FROM KOCH TO TODAY

Scientists, physicians and citizen volunteers banned together to battle tuberculosis, but total victory is still elusive

INSIDIOUS. The adjective so well describes tuberculosis the word could be a synonym for the disease. There is evidence that this scourge has been a faithful but deadly companion of humans — whether kings or commoners — since the beginning of history. The disease, however, has a special affinity for those who dwell in poverty and contend with miserable living conditions. From the mid-18th century on, French, British and German authorities blamed TB for one-sixth to one-fourth of the deaths suffered by the populations of larger towns.

Because the disease seemed to be an ever-present fact of life and did not suddenly sweep through countries in epidemics like smallpox and plague, tuberculosis did not automatically engender a public outcry to do something about it — quickly. A sort of fatalism accepted TB’s slow, steady, consuming course. How well accepted can be judged by the fact that there were even those who romanticized it in the 19th century: They declared consumption to be a mark of spirituality or the wages paid by those seemingly touched with a burning creativity.

The enemy: a living organism

It was in this ambivalent context that on March 24, 1882, Robert Koch announced he had isolated the tubercle bacillus, thus proving the disease to be a palpable enemy. TB wasn’t a hereditary flaw — a theory widely subscribed to by physicians in both Britain and America — nor was it an affliction suffered by those of tender sensibilities. Koch proved that tuberculosis was caused by a living organism. This microbe could be passed from person to person.

The late Dr. René Dubos on page 5 of this Bulletin points out that even before Koch’s discovery, people in some countries believed the disease was catching, citing how the people on the Spanish island of Majorca treated Frederic Chopin like a pariah once it became known he was a consumptive. Though Koch’s breakthrough should have settled the argument between those who blamed heredity and those who held the contagion theory, it took almost two decades for prevailing medical opinion in the United States to accept his results.

TB associations prove that something can be done

With no cure or preventive vaccine forthcoming, American physicians and laymen joined together and formed voluntary local organizations to battle the disease. They tried through education to counteract fear of tuberculosis and, at the same time, warned against infection. Education became the byword for these groups, which formed a national organization, the National Association for the Study and Prevention of Tuberculosis, founded in 1904. In 1918, the name was changed to the National Tuberculosis Association, which was renamed the American Lung Association in 1973.

The TB associations set about to prove that something could be done. They educated the public to the necessity of isolating people with TB from the community. They educated local legislators to enact the sort of enlightened laws required if tuberculosis was to be fought as a public health problem with public funds. They promoted the establishment of local and state health agencies to deal with tuberculosis and guided and counseled those agencies until they came of age.

One of the methods of decreasing contagion was to send patients diagnosed as having TB to sanatoriums. In 1884 Dr. Edward L. Trudeau, who was one of the founders of the American Lung Association, had established a sanatorium in Saranac Lake, N.Y. It seemed that an emphasis on good nourishment, fresh air and bed rest could produce cures in some patients as their bodies’ natural defenses grew strong enough to overcome the TB bacteria. Thus, sanatoriums could interrupt the cycle of infection and hold out some hope for those with the disease.

The building of private sanatoriums and public TB hospitals not only became a primary objective of the voluntary TB associations, it created a lifestyle for the patients who might live in these institutions for several years be-
fore the stubborn disease either killed the victim or finally was controlled. On page 7 Julius L. Wilson, M.D., relates his own experiences as a TB patient at Saranac Lake in the 1920s and traces the sanatorium movement’s growth until modern drugs made them unnecessary.

**Tools to identify and fight the disease are developed**

But before patients could go to sanatoriums or TB hospitals, the disease had to be diagnosed. Because the disease can take decades before displaying obvious symptoms or reaching a contagious state, case finding is difficult. A skin test was developed, but, as Robert J. Anderson, M.D., states in his article on page 11, “For human beings in the 1920s, the tuberculin test was not a practical method for decisive control action. Almost all adults at the time were tuberculin positive.” Anderson then tells of the drive to develop rapid X-ray techniques to be used in mass testing.

Once again the national and local TB associations took the lead in educating the public by running campaigns urging people to get a chest X-ray. By the late 1940s and early 1950s, drugs were beginning to be produced that were effective against the dreaded bacillus, and the coming of TB chemotherapy drastically—yet somewhat gradually—changed the direction of tuberculosis treatment. On page 14 James W. Raleigh, M.D., gives a history of the major TB drug discoveries. These drugs were so effective that some tuberculosis experts believed that TB control could be pushed to a high level.

A conference sponsored by the National Tuberculosis Association and the U.S. Public Health Service at Arden House, N.Y., in 1959 proclaimed that eradication of TB was practical, emphasizing that the tools for eradicating the disease were there for the using. It was to be an unfulfilled vision, and on page 18 Winthrop N. Davey, M.D., gives what he believes to be the reasons why this country has not yet eradicated TB, why there are still pockets of infection in the U.S.A.

**Removing the stumbling blocks to eradication**

TB is an insidious disease that can be asymptomatic for years, so case finding requires time and personnel. In addition, supervision of drug taking takes staff and public health funds. Then, there remains the problem of transmission of tuberculosis among people in overcrowded living conditions that often characterize the lifestyle of the poverty-stricken. William C. Bailey, M.D., on page 21 gives his proposals for removing the remaining stumbling blocks to TB eradication.

This year, probably 25,000 TB cases will be reported in America. Yet even if every case now in America were diagnosed and cured and every infected contact treated with preventive chemotherapy, the tubercle bacillus could still find its way to this land. Much of the rest of the world still lives in poverty, and TB is still one of the major killers. In a world where nations are becoming more and more interconnected, no country is an island. Some of the new immigrants who come to our shores to flee social and economic problems bring along the TB bacillus as well as their hopes for a better life.

Thus it is fitting that the anniversary of Koch’s discovery should spur new efforts to eliminate tuberculosis. The knowledge and tools exist. All that remains is the doing.
THE ROMANCE OF DEATH

In the 19th century, tuberculosis was so prevalent that poets, artists and musicians camouflaged the disease with beauty.

René Dubos, M.D., Ph.D.

Tuberculosis has afflicted humankind from the dawn of civilization. There is evidence that a large sanatorium for treating its victims existed in Egypt about 1000 B.C., and the writings of ancient Greek and Roman physicians leave no doubt that the disease was common in the urban centers of the pre-Christian era. Furthermore, tuberculosis reached epidemic levels in Europe and North America throughout the 19th century, especially during the early stages of the Industrial Revolution.

It is my contention that this prevalence of tuberculosis was profoundly affected by the social conditions in which it thrives and, in turn, exerted a fascinating influence on the culture of the 19th century. A few numbers will suffice to convey the extent of tuberculous infection during the 19th century. In the years 1838 and 1839 it was estimated that 30 percent of deaths among English laborers were caused by tuberculosis. As late as 1899, a quarter of the 46,988 deaths registered in Paris were also attributed to this disease.

Throughout Europe, a very large percentage of cattle were infected with bovine tubercle bacilli, as illustrated by the following incident: When the tuberculin test became available around 1890, Queen Victoria ordered that the dairy cows on the Home Farm at Windsor be tested. Thirty-five of the 40 cows were found to be tuberculin-positive, and tuberculous lesions were found in all of them. Yet the farm on which these cows were kept was probably the best and cleanest in the kingdom.

Consumption becomes a mark of beauty to 19th-century romantics

Although tuberculosis was most prevalent and severe among people in the laboring classes, it struck without regard to social position or economic status. John Keats, Frederic Chopin, Henry David Thoreau, the Bronte sisters, and Elizabeth Barrett Browning are but a few of the host of famous men and women who suffered from the disease in the 19th century. At the crest of the Romantic Movement, to be consumptive was almost a mark of distinction, and the pallor caused by the disease was part of the standard of beauty. The Romantic English poet, George Gordon Byron, longed to achieve this physical appearance. "I look pale," he is reported to have said while looking in the mirror. "I should like to die of consumption...because ladies would say... how interesting he looks in dying."

This taste for the sickly was reflected in the wax, ethereal heroines found in the pre-Raphaelite paintings of Rossetti, Morris and others and especially in the theater and opera. Mimi in La Bohème and Marguerite in La Dame aux Camelias represented ideals drawn from actual women whose histories were well known and who died of tuberculosis in their early twenties. Languid pallor was then such a desirable feminine attribute that the use of rouge was abandoned and replaced by whitening powders. During the 19th and early 20th centuries, tuberculosis was truly the White Plague.

But even though the disease was given a gloss of romanticism during the 19th century, it was still the feared White Plague. In my book, The White Plague: Tuberculosis, Man, and Society, there is an account by French authoress George Sand of the ordeal she had in finding living quarters for her consumptive lover, Frederic Chopin, while they were in Majorca, where he had gone in search of a mild climate. It was a period when only certain countries regarded the disease as catching; other places, by contrast, believed consumption, or phthisis as it was also called, to be the product of a constitutional defect, often inherited from one's parents along with facial features. It is obvious from the following George Sand narrative, Majorca was one of the places that subscribed to the contagion theory:

In 1858, Queen Guinevere was rendered as a consumptive-like beauty by Pre-Raphaelite artist William Morris.

March 1982
transfer pigs to Barcelona. There was no other way to move out of this wretched country."

**TB mortality decreases as wealth increases**

In *Nicholas Nickleby*, Dickens refers to tuberculosis as "a disease which medicine never cured, wealth never warded off, or poverty could boast exemption from." But tuberculosis mortality began to decrease as soon as the wealth accumulated during the later phases of the Industrial Revolution improved living conditions in Western countries. Whereas the mortality rate had hovered around 500 per 100,000 population in 1850, it fell to approximately 50 in 1945, just before the introduction of chemotherapy. Streptomycin, PAS, and especially isoniazid accelerated the rate of decrease in mortality.

By 1954 the Trudeau Sanatorium, which was the first institution created for the treatment of tuberculosis in the United States, had closed its doors, an event symbolizing the extraordinary decrease of tuberculosis in the U.S.

Today most tuberculosis authorities are certain that the disease can be controlled by public health and therapeutic measures, but I still believe that, as was stated in *The White Plague*, real control is possible only under the proper social conditions. This statement is illustrated in our times by the fact that tuberculosis is still very common in poor countries among people who are malnourished and ill-housed, even where isoniazid and other drugs are readily available to patients.

During the past two decades, several localized outbreaks of tuberculosis in the United States have been traced to immigrants from poor countries where the disease is still prevalent. Furthermore, many strains of tubercle bacilli recovered from these outbreaks have been found to be resistant to isoniazid and other antituberculosis drugs—the consequence of unwise medical management and the fact that in some countries the drugs can be purchased over the counter. If such resistant strains were to become widespread, the world eventually might find itself in a situation similar to that which has developed with regard to gonorrhea—a disease that used to be readily cured by penicillin but is now commonly resistant to most forms of chemotherapy.

Neither vaccination nor drug treatment can control tuberculosis where bad social organization and practices result in gross defects in the collective and individual ways of life. There is no evidence that the virulence of the tubercle bacillus has changed since Robert Koch’s discovery, and we now realize—even more clearly than in the past—that tuberculosis is a social disease.

---

*Dr. René Dubos died on February 20, shortly after completing the above article for the ALA Bulletin. The French-born scientist had given up his laboratory work in bacteria and other human pathogens to devote full time to lecturing and writing. He was the author of 20 books, including *The White Plague*: Tuberculosis, Man and Society, and the Pulitzer-winning *So Human an Animal*.*

*American Lung Association Bulletin*
"THE DAILY SANATORIUM ROUTINE WAS THE TREATMENT"

Julius L. Wilson, M.D.

A scene from a 1912 ALA movie. The heroine is "taking the cure" at a sanatorium.

It was June 1925, and I was on a two-week vacation at Long Lake in the Adirondacks. This was six months before my medical internship at New York City's Presbyterian Hospital would be completed and my appointment as assistant resident in pediatrics at New Haven would begin. I was feeling very fit; I swam, fished and played tennis—but I did notice that I was losing weight and had a slight cough.

On returning to Presbyterian I asked the resident, Frank Hanger, to examine my chest. When I coughed up a small gob of sputum, Frank said, "Hold that!" He took a letter out of his pocket, emptied the envelope and had me spit into it. Then he stained and examined that specimen under a microscope while I went down to the X-ray department for a chest film.

When I returned to the little laboratory off my ward, Frank told me to look at the slide under the microscope. I found myself looking at our longtime enemy, those bright-red bacilli. Frank simply said, "You have tuberculosis. I have a room for you off Ward 4-A."

Still benumbed by the diagnosis, I said, "But I must take care of my patients first." Without answering me, Frank took me to my room, got me undressed and took away all my clothes.

For the next three weeks I lay there not afraid to die but shattered and mourning my sudden removal from medicine. Sleep was impossible most of the night. My only physical activity was to crochet the curtain cords and...
then unravel them over and over. As I adjusted to "complete bed rest," I even learned to use the bedpan.

"We will send you up to Saranac as soon as a bed is ready for you."

My wife, family, nurses, doctors and friends were wonderful. A Red Cross lady came by to tell me that, as a veteran, I was entitled to care at the V.A. hospital in Oteen, N.C. Dr. James Alexander Miller, the chief examiner for Trudeau Sanatorium, came to examine my chest. For almost an hour, he sat by my bed and rekindled my belief in my chances for recovery. "We will send you up to Saranac [the location of the Trudeau Sanatorium in upstate New York] as soon as a bed is ready for you." Luckily, the father of a fellow intern at whose home I had been a dinner guest had the overwhelming generosity to send a $1,000 check as a loan, and that enabled me to go to Trudeau Sanatorium.

When a bed was available there, I was shipped off on the sleeper train to Saranac Lake. I resented going through Grand Central Station on a stretcher and being gazed at with pity by curious passers-by.

It seemed very cold on the late-July morning I arrived at the Saranac railroad station, but my room in the new Ludington infirmary turned out to be pleasant and warm, and there was a porch to be shared with the man in the next room.

Friendly nurses and doctors dropped by and welcomed me to the fraternity of "lungers"—they, too, once had been TB patients. My "cure" had begun, and, although I did not know it then, my medical career from that day forward would be redirected from pediatrician to TB specialist, or "chest man."

The daily sanatorium routine was the treatment

The sanatorium was an educational center. It was believed that within a few months limited stay "favorable cases" could be taught to live with their tuberculosis once it had been arrested so the public and family contacts were protected from infection. The return to useful life was furthered by instruction in self-discipline to protect others from TB infection. There was a school for training nurses—almost all former patients themselves—and the Trudeau School for the graduate education of doctors who came from all over the country.

For 50 years, the daily sanatorium routine was the treatment. If running a fever, patients were kept in bed. When free of fever and examination and chest films showed good progress, patients were moved to a cottage and allowed to eat in the central dining room. All—whether confined to bed or ambulant—slept out on the porches,
no matter what the season, and spent two hours in the morning and two after lunch in bed or on a reclining chair. Walking hours were prescribed at each monthly physical examination, beginning with 15 minutes twice daily and working up to unlimited walking before discharge. The simple and hearty diet included as much milk as wanted. The usual daily regimen consisted of rising at 7:00 a.m., morning rest hours, lunch, afternoon rest hours, walks, supper, bed at 9:00. The routine made the months fly past, and the companionship made it pleasant.

At the time I entered Saranac, the older sanatorium doctors did not believe in more aggressive forms of treatment, although these methods, including collapsing the diseased lung, were being tried. Pulmonary tuberculosis involves organs that are always moving, never still, no matter how rigidly the bed-rest treatment might be enforced. Normal distension prevents lung cavities from closing so they can heal. It was logical to inject air around a diseased lung to immobilize and thus rest it for some months. This procedure also shut in infected sputum, keeping the disease from spreading to the other lung or to other people. This treatment, called artificial pneumothorax, finally became the prevailing method in the 1930s and '40s, supplemented by a number of other medical-surgical methods of collapsing lungs. These enabled the patient to get up sooner, go home, and return more quickly to his normal life. Supervision was maintained during several years of visits to a doctor’s office or a clinic.

Like any other effective treatment, these more active methods had their complications. These were usually minor, however, and were far outweighed by the advantages to the patient so treated. For the two decades before the general use of specific drugs against tuberculosis, artificial pneumothorax changed sanatorium practice into a more active and a more optimistic course.

My sojourn at the sanatorium, however, took place during the years when passive treatment held sway. Still, by the end of five months I was well enough to be moved from the infirmary to a cottage, but it seemed likely my funds would run out before the nine-month limit of sanatorium treatment at Trudeau ended, and I would have to continue treatment at a cheaper nursing home in the Saranac area. But before I had to make a move, I was summoned to the office of Dr. Baldwin, Dr. Trudeau’s successor, who asked me, “Would you like a job? I have two state sanatorium jobs for you to choose from.” My rehabilitation was instantaneous: I’d suddenly progressed from invalidism to once again playing a role in the care of others—from simply being another member of the fraternity of tuberculosis patients to joining those dedicated specialists who manned our American sanatoriums.

---

*A pneumothorax operation (left) was featured in a 1936 ALA educational film. At right, a mid-'40s TB ward.*
Emphasis on rest led to a lot of reading at sanatoriums.

**Trudeau’s sanatorium was the model for the many others that followed**

Until the 1930s, when measures were instituted for the protection of medical students and nurses in training, tuberculosis was regarded as an unfortunate but unavoidable occupational hazard for these student professionals. From five to ten percent of both groups developed forms of tuberculosis while in school or in the years immediately following graduation. Luckily, the death rate was low among these students because diagnosis was made early and students received comparatively good treatment, but sanatorium medical staffs could count on a steady flow of new members.

In fact, it was Edward Livingston Trudeau, himself a consumptive and physician, who in 1884 first set up a lasting semi-philanthropic sanatorium in America—the model and training ground for many others that followed over the next 70 years. Having read Robert Koch’s great paper soon after its publication, Trudeau became not only a convert to the bacterial cause of his disease but also a pioneer researcher. Beginning with his tiny laboratory in his home, sanatoriums became the principal tuberculosis research centers for many years.

In 1904, when the first sanatorium directory was published by the new National Association for the Study and Prevention of Tuberculosis, the number of private, city, county, state and federal tuberculosis sanatoriums was 96 with 9,107 beds. That was a time when a belief in the curative effect of altitude and climate was shifting to dependence upon rest and graduated exercise.

“**One bed for every annual death!**”

After 1904, tuberculosis associations grew from a handful to a network of associations in every state. These associations were not organized for the purpose of treating the large number of victims of tuberculosis—that was far beyond their limited resources—but to educate the public about TB prevention, to promote TB control laws and make treatment available to all patients, and to promote research in the causes and treatment. The first national voluntary health association, for many years called the National Tuberculosis Association (NTA), stressed health education and accelerated the provision of more beds for tuberculosis, adopting the slogan, “**One bed for every annual death!**” In each state, health officers—backed by the medical profession, the state tuberculosis associations and growing public opinion—were able to get the legislation needed for funding construction, staffing and maintenance of large, public TB hospitals.

From that time on, tuberculosis treatment continued to move out of the private and into the public sector, which was a profound departure in the handling of a widespread disease. At first, improved methods of diagnosis and increased medical and public knowledge of the disease resulted in longer waiting lists for admission to the new TB hospitals. Then, in 1932, still on an upward curve, the ever-expanding number of such beds crossed the downward curve of annual deaths. The NTA slogan was changed to “**Two beds per annual death!**” The number of TB hospitals grew until it reached a peak of 732 in 1938.

By 1954—eleven years after the discovery of a specific antituberculosis drug—many small sanatoriums had closed due to financial problems and obsolescence. While the total number of beds for tuberculosis in this country had peaked at 108,547, the number of sanatoriums and TB hospitals had decreased to 630.

**Trudeau Sanatorium**, which had started with one building—“**The Little Red Cottage**”—and grew to many buildings, was forced to close at the end of 1954. This historic institution no longer could economically fill its beds: The cost per diem of modern staffing and treatment had risen, and patients stayed nearer home for chemotherapy. Modern treatment had shifted to medical centers in the cities.

**The sanatorium era**, started by Edward Livingston Trudeau and based upon Robert Koch’s great discovery, had ended.

---

**Julius L. Wilson, M.D., was director of the Henry Phipps Institute in Pennsylvania, following appointments at the Trudeau Sanatorium and other TB hospitals. He later served as medical education director of the American Thoracic Society (ATS). Dr. Wilson is a past president of ATS.**

*American Lung Association Bulletin*
IN SEARCH OF TB CASES

Before millions of Americans could get a chest X-ray in the 1940's and '50s, technology had to create low cost, rapid X-ray units that could be used in centers and special vans

Robert J. Anderson, M.D.

My first experience with the fruit of Robert Koch's work came in the 1920s when the county public health nurse came to my small town in Minnesota and gave tuberculin skin tests to all school children. These skin tests were the byproduct of Koch's search for a TB cure.

Koch had isolated a protein in the filtrates of cultures of the tubercle bacillus. This substance, called "old tuberculin," was tried as an immunizing agent and as a treatment for tuberculosis in the late 1800s. It was found wanting as either.

Although the failure of this original tuberculin substance to prevent or treat TB was a blow to Koch, tuberculin was far from a total disaster. The important finding was that a minute amount injected into or under the skin caused a reaction in people and animals infected with tubercle bacilli. If a person reacted positively to the refined tuberculin test, then other clinical laboratory and X-ray tests could be used to determine whether the infection had progressed and destruction of tissues and organs had taken place.

Old tuberculin became the decisive tool in the campaign to rid United States cattle herds of tuberculosis. Tuberculosis in cattle was prevalent in the early 1900s, causing weight loss, stunted growth, the animal's death,

In 1948, billboards blared this message as government and TB associations sought to test millions for TB.
In the mid-'50s X-ray buses reached out to small-town America during the case-finding hunt.

and the contamination of cow’s milk with tubercle bacilli, making tuberculosis in cattle both an economic and a public health problem. In 1917 the U.S. Department of Agriculture—in cooperation with states and counties, veterinarians and farmers—launched a nationwide tuberculin testing program. Cattle that showed a positive reaction to the tuberculin test were removed from the herds and slaughtered.

By 1940 the program had achieved a remarkable degree of success. Throughout the U.S., almost every county reported less than one percent of its cattle reacted positively to the test. Today, the reactor figure is even lower, thanks to the continuing program.

Skin tests did little to screen out those needing further testing

But for human beings living in the 1920s, the tuberculin test was not a practical method for decisive control action. Almost all adults at the time were tuberculin positive. They had lived through the years when tuberculosis was so common and widespread it was the number one cause of death in America. With so many people infected by the TB bacillus (infection does not necessarily mean tuberculous disease), the skin test did little to screen out those needing further testing. Nor was there effective treatment for positive reactors. Because a chest X-ray was recommended for every positive tuberculin reactor, it seemed logical to make it the primary screening tool.

Thirteen years after Koch’s discovery of the tubercle bacillus, Wilhelm Conrad Roentgen discovered the X-ray. Roentgen’s find almost immediately was recognized as a possible TB diagnostic instrument that could show damage to the organs of the body—particularly the lungs, the common site of tuberculosis.

At first, the machines were too expensive and cumbersome for widespread use, and few physicians knew how to read chest X-rays. Even after medical schools had trained students in reading X-rays and there were technological improvements, such as replacing clumsy glass photographic plates with cheaper and flexible celluloid film, the units still were too unwieldy and expensive for the rapid yet economical examination of large numbers of people. Therefore, a program of mass screening for case finding and early diagnosis by X-ray could not be set up at that time.

Fifty years after Koch’s discoveries, tuberculosis remained among the first ten causes of death in the United States. In some areas of the nation, newly reported case rates exceeded 100 per 100,000 population. Almost three-quarters of all people with newly reported TB were suffering from an advanced form of the disease, which meant that they were probably contagious. When examined, two-thirds of those people who were in close contact with newly diagnosed cases were already infected with TB—a fact that demonstrates the importance of early diagnosis in controlling the spread of infection. Thus, there was a growing demand to refine the X-ray—so valuable in diagnosis—into a speedy and efficient screening tool.

Push to develop low-cost, rapid X-ray units for mass testing

Even before, in the 1920s, tuberculosis workers and X-ray experts in Europe, South America and the United States were developing techniques and machinery that improved X-ray imagery and expedited film handling. An early technical advance was putting the photographic emulsion on a paper base instead of acetate, which had previously replaced celluloid. Paper was cheaper, and by using it on a continuous roll that was machine-advanced, the time between individual exposures as well as the cost were reduced.

Other X-ray researchers worked on adapting high-speed, high-resolving power lenses and 35 mm. film. Tests showed that the small film had the capability of showing suspicious abnormalities of the chest just as well as the much larger 14” × 17” film used for X-rays. By the early 1940s there were 35 mm. X-ray systems that automatically advanced the film, as well as a 4” × 5” stereoscopic film and camera system. At last, relatively low-cost, rapid X-ray units were available—and none too soon.

World War II had begun. The United States was mobilizing on a grand scale, which meant that men and women entering the vastly expanding uniformed services had to be examined as quickly as possible for disease, including
TB, which had caused so much damage in the troops and veterans of World War I. The Army and Navy installed the new X-ray screening methods at induction stations, and 20 million young Americans were screened in these centers.

Civilians, too, were mobilized for the war effort. Workers moved to where they were needed most—military installations, shipyards, arsenals and factories. Housing in these areas often became overcrowded, and round-the-clock, seven-day work shifts were common. Such conditions held the threat of undiagnosed cases spreading the disease. The U.S. Public Health Service—with the help of state and local health departments and tuberculosis associations—used small-film X-ray units to examine war workers in localities where working and living conditions posed the threat of disease. Military inductees and war workers with suspicious X-ray findings were referred to local agencies for diagnosis, treatment and follow-up.

**It took the federal government to fund a nationwide screening program**

After the war, health departments and TB associations used improved small-film units for screening general population groups who were harder to reach than inductees and war workers. With proper advance community planning, education and publicity, public participation could keep one X-ray unit busy examining as many as 500 persons a day. But while mass screening programs were possible in small towns and parts of cities, no state had the resources to put enough X-ray units and teams into its large population centers. The federal government decided to help.

Even before World War II had ended, the Public Health Service Act of 1944 had established the Division of Tuberculosis Control in the U.S. Public Health Service (PHS). It also authorized grants to states for tuberculosis control. The division—experienced in the wartime industrial program—recognized that more X-ray units and staff were necessary for case-finding in the more populous areas. By 1947, PHS had organized the support system—technicians, health educators, physicians and the logistical personnel—for the mobile X-ray unit teams that PHS offered to communities of more than 100,000 population. An important part of the mass X-ray program was planning the follow-up system for the large number of suspects that would be found.

Some 20 cities of more than 100,000 population and millions of persons participated in this PHS big-city program. It was discontinued in 1953 after some 20 million people were examined. Thanks to better living conditions and drug treatment for diagnosed cases, fewer new cases were being found. So, when local health departments and the federal government were confronted with a low case-rate yield, rising costs due to inflation and a growing concern about overexposure to X-rays, they phased out mass X-ray programs. At the same time, the tuberculin test was becoming more useful for screening: A positive skin-test reaction had more significance once the vast majority of the populace no longer came in contact with TB.

The mass chest X-ray programs would have been even a greater success if the drug isoniazid had been available earlier as preventive therapy for those whose X-rays showed lesions but whose infection had not progressed to the point of infecting others.

Stopping the spread of infection is still an essential reason for maintaining case-finding programs in localities where TB remains a problem. If a person’s sputum already contains tubercle bacilli, his or her close contacts are probably already infected when the disease is discovered. And the tuberculin test—which came out of Robert Koch’s work 100 years ago—is more useful today than ever before as a means of achieving the early diagnosis that leads to preventive therapy.

In WW II, the Armed Services tested millions of men. Luckily, the new X-ray screening methods were ready.
CHEMOTHERAPY
RINGS THE TB BELL

It took many years of scientific sleuthing to find the drugs
that could knock out the stubborn TB bacillus

James W. Raleigh, M.D.

When Robert Koch made the historic announcement
that he had isolated the tuberculosis-causing microorgan-
ism before a meeting of the Physiological Society of Ber-
lin, another famed pioneer in bacteriology—Dr. Paul
Ehrlich—was present. "All those present were greatly
struck," Ehrlich later wrote, "and I must admit that this
evening stands in my memory as my greatest scientific
experience."

Aside from the widespread ramifications Koch's break-
through had on the burgeoning field of microbiology, Koch's
discovery seemed a first and giant step toward a cure for
what was then one of mankind's most terrifying diseases.
One can imagine the pressures Koch faced to find some
way of turning his discovery into a method of prevention
and treatment.

There was worldwide rejoicing in 1890 when Koch
announced that he had discovered tuberculin, which, he
proclaimed, was capable of arresting the development of
tuberculosis in animals and to a lesser extent in man. It
was soon apparent that tuberculin was a disappointment
as a therapy for humans, although valuable in testing for
TB infection. The world would have to wait until the mid-
20th century for drugs that would revolutionize the treat-
ment of tuberculosis.

The announcement in 1944 of streptomycin's discover-
y is usually cited as the beginning of effective che-
mo-therapy for TB. Dr. Selman A. Waksman of Rutgers Uni-
versity had been exploring antibiosis (the interaction of
different types of organisms to the detriment of one of
them) in soil organisms. Alexander Fleming's discovery
of penicillin in 1929 had alerted TB researchers to the
therapeutic possibilities of antibiosis, although penicillin
did not do well against tubercle bacillus (neither did the
sulfur drugs that were introduced in the 1930s). In 1942
the late Dr. René Dubos, a former Waksman student, had
identified a soil microorganism that produced the antibi-
otic gramicidin, which attacked the pneumococcus by dis-
solving its outer layer, or capsule, although the antibiotic
proved too toxic for human use.

The fact that antibiotics manufactured by soil organ-
isms could destroy bacteria spurred Waksman to narrow
his work on general soil microorganisms and concentrate
on those that might destroy disease-causing bacteria—
especially the tubercle bacillus. By 1943 Waksman had
isolated streptomycin, which seemed to have possibilities
as an antibiotic for TB, and Drs. William H. Feldman
and H. Corwin Hinshaw began experimental studies on
the substance's effect on tuberculosis.

The first effective chemotherapeutic
remedy for tuberculosis

Clinical results with streptomycin were first presented
to a national audience in a report by Hinshaw and Feld-
man at the 42nd Annual Meeting of the National Tubercu-
losis Association in Buffalo, N.Y., on June 12, 1946.
Dr. Walsh McDermott, who with his team at New York
Hospital was conducting similar trials, discussed Hin-
shaw's report and confirmed his promising results. At the
end of the meeting, Drs. Feldman and Hinshaw tele-
graphed Dr. Waksman: "Our streptomycin studies re-
ported at National Tuberculosis Association here fully
confirmed . . . establishing this as first effective chem-
otherapeutic remedy for tuberculosis."

A rapid train of events was set into motion. Within
weeks, experts from the Veterans Administration, Army
and Navy—all faced with an enormous burden of tuber-
culosi s among veterans returning from World War II—
met to formulate and initiate clinical trials of the new
drug. The initial reports of the Veterans Administration,
Army, Navy Streptomycin Conferences, as they were ini-
tially called, describe the growing pains suffered as a

On the model (right) of a carnival's "test-your-strength"
machine, the dates by the drug names refer to the year
the chemotherapy came to clinical trial.

American Lung Association Bulletin
group of dedicated clinicians and research workers strived to bring to life the clinical trials that became models for similar cooperative studies which have followed. The development of study protocols, of individual case report forms, the scientific and ethical problems of using controls—deciding who should and who should not receive the drug in clinical trials—and even the allocation of scarce supplies of streptomycin to researchers occupied considerable time and discussion.

Then, a committee of the American Thoracic Society, the medical section of the American Lung Association, with the aid of a grant from the U.S. Public Health Service, sponsored and supported a large number of basic and clinical studies on the use of streptomycin in tuberculosis. The Surgeon General of the U.S. Public Health Service established a new Tuberculosis Study Section within the National Institutes of Health. A Streptomycin in Tuberculosis Trials Committee of the British Medical Research Council was also established to undertake studies in the United Kingdom.

In the years between 1946 and 1948 much was learned about the new drug, its effectiveness, its toxicity, and its limitations due to the emergence of streptomycin-resistant bacilli in most of the patients treated. But perhaps as much was learned about some of the fine points of conducting multicentered clinical trials, or cooperative studies, as they were then called. The problem of streptomycin toxicity was dealt with by adjusting the daily dose downward, but the problem of drug resistance remained unsolved until the arrival in the U.S. of para-amino-salicylic acid (PAS) from Sweden in 1948. In 1943 J. Lehmann of Sweden had found that PAS, a derivative of salicylic acid, could inhibit the growth of TB bacteria. Extensive trials showed that PAS seemed responsible for symptomatic improvement in TB patients, and it inhibited the onset of bacterial resistance to streptomycin.

The basic principle of a two-drug treatment is set

By using streptomycin injections and PAS pills together, physicians could prolong treatment for the year or more that it might take to defeat the disease without bacilli becoming resistant. The basic principle that treatment of tuberculosis should always consist of two or more effective drugs became firmly established.

As new drugs came along, they were mainly used on patients whose bacilli had become resistant to streptomycin or PAS, but none of these drugs challenged the combination of streptomycin and PAS as the standard first-line regimen until the advent of isoniazid (INH), a drug with the ability to kill the TB germ. Developed in the research departments of several drug manufacturers, preclinical laboratory studies of INH had attracted little or no attention until the first reports of its remarkable clinical effectiveness in tuberculosis hit the public press in February 1952. A highly cost-effective drug, it could be taken in pill form instead of the injection method used in giving streptomycin, it was well tolerated by patients and it dis-
played few side-effects. Combined with PAS, it made streptomycin unnecessary for most patients, and this combination became the standard regimen against which all new regimens would be compared.

Until the 1960s drug therapy for tuberculosis had been considered an adjunct to the basic bed-rest treatment at hospitals and sanatoriums. As patients improved dramatically and consistently on chemotherapy, the amount of decreed rest in a patient’s day decreased.

At Fitzsimons Army Hospital, a group of tuberculosis patients treated with isoniazid and PAS were encouraged to participate in strenuous physical and athletic activities from the beginning of their treatment; they responded just as well to treatment as a control group given the same drugs and kept at rest. The activity program’s only complications were a few sprains and fractures sustained by overenthusiastic participants. In Madras, India, patients treated with isoniazid and PAS in their own homes did almost as well as a similar group of patients treated with the same drugs in hospitals for a year. Gradual shortening of the period of hospitalization began and soon reached the point where hospitalization for tuberculous patients could be limited to those clinically too sick to remain at home, and the duration of hospitalization was measured in days or weeks, rather than in months.

In 1963, ethambutol became available. By virtue of its better acceptance by patients, it soon replaced PAS—which could require as heavy a dosage as 24 pills a day and often made patients ill—as the companion drug to INH in the standard regimen.

Effective, well-tolerated drugs with few side effects were not the complete answer to successful treatment. Poor compliance in drug intake was a major obstacle in many patients. In Madras, studies clearly had demonstrated that supervised administration of certain drugs on a twice-weekly schedule equaled the results achieved with the same drugs taken daily but without supervision. This made it possible to monitor drug intake carefully and to take remedial action promptly when a lapse in clinic appointments or treatment occurred.

Successful treatment in about half the time

The next major advance was when the drug rifampin went into clinical trial in 1967. Equal to INH in effectiveness, patient tolerance and freedom from side effects, rifampin was soon found to be, like INH, a TB germ-killer. It then became apparent that, when INH and rifampin were used together, not only could successful treatment outcome be assured in most cases, but that this could be accomplished in just about half the time required with previously used standard regimens. An imposing body of evidence now suggests that these powerful bacteria-killing drugs together can shorten the period of treatment for pulmonary tuberculosis from the previous standard 18–24 months to nine months in most patients and even less in some. Whether intermittent treatment and short-term treatment under medical supervision will fully solve the problem of poor compliance is still uncertain, but they are certainly major steps in the right direction.

In 1947, when streptomycin was in clinical trial, the rate of new TB cases in that year was 94.1 per 100,000 in the U.S., based on over 135,000 new cases. With the development and application of streptomycin and other chemotherapeutic drugs, TB case rates declined sharply. In 1980, the case rate was 12.4 per 100,000, based on 28,000 cases.

In the intervening 35 years between that first trial and today, chemotherapy researchers raised their sights considerably, and they intend to keep on doing so until tuberculosis threatens us no more.

In Madras, India, twice-weekly treatment proved effective.
A 1959 conference of TB experts declared that the disease could be eradicated. Here are some of the reasons the job is yet to be completed.

Winthrop N. Davey, M.D.

"TREATMENT IS THE TOOL." That was the new slogan, the trumpet call that was supposed to lead to elimination of tuberculosis in America. The slogan and the thrust it represented were the work of the Arden House Conference on Tuberculosis, which was called in 1959 to stocktake—to reassess the TB control programs in place and to plan for future goals. There was a need for such a conference.

In a relatively few years, TB treatment had undergone profound changes, which were reflected in declining death and case rates. From 1948 to 1959, the annual death rate declined 76.7 percent, and new cases went down by 52.2 percent. Since the 1920s these rates had been dropping steadily, anyway, because of better living conditions, improved case finding, and the work done by sanatoriums, but the main credit for the dramatic drop that began in the 1940s was due to the development of effective TB drugs that revolutionized TB control.

By 1959, it looked as if TB control was well in hand. It was not: There were still 12,000 deaths a year from the disease, and up to half the admissions to TB hospitals were readmissions—many of whom had failed to complete previous drug treatment. A 1955 Public Health Service study showed that 45 percent of the people with TB who needed supervision were not hospitalized, and of these, 72 percent had what was called active disease, often advanced. In communities where local initiative was strong and there were adequate resources for TB control, the
disease was managed well. But in other communities, TB control programs were geared to needs 15 years back. Too many patients had a recurrence of their disease, increasing the number of people with infectious TB and increasing the cost to taxpayers when the patients had to return for retreatment.

Aware of these needs, the National Tuberculosis Association (NTA) and the Public Health Service (PHS) asked a small group of leaders in tuberculosis and public health to come together to set a new course. At about the same time, the governing council of the National Conference of Tuberculosis Workers suggested that the NTA develop standards for evaluating TB control programs.

**Adequate drug treatment can eradicate TB**

These recommendations resulted in the landmark 1959 Arden House Conference, so named because it took place at Arden House, a conference center in Harriman, N.Y. The conferees came up with a strong, new focus for TB control: eradication of the disease in the U.S.—to be accomplished by making drug treatment the main tool in public health TB programs.

The specific goal was the seeking out and destroying of the reservoirs of tubercle bacilli that still existed in the nation. These reservoirs could be found in persons whose tuberculosis had gone untreated or whose disease had been inadequately treated. The thrust of the Arden House Conference was to mobilize all resources to adequately treat all persons with TB.

The conferees also made 11 secondary recommendations, most of which were targeted at making chemotherapy feasible and efficient. These recommendations included concentrating funds and health worker efforts on population groups with the greatest TB incidence; making provisions for convenient laboratory services that also met certain minimum standards; intensifying research on a simple and accurate tuberculin test that could be applied and read by nonmedical personnel; and continuing study of isoniazid in recognition of the drug’s potential to prevent TB.

Also among the secondary recommendations was the establishment of intermediate goals en route to TB elimination and the development of suggested program priorities and performance standards. A committee appointed by the Public Health Service took on this task. After much study and discussion, the committee set up this goal: a new active case rate of no more than 10 new cases per 100,000 population by 1970 and the control of infection to the point where not more than one percent of any community’s 14-year-olds had a positive reaction to the tuberculin skin test.

**Apparenty, Arden House was too radical a shift in emphasis**

Although the Arden House Conference groups which afterward worked on eradication plans sparked much dis-
Discussion and planning during the next several years, the recommendations of the conferences and other committees that followed were apparently too radical a shift in emphasis for many who would have to carry them out. Most health professionals concerned with TB treatment had been trained in more traditional methods, such as treatment in large TB hospitals. At any rate, little changed.

In 1963, however, Congress decided that action was needed due to the continuing problem of tuberculosis, and the lawmakers requested that the U.S. Surgeon General appoint a task force to recommend what PHS should do to control tuberculosis in the United States.

After months of deliberation, this task force—of which I was a member—concluded that, though very good tools were available for the control of tuberculosis, they were not being applied as effectively and efficiently as they might be. These tools were principally the tuberculin test, chest X-rays and the use of chemotherapy in treatment and prevention.

The task force sets priorities in TB control

In the task force’s report, “The Future of Tuberculosis Control,” a “workable and productive course of action” was outlined. Top priority in TB control was given, first, to providing treatment to those with active TB, then to those with a history of TB, and then to identifying and treating contacts of newly reported cases. Beyond the contacts, other people who might be at risk were also considered for treatment—those who had a positive tuberculin skin test and might develop tuberculosis later in life. Some people are more likely to do this than others, and there was considerable knowledge about which of these might develop the disease.

Beginning in the mid-1960s, extensive programs of drug treatment and isoniazid preventive therapy aimed at those at risk of developing the disease were inaugurated by health departments throughout the U.S. TB control also shifted from prolonged treatment in sanatoriums, or TB hospitals, to early discharge, together with continued management on an outpatient basis.

Though various plans looked good on paper, they were not implemented

To implement these changes, many groups were appointed to outline specific plans for the nation’s designated TB problem areas. I was honored to serve on several of these, including the Mayor’s Task Force on Tuberculosis in New York City and the City of Detroit’s Committee on Tuberculosis Control. However, although the various plans looked good on paper, they were not fully implemented. The reasons for this were similar to the ones that had kept the Arden House recommendations from being fully achieved: First, the sanatorium system was firmly established, and its abandonment meant displacement of many people, including the medical directors of the institutions. Second, as the urgency over TB lessened, the monies saved by a shift from expensive inpatient care to less expensive outpatient management were not transferred to operating clinics responsible for such care. And third, there was a rather widespread belief that isoniazid preventive therapy was far from a panacea; some physicians had grown skeptical of so-called wonder drugs and were hesitant to rely heavily on a single drug which had not yet proved to be cost-effective. Last and perhaps more important by the late 1960s, it was evident that there was a risk of isoniazid-associated hepatitis, especially in older people, a fact that discouraged both physicians and patients from starting preventive programs.

By the end of the 1960s, despite the many advances in TB control, including improved chemotherapy, the goals and standards set by the Arden House Conference had yet to be met on a nationwide basis. Perhaps the standards were unrealistically high, but more likely the failure was a result of two things: Tuberculosis is a very stubborn disease; it stays viable 40 to 50 years in a person if it is not treated. In addition, as Koch said in 1882, TB is a manifestation of social misery. Today, the main pockets of TB infection are still found among the poor.

Much pride can be taken in the advances made in TB control. The 1980s can be a decade of promise, a time when the goal of Arden House is achieved. There is still important work to be done before tuberculosis is conquered in this country.

Winthrop N. Davey, M.D., was associated for many years with the University of Michigan, where he became professor of medicine in 1960. He was a member of the Task Force on TB Control which reported to the Surgeon General of the Public Health Service in 1963 and was a consultant to the PHS TB program. He is a past president of the American Thoracic Society.

American Lung Association Bulletin
WHERE DO WE GO FROM HERE?

Pockets of disease remain in this country. We have the tools to root them out—all we need is the will.

William C. Bailey, M.D.

Victory over tuberculosis in the United States seemed close a few years ago. The incidence of the disease had been decreasing in this country for many years, a decline hastened significantly by the advent of effective TB drugs. Many health professionals, such as myself, who were concerned with controlling the disease believed that patients on modern drug treatment could be discharged from hospitals early and that most of the tuberculosis care could be provided through an outpatient system. In the 1960s and 1970s, TB hospitals were closed, and millions of dollars were saved as TB care was shifted to physicians' offices and clinics.

We expected tuberculosis in the United States to become a medical curiosity. This has not happened. The decline seems not only to have stabilized, but tuberculosis appears to have increased in some parts of the United States. In fact, in many urban areas—such as Miami and Los Angeles—TB cases have increased significantly in recent years, and there are isolated pockets in these places where case rates are quite high. The problem is further aggravated because many patients with tuberculosis do not seek medical help until the disease is advanced. And even when they do get care, the disease may be inadequately treated; there are even cases where improper medications are prescribed. Instead of a tuberculosis story that should have had a happy ending, tragedy occurs.

Many local health departments are not geared to help the TB patient

This treatment problem has arisen in the aftermath of a dramatic drop in TB cases. Because less than 30,000 new cases of tuberculosis now appear in the U.S. each year and there are very few cases in some regions, many physicians rarely encounter a TB patient. Such physicians often are not sufficiently prepared to make a diagnosis or prescribe the proper treatment for the disease. Many are not even aware that TB infection is still something they might have to deal with. A recent study showed that even recently trained internists from excellent medical schools can make significant errors in the treatment of the disease.

In most regions, even the local health departments are not geared to be of real help to the TB patient. In former years, health departments were staffed to provide specialized services to TB patients, but they no longer have the resources to do so.

During the sanatorium era, most people with tuberculosis were treated in the hospital—often for many years—and health departments maintained the tuberculosis case register, conducted tuberculin skin-testing surveys in schools, and provided tuberculosis laboratory and X-ray services and outpatient clinics. Medical care was really a very small part of these departments' overall function at that time. When the sanatoriums—or TB hospitals—closed, money that should have been earmarked to upgrade the outpatient facilities in health departments was simply not transferred. Particularly in the bigger cities, where the problem was the greatest and the cry for funds from many other programs the loudest, health departments remained inadequately staffed for providing diagnostic and follow-up services.

Today, many TB patients are treated in the hospital for two weeks or less, and then are discharged to a health department to receive the rest of their therapy as outpatients. Until recently, this required at least 18 months of care.

If a TB patient is loyal, diligent, enthusiastic and has great perseverance, he or she will use what often is a poor public transportation system to return time and again to a clinic that may be open only at inconvenient hours. Chances are the patients will have to wait many hours to see clinic staff, who have many duties other than overseeing tuberculosis cases. So, if the TB patient has even the slightest lack of motivation to continue such outpatient treatment, that patient can be easily lost to follow-up. In 1977, for example, 15 percent of TB patients in the United States were known to have stopped taking their TB medication.

As a result, the close contacts of these patients are at high risk of developing tuberculosis. This problem has become even more complicated in recent years by a large influx of foreign refugees and migrant workers, many with tuberculosis, and some with drug-resistant disease.

March 1982
The answer does not lie in adequate funding alone

What can be done? In some regions, certain cities and counties have been able to conduct successful programs. A number of these communities have had the foresight to transfer funds for TB care when the TB hospitals closed. In these instances, the redirected funds went toward the expansion and improvement of TB facilities and services at the local health department.

Adequate funding alone, however, is not the only ingredient for an efficient TB control program. In successful localities the health department works closely with physicians in the community who have an interest in tuberculosis—usually with pulmonary and infectious disease specialists. In these communities, such physicians become well versed in the treatment of tuberculosis by going to the clinic at the local health department, working with perhaps 40 to 50 patients a week and learning about tuberculosis. They are then in a position to teach and influence their colleagues throughout the community. This seems to work particularly well when the health department has a formal relationship with an academic institution because the opportunities for training extend to the entire medical community.

Successful local tuberculosis programs set priorities and get the most out of the budget dollar. Many activities effective in the past are no longer economically efficient. These include tuberculin skin-testing the entire community, skin-testing particular sections of the community and even screening for abnormalities through X-ray hospital admission programs. Even the best funded health departments have very limited resources, and in urban areas, health departments almost exclusively have to provide the bulk of care. They are, therefore, forced to be very good stewards of their limited funds.

Today, the two prime priorities in tuberculosis control are: 1) adequate treatment of known cases, and 2) contact investigation and provision of preventive treatment, where necessary. Until these are done and done well, it is foolish to do anything else. These activities are not carried out perfectly anywhere, and there is no large urban area with a TB control program so well funded that it can consider other activities. The only successful control programs are those that are reasonably well funded and that concentrate only on these two aspects of tuberculosis control.

It will take time and effort to ensure that people take their medication

We need to concentrate on the practical development of priority number one—adequate treatment of known cases.

In recent years, it has become firmly established that a significant percentage of tuberculosis patients require supervision to ensure the taking of proper medication during the long period required. Even so-called short-term chemotherapy means that the patient must take isoniazid and rifampin for nine months. This treatment can be provided on a twice-weekly basis after about a month of daily therapy. But no matter how good the patient education, no matter how friendly the environment of the clinic, no matter how convenient the location and the hours of the clinic, at least 25 percent of tuberculosis patients in urban areas will not take the medicine required for the full nine months unless their drug taking is supervised.

To devote the time and effort required to ensure that these people do take their medication, the successful health department will have to eliminate all unnecessary activities in tuberculosis control. Adequate supervision often requires a public health nurse or public health investigator who will visit TB patients in their homes, and that takes considerable staff time. Therefore, in order to provide the staff to supervise drug taking, the health department must eliminate unnecessary paperwork, pure down clinic visits and examinations, and conduct only the laboratory tests that are truly necessary.

With only a few hundred dollars in the average health

TB can afflic the very poor, such as Haitian immigrants.
department budget for the care needed to get a patient through nine months of TB therapy, it is much more important to provide the staff to see that the patient takes the medicine than to recheck the possibility of recurrence of the disease. It has been well documented that following patients with X-rays on an annual basis after completion of therapy is a complete waste of time, and yet many health departments often spend their limited time and money following people with treated TB who come in for an annual chest X-ray.

In the face of limited resources and a very big problem, solutions will not be easy, but I would make the following recommendations: First, those physicians in the community who are involved in delivering care to TB patients should, in an organized manner, become allied with the health department. This may be accomplished in different ways, but a reasonable model would be an academic institution acting as the bridge between these physicians and the health department. Under this arrangement, the physicians can learn about tuberculosis and can serve the community by providing care and policy direction. This model could have continuing future impact as physicians trained at such institutions move to other communities. The local lung association can serve as a facilitator to promote the development of this very productive liaison.

Health departments should eliminate unnecessary activities and concentrate on priorities

Second, community groups should push for legislation to adequately fund health departments so they can provide the required outpatient care. This effort should be coupled with very strong encouragement to health departments to use the funds wisely by eliminating all unnecessary activities in order to concentrate on the priorities of adequate treatment of known cases—including supervision of therapy where necessary—and contact investigation. Again, the focal point for the promotion of such an effort is the local lung association.

If these proposals were carried out, the overwhelming impact on tuberculosis that should have occurred in the 1960s can occur in the 1980s. The opportunities for success are even better now because chemotherapy currently can be cut to nine months. Patients can be completely eliminated from the case register at the end of treatment, so the total number of patients under supervision should be less than the total number diagnosed per year.

Tuberculosis really is a manageable problem, but the eradication of TB will take the cooperation of the public and private sector to succeed. With modern tuberculosis control, victory remains within our grasp.

Dr. Jerome Beloff (left) in Miami examines a refugee. At right, a patient takes his medication at an Atlanta clinic.
The Man in this Picture has Consumption

He has spit on the floor.
The germs of CONSUMPTION are in his spit.
Flies walk in the spit and carry the germs of CONSUMPTION to the mouth of the baby and to the food the woman eats

In Your Home

Do NOT spit on the floor.
Keep the baby's crib covered from the flies.
Keep food covered from the flies.
Keep flies out of your house.
Screen your windows and doors.
If you cannot buy wire screen, use mosquito netting.
Fasten this wire screen or mosquito netting on the outside of the window frame.
If possible make, or have made, a door frame; fasten wire screen or mosquito netting onto this door frame.
Keep this SCREEN DOOR shut.
Sleep with your windows open at night.

Issued by MISSISSIPPI ANTI-TUBERCULOSIS CAMPAIGN COMMITTEE
Paid for out of 1915 Red Cross Christmas Seal Sale Fund.

In 1915, when this poster was put up in Mississippi post offices, scientists thought that TB was transmitted mainly by spitting. However, it was later proved that the disease is airborne. Prolonged exposure to the bacillus is usually necessary before TB is contracted.