The History of Medicine Through Tuberculosis

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I'M TIRED OF LIVING IN THIS FIELD WITH THIS COW. LET'S JUMP ONTO THAT MAN SO WE CAN GO PLACES!
LET'S GO TO THE PARTY! NOBODY WILL RECOGNIZE US!
The Lord shall smite thee with a consumption, and with a fever, and with an Inflammation…and they shall pursue thee until thou perish.

Deuteronomy 28:22

- Named TB Phthisis (wasting).
- Describes the clinical disease that could be TB.
- Advised physicians not to visit terminal TB patients. This may diminish their reputation.
- TB was treated with honey, barley gruel, dark wine and herbs.

Hippocrates

- Greek physician to three Roman Caesars.
- Believed there were two types of blood—from the liver and from the heart.
- Believed the lungs’ function was to cool and warm blood.
- Popularized blood letting of ill rumors.
- Established chemical concoctions called galenicals.
- Treated phthisis with fresh air, milk, and sea voyages.
- Wrote extensively and influenced medicine until the 20th century.

Galen
UH-OH, THEY'RE LOOKING INTO OUR HIDEOUTS!
Science vs. Empiricism

The Beginning of Scientific Inquiry

Bologna and Padua (16th Century)

Astronomy

Copernicus (Poland)
Galileo (Italy)

Anatomy

Vesalius (Belgium)
Harvey (England)
G. Fracastoro (Italian) (1478-1553). Advanced infectious concept of tuberculosis – “seed like elements” that could transfer over distances.

Sylvius (Dutch) (1614-1672). Described tubercles that progressed into cavities and ulcers.

B. Marten (English) (1720). Advanced the theory of consumption in which he termed animalculae particles could pass from person to person.

19th Century Northern Europeans believed tuberculosis was inherited.

19th Century Southern Europeans believed tuberculosis was contagious.

Paganini and Chopin were kicked out of dwellings in southern Europe.
Fig. 2. – Andreas Vesalius (1514–1564) as depicted in one of the engravings from his masterpiece *De Humani Corporis Fabrica.*
DON’T WORRY, THEIR CHEMICALS AND BLOODLETTING ARE MAKING OUR JOB EASIER!
Medical Treatments, 18th – 19th Century

Iodine
Cod Liver oil
Calcium phosphate
Fresh blood
Antimony tartarate
Quinine
Gas insufflation
Warm breath of a healthy beast (horse)
Leeches


Phlebotomy
Theriac (Galens mixture)
Blindweed (cathartic)
Mercuric oxide (emetic – purgative)
Blessed oil
Mercuric chloride (calomel)

Ref: Eamon, William. The Professor’s Secret.

Laudanum (tincture of morphine)
Holding a lancet between his teeth, a barber-surgeon prepares a woman for a bloodletting. The ancient practice was believed to draw corrupt matter from the body. At right, a physician indicates the proper vein to cut.
The barbers' poles and the reasons for their colors
Rawlins came in soon after sunrise. The general, observing that Rawlins appeared agitated said, “Don’t be afraid”...the incision was made and the blood ran freely.

Dr. Craik came in soon after and put a blister of cantharides on his Throat and took some more blood from him.

Dr. Craik returned soon after. The general could now swallow a little. Calomel and tarter em were administered.
Modesty demanded that Nabby unbutton only the top of her dress and slip it off her shoulder, exposing the diseased breast but nothing else. Dr. Warren did not wash his hands. He sat her down, leaning back in a reclining chair. He belted her waist, legs, feet and right arm to the chair.

He thrust a two-pronged fork into her breast and, with a large razor, started slicing into the base of the breast. The tumor was larger than anticipated and he felt lymph nodes under her left arm. He razored in there as well. Nabby grimaced, groaned, flinched and twisted in the chair with blood staining her dress and Warren’s shirt and pants.

To stop the bleeding, Warren pulled a red-hot spatula from the oven and cauterized the worst bleeding points. The whole procedure took less than 25 minutes. Abigail and Caroline helped Nabby pull her dress back over her shoulder as modesty demanded.
—Mon cher je t'assure que je te trouve mauvaise mine ce matin... Ce n'est pas un médecin qui je te parle, c'est en ami... Je veux absolument te soigner... mieux que je ne me souviens moi-même... je vais l'appliquer trente sangles à l'épaule, et si demain matin je ne te trouve pas plus robuste, je t'en réappliquerai demain!...
I WANT TO GO TO THE CITY AND SEE THE LIGHTS.
TB: Major Cause of Suffering and Death

- One Billion deaths in the 19th Century
- During 20th Century, TB killed ~100 million
- England 1815: 1 in 4 deaths
- France 1918: 1 in 6 deaths
- Major cause of death in the U.S. in 1911
Inventors: Thomas Savery,
LOOKS LIKE WE ARE FOUND OUT! BUT DON'T WORRY, THEY STILL DON'T SEE US.
Decline in Mortality due to Infectious Disease, United States, 1900-1996
Edward Jenner

- “Milkmaids skin”
- Vaccination
Ignaz Semmelweis

- Purpural sepsis in maternity wards
- Hand washing
Cholera: John Snow

- London physician to poor
- Studied cholera outbreaks in 1830s
- Symptoms: fever, pain in stomach, diarrhea.

- Cholera is again a problem in London 1848-1854
- Snow conducts a landmark series of studies which:
  a) test his hypothesis about mode of transmission
  b) lead to an intervention
Epidemiologist Pilgrimage to the Broad Street Pump
Advances in the 19th Century

• Microscope invented by Van Leeuwenhoek (Dutch)
• Bichat, (French) in 1802, used the microscope in describing morbid anatomy
• Auenbrugger (Austrian) described diagnostic percussion
• Laennec (French) invented the stethoscope
• Schoenlein (Swiss) describes the fundamental pathology of tuberculosis
• Long or Morton (American) developed clinical anesthesia
• Roentgen (German) discovered x-ray
Chest Radiograph

- Abnormalities often seen in apical or posterior segments of upper lobe or superior segments of lower lobe.
- May have unusual appearance in HIV-positive persons.
- Cannot establish or confirm diagnosis of TB.

Arrow points to cavity in patient's right upper lobe.
OH, GOODY! WE GET TO GO TO THE RESORT!
1840  George Bodington proposed a hospital for tuberculosis in England

1854  Herman Brehmer, a German, established the first TB sanatorium

1885  Edward L. Trudeau founded the first TB sanitorium in the U.S.

1942  The United States had 100,000 sanitorium TB beds
1943 – Major TB Sanitoria
Total 1300

Inpatient Facility:
- Hopemont in Terra Alta
- Pinecrest in Beckley
- Denmar in Hillsboro

Smaller Local Centers:
- Charleston
- Morgantown
- Ohio County
- Weston State Hospital
Fig. 1. Respiratory tuberculosis: mean annual death rate, England and Wales. (Reproduced with permission from McKeown T, Lowe CR. An Introduction to Social Medicine. Oxford: Blackwell, 1974.)
Cause of Decline in TB (Pre-Antibiotic Era)

Environment:

T. McKeown. Improvement in Housing and Nutrition.

Hoffman, F. L. Housing, Nutrition and Abolishment of Child Labor.

Dubois, René. The White Plague.

Public Health Measures:

E. Long. Treatment and Public Health Measures


Natural Immunity:

Generational Acquired Residual Resistance.

Mini epidemics

Irish-German migration Chicago, 1860
African-American migration to southern cities, 1880
Indian-Mexican migration, Southeast U.S., 1910
Chinese-Japanese migration, West Coast after WWII


Hispanic x 7
African American x 8
Asian x 25
1882 - Koch

BLAST! WE ARE DISCOVERED!
Establishment of Tuberculosis as an Infectious Disease

Villemin, J.A.: A military surgeon who transferred tuberculosis from infected patients to rabbits with the use of controls, conceived after observing the transfer of the horse disease “glanders” to humans.

Koch, R.:
- Established Koch’s Postulates regarding infection.
- He cultured TB.
- He stained the TB germ.
- He developed Tuberculin for later use in skin testing.
- He erroneously thought Tuberculin could be used as treatment.
- He erroneously stated that bovine tuberculosis was not contagious.
- He received the Nobel prize for medicine twenty-five years after his discovery of the cause of tuberculosis.
HEY, THEY'RE COMING AT US WITH A KNIFE!
Surgery in Tuberculosis

• Pneumothorax and pneumoperitoneum
• Phrenic nerve interruption
• Lucite balls or wax implants
• Thoracoplasty
• Pulmonary resection
Lucite-Ball Plombage
IMMUNIZATION/SMUNIZATION...DON’T THEY KNOW I CAN LIVE 100 YEARS IN THE BODY?
Tuberculosis Vaccination

• Attenuated mycobacterium bovus for immunization developed by Calmett and Guerin.

• BCG vaccine trials summarized twenty-two studies reported in the Review of Infectious Disease, 1989.11. There was -20 to +80% protection.

• New vaccines slow in development. New prospect is Aeras-402 is a booster to lymphocytes and an adjunct to BCG. Am J Resp Crit Care Med, vol 181 pp 1407. 2010.
CRAP! OUR COUSIN IS BEING DECIMATED!
TUBERCULOSIS IN CATTLE
Decline in the infection rate and highlights of progress.

THE TUBERCULIN TEST
The only test used to determine the presence of Tubercle Bacilli in the body of the animal. This simple test made possible the great progress in eradicating tuberculosis from cattle.

1922 4.0%
1926 2.6%
1930 1.7%
1934 1.1%
1938 0.5%

DR. MOHLER  DR. WIGHT  DR. KIERNAN
The organization of the Tuberculosis Eradication Division of the Bureau of Animal Industry, under Doctors Mohler, Wight, and Kiernan, heralded the epic struggle against bovine tuberculosis.

The work of testing millions of animals yearly was carried on in the United States, Alaska, Puerto Rico, and the Philippines. The interest of farmers and dairymen in finding their hands of tuberculosis was so great that huge waiting lists of untested animals resulted.

Federal and State governments cooperated in paying indemnities to dairymen whose cattle were slaughtered as a result of positive tuberculin reactions.

Tuberculosis in Cattle: A Success Story. Poster issued by the United States Federal Department of Health in 1939. The curve over the period 1922 to 1938 in Britain would have shown a steady upward rise.
YIKES! THEY FOUND A POISON!
Antibiotic Treatment of Tuberculosis

- 1943: Selman Waksman and Albert Shatz discover Streptomycin.
- 1944: Corwin Hinshaw and William Feldman do clinical trials with Streptomycin.
- 1946: Jorgen Lehmann discovers para amino-salicylic acid.
- 1946: Numerous reports of resistance developing to streptomycin and P.A.S.
- 1949: Gerhard Domagk of Bayer lab simultaneously with Squibb and Hoffman-LeRoche discover Isoniazid.
- 1957: John Crofton established that if tuberculosis is treated with three drugs under supervision for eighteen (18) months TB is cured without relapse or the development of resistance. “TB was 100% curable.”
Antibiotic Treatment of Tuberculosis (cont.)

• 1948: Oxford first controlled study done was for streptomycin treatment of TB.

• 1948: Framingham population study

• 1952: British physician health study
  American physician health study
  American nurses health study

• Current: One million man VA health study

3% per year

2.5% per year

Proportional contributions of treatments and risk factor changes to CHD mortality across countries

THEY’RE CLOSING DOWN OUR RESORTS, AND GIVING GUNS TO POOR SHOTS.
BIBLIOGRAPHY

Hey, it's good - little old ladies tell lies!
Emerging Pockets of Very Resistant Tuberculosis

- United States: Elevated rates of TB and resistant tuberculosis in major cities, 1985-1992. The reasons are:
  1. TB infrastructure reduced.
  2. Development of HIV.
  3. Immigrant influx.
  4. Drug culture expansion.


- Eastern Europe: Emergence of resistant tuberculosis due to
  1. Political dislocation due to collapse of the Soviet Union.
  2. Prison design.
  3. Treatment similar to TB management in the 1940’s.
  4. Lack of follow-up prison release to society.

- Sub-Saharan Africa and Southeast Asia: Due to
  1. Impoverishment.
  2. Political disorganization.
  3. Inadequately organized health care delivery.
  4. Epidemic HIV and sexual practices.
  5. 80% of tuberculosis in Sub-Saharan Africa is associated with HIV. WHO 2009.
BIBLIOGRAPHY


- Iseman, M.D., Cohn, D.L. Sbarbaro, J.A., Sounding Board- Directly Observed Therapy of Tuberculosis: We Can’t Afford Not to Try It. NWJM; 1993; 328(8): 576-78.

• 1957: John Crofton established that if tuberculosis is treated with three drugs under supervision for eighteen (18) months TB is cured without relapse or the development of resistance. “TB was 100% curable.”
Air travel was a good vehicle for a long time. But hey, lets tag along with that babe!
Co-infection: HIV and Tuberculosis

- One-third of 33.2 million HIV TB patients globally will develop active tuberculosis at a rate of 10% per year

- In sub-Saharan Africa, 50% of TB cases are also HIV positive

- HIV and TB enhance each other

- Public Health infrastructure, education, and economic development are lacking in endemic areas
HEY, WE CAN FIGHT BACK. THE POOR SHOOTERS ARE BACK!
GLOBAL TB PROBLEM

2,000,000,000 people infected with TB worldwide
50,000,000 of these have drug resistant TB
15,000,000 have TB infection
1,700,000 die annually of tuberculosis
400,000 new MDR-TB cases annually
27,000 XDR-TB annually
Extensively Drug Resistant TB (XDR-TB)

The XDR-TB afflicted, the modern leper of biblical description, is the consequence of inadequate and incomplete tuberculosis treatment.
# RATES OF MDR-TB AMONG PREVIOUSLY TREATED CASES OF TB IN SELECTED COUNTRIES/REGIONS

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Year</th>
<th>% of MDR among PREVIOUSLY TREATED CASES</th>
<th>% of any resistance (1 or more drugs) among PREVIOUSLY TREATED CASES</th>
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<tr>
<td>Kazakhstan</td>
<td>2001</td>
<td>56.4</td>
<td>82.1</td>
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<tr>
<td>Lithuania</td>
<td>2002</td>
<td>53.3</td>
<td>67.9</td>
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<td>Estonia</td>
<td>2000</td>
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<td>58.1</td>
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<tr>
<td>Russian Fed. – Tomsk Oblast</td>
<td>2002</td>
<td>43.6</td>
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<tr>
<td>Russian Fed. – Orel Oblast</td>
<td>2002</td>
<td>42.4</td>
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<tr>
<td>Uzbekistan – Karakalpakstan</td>
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<td>40.2</td>
<td>79.4</td>
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<tr>
<td>Egypt</td>
<td>2002</td>
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<td>China – Henan</td>
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<td>Latvia</td>
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<td>Ecuador</td>
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<td>Mexico (Baja CA, Oaxaca, Sinaloa)</td>
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<td>22.4</td>
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<tr>
<td>United States</td>
<td>2001</td>
<td>5.2</td>
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</tbody>
</table>

Source: WHO
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• Lack of resources in global battle
• Prospect of TB vaccine poor
• AIDS treatment difficult & expensive
• Lack of infrastructure for TB treatment
• Increasing population

• Prospects for AIDS vaccine
• New drugs in pipeline
• Public Health strengthening
• They may finally follow Crofton’s plan
SUGGESTED REFERENCES


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