use in preparing and planning educational activities or as a reference for the practicing clinician caring for patients with TB or TB infection. The *Core Curriculum* covers TB epidemi-

ology, diagnosis, treatment, prevention, and infection control. This document and accompanying slide set were revised to include current recommendations for the diagnosis, treatment, and control of TB in 1994. The newest revision will be available in 2000. The booklet is available from each state TB office or DTBE. Slide sets are available for purchase ($62 per set) through the National Technical Information Service (800-553-6847 or 703-605-6000), item number AVA19830SS00. The Core Curriculum may also be viewed on DTBE's Web site at http://www.cdc.gov/nchstp/tb.

Forging Partnerships to Eliminate TB - 1995. This print-based, self-study module was developed in 1995 for TB program managers to provide information on forming partnerships, resource acquisition, marketing, and media relations. The module includes information from the Mobilizing for TB Elimination workshops, along with a selected bibliography listing other available resources. This module is available from each state TB office or the DTBE.

Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health Care Facilities, 1994 **Slide Series.** A slide series based on the 1994 *MMWR* supplement *Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health Care Facilities* was developed in 1995 for use in training health care workers, infection control practitioners, and others on how to effectively implement the guidelines. A limited number of sets of the slide series were distributed to TB control programs. Additional copies are available for purchase ($80 per set) through the National Technical Information Service (800-553-6847 or 703-605-6000), item number AVA19824SS00. The slide set can also be viewed and downloaded from DTBE's Web site at http://www.cdc.gov/nchstp/tb.

How You Can Assess Engineering Controls for TB in Your Healthcare Facility **- 1999.** A video and viewer's guide developed by the Francis J. Curry National TB Center about basic techniques that can be used to evaluate engineering controls, including instructions for bringing an isolation room into compliance with CDC recommendations.

Improving Patient Adherence to Tuberculosis Treatment **Booklet - 1994.** DTBE developed a guide for TB health care providers to help improve patient adherence to medication and follow-up care. This 1994 booklet replaces the booklet *Improving Patient Compliance in Tuberculosis Treatment Programs*. It is available from each state TB office and the DTBE.

Mantoux Tuberculin Skin Testing Wall Chart (1990) and Videotape (1991). Developed in 1989, the videotape and wall chart are designed for use by health department TB staff in teaching tuberculin skin testing to other health care workers who are providing services to persons at risk for TB (e.g., STD clinic staff, drug abuse treatment staff, correctional facility staff, nursing home staff, etc.). Providers are encouraged to contact their state TB program to obtain these materials and to arrange for training. The wall chart was revised in September 1990 to reflect the latest recommendations of the Advisory Council for the Elimination of Tuberculosis. These materials are available from each state TB office or the DTBE.

Multidrug-Resistant Tuberculosis **- 1994.** 8-page article on causes, treatment, and control of drug-resistant TB.

Reported TB in the United States - 1998. The most recently reported statistics on TB cases and case rates.

Self-Study Modules on Tuberculosis **(Modules 1 - 9).** In 1995 DTBE developed a series of five self-study modules to train and educate new

outreach workers. Modules 1-5 cover transmission and pathogenesis of TB, epidemiology of TB, diagnosis of TB infection and disease, treatment of TB infection and disease, and infectiousness and infection control. DTBE subsequently developed a second series, modules 6-9, consisting of four modules that cover contact investigations for TB, confidentiality in TB control, TB surveillance and case management in hospitals and institutions, and patient adherence to TB treatment. Both series of modules are available from DTBE. The modules are also available through the Public Health Training Network for continuing education credit, free of charge; call toll free 800-418-7246 to register.

***Self-Study Modules on Tuberculosis* broadcasts on videotape. *Satellite Primer on Tuberculosis: Modules 1-5* (1995), and *TB Frontline - Satellite Primer Continued: Modules 6-9* (2000).** DTBE's first five Self-Study Modules on TB were used as the basis for a series of live broadcasts via satellite entitled *A Satellite Primer on Tuberculosis*, conducted in May and June 1995. The second set of modules served as the basis for a satellite training course entitled *TB Frontline-Satellite Primer Continued, Modules 6-9*, conducted in January and February 2000. Each broadcast provided information to supplement the training modules and allowed participants to telephone their specific questions to the presenters. Additional videotapes of *A Satellite Primer on Tuberculosis* are available for purchase through the Alabama Department of Public Health at 334-206-5618, or by FAX 334-206-5640. Videotape copies of *TB Frontline-Satellite Primer Continued, Modules 6-9* are available on a limited basis from DTBE at 404-639-8135.

***Self-Study Modules on Tuberculosis* on the Web - 1999.** The Web-based version of the Self-Study Modules on Tuberculosis provides a base level of TB knowledge accessible worldwide through the Internet. The Web-based course builds upon existing products: the print-based *Self-Study Modules on Tuberculosis* and the *Satellite Primer on Tuberculosis.* The Web-Based Self-Study Modules on Tuberculosis course has interactive features such as animation, study questions, case studies, and links to other TB-related sites. The course can be accessed at http://www.cdc.gov/phtn/tbmodules.

TB Facts for Health Care Workers - 1997. This 14-page booklet is based upon the TB Fact Sheet that was originally developed in 1984. It was updated in 1993 to include information on MDR TB and again in 1997 to include current screening and treatment recommendations. The booklet contains the key points to remember about the diagnosis, treatment, and prevention of TB. The intended audience is health care professionals. This booklet is available from each state TB office or DTBE. It can also be viewed on DTBE's Web site at http://www.cdc.gov/nchstp/tb.

TB Notes. This quarterly newsletter is distributed to state and big city TB control officers, directors of pulmonary and infectious disease training programs, state epidemiologists, public health laboratory directors, and many other people involved in (or just interested in) TB in the U.S. and worldwide. State and big city TB control officers are encouraged to duplicate copies for TB workers throughout their jurisdictions. *TB Notes* contains news about DTBE activities as well as highlights from state and local TB programs across the country. It also contains a calendar of events describing training courses, meetings, conferences, and other educational activities of potential interest to those working in TB. Current and previous editions of TB Notes are now available on the DTBE Internet home page at http://www.cdc.gov/nchstp/tb.

***Think TB* Poster.** This poster was reprinted by the DTBE in 1992 with permission from the Mississippi State Department of Health,

the original designer of the poster. Prepared for health care providers and other service organizations serving high-risk populations, the poster lists signs and symptoms of TB, and it reads, "Recognize possible signs and symptoms of TB. Early diagnosis and treatment reduce spread. Contact your health department or physician for more information." DTBE collaborated with the Mississippi Department of Health on the development of a Spanish version of the Think TB poster in 1993. Both the English and Spanish versions are available from each state TB office or DTBE.

Tuberculosis Training and Education Resource Guide. This resource guide was produced by the CDC National Prevention Information Network (NPIN) in collaboration with DTBE, and provides information available through NPIN databases and other resources on topics relating to TB. The resource guide includes educational materials, consensus guidelines, journal articles, Internet resources, and funding organizations. For more information on NPIN services call 800-458-5231 (800-243-7012 TTY) or visit the NPIN Web site at http://www.cdcnpin.org. (This information is made available as a public service. Neither CDC nor NPIN endorses the organizations and materials represented. It is the responsibility of the user to evaluate this information prior to use based on individual needs and community standards.)

Resources for Patients and the General Public

Automated information sytems

CDC Fax Information System. CDC developed a fax information system for persons who would like to receive health information by fax. Callers first access the main CDC menu and then select TB-related topics. Designed to answer many routine questions about TB, the system can provide up-to-date information by fax or mail. Callers can choose to receive general information about TB or specific information about treatment, diagnosis, BCG, infection control, or screening. The Fax Information System can be accessed by dialing toll-free 888-CDC-FAXX (888-232-3299). To receive a listing of documents available by fax, request document number 250000.

CDC Voice Information System. CDC developed a voice information system for persons who call for specific disease information. Callers first access the main CDC menu and then select TB-related topics. Designed to answer many routine questions about TB, the system can provide up-to-date information by voice, fax, or mail. Callers who choose to listen to the voice recordings can receive general information about TB or specific information about treatment, diagnosis, BCG, infection control, or screening. Callers who would like written information can choose from a variety of topics and then receive information sheets by fax or specific educational materials by mail. The TB component of the Voice Information System can be accessed by dialing toll-free 888-CDC-FACT (888-232-3228), then pressing options 2, 2, 1, 5, 2.

Materials

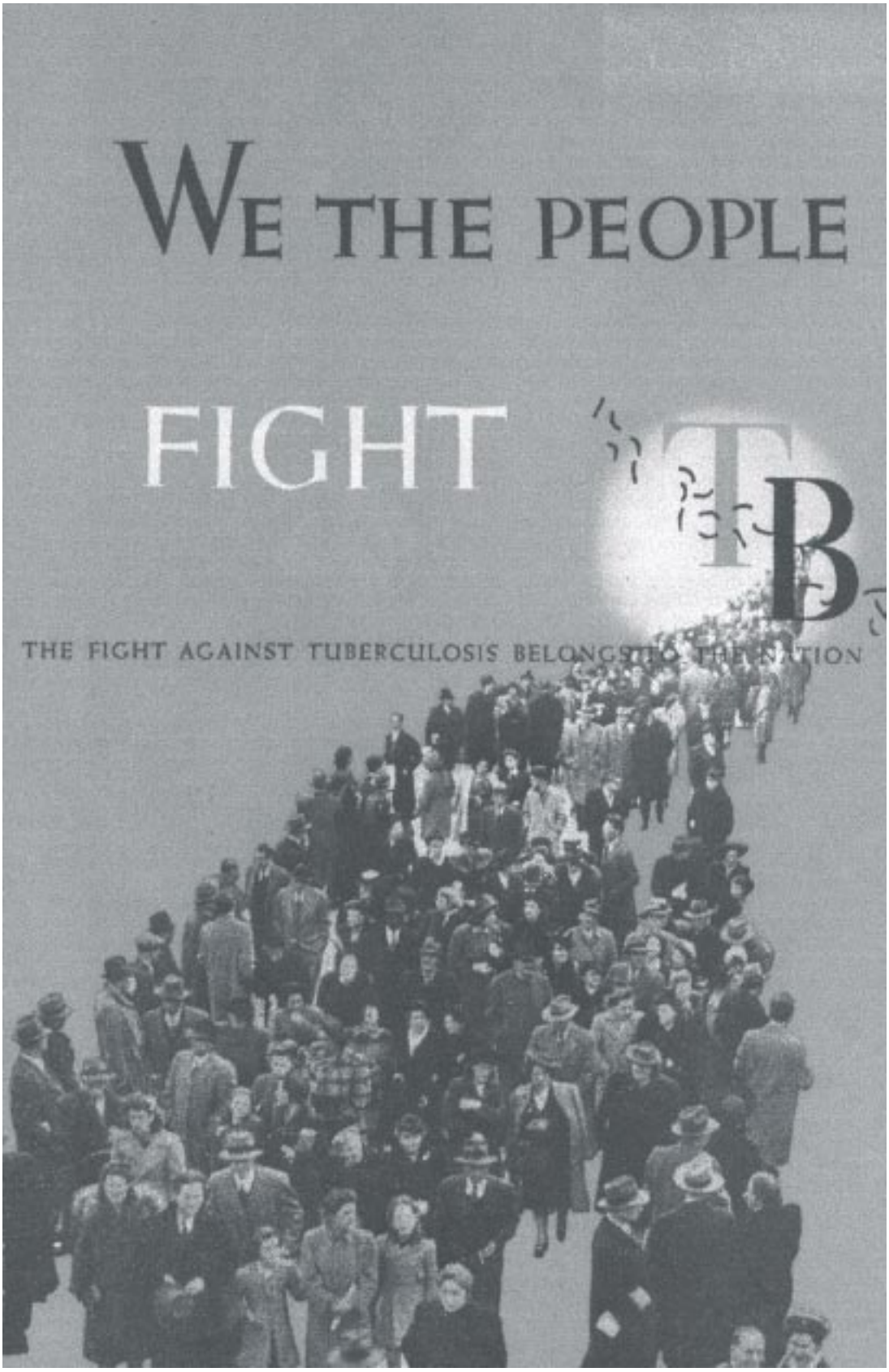
Questions and Answers about TB **Booklet - 1994.** A patient education booklet for persons with TB disease or infection, it provides information on TB transmission, pathogenesis, diagnosis, treatment (including medications and side effects), infection control, and follow-up care. This booklet is also appropriate for use in educating those who provide services to persons with or at risk for TB (for example, staff of drug treatment centers, correctional facilities, homeless shelters). This booklet is available from each state TB program and the DTBE. This publication can also be viewed on DTBE's Web site at http://www.cdc.gov/nchstp/tb.

***Stop TB!* Poster and Tear-Off Sheets - 1994.** This pictorial poster was developed to educate persons with or at risk for TB. The poster displays the transmission of TB, progression from infection to disease, treatment, and prevention. A smaller version of the poster was developed for patients to take with them; this is available as tear-off-pads of 40 8 ½" x 11" sheets per pad. The poster and tear-off-pads are available from each state TB program and DTBE.

TB Fact Sheets - 1997. This series of five fact sheets was developed for persons with or at risk for TB. The fact sheets include "TB Facts — You Can Prevent TB" (item number 00-5981); "TB Facts — TB and HIV (the AIDS Virus" (item number 00-5982); "TB Facts — Exposure to TB" (item number 00-5983); "TB Facts — The TB Skin Test" (item number 00-5984); and "TB Facts — TB Can be Cured" (item number 00-5985). Each pad of 40 tear-off sheets is available from each state TB program and the DTBE. The fact sheets are also available in Spanish.

TB: Get the Facts! - 1991. This pamphlet is for persons with or at risk for TB. The pamphlet provides general information about TB, including signs and symptoms, risk factors, infection versus disease, skin testing, and preventive therapy. It is available in English and Spanish from each state TB office or DTBE.

***Tuberculosis: The Connection between TB and HIV* (the AIDS virus) - 1990.** This pamphlet is intended for use with persons at risk for HIV-related TB. The pamphlet covers the TB/HIV connection and screening and prevention for HIV-related TB. The TB/HIV pamphlet is available in English and Spanish from each state TB office or the DTBE.


WE THE PEOPLE
FIGHT
TB
THE FIGHT AGAINST TUBERCULOSIS BELONGS TO THE NATION

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

Division of Tuberculosis Elimination Educational and Training Materials

Please indicate desired quantity in the blank provided. All materials are free of charge

Note: All materials listed are in the public domain. You may reproduce these materials without permission. You are also free to adapt and revise these materials; however, you must remove the CDC name and logo if changes are made.

For Health Care Providers

Multidrug Resistant Tuberculosis - 1994
____ **(00-6529)** *8-page article on causes, treatment, & control of drug-resistant tuberculosis*

Core Curriculum on Tuberculosis, 4th Edition - 2000
____ **(00-5763)** *Training guide on clinical & public health aspects of TB control*

TB Facts for Health Care Workers - 1997
____ **(99-5497)** *14-page booklet for clinicians on diagnosis, treatment, & prevention of TB*

Think TB! - *Poster listing the symptoms of tuberculosis*
____ **(00-6186)** *English language - 1992* ____ **(00-6406)** *Spanish language - 1993*

Improving Patient Adherence to Tuberculosis Treatment - 1994
____ **(00-5988)** *55-page booklet on measuring, predicting, & improving compliance*

Forging Partnerships to Eliminate Tuberculosis - 1995
____ **(00-6552)** 67-page resource guide to strengthen TB elimination strategies through partnerships

Mantoux Tuberculin Skin Testing - *Visual aids for training to administer & interpret the Mantoux test*
____ **(00-5564)** *Wall chart - 1990* ____ **(00-5457)** *Videotape - 1991* (limit 1 copy per order)

Reported TB in the United States - 1998
____ **(99-6163)** *Statistics on tuberculosis cases & case rates reported for 1998*

Controlling TB in Correctional Facilities - 1995
____ **(00-6553)** *A comprehensive guide that provides a resource to assist correctional officials in controlling TB among inmates & staff of correctional facilities.*

Self-Study Modules on Tuberculosis (Modules 1 - 5) - 1995
____ **(00-6514)** *A series of five modules covering epidemiology, transmission and pathogenesis, diagnosis, treatment of TB infection and TB disease, and infection control*

Self-Study Modules on Tuberculosis (Modules 6 - 9) - 2000
____ **(99-6206)** *A continuation of the Self Study Modules on TB series, these four new modules cover contact investigations, confidentiality, TB surveillance and case management in hospitals and institutions, and patient adherence*

Web-Based Self-Study Modules on Tuberculosis - 1999
Based on the print version Self-Study Modules, this interactive course can be found at www.cdc.gov/phtn/tbmodules

How You Can Assess Engineering Controls for TB in Your Healthcare Facility - 1999
____ **(99-6158)** *A video and viewer's guide developed by the Francis J. Curry National TB Center about basic techniques used to evaluate engineering controls, including instructions for bringing an isolation room into compliance with CDC recommendations*

Tuberculosis Training and Education Resource Guide - 2000
____ **(99-6352)** *A catalog of TB educational materials, consensus guidelines, journal articles, Internet resources and funding organizations, produced by CDC National Prevention Information Network (NPIN) in collaboration with DTBE.*

TB Notes 2000, Vol. 1
____ **(99-6420)** *Special issue of the TB Notes newsletter noting accomplishments in TB control in the past and what the future challenges will be.*

For Patients and the General Public

Questions and Answers about TB - 1994
____ **(00-6469)** *16-page booklet on TB transmission, skin test, & treatment, including DOT & medication side effects*

Stop TB! - 1994 - *Poster uses pictures & text to describe the transmission & pathogenesis of TB*
____ **(00-6474)** *Poster* ____ **(00-6475)** *Pad of 50 tear-off sheets duplicating the poster*

Tuberculosis - Get the Facts! - 1990
One-page pamphlet on basic facts about TB transmission, infection, & the tuberculin test
____ **(00-5743)** *English language* ____ **(00-5772)** *Spanish language*

Tuberculosis - The Connection Between TB and HIV (the AIDS Virus) - 1990
One-page pamphlet on the risk of HIV-related TB, tuberculin testing, & preventive therapy
____ **(00-5738)** *English language* ____ **(00-5745)** *Spanish language*

Tuberculosis Fact Sheets (tear-off pads, 40 tear-off sheets per pad) - 1997
____ **(00-5981)** TB Facts — You Can Prevent TB ____ **(00-5984)** TB Facts — The TB Skin Test
____ **(00-5982)** TB Facts — TB and HIV (The AIDS Virus) ____ **(00-5985)** TB Facts — TB Can be Cured
____ **(00-5983)** TB Facts — Exposure to TB

To order materials on-line, please visit our Web site at http://www.cdc.gov/nchstp/tb

GUIDELINES

You may also access and download the following guidelines from our Web site at http://www.cdc.gov/nchstp/tb.

TB Prevention and Control

____ (00-5856) **Guidelines for Preventing the Transmission of *Mycobacterium tuberculosis* in Health Care Facilities**. *MMWR*, 1994.
____ (00-6410) **Tuberculosis Control Laws -- United States 1993**. *MMWR*, 12/12/1993.
____ (00-6330) **Control of Tuberculosis in the United States**. Reprint from the *American Review of Respiratory Disease*, 12/92.
____ (00-6224) **National Action Plan to Combat Multidrug-Resistant Tuberculosis**. *MMWR*, 6/19/92.
____ (00-6223) **Prevention and Control of Tuberculosis in Migrant Farm Workers**. *MMWR*, 6/5/92.
____ (00-6148) **Prevention and Control of Tuberculosis Among Homeless Persons** and **Prevention and Control of Tuberculosis in U.S. Communities with At-Risk Minority Populations**. *MMWR*, 4/17/92.
____ (99-5791) **Recommendations for Prevention and Control of Tuberculosis Among Foreign-Born Persons**. *MMWR*, 9/8/98.
____ (00-3327) **Prevention and Control of Tuberculosis in Facilities Providing Long-Term Care for the Elderly**. *MMWR*, 7/13/90.
____ (00-5456) **A Strategic Plan for the Elimination of Tuberculosis**. *MMWR*, 4/21/89.
____ (00-6574) **Prevention and Control of Tuberculosis in Correctional Facilities.** *MMWR,* 6/7/96.
____ (99-5775) **Development of New Vaccines for Tuberculosis.** *MMWR,* 8/21/98.
____ (99-5879) **Prevention and Treatment of Tuberculosis Among Patients Infected with Human Immunodeficiency Virus: Principles of Therapy and Revised Recommendations. MMWR, 10/30/98.**
____ (99-6144) **Tuberculosis Elimination Revisited: Obstacles, Opportunities, and a Renewed Commitment.** MMWR, 8/13/99.
____ (99-6422) **Targeted Tuberculin Testing and Treatment of Latent TB Infection.** MMWR. ***(available June 2000)***
____ (99-6423) **Diagnostic Standards and Classification of Tuberculosis in Adults and Children**. Reprint from the *American Journal of Respiratory and Critical Care Medicine*, 4/00. **(available June 2000)**

TB Screening and Treatment

____ (00-6453) **Treatment of Tuberculosis and Tuberculosis Infection in Adults and Children**. Reprint from the *American Journal of Respiratory and Critical Care Medicine*, 5/94.
____ (00-6225) **Management of Persons Exposed to Multidrug-Resistant Tuberculosis**. *MMWR*, 6/19/92.
____ (00-6575) **Essential Components of a Tuberculosis Prevention and Control Program.** *MMWR, 9/8/95.*
____ (00-6617) **Screening for Tuberculosis and Tuberculosis Infection in High-Risk Populations**. *MMWR*, 9/8/95.
____ (00-6573) **The Role of BCG Vaccine in the Prevention and Control of Tuberculosis in the U.S.** *MMWR,* 4/26/96.
____ (99-5412) **Anergy Skin Testing & Preventive Therapy for HIV-Infected Persons: Revised Recommendations**. *MMWR,* 9/5/97.

4/00

To order tuberculosis educational and training materials or guidelines, you may (1) from a touch tone phone, call the Centers for Disease Control and Prevention Voice and FAX Information System (recording) toll free at (888) 232-3228, then press options 2, 5, 1, 2 (Note: You may select these options at any time without listening to the complete message); (2) FAX this form to the Office of Communications, NCHSTP at (404) 639-8628; (3) mail this form to: Office of Communications, NCHSTP, CDC, 1600 Clifton Road NE, Mailstop E-06, Atlanta, Georgia 30333 OR (4) access the on-line order form at http://www.cdc.gov/nchstp/tb.

PLEASE NOTE: Large shipments are sent by UPS and require a street address. Large packages cannot be shipped to PO Boxes. International orders are limited to 1 copy of each publication.

Date requested: _____

Name: _____ Phone: ( ) _____

Address: _____

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Slide sets available through National Technical Information Service (NTIS)

Some DTBE slide sets are available through NTIS in Springfield, Virginia. To order, call NTIS toll free at 800-553-6847 or 703-605-6000 and request the product number desired. Slide sets currently available include:

- ❑ *Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health Care Facilities, 1994* AVA19824SS00. $80 per set plus shipping and handling.
- ❑ *Core Curriculum on Tuberculosis, 4th Edition, 2000.* **(Available June 2000)**
- ❑ *Controlling TB in Correctional Facilities, 1995.* AVA20023SS00 $75 per set plus shipping and handling.