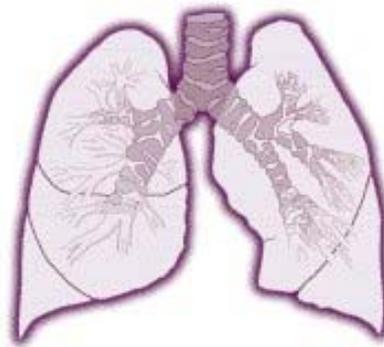


# MEDICAL CONSEQUENCES OF ADDICTION SERIES: TUBERCULOSIS



**OASAS**  
Improving Lives.

NEW YORK STATE  
OFFICE OF ALCOHOLISM & SUBSTANCE ABUSE SERVICES  
*Addiction Services for Prevention, Treatment, Recovery*

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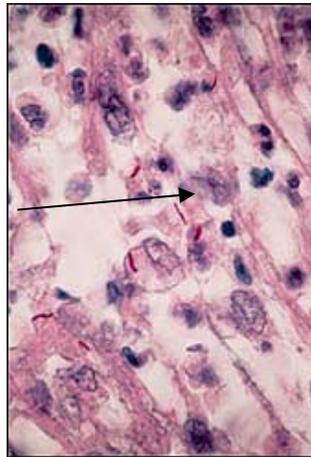
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Tuberculosis is a leading cause of infectious morbidity and mortality worldwide.

# MYCOBACTERIUM TUBERCULOSIS

- Disease is caused by the tuberculosis bacilli
- Tuber – Latin for degenerative protuberances or tubercles
- Phthisis – Greek for Pulmonary Disease
- Other Names – Scrofula, Tabes, Hectic Fever, Gastric Fever, Great White Plague (consumption)



Tubercula bacilli are red bacilli  
seen in this microscopic specimen

# HISTORY

- ***Mycobacterium tuberculosis*** has infected humans for thousands of years
  - Spinal column from Egyptian mummies from 2400 BCE show signs of tubercular decay
- 460 BCE Hippocrates identified “phthisis” (Greek for consumption) as the most prevalent disease of the era, killing almost all who were infected and very contagious in the late stages
  - He warned physicians to not visit their patients in the late stages

# HISTORY

- 1650 – Shakespeare’s plays used Tuberculosis in the story line
  - Consumption lovers in “Much Ado About Nothing”
  - Scofula in “Macbeth”



# HISTORY



- 1679 – Sylvius wrote *Opera Medica* which described active tubercles in the lung
- 1699 – Physicians in Italy must notify authorities of occurrence of the disease – early public health initiative.

# HISTORY



- 1720 – Benjamin Marten, an English physician, theorized that TB was caused by “wonderfully minute living creatures” and that they can be caught by long periods of contact with an infected person.

# HISTORY

- Many famous people died of TB in the 1800's
  - Chopin 1849
  - Robert Lewis Stevenson 1899

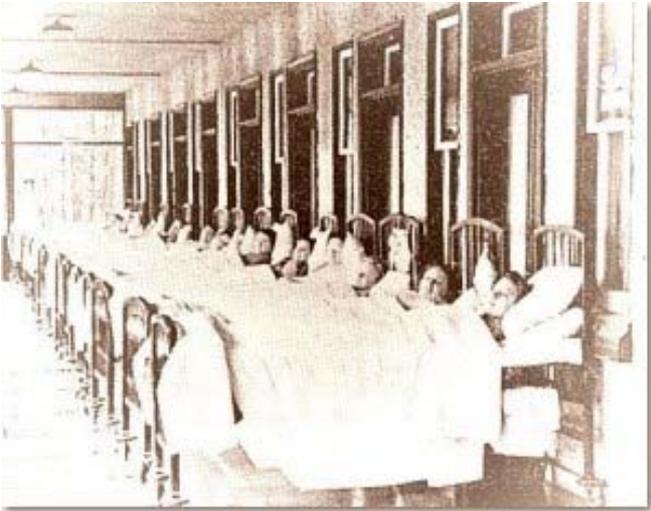
# HISTORY



POCKET SPITTOON

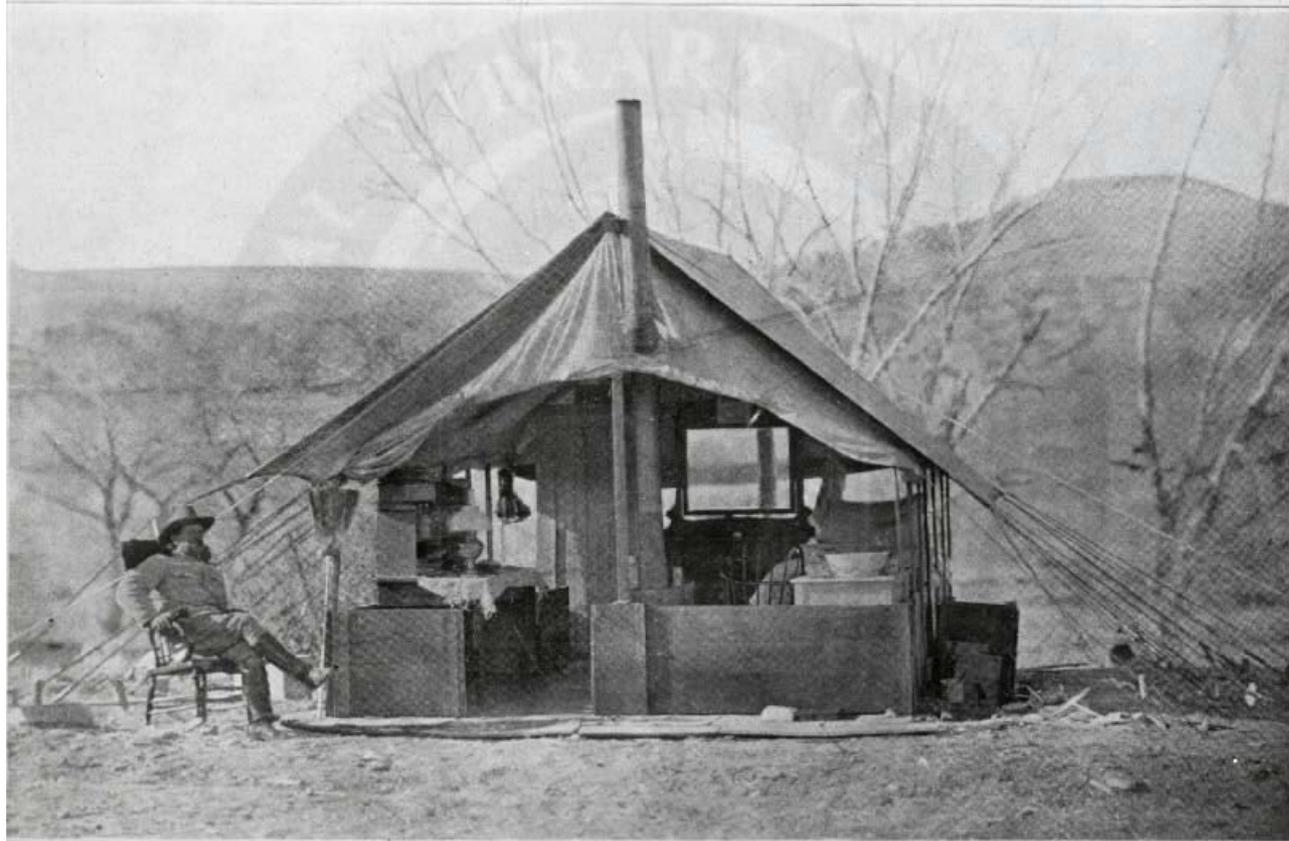
- Migration west in the US was partially due to people looking for healthier climates and places to live beginning in 1844
- Communities in Colorado, Texas, Southern California, New Mexico and Arizona

# HISTORY



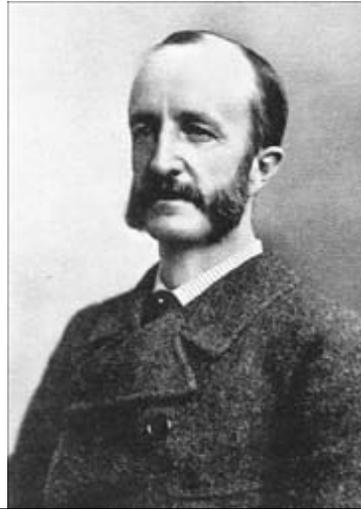
- 1854 – Hermann Brehmer stated that TB was a curable disease and he built the first sanatorium where patients could get fresh air and good nutrition as the cure.

# HISTORY



TENT OCCUPIED BY CONSUMPTIVE MEDICAL OFFICER, FORT STANTON SANATORIUM.

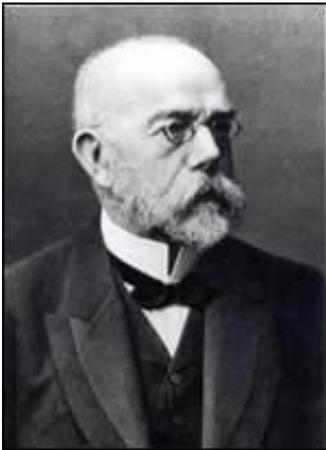
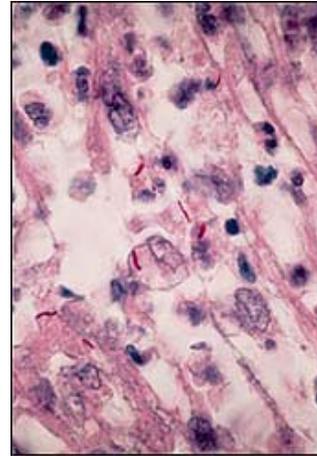
# HISTORY



- Dr. Edward Livingston Trudeau founded the sanatorium at Saranac Lake, NY in the early 1880's. Robert Louis Stevenson was one of the famous patients treated here.



# HISTORY



- 1882 – Robert Koch discovered a special staining technique and was the first to view *Mycobacterium tuberculosis*
  - He won the Nobel Prize in 1905

# HISTORY

- Art was impacted by TB
  - Edvard Munch's work in 1885 ("Sick child") of his sister dying of TB



# HISTORY

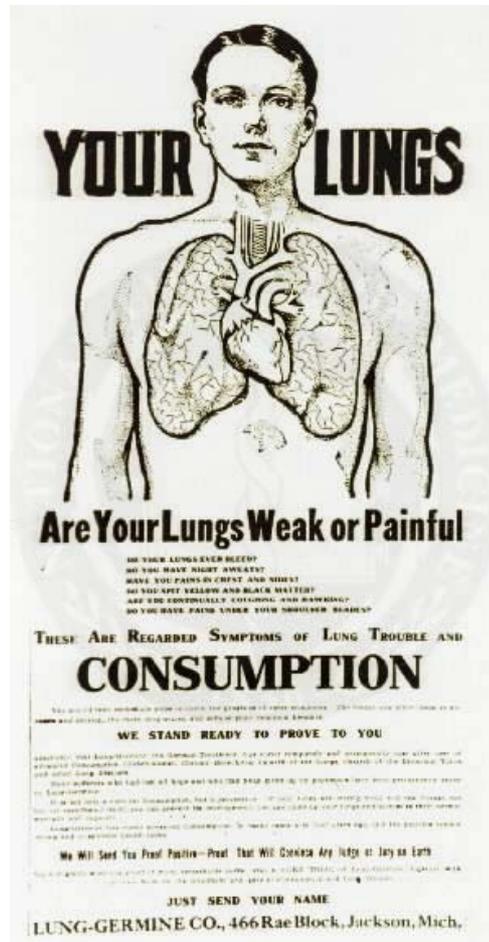
- 1895 – Wilhelm Konrad von Rontgen discovered radiation could be used to view progress of a patient's disease of TB
  - To the right is the famous x-ray of his wife's hand showing the bones and a ring
  - This discovery transformed the diagnosis of TB



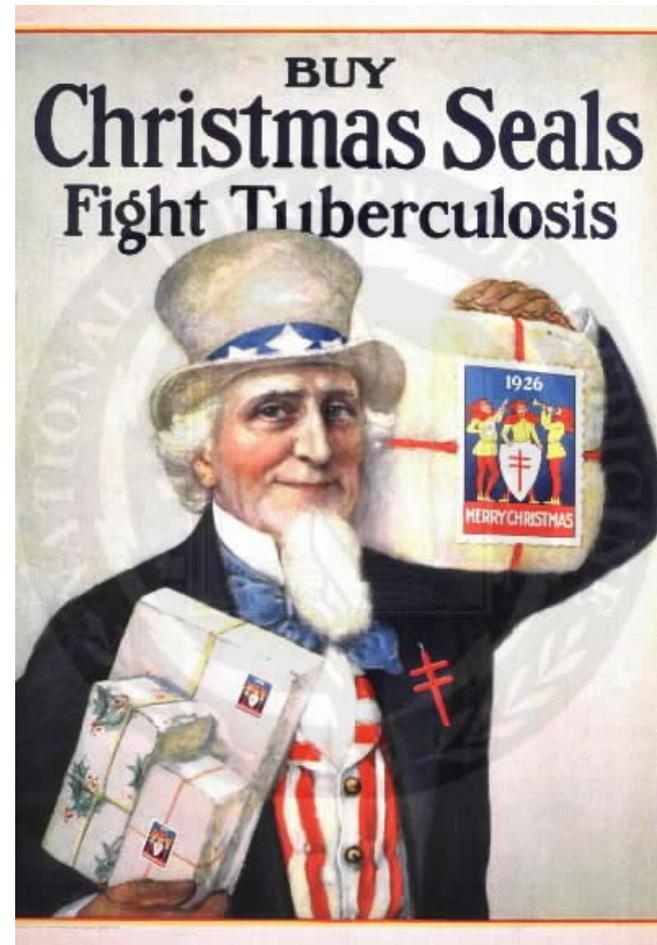
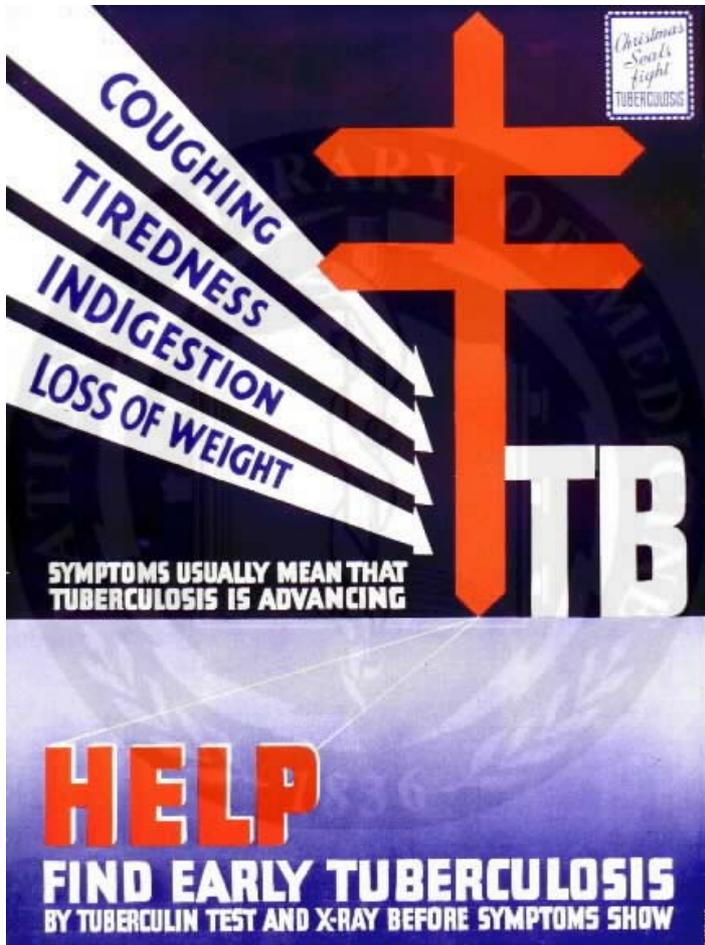
# HISTORY

- Discovery of Rontgen rays or x-rays worried some people, so much so that a London clothing firm advertised X-ray proof underclothing for ladies
  - Miss Marie Lloyd sang:
    - I'm full of daze
    - Shock and amaze
    - For nowadays
    - I hear they'll gaze
    - Through cloak and gown and even stays
    - Those naughty, naughty, Roentgen rays

# HISTORY - POSTERS (DATE ?)



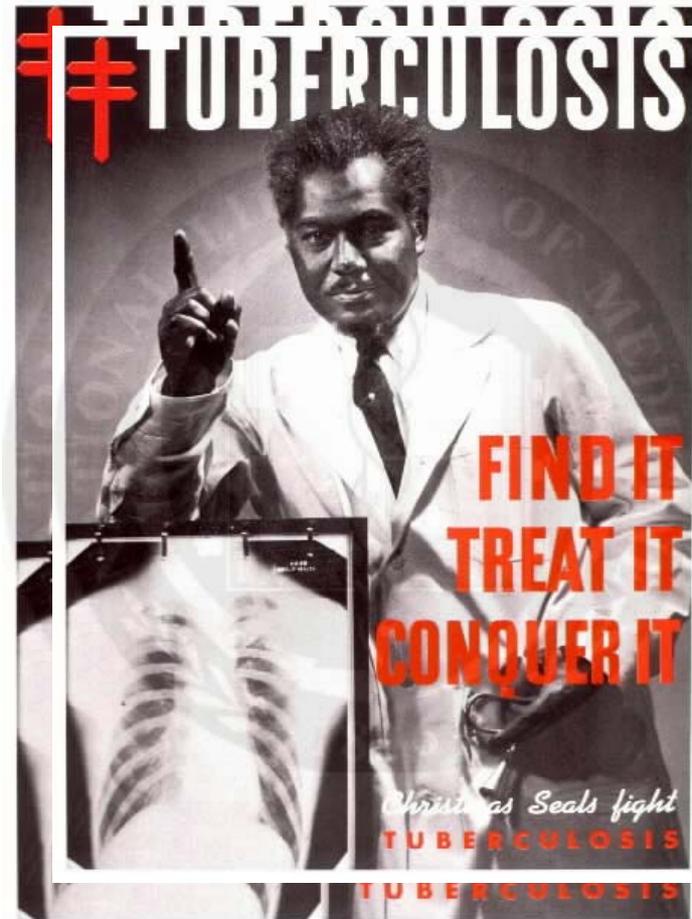
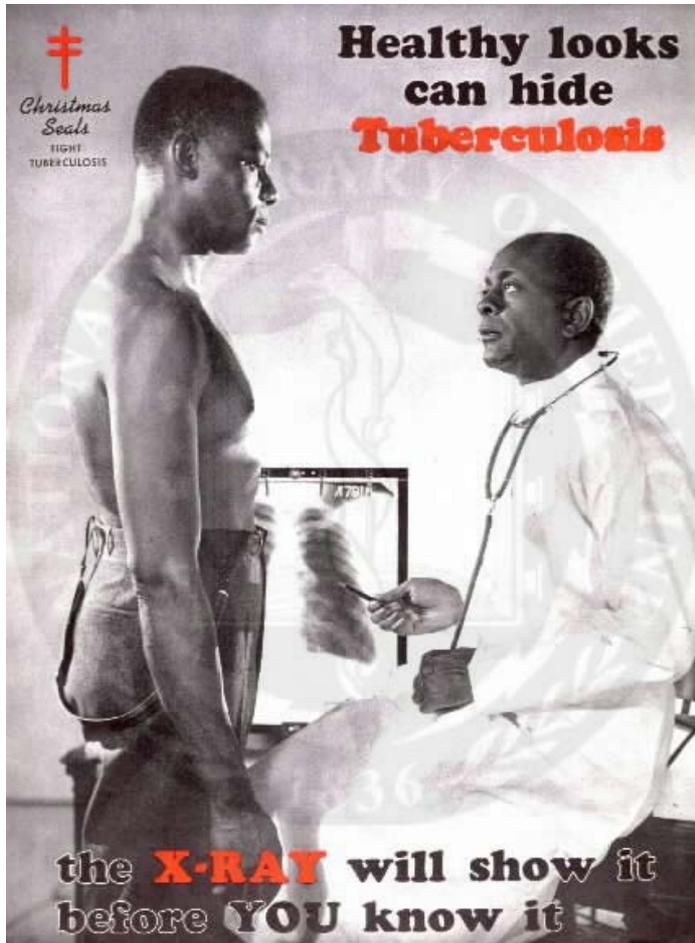
# HISTORY - POSTERS OF THE 1920'S



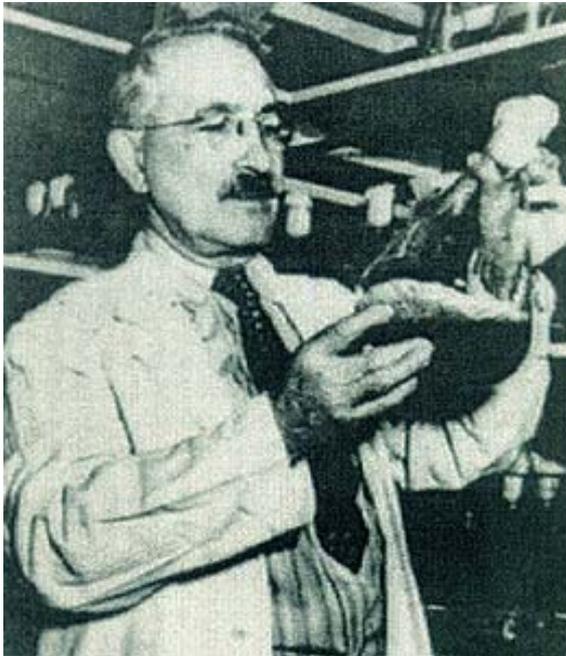
# HISTORY

- Quackery
  - 1924 complex gold salts, called Sanocrysin, was used to treat TB
    - Caused a shock – like reaction when injected: kidney damage, heart failure, very low or high temperature
  - Congreve's Balsamic Elixir
    - Vegetable matter, sulphuric acid (to treat night sweats), Virginia Prune (sedative) and 2.5% by vol. alcohol
  - Dr. Derk Yonkerman – a horse doctor
    - Wrote "Consumption and How It May Be Cured"
    - Sold Tuberculozyme Elixir (contained bromide, alcohol, caustic soda and almond oil)

# HISTORY - POSTERS OF THE 1930'S



# HISTORY



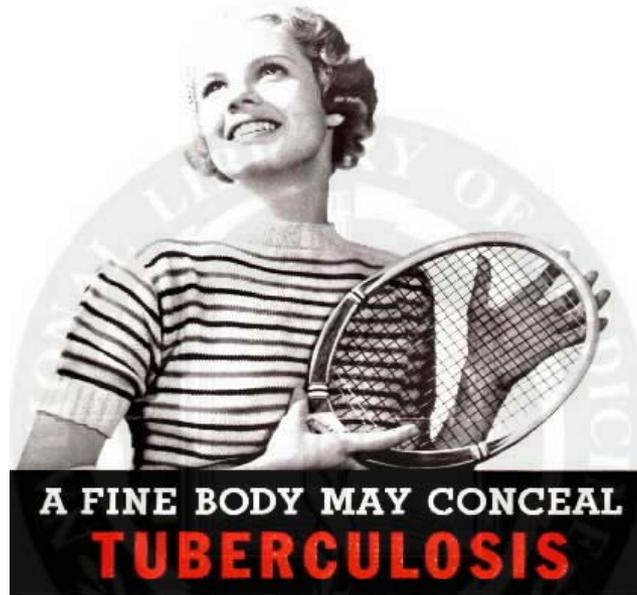
- 1943 – Selman Waksman found Streptomycin which was the first successful antibiotic used for the treatment of TB

# HISTORY



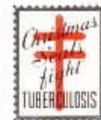
- Medications Discovered
  - P –amino salicylic acid 1949
  - Isoniazid 1952
  - Pyrazinamide 1954
  - Cycloserine 1955
  - Ethambutol 1962
  - Rifampin 1963

# HISTORY - POSTERS OF THE 1950'S



But **modern** methods uncover  
it before it does harm

*Let the Doctor be your guide*



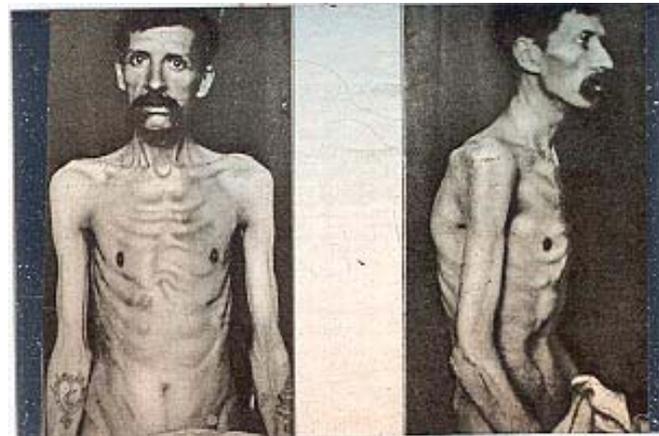
# EPIDEMIOLOGY

# EPIDEMIOLOGY

- It is estimated that 10 – 15 million persons in the US are infected with *M. tuberculosis*
  - Without treatment, about 10% will develop TB disease at some point in their lives
- The World Health Organization (WHO) estimates that 8 million people get TB yearly
  - 95% of these people live in developing countries

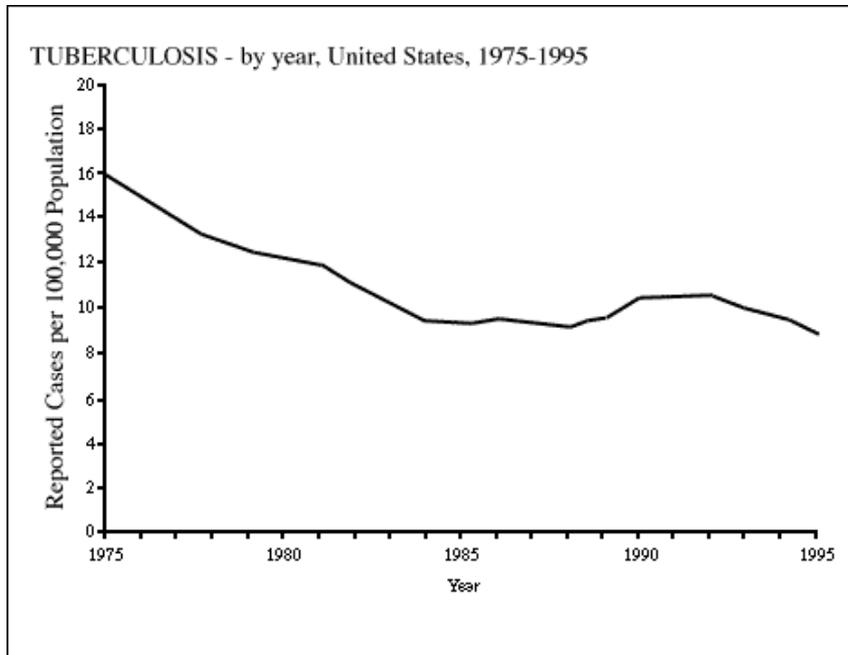
# EPIDEMIOLOGY

- W H O estimates that 3 million people die each year of TB



Consumption 1892

# EPIDEMIOLOGY



- TB in the US
  - Cases continue to be reported from every state
  - From 1953 to 1984, reported cases decreased by an average of 5.6% per year

# EPIDEMIOLGY

- TB in the US
  - From 1985 to 1992, reported TB cases increased by 20%
    - Due to:
      - Deterioration of the TB public health infrastructure
      - HIV/AIDS epidemic
      - Immigration from countries with high TB prevalence

# EPIDEMIOLOGY

- TB in the US
  - Since 1993, reported cases have been declining again
    - Due to:
      - Efforts to improve TB control programs
        - Promptly identify persons with TB
        - Initiate appropriate treatment and ensure completion of therapeutic regimen
  - 18,361 cases reported in the US in 1998

# EPIDEMIOLOGY

## TB IN NYS\*

Years	Cases
1990	656
1991	748
1992	763
1993	717
1994	641
1995	621

Years	Cases
1996	535
1997	535
1998	442
1999	377
2000	412
2001	415

# TRANSMISSION



# TRANSMISSION

- *M. tuberculosis* is spread by droplet nuclei or aerosolization of the bacilli in airborne particles of respiratory secretions
- Particles are expelled when a person with infectious TB coughs, sneezes, speaks or sings
  - There is increased transmission in smoking (cigarettes, crack and/or marijuana) from associated coughing
- TB with cavities (holes caused by the bacilli eating away surrounding tissue) in the lung is the most infectious
- Close contacts are at highest risk of being infected.

# TRANSMISSION

- Probability that TB will be transmitted is based on:
  - Infectiousness of the person with TB
  - Duration of exposure
  - Hardiness of the bacilli
  - Environment in which exposure occurred
    - Closed environment vs. outdoors
    - Foreign - born persons from areas where TB is common
    - Health care workers who treat high risk patients

# LATENT TB AND TB DISEASE

# LATENT TB AND TB DISEASE

- What is LATENT TB?
  - Most people who breath in the TB bacilli become infected
  - The body's immune system is able to fight the TB bacilli and stop them from growing
  - The bacilli then become inactive, but remain alive in the body
  - The bacilli can activate later in life if not treated in the latent period

# LATENT TB AND TB DISEASE

- 1/3 of the world population is latently infected.



# LATENT TB AND TB DISEASE

- What is TB disease?
  - TB bacilli become active if the immune system cannot stop them from growing
    - This can occur at the time of initial exposure or later on in life.
  - The person with TB disease is symptomatic
    - Cough
    - Chest pain
    - Blood in sputum
    - Fever
    - Night sweats
    - Weight loss

# LATENT TB AND TB DISEASE

- 10% of infected persons with normal immune systems develop TB at some point in their lives
- Certain medical conditions increase the risk that TB infection will progress to TB disease
  - Risk of developing TB disease if already HIV positive is 7 – 10% per year

# LATENT TB AND TB DISEASE

- Other medical conditions that will increase the risk to progression to TB disease
  - Substance abuse
  - Recent infections
  - Chest x – ray finding suggestive of previous TB
  - Persons with inadequately treated latent TB
  - Diabetes mellitus
  - Silicosis
  - Prolonged corticosteroid use
  - Other immunosuppressive treatments
  - Cancer of the head and neck
  - Blood diseases
  - End - stage kidney disease
  - Intestinal bypass or stomach resection surgery
  - Chronic malabsorption syndromes
  - Low body weight (10% or more below the ideal body weight)

# LATENT TB AND TB DISEASE

If one has a positive skin test for TB – what is the annual risk of developing TB disease?

Annual Risk of Tuberculosis in Individuals with a Positive Skin Test	
Group	Annual Risk of TB
HIV	3-10%
PPD Converters	2-5%
Abnormal CXR	2-4%
IDU	1%
ESRD	1%
Diabetes	0.3%
No Risk Factor	0.01-0.1%

\* PPD = TB Skin test (Purified Protein Derivative); IDU = Intravenous Drug User; ESRD = Esophageal reflux disease

# DIFFERENCE BETWEEN LATENT TB INFECTION AND TB DISEASE

Latent TB Infection	TB Disease
<ul style="list-style-type: none"><li>•Have no symptoms</li><li>•Do not feel sick</li> <li>•Cannot spread TB to others</li> <li>•Usually have a positive skin test</li> <li>•Chest X-Ray and sputum tests are normal</li></ul>	<ul style="list-style-type: none"><li>•Symptoms include:<ul style="list-style-type: none"><li>–A bad cough that lasts longer than 2 weeks</li><li>–Pain in the chest</li><li>–Coughing up blood or sputum</li><li>–Weakness or fatigue</li><li>–Weight loss</li><li>–No appetite</li><li>–Chills</li><li>–Fever</li><li>–Sweating at night</li></ul></li><li>•May spread TB to others</li> <li>•Usually have a positive skin test</li> <li>•May have abnormal chest x-ray and/or positive sputum smear or culture</li></ul>

# DIAGNOSIS AND TESTING

# DIAGNOSIS AND TESTING



# DIAGNOSIS AND TESTING



1850 MONAURAL  
STETHOSCOPE

- The evaluation for TB includes:
  - A medical history
  - Physical examination
  - Tuberculin skin test
  - Chest X – Ray
  - Bacteriologic exam (smear and culture)

# DIAGNOSIS AND TESTING

- Medical history includes:
  - History of prior exposure
  - History of prior testing
  - Symptoms of TB
  - History of TB treatment
  - Evaluation of risk factors and medical conditions that could increase the risk for TB



# DIAGNOSIS AND TESTING

- The symptoms of TB disease (active pulmonary or lung TB)
  - Cough of 3 weeks or more
  - Cough productive of mucous which is bloody or pus like
  - Malaise
  - Night sweats (high fever at nighttime – may not be present if patient is immunosuppressed)
  - Weight loss
  - Chest pain
  - Appetite loss
  - Chills

# DIAGNOSIS AND TESTING

- Active TB disease is most frequently seen in the lung, but can be found in other sites:
  - Pleura (lining of the lung)
  - Central Nervous System (brain, meningitis)
  - Lymphatic System
  - Genitourinary System
  - Bones and joints
  - Disseminated (throughout the body – called Miliary TB)

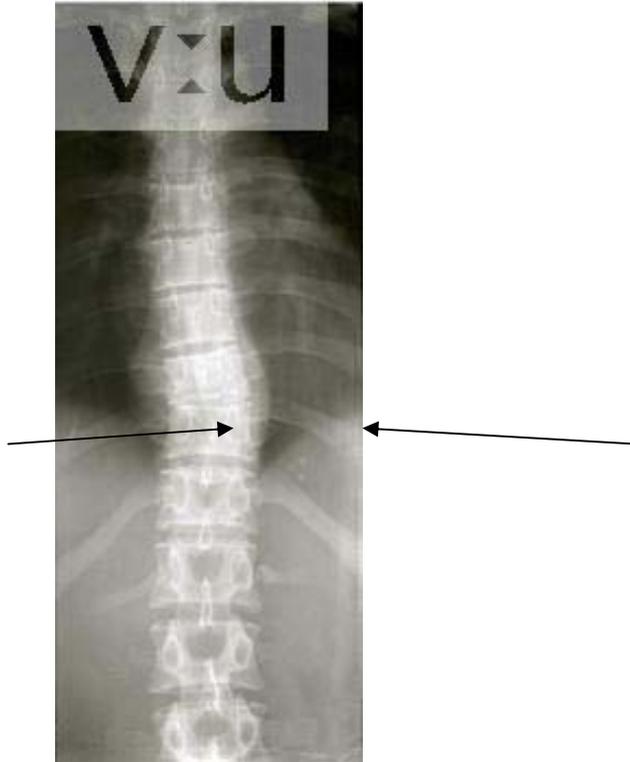
# DIAGNOSIS AND TESTING



- Osteomyelitis of skull and inflammation of meninges on Cat Scan

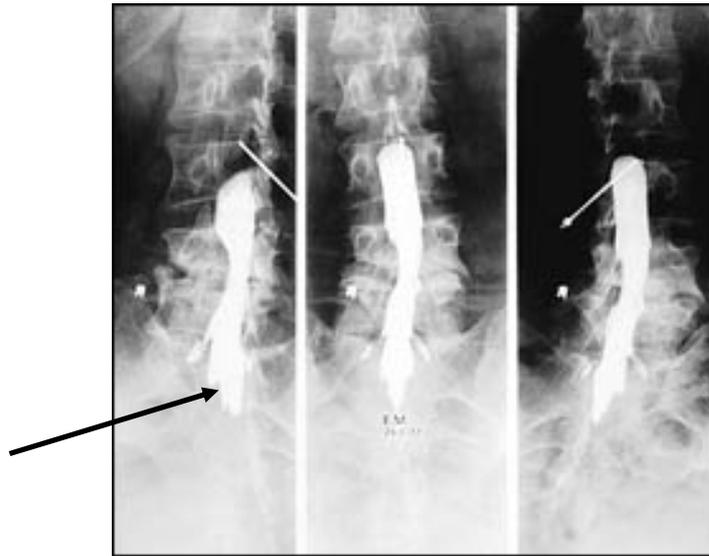
# DIAGNOSIS AND TESTING

- TB of the spine with paraspinal mass



# DIAGNOSIS AND TESTING

- Osteomyelitis of Lumbar vertebra 3 and 4 due to a TB abscess

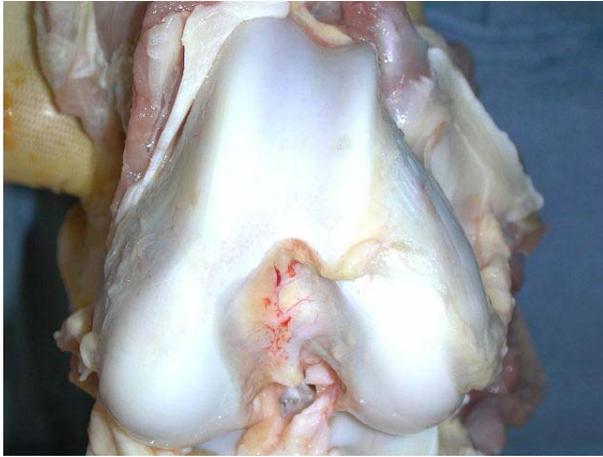


# DIAGNOSIS AND TESTING

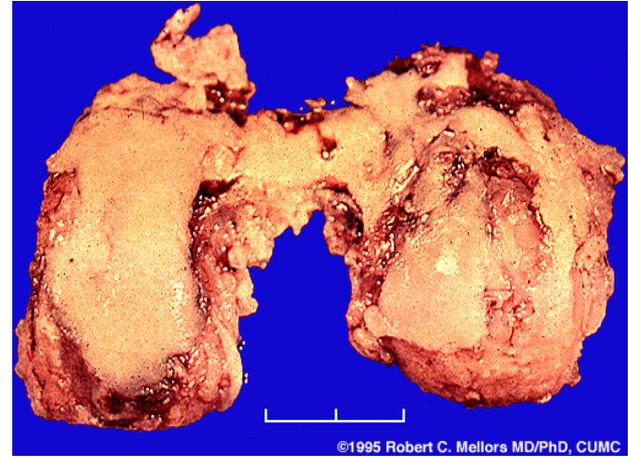
- Pott's Disease
  - Spinal TB
  - Can cause "hunchback"



# DIAGNOSIS AND TESTING

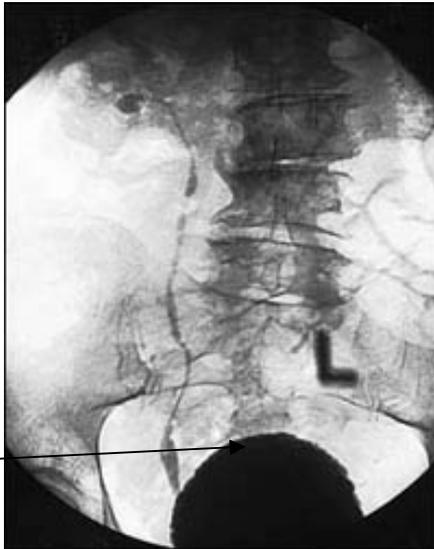


Normal knee



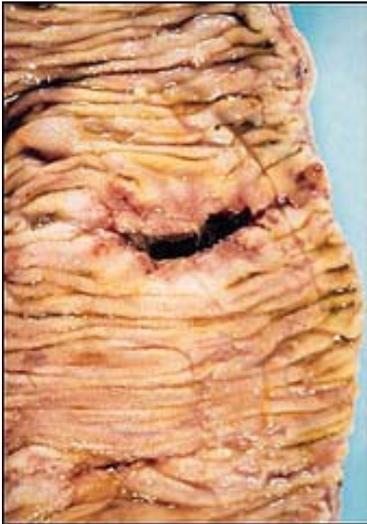
- Osteomyelitis of the knee (on the right) due to tuberculosis – eaten away appearance

# DIAGNOSIS AND TESTING



- Mild urethral narrowing (arrow) and upper tract is dilated on an intravenous pyelogram (IVP)

# DIAGNOSIS AND TESTING



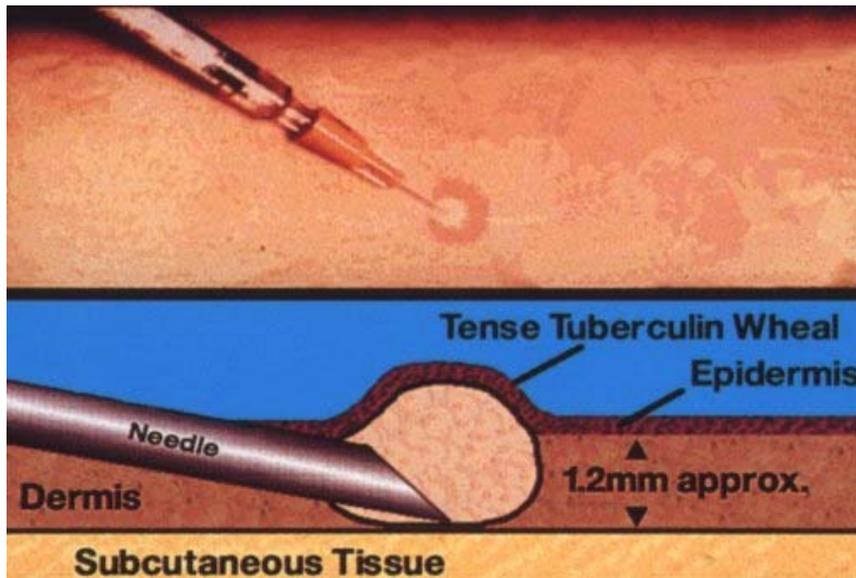
- Terminal ileum (GI tract) perforation due to TB

# DIAGNOSIS AND TESTING



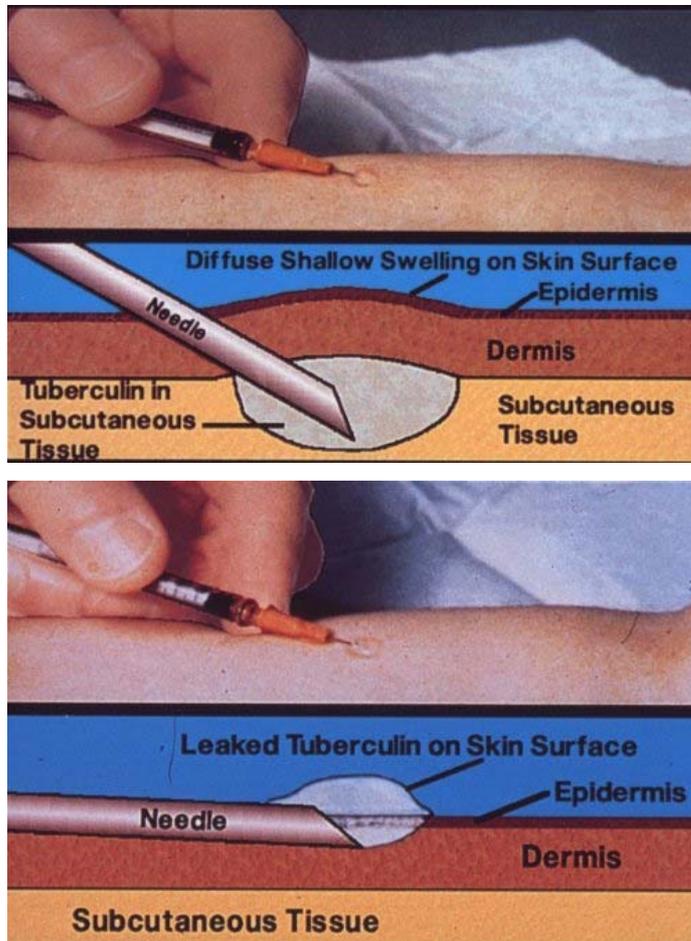
- Scrofula
  - Enlargement of the cervical (neck) lymph nodes with ulceration and scarring
  - Called the King's Evil : TB killed several rulers
    - King Edward VI of England
    - King Charles IX of France

# DIAGNOSIS AND TESTING



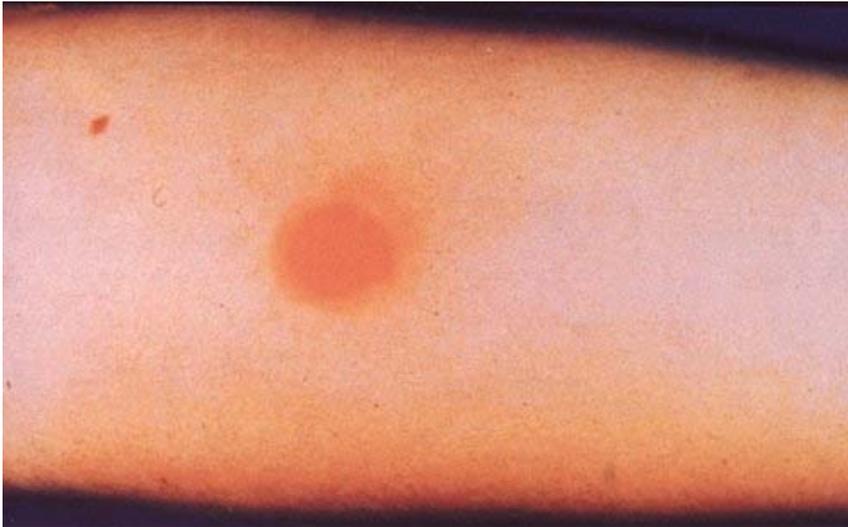
- The Tuberculin skin test
  - Inject into the dermis 0.1 ml of 5 TU PPD tuberculin (tuberculin units of purified protein derivative)
  - Produce a wheal 6 mm to 10 mm in diameter
  - Follow universal precautions for infection control

# DIAGNOSIS AND TESTING



- The skin test should not be too deep or too superficial so that an accurate reading can be made

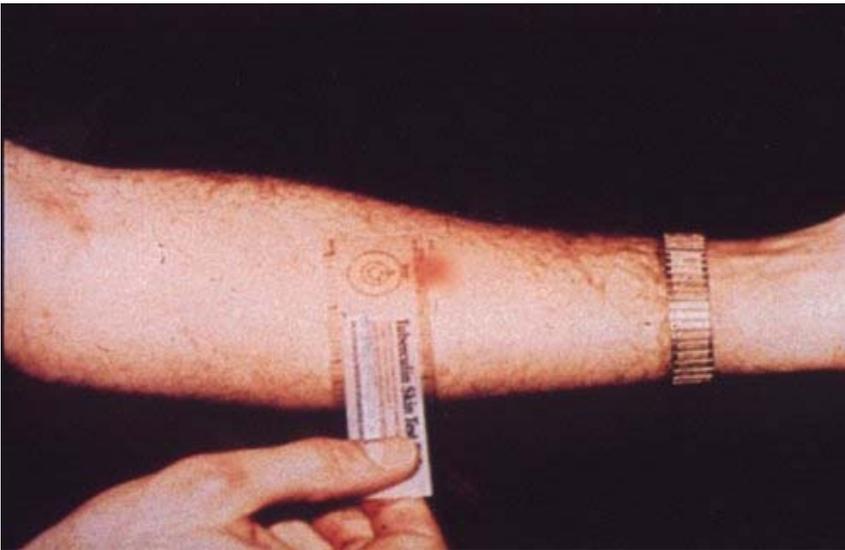
# DIAGNOSIS AND TESTING



- Read the reaction 48 – 72 hours after the injection
- Measure only the swollen area (area of induration), not the area that is just red.
- Record the reaction measurement in millimeters

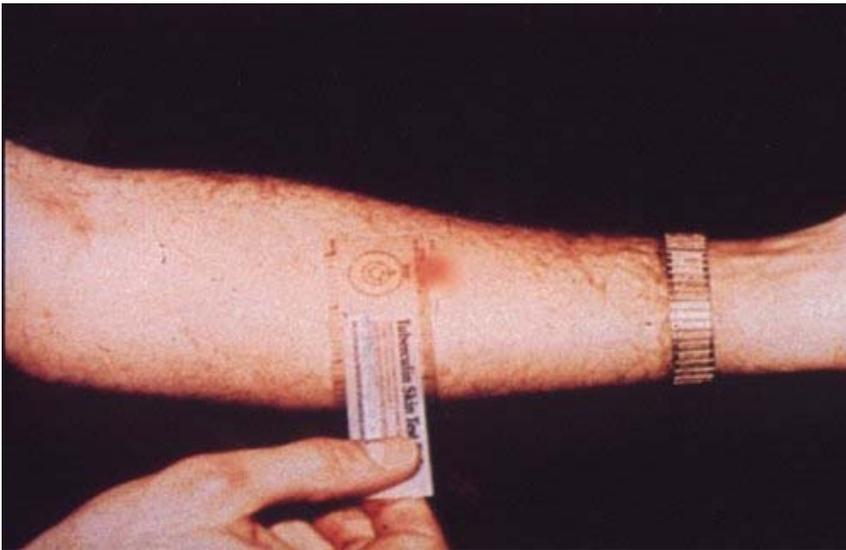
# DIAGNOSIS AND TESTING

- If 5 mm or more, classified as a positive reaction in
  - Persons who are HIV positive
  - Recent contacts with active TB cases
  - Persons with fibrotic (scarring) changes on the chest x-ray which is consistent with old healed TB
  - Patients with organ transplants and other immunosuppressed disorders

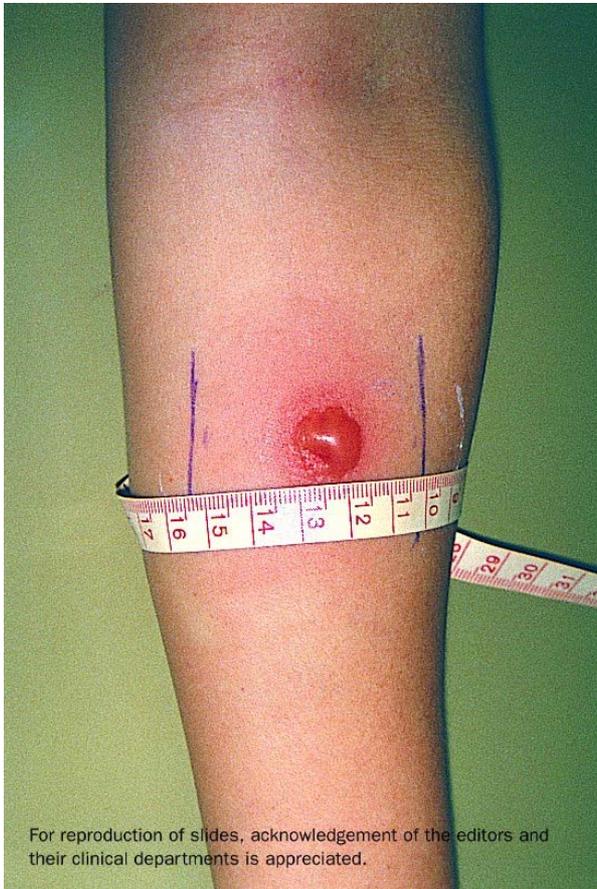


# DIAGNOSIS AND TESTING

- If 10 mm or more, classified as a positive reaction in
  - Persons who recently arrived from high TB prevalence countries
  - Injection drug users
  - Mycobacteriology laboratory personnel
  - Persons with medical conditions that place them at high risk
  - Children less than 4 years old, or children and adolescents exposed to adults in high – risk categories



# DIAGNOSIS AND TESTING



- If 15 mm or more, classified as a positive reaction in
  - Persons with no known risk factors for TB

# DIAGNOSIS AND TESTING

- Factors that may affect the skin test reaction
  - False positive (skin test reading is positive, but person does not have the infection)
    - Person had a history of a BCG vaccination (see special population section)

# DIAGNOSIS AND TESTING

- False negative (person has infection but not showing up on skin test as positive)
  - Anergy (person does not react to skin testing because of immune system problems)
    - Consider anergy in persons with no reaction if they are:
      - HIV infected
      - Have a severe illness or fever
      - In the midst of a viral infection
      - Receiving immunosuppressive therapy
  - Recent TB infection
  - Very young age (less than 6 months old)
  - Overwhelming TB disease

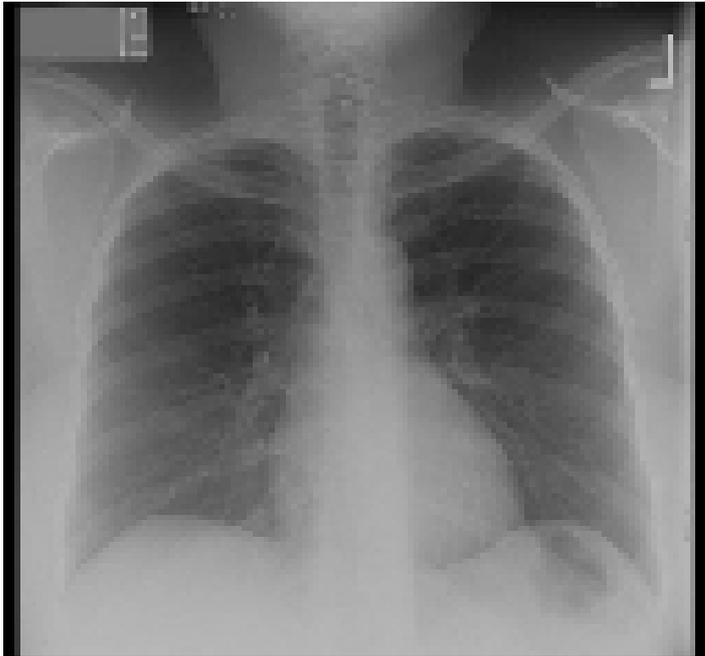
# DIAGNOSIS AND TESTING

- Special cases
  - Boosting
    - Some people with latent TB may have a negative skin test reaction when tested years after the infection, but the skin test will stimulate or boost the ability to react to tuberculin and subsequent positive reactions will be misinterpreted as a new infection

# DIAGNOSIS AND TESTING

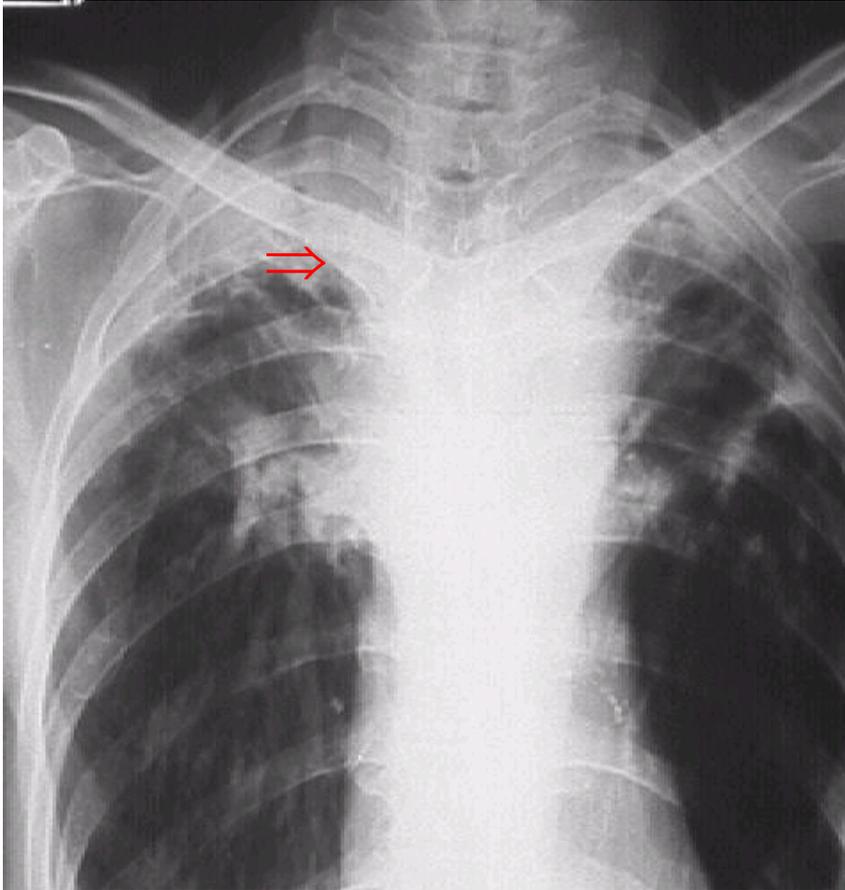
- Special cases
  - If a skin test is read as positive, there is no reason to repeat the skin test, unless there is no documentation of the result. (a repeated test can cause a severe skin reaction).
  - All testing activities should be accompanied by a plan for follow-up care.

# DIAGNOSIS AND TESTING



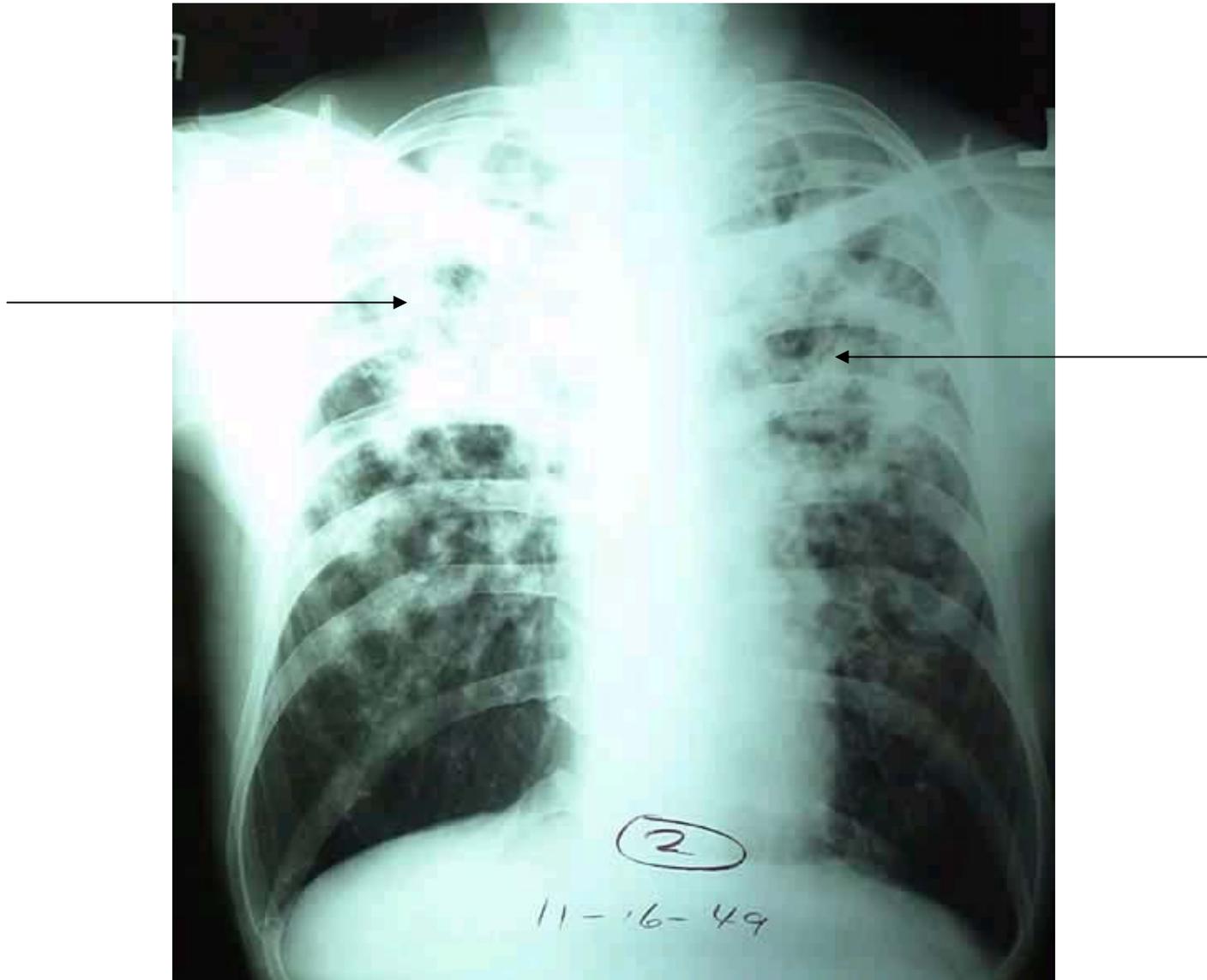
- Chest Radiograph can be used to help diagnose latent or active TB disease. The CXR to the left is normal.

# DIAGNOSIS AND TESTING



- Abnormalities on CXR indicating TB infection are usually seen in the apical or top part of the lung (Arrow on this and next slide)
- HIV positive persons may have unusual presentations
- A CXR ALONE CANNOT CONFIRM A DIAGNOSIS OF TB

# ARROWS SHOW TB INFILTRATES IN THE LUNG

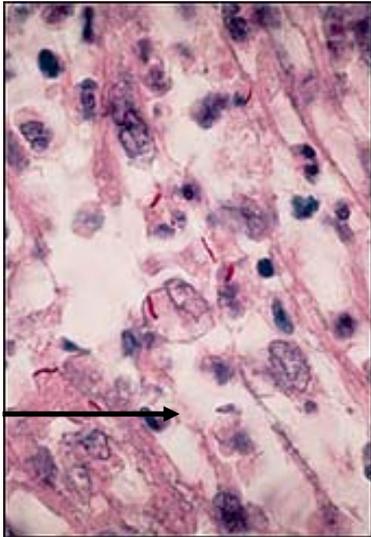


# DIAGNOSIS AND TESTING



- Sputum specimen collection
  - Obtain 3 specimens for smear examination and culture 8 – 24 hours apart
  - Persons unable to cough up sputum may need to have it induced
  - Always follow infection control precautions during specimen collection

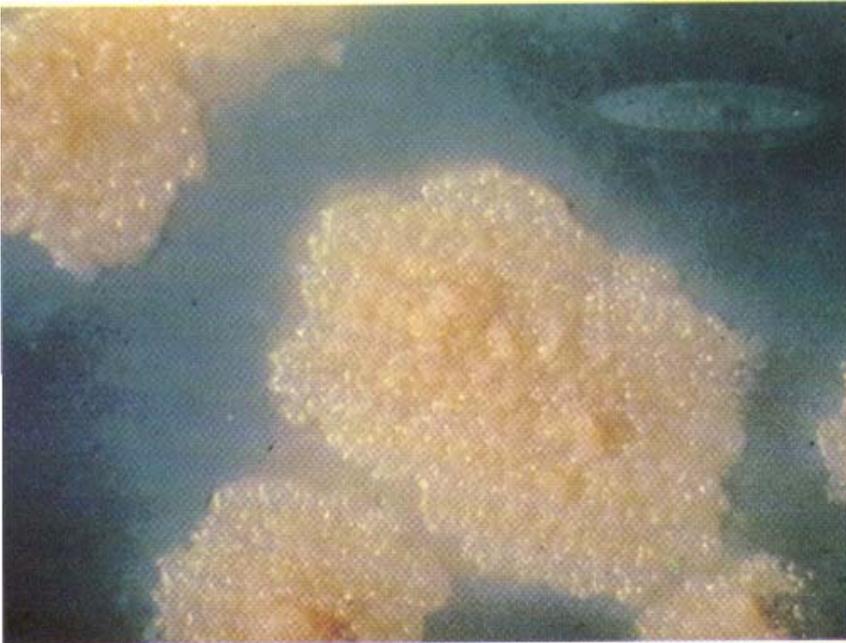
# DIAGNOSIS AND TESTING



- Strongly consider TB in patients with smears containing acid – fast bacilli (arrow shows AFB)
- A positive smear makes the presumptive diagnosis of TB

# DIAGNOSIS AND TESTING

- Culture
  - Used to confirm diagnosis of TB
  - Culture all specimens, even if smear is negative
  - Results take 4 – 14 days when liquid medium systems are used



# DIAGNOSIS AND TESTING

- Cultures are tested against various medications to see if the *M. tuberculosis* is susceptible to them or resistant to the medication
- Multidrug – Resistant TB (MDR TB) remains a serious public health problem
  - 45 states have reported at least one MDR TB case during the years 1993 - 1998

# DIAGNOSIS AND TESTING

- Other considerations
  - Measure liver functions, complete blood count (CBC)
  - Consider counseling and testing for HIV infection
  - Consider Hepatitis A, B , C serology testing and vaccinations, if applicable for Hepatitis A and B

# “TREATMENT” BEFORE ANTIBIOTIC MEDICATIONS

# “TREATMENT”

- Treatment of Active TB Disease – Before Antibiotics
  - The Greeks felt it was important to cut off cool air
  - The Romans felt that diet was the most important factor
  - The Hebrews used several treatments
    - Warm sea air
    - Milk for pregnant women
    - Seaweed placed under the pillow
    - Cold baths
    - Deep breathing

# “TREATMENT”

- The Touch of the King was considered a cure
  - King Edward I touched 533 sufferers in one month
  - King Charles II was said to have touched 92,102 subjects in his 25 - year reign



# “TREATMENT”

- The poet John Keats died of TB. He was treated with starvation diets and blood letting



# “TREATMENT”

- 1800’S
  - Rub bodies with fat as Butchers rarely got TB
  - Drink Boa constrictor excreta (1/2 teaspoon) mixed with a gallon of water
  - Drink a mixture of Indian Hemp, Quinine, Mercury, Cod Liver Oil and Beef Tea



# “TREATMENT”

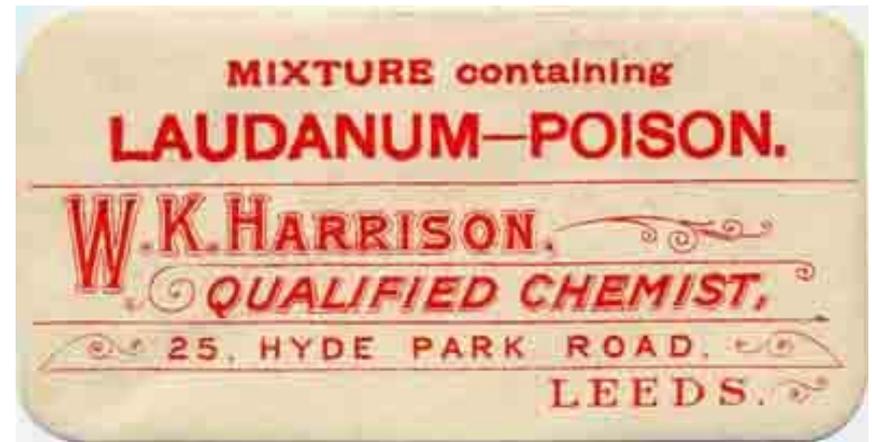
- Inhalations
  - Expand the bronchi with gases and the chemicals will kill the TB
    - Sulphur Hydrogen, Coal Gas, Iodine, Creosote, and Turpentine inhaled 4 times a day for 6 weeks

# “TREATMENT”

- Inhalations
  - Expand the bronchi with gases and the chemicals will kill the TB
    - Gas - filled rooms came into vogue
    - Gas passed into the rectum thought to go directly to the lung
    - Warm breath of a healthy beast (stallion, cow and sheep) thought to be curative

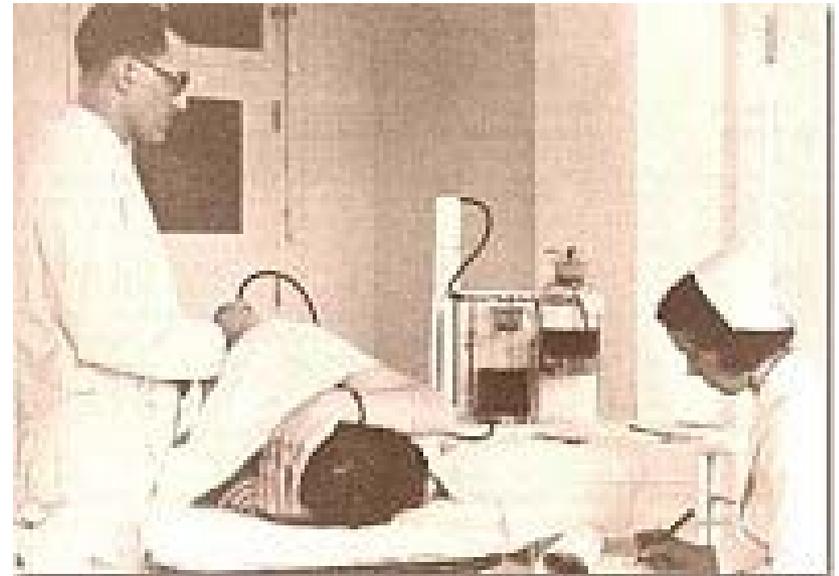
# “TREATMENT”

- Elixir of Laudanum was thought to be curative and opiate dependence was not thought to be a problem.



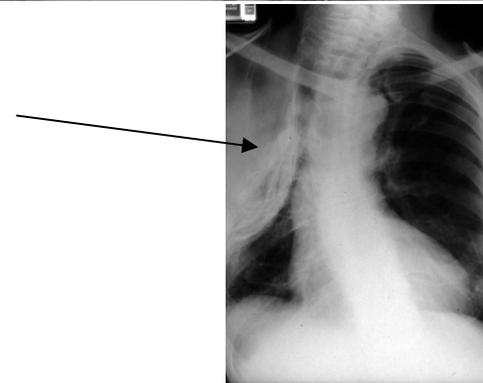
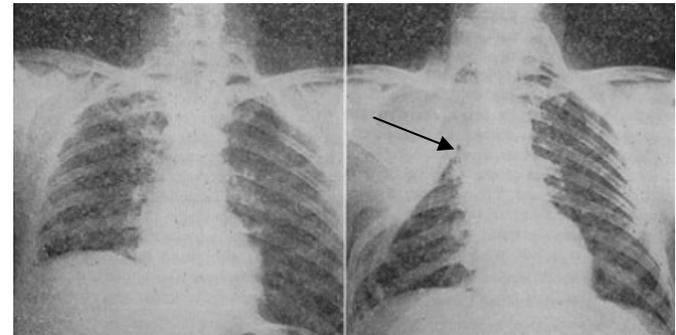
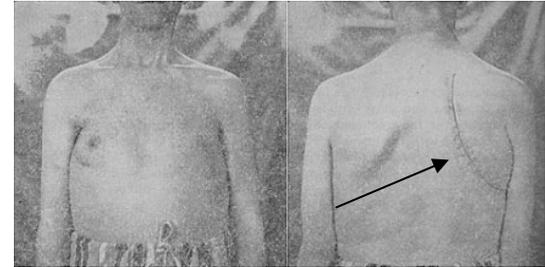
# TREATMENT

- Treatment of Active TB Disease – Before Antibiotics
  - Collapse Therapy
    - As seen here, air was let into the thoracic cavity = induced Pneumothorax



# TREATMENT

- Treatment of Active TB Disease – Before Antibiotics
  - Collapse Therapy
    - As seen here, surgery was performed to collapse the thorax, removal of 6 – 8 ribs = Thoracoplasty



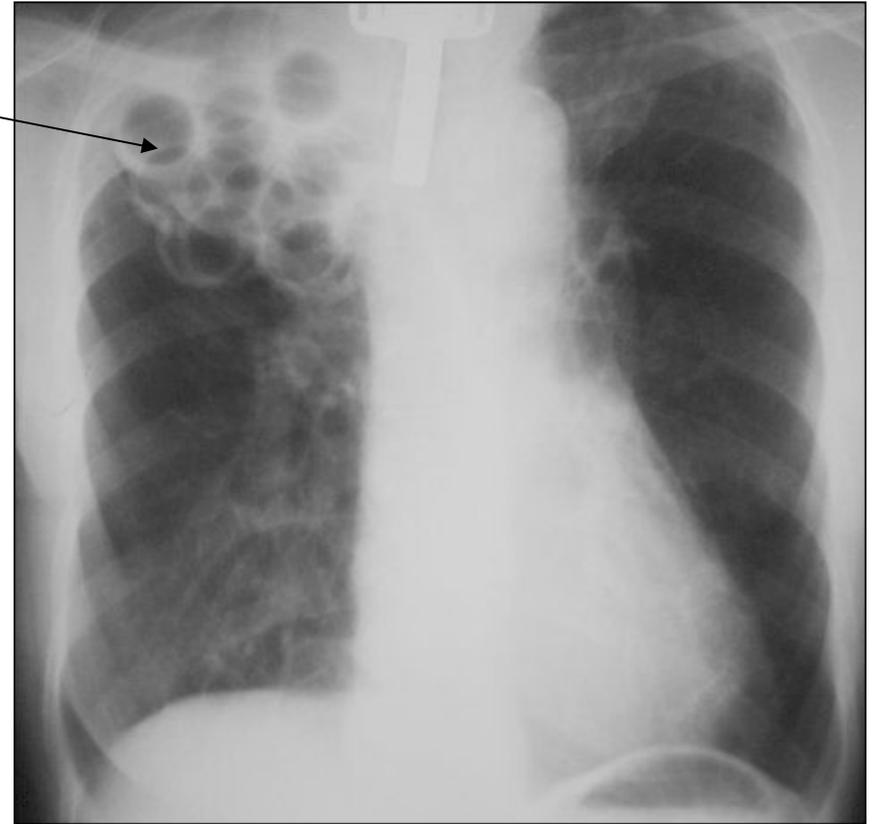
# TREATMENT

- Treatment of Active TB Disease – Before Antibiotics
  - Collapse Therapy
    - As seen here, surgery was performed to crush the phrenic nerve = Phrenicotomy



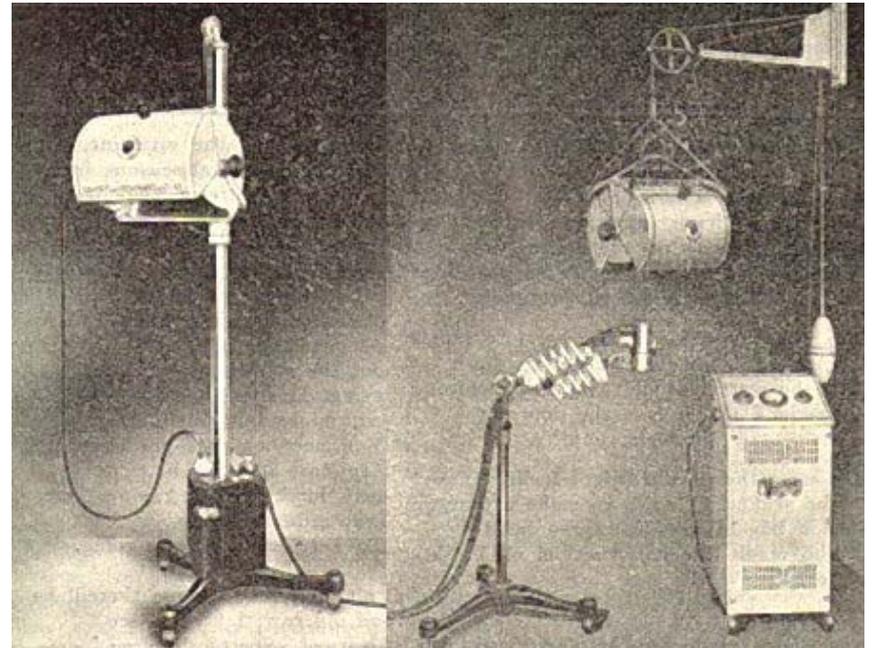
# TREATMENT

- Treatment of Active TB Disease – Before Antibiotics
  - Collapse Therapy
    - Surgery was performed where fat, soft paraffin wax, sponges, lucite spheres or as seen here, ping-pong balls were inserted into the thorax to collapse the area of the lung where TB was suspected to be = Plombage



# TREATMENT

- Treatment of Active TB Disease – Before Antibiotics
  - As seen here, sun lamps were used = Heliotherapy



# THE AGE OF ANTIBIOTICS

# TREATMENT

- Treatment can be broken down into:
  - Treatment of Latent TB
  - Treatment of Active TB

# TREATMENT

- Before starting treatment for Latent TB
  - Make sure patient does not have active TB
  - Determine the history of treatment in the past
  - Determine contraindications to treatment
  - Recommend HIV testing if risk factors are present
  - Establish rapport with the patient
    - Emphasize benefits of treatment
    - Emphasize the importance of adherence to the medication regimen
    - Inform the patient in regards to expected side effects of the regimen
      - For example, Rifampin (RIF) may lower the methadone level and a higher dose may be needed to prevent opiate withdrawal symptoms
    - Always establish a follow – up plan with the patient
    - Always test family members who live with the patient
  - Consider baseline liver function testing if the patient has a history of HIV infection, substance abuse (especially Alcohol), pregnant women, women who are in the immediate postpartum period and patients who have a history of chronic liver disease

# MEDICATIONS

- First - Line
  - Isoniazid (INH)
  - Rifampin (RIF)
  - Pyrazinamide (PZA)
  - Ethambutol (EMB)
  - Rifabutin\*
  - Rifapentine (RPT)
- Second – Line
  - Streptomycin (SM)
  - Cycloserine
  - p-Aminosalicylic Acid
  - Ethionamide
  - Amikacin
  - Capreomycin
  - Levofloxacin\*
  - Moxifloxacin\*
  - Gatifloxacin\*

\* Not approved by the U.S. Food and Drug Administration for use in the treatment of TB

# MEDICATIONS

- Role of New Medications
  - Rifabutin: for patients who are receiving medications having unacceptable interactions with rifampin, such as HIV/AIDS patients
  - Fluroquinolones (Levofloxacin, Moxifloxacin, Gatifloxacin): for patients who cannot tolerate first – line medications; have resistant strains to RIF, INH, or EMB; or have other resistant patterns with fluroquinolone susceptibility

# TREATMENT

- Treatment of Latent TB
  - Positive skin test results falling into the 5mm, 10mm or 15 mm categories
  - Use of INH
    - 9 month regimen is considered optimal treatment
    - Children should always receive 9 months of therapy
    - INH can be given twice a week if directly observed

# TREATMENT

- Treatment of Latent TB – SPECIAL CASES
  - Treatment with Rifamycin and PZA
    - HIV positive patients
      - Rifamycin and PZA daily for 2 months (can be given twice a week). Rifampin (RIF) cannot be given with some HIV medications (protease inhibitors and nonnucleoside reverse transcriptase inhibitors)
    - HIV negative patients
      - No clinical trials

# TREATMENT

- Treatment of Latent TB – SPECIAL CASES
  - Treatment of Contacts of INH – Resistant TB
    - Treat with rifamycin and PZA, if unable to tolerate PZA can use 4 month regimen of daily RIF
  - Treatment of Contacts of Multi – Resistant TB
    - Use 2 drugs which the infecting organism is susceptible to
    - Treat for 6 months or observe without treatment if contact is HIV negative
    - Treat HIV positive contact for 12 months
    - Follow for 2 years regardless of treatment plan

# TREATMENT

- Treatment of Latent TB – SPECIAL CASES
  - Treatment of patients with fibrotic lesions on CXR
    - 9 months of INH or
    - 2 months of RIF and PZA or
    - 4 months of RIF (with or without INH)
  - Treatment of patients who are Pregnant or Breast – feeding
    - INH daily or twice a week
    - Give Pyridoxine supplements
    - Breast – feeding is not contraindicated

# TREATMENT

- Monitor Treatment of Latent TB Monthly
  - Is the patient adhering to the medication regimen?
  - Is the patient showing signs and symptoms of active TB?
  - Is the patient showing signs and symptoms of hepatitis?

# TREATMENT

- With the advent of antibiotics starting in the 1950's basic principles of treatment include:
  - Provide the safest, most effective therapy in the shortest duration of time
  - Use multiple medications to which the bacilli are sensitive to
  - Never add a single medication to a regimen which is failing
  - Ensure adherence to the therapeutic regimen
    - Nonadherence is a major problem in TB treatment and control. Case management and Directly Observed Therapy (DOT) can be used to ensure patient compliance with the treatment and completion of the treatment

# TREATMENT

- Directly Observed Therapy
  - Health care worker watches patient swallow each dose of medication
  - Should be used with all non-daily medication regimens
  - Leads to reductions in relapse and resistance

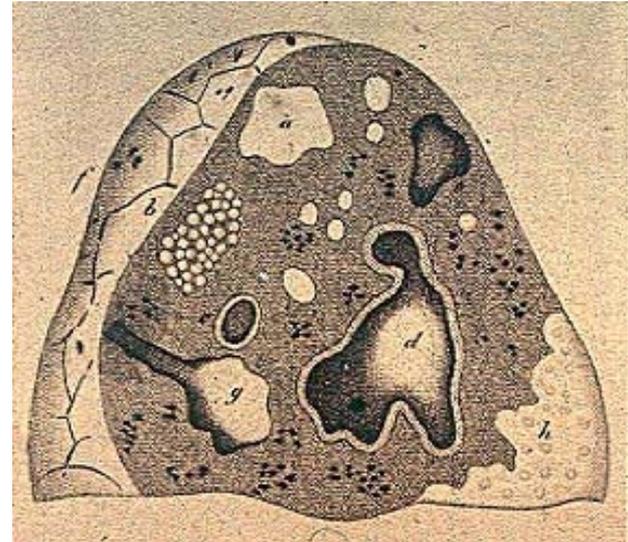


# TREATMENT

- Regimens for the Treatment of Active TB
  - Initial phase includes 4 medications for 2 months
    - INH, RIF, PZA, EMB or SM
  - Continuation phase options
    - 4 months – INH, RIF daily
    - 4 months – INH, RIF twice a week
    - 7 months – INH, RIF daily
    - 7 months – INH, RIF twice a week

# TREATMENT

- Treatment should be for 7 months if initial chest x-ray shows cavitary lesions and sputum specimen collected at end of initial phase is still culture positive for *M. tuberculosis*
  - Extended continuation phase decreased relapses from 20% to 3% in patients with silicosis and tuberculosis



Laennec's depiction of a lung with a cavity caused by tuberculosis

# TREATMENT

- Adverse Reactions
  - Patients should be instructed to immediately report any adverse reactions
  - Patients should be monitored at a minimum monthly

# COMMON ADVERSE REACTIONS TO TB MEDICATIONS

CAUSED BY	ADVERSE REACTION	SIGNS AND SYMPTOMS
Isoniazid	<ol style="list-style-type: none"> <li>1. Peripheral neuropathy</li> <li>2. Hepatitis</li> </ol>	<ol style="list-style-type: none"> <li>1. Tingling sensation in the hands and feet</li> <li>2. Abdominal pain, fatigue, nausea, vomiting, yellow skin, dark urine, elevated liver function tests</li> </ol>
Pyrazinamide	<ol style="list-style-type: none"> <li>1. Gastrointestinal intolerance</li> <li>2. Arthralgia</li> <li>3. Arthritis</li> <li>4. Hepatitis</li> </ol>	<ol style="list-style-type: none"> <li>1. Upset stomach, vomiting, lack of appetite</li> <li>2. Joint aches</li> <li>3. Gout (rare)</li> <li>4. See INH</li> </ol>
Streptomycin	<ol style="list-style-type: none"> <li>1. Ear damage</li> <li>2. Kidney damage</li> </ol>	<ol style="list-style-type: none"> <li>1. Balance problems, hearing loss, ringing in the ears</li> <li>2. Abnormal kidney function</li> </ol>
Ethambutol	<ol style="list-style-type: none"> <li>1. Eye damage</li> </ol>	<ol style="list-style-type: none"> <li>1. Blurred or changed vision; changed color vision</li> </ol>
Rifampin	<ol style="list-style-type: none"> <li>1. Hepatitis</li> <li>2. GI intolerance</li> </ol>	<ol style="list-style-type: none"> <li>1. See INH</li> <li>2. Upset stomach</li> </ol>
Any medication	<ol style="list-style-type: none"> <li>1. Allergy</li> </ol>	<ol style="list-style-type: none"> <li>1. Skin rash</li> </ol>

# TREATMENT

- Drug interactions
  - Antituberculosis medications sometimes change concentrations of other medications
    - Rifamycins can decrease many of the HIV protease inhibitors
    - Rifampin can decrease methadone levels
    - Isoniazid increases concentrations of some drugs
      - Dilantin

# TREATMENT

- Monitoring of the patient during treatment
  - Monthly sputum for acid fast bacilli (AFB) smear and culture until 2 consecutive monthly cultures are negative
  - Serial sputum smears every 2 weeks to assess early response
  - Additional medication susceptibility testing if cultures are still positive after 3 months of treatment
  - Assess adherence at every visit (minimum is monthly)
  - Repeat Chest X – Ray
    - At completion of initial treatment phase if cultures are negative
    - At end of treatment for patients with negative cultures
  - Visual acuity and color vision testing monthly if on Ethambutol for 2 or more months and/or if dose is greater than 15 – 20 mg/kg

# TREATMENT

- Completion is defined by the number of doses ingested within the specified time frame
- If there are interruptions in the initial treatment phase:
  - If lapse greater than 14 days, restart from beginning
  - If lapse less than 14 days, continue treatment

# TREATMENT

- If interruptions in the continuation phase, it is considered complete if:
  - Greater than 80% of the total dose has been taken and if sputum is negative

# RELAPSE

- If a patient's cultures were negative and he/she completed treatment, but the culture became positive again, this is considered a RELAPSE
  - Most occur in the first 12 months after completion of therapy
  - These patients are at increased risk to develop acquired medication resistance

# TREATMENT FAILURE

- Defined as positive cultures after 4 months of treatment when ingestion of medication was ensured
  - Never should a single medication be added to a failed regimen
  - Add at least 3 new medications



# SPECIAL POPULATIONS

# SUBSTANCE USERS

- Patients who use alcohol and especially those who are intravenous drug users, appear to have an increased incidence of reactivation TB. The reason for this is unclear.

# SUBSTANCE USERS

- Drinking alcoholic beverages while taking anti – TB medications, especially INH, can be dangerous.

# PATIENTS WITH LIVER DISEASE

- Most consider regimens with the least hepatotoxic medications
  - If using regimens with no potentially hepatotoxic medications, it should last for 18 – 24 months.

# HIV/AIDS

- Treatment for the HIV – positive patient is very similar to that of the negative patient.
- Patients with HIV/AIDS have a high prevalence of extrapulmonary disease
  - 60 – 80% in the HIV positive patient vs. less than 18% in the normal adult population

# HIV/AIDS

- A Rifamycin - based regimen should be used if possible for the entire course of treatment
- Care for this patient should include a team approach with HIV and TB experts.

# CHILDREN AND ADOLESCENTS

- Use directly observed therapy (DOT)
- Children under 5 should be treated with 3 drugs in the initial phase ( INH,RIF, PZA)
- Ethambutol is not recommended in this age category
- Treatment should last 6 months if there are no risk factors indicating the possibility of relapse

# EXTRAPULMONARY TB

- Treatment can be the same as for pulmonary TB but treatment duration is being evaluated
  - 9 month regimens appear effective if they include INH and RIF
- Corticosteroids may be used in patients with TB meningitis and pericarditis (inflammation of the sac around the heart)

# PREGNANCY AND BREASTFEEDING

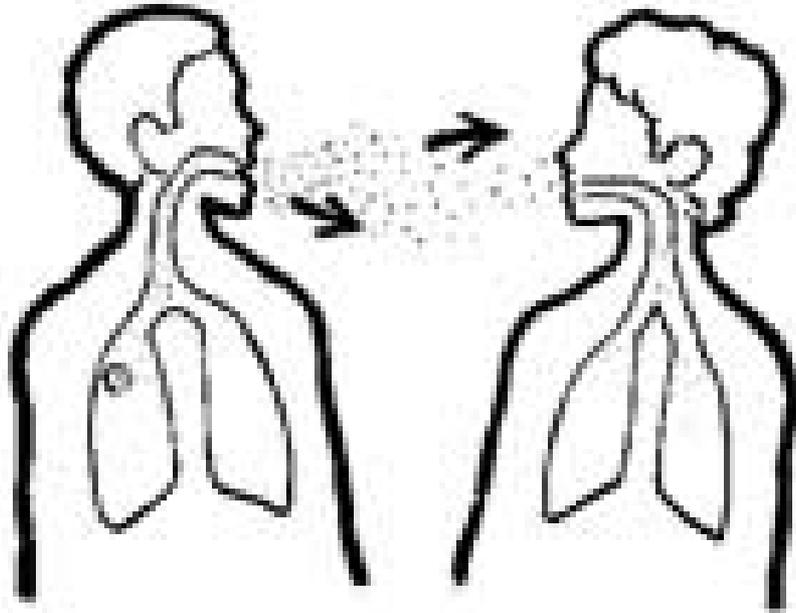
- Untreated TB has a greater chance of adverse risks than treated TB
- Treatment should include INH, RIF, and EMB initially
- **SM and PZA should not be used**

# PATIENTS WITH A BCG VACCINATION HISTORY

- BCG is a vaccine given to protect people from getting TB and was named after the French scientists Calmette and Guerin.
- BCG is not widely used in the US, but is used in other countries
- If a patient was vaccinated with BCG, he/she may have a positive reaction to the TB skin test. The reaction may be due to the BCG vaccination or more commonly that latent TB is present. A TB expert should be consulted.

# MULTIDRUG – RESISTANT TB PATIENTS

- Difficult to treat
- Treatment must be individualized
- Always use expert consultation
- Always use directly observed therapy



INFECTION  
CONTROL  
IN  
THE  
HEALTH  
CARE  
SETTING

# HEALTH CARE CONSIDERATIONS

- Consider the patient infectious if:
  - They are coughing
  - Have sputum positive smears and are not getting anti – TB medications
  - Have just started treatment
  - When in doubt, play it safe – use precautions

Remember, the patient who is on adequate therapy, had clinical improvement and has 3 consecutive negative sputum smears should be considered no longer infectious.

# AOD PROGRAMS

- AOD Programs should:
  - Be sure to detect, isolate and treat patients and applicants with active TB
  - Take care not to discriminate against those with TB who are not infectious
  - Use intake questionnaires that focus on the signs and symptoms of TB and on past TB infections

# AOD PROGRAMS

- AOD Programs should:
  - Provide purified protein derivative (PPD) skin testing for all high risk patients
    - Persons with HIV infection
    - Close contacts of persons with infectious TB
    - Patients with chronic diseases such as diabetes and silicosis
    - Persons who inject drugs
    - Recent immigrants from areas where TB is common
    - Those that are medically underserved
    - Residents of long – term care facilities
    - The homeless

# AOD PROGRAMS

- AOD Programs should:
  - Ensure that applicants and patients with positive PPD's receive proper medical evaluations
  - Report suspected and confirmed cases of active TB to their local and state public health offices
  - Remove or isolate patients with active TB
  - Keep careful records of patients and staff in regards to PPD results, X-ray's, evaluations, etc.

(TIPS #18 "The TB Epidemic")

# REFERENCES

- TIPS # 18 – The TB Epidemic
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- [www.health.state.ny.us](http://www.health.state.ny.us)
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