

## Review Article

# The fight against tuberculosis, the loathsome killer

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## ABSTRACT

### Keywords

Tuberculosis,  
Streptomycin,  
and Isoniazid

Tuberculosis, a serious infections disease is an ancient disgusting killer of humans which spreads by air droplets and raw milk. Its lesions on the Neolithic man are the oldest examples of bone tuberculosis. Babylonian described and recognized it as contagious. Greek, Chinese, and Persian suggested the communicable nature of tuberculosis. Girolamo Fracastorio and Giovanni Batista Morgagni also described it. The modern knowledge of this loathsome killer began with Laënnec, and Koch who identified the tuberculosis bacillus. Pirquet devised the “Pirquet test” and Mantou improved his method. Alexander of Trailles recommended sea voyage and ass’s milk as treatment for tuberculosis. Medieval people called it scrofula, “king’s touch”, and king’s evil. Finsen and Rollier advocated sunlight in the treatment of TB and established a sanatorium in Swiss Alps. Calmette does not miss his turn and introduced “BCG”. Waksman obtained streptomycin and proved to be useful against TB. Eventually isoniazid joined streptomycin as anti-tuberculosis. Hibbs of New York in 1911, revolutionized the treatment of spinal tuberculosis by devising a fusion operation.

## Introduction

A disease caused by the bacteria mycobacterium tuberculosis, is found throughout the world. Although tuberculosis has a long history<sup>1</sup>, medical knowledge of the disease was not acquired until the nineteenth century. It was then that lung tuberculosis, skin tuberculosis (lupus vulgaris<sup>\*\*</sup>) and tuberculosis of the lymph

glands of the neck (scrofula) were established as different manifestation of the same disease, the tubercle bacillus was isolated, and tuberculosis of birds and cattle was recognized.

Tuberculosis is usually spread by infected person air- borne droplets, coughed by individuals with the active disease and inhaled by susceptible persons. The bacilli lodge in the lungs, where conditions favour their multiplication. At this point, the body may successfully combat the infection. But if body resistance is impaired by poor

<sup>1</sup> Early medical documents described it as phthisis, or consumption.

<sup>\*\*</sup> Lupus vulgaris, is tuberculous infection of skin and mucous membranes with formation of nodules which later may ulcerate.

health, or if another onslaught of germs reaches the lung, the bacteria multiply and destroy lung tissue. In rare cases the tubercle bacilli consumed with contaminated food or milk which has not been pasteurized and the primary focus of infection is in the digestive tract<sup>1</sup>.

### **The history and nature**

Tuberculosis, the loathsome and disgusting killer is an ancient disease of humans, and possibly lesions of tuberculosis discovered on spine of the Neolithic man, c.7000- 3000 BC, are probably the oldest example of bone tuberculosis<sup>2</sup>.

The history of the struggle against tuberculosis reflects many of the major developments in medical science from ancient times to the present. The true nature of tuberculosis could not be recognized until Louis Pasteur's germ theory of disease<sup>\*\*\*</sup>

had supplanted the earlier concepts of disease as being caused by demons (Babylonia, Egypt) or by an imbalance of the humours, or fluids of the body (Greece). In addition, tuberculosis presented some special problems because it appeared in variety of forms, attacking the bones, skin and viscera as well as the lungs.

An ancient Babylonian description of tuberculosis of the lungs reads: "The sick one coughs frequently, his sputum is thick and sometimes contains blood, his respirations give a sound like a flute."

Greek physicians of the Hippocratic School accurately described pulmonary tuberculosis and recognized that it was contagious.

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<sup>\*\*\*</sup> Louis Pasteur (1822-1895), French chemist and father of bacteriology and the germ theory, also introduced pasteurization to destroy pathogenic bacteria, and developed attenuated strains for vaccination.

An illness that may have been tuberculosis was recognized by Chinese contagious : "Generally the disease gives rise to high fever, sweating, asthenia, without localized pains making all positions difficult and slowly bringing about consumption and death, after which the disease is transmitted to the relations until the whole family has been wiped out<sup>3</sup>."

Islamic physicians contributed brilliant observations that have stood the rest of time. They described diseases that had hardly been perceived as such by Greeks. They understood tuberculosis and pericarditis\* better than their predecessors. Iranian physician, Avicenna (980-1037), called the prince of physicians, suggested the communicable nature of tuberculosis<sup>4</sup>.

Girolamo Fracastorio (c.1478–1553), Italian physician, physicist, astronomer, and pathologist, recognized that "germs" caused tuberculosis and pondered ways of destroying them without injuring the tissues of the patient. For this purpose he recommended various root preparations and turpentine, myrrh, and pine.

Giovanni Battista Morgagni (1682–1771), Italian physician and anatomist and founder of modern anatomy and a professor of Padua, gave an early description of tuberculosis. René Théophile Hyacinthe Laënnec (1781–1826), French physician and inventor of the mono aural stethoscope, described the pathological course of pulmonary tuberculosis. He recognized early and later forms of being stages of a single disease process. Actually the modern knowledge of tuberculosis began with Laënnec<sup>\*\*</sup>, and his description of lung

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\* Pericarditis is inflammation of the membrane surrounding the heart.

\*\* Robert Koch (1843-1910), Nobel Prize winner of 1904

diseases are considered classics of clinical observation<sup>5</sup>.

Jean- Antoine Villemin (1827–1892), French physician and professor in the Institute at Val-de-Grâce, who made the fundamental discovery that material taken from a tuberculous lung and inoculated into an animal produced the disease<sup>6</sup>. He indeed demonstrated experimentally that human tuberculosis could be transmitted to animals. Robert Koch (1843–1910), German pioneer bacteriologist and Nobel Prize winner who discovered the tubercle bacillus in 1882, perhaps his two most influential contributions were the isolation of the tubercle bacillus the cause of tuberculosis and establishment of the essential steps (“Koch’s postulate”) required to prove that an organism is the cause of disease. Koch believed at first that human tuberculosis and tuberculosis of cattle were identical disease, but later decided that they were not and bovine tuberculosis could not be transmitted to man. In this he was not accurate.

An English Royal Commission, in 1911, demonstrated the transmissibility of bovine tuberculosis. This had important public health implication, such as the importance of pasteurizing milk and the necessity of raising tuberculosis-free herds.

### **Detection of Tuberculosis**

Tuberculosis is a chronic, insidious disease that can establish a firm foothold in the body long before the victim becomes aware that he is ill. The discoveries of Pirquet and Mantoux gave the physician a tool that enabled him to say: “The tissues of this person have at one time fought a tuberculosis infection,” but left unanswered the vital question of whether the infection was conquered or was continuing. The use

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for his discovery in relation to tuberculosis.

of X-rays has been more satisfactory in detecting early cases<sup>7</sup>. Robert Whytt (1714–1766), physician and foremost British neurologist of his time described tubercular meningitis in children, in 1768<sup>8</sup>.

Clemens Freiherr von Pirquet (1874–1929), Austrian paediatrician and immunologist who devised the Pirquet test for diagnosis of tuberculosis (1907), where old tuberculosis was applied through a needle scratch on the skin<sup>9</sup>. It could be concluded that the individual had previously had a tuberculous infection.

In 1910, Charles Mantoux (1877–1947), improved the Pirquet’s method by injecting the tuberculin between the layers of the skin. This permitted more accurate control of the quantity of tuberculin used. (Today a purified protein derivative of TB bacteria [“PPD”] has replaced tuberculin.)

The invention of X-ray by Wilhelm Konrad Roentgen (1845–1923), German physicist and Nobel laureate enabled physicians to detect TB in its early stages that treatment can be more effective.

### **Treatment and Prevention**

In treating an infectious disease it is necessary to strike at the germ that causes it. Such an approach was obviously impossible before the true nature of tuberculosis was discovered and even for many years afterward treatment was upon rest, diet, and other indirect measures aimed at increasingly the resistance of the body. A direct assault against TB bacteria deep in the tissues was made possible by the introduction of streptomycin\*, but it was

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\* Streptomycin an antibiotic produced by the actinomycete soil- fungus “*Streptomyces griseus*,” an organic base of very complicated molecular constitution. Many infections (some not affected by penicillin) respond to its therapeutic

soon discovered that bacteria resistant to the drugs, PAS (para- aminosalicylic acid), and isoniazid\*, used with streptomycin have given a brighter hope for controlling the disease<sup>8</sup>. Surgery may still be necessary, and in these cases all or part of lung may be removed. Less frequently a part of the lung is permanently or temporarily collapsed.

### **Treatment and Prevention in Chronological Order**

Alexander of Tralles (born 525 AD), a Greek philosopher and physician noted for his *Libri duodecim* (Twelve Books of Medicine), recommended sea voyage and ass's milk as treatment for tuberculosis<sup>9, 10</sup>. During the Middle Ages people seem to have suffered much from the disease most probably had the glandular form called scrofula\*\*. In England and France, it was believed that royalty had the power to cure the affliction by touching the sufferers, and from the twelfth until the eighteenth centuries the "king's touch" was regularly used against the condition. Medieval people indeed called scrofula<sup>11</sup> the "king's evil" or "king's touch," because it was believed that the disease could be cured by royal touch. Over 92000 sufferers queued for Charles II, King of England (1630–1685), to touch

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use, particularly tularaemia, influenza meningitis, and tuberculosis.

\* Pyridine- 4- carboxyhydrazide  $C_6H_7N_2O$  used in the treatment of tuberculosis. Among antibacterial chemical substances that were developed, isoniazid proved so effective against the tubercle bacillus that the therapy of tuberculosis was revolutionized. Streptomycin had been introduced before, but it required injection and had also potentially side effects.

\*\* Scrofula, tuberculosis of the lymph glands of the neck, characterized by swelling of the neck and, in some cases, by open wounds which drains a thick greenish yellow pus. Caused chiefly by the contaminated milk of tuberculosis cows, scrofula is much less common today than before, owing to the elimination of tuberculosis in cattle and the pasteurization of milk. (Encyclopedia International. Vol.16, p.305.)

them between 1661 and 1665<sup>12</sup> (3833 patients per year). Slaves on the plantations suffered mostly from scrofula, as did the Amerindians of the USA and Canada during the early twentieth century.

Like blacks, Amerindians revealed an extraordinary susceptibility to the disease and had little resistance once infected. For other peoples, tuberculosis began to recede in the nineteenth century and this dramatic recession continued into the 20th century.

Niels Ryberg Finsen (1860–1904), Danish physician and Nobel laureate studied effects of light in the disease. He showed that blue and UV light caused inflammation but that red and infrared\*\*\* light were therapeutic in patient with smallpox, and used UV\*\*\*\* light to treat lupus vulgaris<sup>14</sup>. He indeed used light in the treatment of skin tuberculosis. Augustus Rollier (1874–1954), a Swiss physician advocated the use of increasing doses of sunlight in the treatment of tuberculosis (1913). He established a sanatorium in Swiss Alps based on the use of natural sunlight in the treatment of tuberculosis. Albert Léon Charles Calmette (1863–1933), French microbiologist and follower of Pasteur introduced BCG (Bacillus Calmette- Guérine\*\*\*\*\* ) a vaccine of live weakened TB bacteria (1923)<sup>15</sup>. This method has been used for mass immunization in some countries, but has not been universally accepted for this purpose.

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\*\*\* Infrared therapy, is treatment of disease with generators producing electric oscillations of a wavelength between 0.8 and 16  $\mu m$ .

\*\*\*\* Ultraviolet therapy (UV). Treatment of disease by ultraviolet rays. The therapeutic rays (300-400 nm) are generated by two types apparatus: carbon and tungsten arc lamps and quartz mercury- vapor lamps.

\*\*\*\*\* He is best remembered for his work with Camille Guérine in the development of the first vaccine against tuberculosis (BCG: Bacillus Calmette- Guérine, 1908). (Sebastian, Anton. Dates in Medicine. P.209.)

In 1944, Selman Abraham Waksman (1888–1973), Russian-born American microbiologist and Nobel Prize winner, isolated antibacterial substances from soil actinomycetes. He discovered the anticancer drug actinomycin, the first effective anti-tuberculosis drug streptomycin (1944), and neomycin<sup>16</sup>. He indeed discovered an antibiotic useful in tuberculosis therapy, and proved to be use- full against a variety of infections<sup>17</sup>.

Artificial pneumothorax yielded to thoracoplasty, an operation to collapse a lung permanently by removing ribs. Later tuberculosis surgery involved removal of all or part of a lung.

In the 1950s para- aminosalicylic acid and “isoniazid” joined streptomycin as anti-tuberculosis drugs. These three agents used in different combinations, offer unprecedented control of tuberculosis<sup>18</sup>.

Until the twentieth century, most orthopaedic treatment was mechanical, with brace, plaster casts, and manipulation, but some simple operations such as osteotomy and uncomplicated tendon transplants were also done. In 1888, Erich Lexer apparently brilliant success with transplantation of total knee joints from one person to another. In 1911, Russell Hibbs of New York revolutionized the treatment of scoliosis and spinal tuberculosis by devising a fusion operation, which continues to be improved upon and modified<sup>19</sup>.

## Argument

Mortality rate of tuberculosis in the Western world has fallen substantially since mid-nineteenth century. Of course the cause of this decline remains a subject of debate amongst medical historians. For, they are still uncertain of the causes of the changing

epidemiological, morbidity, and mortality spectrum. Preventive measures, such as public health, quarantine, sanitation, improved nutrition, better living conditions, personal hygiene, and changing of behavioural patterns, along with a range of therapies and drugs, antibiotic, immunization, and increasingly sophisticated medical cares, and technologies, have each, in some ways and at different times, played a significant role in the secular decline of general mortality including specific morbidity and mortality rates of tuberculosis. But although tuberculosis has been somehow disappeared from developed world but it still ravages the developing countries. For instance number of cases of pulmonary tuberculosis\* diagnosed by laboratories throughout Iran for 1986 until 1999 were according the table 1.

It must be borne in mind that tuberculosis is a chronic, insidious disease, and it is debatable as to whether an absolute cure can be achieved. Some tubercle bacilli appear to remain in the lung in a quiescent state even after the progress of the disease has been satisfactory halted. Relapses may occur if poor general health or stress permit the dormant germs to become reactivated.

## The highlights

- Probably the oldest example of bone tuberculosis, are lesions of tuberculosis on the spine of a Neolithic man (c.7000-3000 BC).

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\* According to the “International Classification of Disease (ICD),” tuberculosis includes tuberculosis of respiratory system; tuberculosis of meninges and central nervous system; tuberculosis of intestines, peritoneum and mesenteric glands; tuberculosis of bones and joints; and other tuberculosis including late effects. (Nasir Pūyān, Ministry of Health, List of 150 Causes for Tabulation of morbidity and mortality, Tehran, 1967, translated in Persian.)



- Physicians of the Babylonians held the demon Asakku to be responsible for the disease, including tuberculosis.
- The Greek Hippocratic School accurately described pulmonary tuberculosis.
- Alexander of Trailles recommended sea voyage and Ass's milk as treatment for TB.
- Tuberculosis was known to Hippocrates as phthisis.
- Girolamo Fracastorio (1483-1553), Italian pathologist recognized that "germ" caused tuberculosis.
- Giovanni Battista Morgagni (1682-1771), a professor at Padua, gave an early description of tuberculosis of the kidneys.
- Modern Knowledge of tuberculosis began with René Théophile Hyacinthe Leönnec (1781-1826), who described the pathological course of pulmonary tuberculosis.
- Jean Antoine Villemin (1827-1892), professor in the Institute of Military Hygiene at Val de Grâce demonstrated experimentally that human tuberculosis could be transmitted to animals.
- Robert Koch (1843-1910), the "father of modern bacteriology," discovered the tuberculosis bacterium in 1882.
- The transmissibility of bovine tuberculosis to man was demonstrated by an English Royal Commission in 1911. This had important public health implication such as the importance of pasteurizing milk and the necessity of raising tuberculosis free herds.
  - Clemens von Pirquet (1874–1929), an Austrian paediatrician, developed a technique for identifying individuals who had had tuberculosis infection.
  - In 1910 Charles Mantoux (1877–1947), improved Pirquet's method by injecting the tuberculin between the layers of the skin.
- The invention of X- ray by Wilhelm Konrad Roentgen (1845–1923), enabled physicians to detect TB in its early stages, when treatment can be more effective.
- Alexander of Trailles (c.6th century AD) recommended sea voyages and ass's milk as a treatment for tuberculosis.
- In the Middle Ages scrofula, or tuberculosis of the lymph glands, was called the king's evil because it was believed that it could be cured by the royal touch.
- Carlo Ferlamini (1847–1918), pioneered artificial pneumothorax in the treatment of pulmonary TB. In this technique air is introduced into the chest to collapse a lung.
- Niels Ryberg Finsen (1860–1904), used ultraviolet light in the treatment of skin tuberculosis.
- Auguste Rollier (1874–1954), established a sanatorium in the Swiss Alps based on the use of natural sunlight in the treatment of tuberculosis.
- Albert Léon Charles Calmette (1863–1933), and Camille Guérine (1872–1961), introduced BCG (Bacillus Calmette Guérine), a vaccine of live weakened TB bacteria. This method has been used for mass immunization in some countries, but has not been universally accepted for this purpose.
- In 1944 Selman A. Waksman (1888–1973), discovered streptomycin, an antibiotic useful in tuberculosis therapy.
- Artificial pneumothorax yielded to thoracoplasty, an operation to collapse a lung permanently by removing ribs. Later tuberculosis

surgery involved removal of all or part of lung.

- In the 1950, para- aminosalicylic acid and isoniazid joined streptomycin as anti tubercular drugs. These three agents, used in different combinations, offer unprecedented control of TB<sup>21</sup>.
- Tuberculosis was widespread in the 19th and early 20th centuries.
- Its only treatment was rest, good food, lots of sun and fresh air.
- The discovery of electricity gave rise to many diseases including tuberculosis.
- Mortality rate of tuberculosis in developed countries has fallen since mid- nineteenth century.

#### **More regarding tuberculosis**

- Tuberculosis, MTB, TB (tubercle bacillus), also called phthisis, phthisis pulmonalis, and consumption is an infectious disease caused by various strain of mycobacteria, usually by mycobacterium tuberculosis.
- It typically attacks the lungs, but can also affect other parts of the body.
- Most infections do not have symptoms, known as latent tuberculosis.
- The classic symptoms of active tuberculosis are chronic cough with blood- tinged sputum, fever, night sweats, and weight loss.
- Diagnosis of active TB relies on radiology as well as microscopic examination and microbiological culture of body fluids.
- Diagnosis of latent TB relies on the tuberculin skin test (TST) and or blood test.
- General signs and symptom

include fever, chills, night sweats, loss of appetite, and fatigue. Significant nail clubbing may also occur.

- The World Health Organization has achieved some success with improved treatment regimens, and a small decrease in case numbers.
- The two antibiotics most commonly used are isoniazid and rifampicin.
- The recommended treatment of new onset pulmonary TB, as 2010, is six months of a combination of antibiotics containing rifampicin, isoniazid, pyrazinamide, and ethambutol for the first two months, and only rifampicin and isoniazid for the last four months as an alternative.

#### **Epidemiology point of view**

- Approximately one- third of world's population has been infected with Mycobacterium TB, with new infection occurring in about one percent of the population each year.
- Most infections with Mycobacterium tuberculosis do not cause TB disease, and 90-95 percent of infections remain asymptomatic.
- About 8.6 million chronic cases were active, in 2012, and 1.20–1.45 million deaths occurred, most of these occurring in developing countries. Of these 1.45 million deaths, about 0.35 million occur in those also infected with HIV.
- Tuberculosis is the second- most common cause of death (after those due to HIV/AIDS).
- China has achieved dramatic progress, with about an 80 percent

reduction in its tuberculosis mortality rate between 1990 and 2010.

- About 80 percent of the population in many Asian and African countries have the test positive in tuberculosis, while only 5–10 percent of the US population has test positive.
- In 2007 the country with the highest estimated incidence rate of tuberculosis was Swaziland (in Africa), 12 per 1000 population. India had an estimated two million new cases (the largest total incidence).
- In 2010, incidence rate of TB per 100000 population were: Globally: 178; Africa: 332; the Americas: 36; Eastern Mediterranean: 137; Europe: 63; Southeast Asia: 278; and Western Pacific 139. Tuberculosis is many time more common among the aboriginal population, especially in remote areas. In the United State, the aboriginal people have a fivefold greater mortality from tuberculosis, and racial and ethnic minorities accounted for 84 percent of all reported TB cases.
- Worldwide, 22 “high- burden” states or countries together experience 80 percent of cases as well as 83 percent of deaths.
- Tuberculosis is mainly a disease of older population.

### **Studies and Researches**

- Robert Whytt (1714–1766), physician and foremost British neurologist of his time discovered spinal shock and tubercular meningitis in children.
- Percivall Pott (1714–1788), British

surgeon who wrote on the paralysis of tuberculosis (Pott paraplegia).

- Lemuel Hopkin (1750–1801), Outstanding American physician, was an authority on the treatment of tuberculosis, recommend fresh air and exercise.
- Thomas Beddoes (1760–1808), English physician founded “The Medical Pneumatic Institution in Bristol for the treatment of pulmonary tuberculosis.”
- Gaspard Laurent Bayle (1774–1816), French physician who in 1810 described carcinoma of the lung and the pathological nature of a tubercule.
- Marie Edouard Chassaignac (1805–1879), a Paris surgeon who described Chassaignac tubercule.
- Auguste Nélaton (1807–1837), French surgeon and oncologist who described tuberculosis osteomyelitis.
- Lewis Albert Sayre (1820–1900), American orthopedic surgeon who invented the Sayre plaster Jacket for Pott disease.
- Charles Fayette Taylor (1827–1899), American orthopedic surgeon who developed a brace of Pott disease<sup>22</sup>.

### **More about the major contributions to fight against tuberculosis**

- In 1721, E. Barry of Dublin, showed the infective nature of tuberculosis through microscopy.
- M. Bourru of Paris, made the first suggestion of artificial pneumothorax as treatment of tuberculosis, in 1770.
- Wilhelm Roser (1817–1888), German professor of surgery at



Marburg who defined surface marking from the anterior superior iliac spine to the ischial tubercles (Roser line).

- Ernst Victor von Leyden (1832–1910), German physician established sanatoria for treatment of tuberculosis.
- Johann Nepomak Rust, German surgeon who described tuberculous spondylitis of the cervical vertebrae (rust disease); in 1834.
- Theodor Albrecht Edwin Klebs (b 1834), a German bacteriologist who pointed out the tuberculous cavities in the lungs as a source of intestinal tuberculosis (1873). He also demonstrated the peculiar property of acid fastness of the tuberculous bacilli (1896).
- Fritz Waldemar Rasmussen (born 1834), Danish physician who described a branch of the pulmonary artery affected by tuberculosis (Rasmussen aneurysm).
- Sir Robert William Philip (1857–1939), Scottish pioneer in the study and control of tuberculosis, who established the first tuberculosis dispensary in the world in Edinburgh, in 1888.
- Sigard Adolphus Knopf (1857–1940), New York and pioneer in the treatment of tuberculosis, promoted the Knopf method of breathing using diaphragmatic muscles rather than intercostal muscles in apical lobe tuberculosis.
- Theobald Smith (1859–1934), American pioneer bacteriologist and professor of microbiology at Harvard.
- Henry Tirboullet (1864), French physician who devised a fecal test for intestinal tuberculosis, which is now obsolete.

- Mark Armand Ruiffier (1859), a pioneer in paleopathology who studied conditions such as tuberculosis, arteriosclerosis, and gallstones.
- In 1868, Auguste Chauveau of Paris was the first to demonstrate experimentally in animals that swallowing tubercular matter led to ulceration in the intestines (intestinal tuberculosis).
- Sir Hugh William Bell Cairns (1896–1952), an Australian neurologist. He, in 1949 gave a clear description of hydrocephalus following obstruction of the flow of cerebrospinal fluid secondary to tuberculosis meningitis.
- Sir Hugh William Bell Cairns (1896–1952), Australian neurologist who gave a clear description of hydrocephalus following obstruction of the flow of cerebrospinal fluid secondary to tuberculosis meningitis in 1949.
- In 1898, made the clear distinction between bovine and human tubercle bacilli.
- Walch McDermott (1909–1981), American physician and founder of the institute of Medicine of the National Academy of Science who introduced pyrazinamide in combination with isoniazid as first-line treatment for tuberculosis.

### **The great victims of tuberculosis**

With urban and industrial development since sixteenth century onwards, the virulent tuberculosis become dominant in most countries, and many places 500 or more of every 100000 people died from it. Many of the victims of tuberculosis were very great men including:

**Simón Bolívar** (1783–1830), called “The Liberator” South American leader in movement for independence.

**Frédéric Chopin** (1810–1849), outstanding Polish composer.

**Robert Koch** (1843–1910), German pioneer bacteriologist and Noble Prize winner who discovered tuberculosis bacillus.

**Anton Pavlovich Chekhov** (1860–1904), Russian dramatist and fiction writer, although received a medical degree in medicine (1884) but devoted his life to writing and eventually became a great victim of tuberculosis.

### Conclusion and Impact

Tuberculosis, an ancient disease of humans, and possibly evolved with them, in nineteenth century killed millions and in some places it affected all of the population. Its true nature could not be understood until the introduction of germ theory of disease by Louis Pasteur (1822–1895). Tuberculosis itself presented some problems because it appeared a variety of forms attacking the skin, bones, viscera as well as lungs. Another leading problem was the growth of

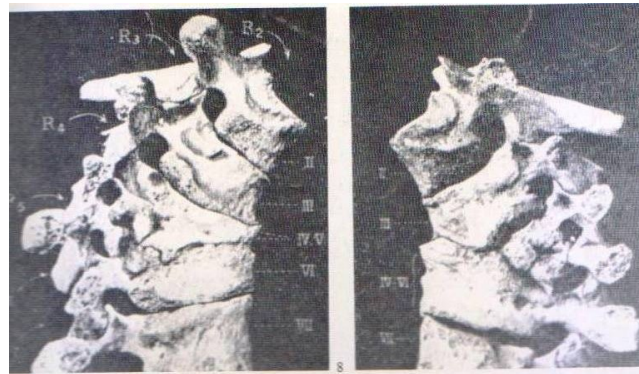
population. As population increased, hospitals became more crowded, and it was not possible to keep them hygienic. Patients would share beds during an outbreak, increasing the danger of infection, and diseases such as tuberculosis. The discovery of Pirquet and Mantoux gave physicians a tool of detection of tuberculosis. Also the use of X- rays has been more satisfactory in detecting early cases.

The impacts of the newer anti- TB drugs, para- aminosalicylic acid and isoniazid, used with streptomycin have given a brighter hope for controlling and eradicating tuberculosis. Specific mortality rate of tuberculosis in developed countries has fallen since mid-19th century. Preventive measures, such as, public and personal health, quarantine, sanitation, pasteurization of milk, improved nutrition, infant and mother care and welfare, better living conditions, changing behavioural pattern, along with increasingly sophisticated medical care and immunization and technology, have each, in some ways and at different times played a significant role in the decline of morbidity and mortality rates of tuberculosis.

**Table.1** The morbidity rate of tuberculosis

Year	Number of Cases diagnosed by laboratories	Population	Morbidity rate per 100,000 of population
1986	7004	49000000	14.3
1991	11090	56000000	19.8
1995	11631	58800000	19.2
1996	9578	60000000	16.0
1997	9207	61200000	15.0
1998	8410	62400000	13.5
1999	8565	63600000	13.5

**Fig.1** Lesions of tuberculosis on the spine of a Neolithic man (the oldest example of bone tuberculosis)



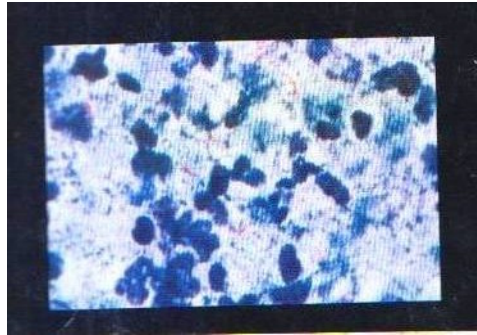
**Fig.2** Tuberculosis decay has been found in the spine of Egyptian mummies (From: British museum)



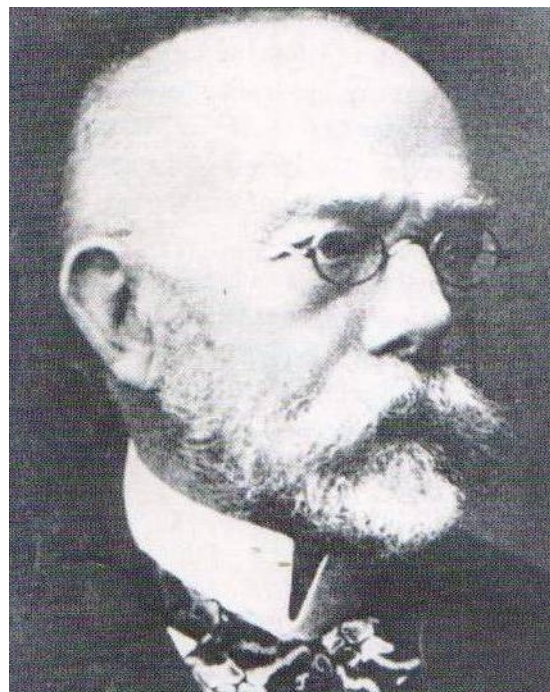
**Fig.3** René T.H.Laënnec (1781-1826), died of tuberculosis, in 1826 (Drawn and lithographed by himself)



**Fig.4** Microscopic slide showing tubercule bacillus

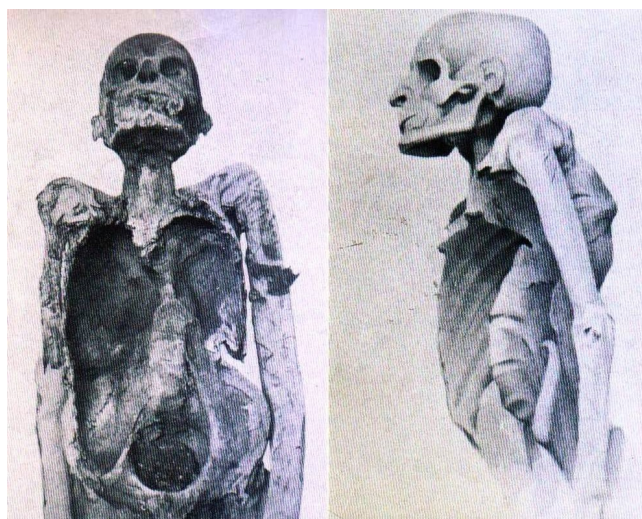


**Fig.5** Robert Koch (1843-1910), Nobel Prize winner of 1904 for his discovery in relation to tuberculosis





**Fig.6** Right: Mummy of priest of Amen (c. 1000 BC), with profile view showing protrusion of spine common to “Pott’s disease” (tuberculosis of spine). Left: Frontal the same mummy showing huge psoas abscess into which tubercular lesion drained



**Fig.7** Gold touch pieces. Some kings and ruler were believed to have healing powers, curing their subject by touch with gifts. These gold touch pieces from the reign of James I of England (1603-1625), were thought to cure a wide spread, disfiguring form of tuberculosis called Scrofula<sup>13</sup>

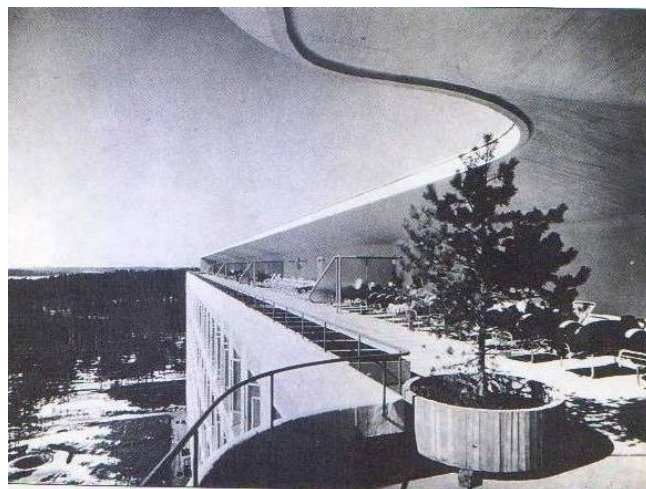


**Fig.8** In Middle Ages various swelling and conditions were well known, notably scrofula. Scrofulous sores were treated with cleansing and ointments as shown in these drawing from a 13th- century translation in Norman French of Roger of Paravia’s surgical treatise *chirurgia*





**Fig.9** A tuberculosis sanatorium built at Paimio, Finland, designed by A. Aalto, 1929- 1933



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