TB 2016
Everything Old is New Again

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Agenda

• Allen County Cases
• Review Tuberculosis Basics
• TB bone and joint
• Renal TB
• GU TB
Tuberculosis in Allen County

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TB Stats 2012-2016

TB in Allen County Cases

- 2012: 16 cases
- 2013: 8 cases
- 2014: 8 cases
- 2015: 6 cases
- 2016 (YTD): 20 cases
2016 Case Snapshot

- Case Classification:
  - Pulmonary: 11 cases
  - Extra-pulmonary: 1 case (spine)
  - Clinical: 8 cases
- Gender: 10 male, 10 female
- Age range: 11 months - 68 years old
# 2016 Case Snapshot

<table>
<thead>
<tr>
<th>Country of Birth</th>
<th># of Cases</th>
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<tbody>
<tr>
<td>Burma</td>
<td>8</td>
</tr>
<tr>
<td>America</td>
<td>4</td>
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<tr>
<td>Philippines</td>
<td>4</td>
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<tr>
<td>Yemen</td>
<td>1</td>
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<td>Pakistan</td>
<td>1</td>
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<tr>
<td>Bosnia</td>
<td>1</td>
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<td>Mexico</td>
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Total # of Contacts Tested

# of people tested by DOH: 675
# of interjurisdictional transfers: 18
# of healthcare workers tested at hospitals: 471

=1,164 contacts tested
At the end of this talk, you should be able to ...

• Understand who is at risk for TB
• Diagnose latent and active TB
• Know the clinical manifestations of EP TB
• Manage EP TB including basic medical treatment
Tuberculosis Basics
History of Tuberculosis

- 1884: First TB sanatorium is established in the United States
- 1865: Jean-Antoine Villemin proves that TB is contagious
- 1882: Robert Koch discovers *M. tuberculosis*, the bacteria that causes TB
- 1943: Streptomycin, a drug used to treat TB, is discovered
- 1943-1952: Two more drugs are discovered to treat TB
- By the mid-1970s, most TB sanatoriums in the United States had closed
TB Pathogenesis

- *Mycobacterium tuberculosis* bacilli are inhaled through the lungs to the alveoli, where they are phagocytosed by PMNs and macrophages.
- Most bacilli are initially contained, however some are carried to the region's lymph nodes.
- Eventually, the thoracic duct may deliver mycobacteria to the venous blood; this may result in seeding of different organs.
  - In addition, multiple granuloma form at the site of metastatic foci.

TB 101

- Primary tuberculosis: seen as an initial infection, usually in children.
  - The initial focus of infection is a small subpleural granuloma called a Ghon focus accompanied by granulomatous hilar lymph node infection.
  - Together, these make up the Ghon complex.
  - In nearly all cases, these granulomas resolve and there is no further spread of the infection.
TB 101

• Secondary tuberculosis: seen mostly in adults as a reactivation of previous infection (or reinfection), particularly when health status declines.

• The granulomatous inflammation is much more florid and widespread. Typically, the upper lung lobes are most affected, and cavitation can occur.
TB Infection vs. TB Disease

You can have small numbers of bacteria in your body (called TB infection or latent TB)

or

You can have a large number of TB bacteria in your body (called TB disease or active TB)
<table>
<thead>
<tr>
<th></th>
<th>Infection</th>
<th>Active</th>
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</thead>
<tbody>
<tr>
<td>Contagious</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Symptoms</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Positive TST or IGRA</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Abnormal x-ray</td>
<td>No</td>
<td>Maybe</td>
</tr>
</tbody>
</table>
Clinical Course

Most cases of active TB are the result of developing TB much later after the exposure (People with latent TB infection)

Risk is based on how well your immune system works

- Average person: 10%
- Patient with CRF: 30%
- Patient with HIV: 100%
Special Populations
Prevalence of Active TB in Foreign Born

• The rate among foreign-born persons in the United States in 2014 was 13.4 times higher than among U.S.-born persons.

• Asians continue to be the racial/ethnic group with the largest number of TB cases.

• Compared with non-Hispanic whites, the TB rate among Asians was 28.5 times higher, whereas rates among non-Hispanic blacks and Hispanics were each eight times higher.

https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6410a2.htm#Fig1
Prevalence of Active TB in Foreign Born

55.3% of foreign-born persons with TB originated from five countries:
• Mexico (1,268 TB cases [20.6%])
• The Philippines (745 [12.1%])
• Vietnam (498 [8.1%])
• India (472 [7.7%])
• China (420 [6.8%])

https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6410a2.htm#Fig1
Diagnosis of TB
Risk Factors for TB – Recently Infected

- Close contacts of a person with infectious TB disease
- Persons from areas of the world with high rates of TB
- Children less than 5 years of age who have a positive TB test
- Groups with high rates of TB transmission, such as homeless persons, injection drug users, and persons with HIV infection
- Persons who work or reside with people who are at high risk for TB in facilities or institutions such as hospitals, homeless shelters, correctional facilities, nursing homes, and residential homes for those with HIV
Risk Factors – Weaken Immune System

- HIV infection
- Substance abuse
- Silicosis
- Diabetes mellitus
- Severe kidney disease
- Low body weight
- Head and neck cancer
- Medical treatments such as corticosteroids or organ transplant
- Specialized treatment for rheumatoid arthritis or Crohn’s disease
TB Symptoms

- Unexplained weight loss
- Loss of appetite
- Night sweats
- Fever
- Fatigue
- Coughing for longer than 3 weeks
- Hemoptysis
- Chest pain
TB Assessment – Medical Hx

- Ask about the patient’s history of TB exposure, infection, or disease
- Consider demographic factors (e.g., country of origin, age, ethnic or racial group, occupation) that may increase the patient’s risk for exposure to TB
- Determine whether the patient has medical conditions, especially HIV infection, that increase the risk of latent TB infection progressing to TB disease.
  - Biologics
  - Cancer
TB Assessment – Test for TB Infection

- The TST or the TB blood test can be used to test for *M. tuberculosis* infection.
- The test is read within 48 to 72 hours by a trained health care worker, who looks for a reaction (induration) on the arm (Not redness)
TB Assessment – Radiographs

• A posterior-anterior chest radiograph is used to detect chest abnormalities.
• Lesions may appear anywhere in the lungs and may differ in size, shape, density, and cavitation.
• These abnormalities may suggest TB, but cannot be used to definitively diagnose TB.
• A chest radiograph may be used to rule out active pulmonary TB in a person who has had a positive reaction to a TST or TB blood test and no symptoms of disease.
TB Assessment – Microbiology

• The sputum for AFB smear and culture, obtained 8 hours apart (first sputum of day best)

• The presence of acid-fast-bacilli (AFB) on a sputum smear or other specimen often indicates TB disease.

• Acid-fast microscopy is easy and quick, but it does not confirm a diagnosis of TB because some acid-fast-bacilli are not *M. tuberculosis*. 
TB Assessment – Microbiology

• A **culture** is done on all initial samples to confirm the diagnosis. (However, a positive culture is not always necessary to begin or continue treatment for TB.)

• A positive culture for *M. tuberculosis* confirms the diagnosis of TB disease.
Latent TB

- Positive TST or IGRA
- No symptoms
- Normal exam
- Normal Chest X-ray
Treatment of Latent TB

- INH times 9 months
- Rifampin times 4 months (6 months children)
- INH/Priftin q week times 12 weeks DOPT
Active TB

- May or may not have positive TST or IGRA
- Symptoms
- Positive culture
  - High risk, symptoms, TST or IGRA – culture neg/clinical case
- Treatment (RIPE)
  - Rifampin
  - INH
  - Pyrazinamide
  - Ethambutol
Extrapulmonary TB
Prevalence of Extrapulmonary TB

In 2014

- 68.9% were pulmonary TB (PTB)
- 20.6% were EP TB
  - lymphatic (38%)
  - pleural (16%)
  - bone and/or joint (10%)
  - genitourinary (5%)
  - meningeal (5%)
  - peritoneal (6%)
  - Unknown (20%)

EP TB and Special Populations

• Extrapulmonary involvement can be seen in more than 50 percent of patients with concurrent AIDS and tuberculosis
• The risk increases with advancing immunosuppression
• Children have a higher predisposition
Pathophysiology

- At the time primary TB infection, may have blood or lymphatic spread of tubercle bacilli to parts of the body outside the lung.
- In the fully immunocompetent patient these bacteria are probably destroyed. However, if some immune deficit is present some may concentrate at a particular site where they may lie dormant for months or years before causing disease.
Pathophysiology

• Bacteria may also be coughed from the lungs and swallowed.
• By this route they may enter the lymph nodes of the neck or parts of the gastro-intestinal (GI) tract.
Main sites of Extrapulmonary tuberculosis

- Central nervous system
  - Meningitis

- Lymphatics
  - Scrofula (of the neck)

- Pleura
  - Tuberculosis pleurisy

- Disseminated
  - Miliary tuberculosis

- Bones and joints of spine
  - Pott's disease

- Genitourinary
  - Urogenital tuberculosis
Clinical Clues to EP TB

- **Ascites** with lymphocyte predominance and negative bacterial cultures
- **Chronic lymphadenopathy** (especially cervical)
- **CSF lymphocytic pleocytosis** with elevated protein and low glucose
- **Exudative pleural effusion** with lymphocyte predominance, negative bacterial cultures, and pleural thickening
Clinical Clues to EP TB

- HIV infection
- Joint inflammation (monoarticular) with negative bacterial cultures
- Persistent sterile pyuria
- Tuberculosis-endemic country of origin
- Unexplained pericardial effusion, constrictive pericarditis, or pericardial calcification
- Vertebral osteomyelitis involving the thoracic spine
Central Nervous System
CNS TB

- CNS tuberculosis accounts for about one percent of all cases of TB and **six percent** of all extrapulmonary infections in immunocompetent individuals.

- The case fatality ratio remains relatively high at 15 to 40 percent despite effective treatment regimens.
Two major forms of CNS tuberculosis include:
- meningitis which accounts for 0.5-1% of tuberculous disease
- intra-cranial tuberculomas which on a global level account for up to 40% of ‘brain tumors
CNS TB

• Bacilli in the meninges or brain parenchyma, resulting in the formation of small foci of metastatic caseous lesions, termed Rich foci, which increase in size until it ruptures into the subarachnoid space.

• The location of the expanding tubercle (i.e., Rich focus) determines the type of CNS involvement.

• Tubercles rupturing into the subarachnoid space cause meningitis
Meningeal TB Symptoms

- Initially presents with fatigue, malaise, intermittent headaches and low-grade fever.
- Progresses over a few weeks to cause headaches, altered mental state and vomiting, and then to focal neurological signs.
- TB meningitis may present with sudden severe meningitis progressing rapidly to coma and death.
- The duration of presenting symptoms may vary from 1 day to 9 months.
Diagnosis of CNS TB

• Magnetic resonance imaging (MRI) with gadolinium enhancement is the preferred method of initial investigation.

• MRI is superior to computed tomography (CT) scanning in detecting parenchymal abnormalities, such as tuberculomas, abscesses, and infarctions.
  • MRI also readily depicts hydrocephalus.
Diagnosis of CNS TB

• Cerebrospinal fluid (CSF) analysis is usually used to detect:
  – decreased glucose level
  – elevated protein levels
  – slight pleocytosis
  – TB meningitis culture – 52- 87% (87% from 4 lumbar punctures)
  – Results of CSF polymerase chain reaction (PCR) assays may be diagnostic
CNS TB Treatment

• Empiric antituberculous therapy should be started immediately in any patient with meningitis syndrome and cerebrospinal fluid (CSF) findings of low glucose concentration, elevated protein, and lymphocytic pleocytosis, if there is evidence of TB elsewhere in the body or if prompt evaluation fails to establish an alternative diagnosis.
CNS TB Treatment

- The benefits of adjuvant corticosteroids remain in doubt: their use in adults is controversial, though they may be indicated in the presence of increased ICP, altered consciousness, focal neurological findings, spinal block, and tuberculous encephalopathy.
TB Meningitis Case

• 22 year old AA male contact to active case
• Converted his TST when tested as part of investigation
• Refused treatment
• Two years later developed symptoms of meningitis -- MRI revealed tuberculoma
  • Became progressively paralyzed which progressed to vegetative state
  • Died two years later
TB Lymphadenitis

- Tuberculous lymphadenitis is among the most frequent presentations of extrapulmonary tuberculosis
- Cervical lymph nodes providing the site of infection in two thirds of cases.
- It has been postulated that cervical tuberculous lymphadenitis occurs as a result of reactivation of TB infection involving the tonsils, adenoids, and Waldeyer's ring, leading to cervical lymphadenopathy

https://www.uptodate.com/contents/tuberculous-lymphadenitis
Lymphatic TB - Agents

• Approximately 95% of adult scrofula cases are caused by mycobacterium tuberculosis, while the remaining 5% are caused by NTM.
• In children, this statistic is reversed, with NTM responsible for up to 92% of scrofula cases.
• In developed countries, most cases of tuberculous lymphadenitis occur among adult immigrants from tuberculosis (TB)-endemic countries.
• It has a peak age of onset of 20 to 40 years.
TB Lymphadenitis Symptoms

• Systemic symptoms include fever/chills, weight loss, or malaise in 43% of patients
• Patients report a painless, enlarging, or persistent mass
• Enlarging nodes may compress the esophagus, causing dysphagia
TB Lymphadenitis Symptoms

• Any cervical node, although anterior cervical chain is more common
• Unilateral most common
  – Bilateral nodes in one third of patients
• Firm rubbery node becoming more firm and matted as disease progresses
• Infrequently, fluctuant with draining fistula
• Multiple masses in two thirds of patients
TB Lymphadenitis Diagnosis

• Both CT and MRI can accurately depict sites, pattern, and extent of disease, but they also have limitations and findings are nonspecific.

• Tuberculosis-infected nodes are frequently mistaken for metastatic carcinoma.

• 10 to 24% of patients with TB lymphadenitis will have an abnormal chest x-ray.
TB Lymphadenitis Diagnosis

• TB Skin Test or IGRA
  – Generally, more than 85% of patients have a positive test of greater than 10 mm of induration.
  – Remember there is PPD cross-reactivity between TB and some NTM antigens
TB Lymphadenitis Diagnosis

• Excisional biopsy of the lymph nodes with histology, AFB stain, and mycobacterial culture is the diagnostic procedure of choice.

• Cultures take 4-6 weeks for growth; PCR techniques can expedite diagnosis.

• Biopsies are potentially hazardous because they may spread the disease and give rise to sinus formation.
TB Lymphadenitis Treatment

- The current standard drug regimen for sensitive M. tuberculosis consists of isoniazid, rifampin, pyrazinamide, and ethambutol. for the first 2 months, followed by isoniazid and rifampin for a total of 6 - 12 months.

- Surgical intervention is reserved for complications such as abscess formation and draining sinuses.
Pleural TB
Pleural TB

- Tuberculous pleuritis may occur in 5% - 10% of people who have the lung disease from tuberculosis.
- The pleural disease occurs from the rupture of a diseased area into the pleural space, the space between the lung and the lining of the abdominal cavity.
- Nonproductive cough, chest pain, and fever.
- The disease may go away and then come back at a later date.
Pleural TB - Diagnosis

- Chest X-Ray findings include:
  - small to moderate, unilateral pleural effusion (r>l)
  - about 20 percent of patients have associated pulmonary lesions

- Chest CT findings include:
  - pleural thickening
  - lymphadenopathy
  - pulmonary infiltrates
  - cavitation

Pleural TB - Diagnosis

• Pleural fluid analysis reveals
  – Exudative fluid with a lymphocyte predominance (i.e., more than 50 percent of white blood cells in more than 90 percent of effusions)
  • Although in patients with less than two weeks of symptoms, an initial predominance of neutrophils may be seen.
  – Pleural fluid glucose and pH can be low or normal.

Pleural TB - Diagnosis

• TB pleural effusions result from a hypersensitivity reaction to the *Mycobacterium* rather than from microbial invasion of the pleura.

• Acid-fast bacillus stains of pleural fluid are rarely diagnostic (< 10% of cases), and pleural fluid cultures grow *Mycobacterium tuberculosis* in less than 65% of cases.

• The combination of histology and culture of pleural tissue obtained by pleural biopsy increases the diagnostic yield to 90%.

Pleural TB - Diagnosis

• **Adenosine deaminase (ADA)** activity of greater than 43 U/mL in pleural fluid supports the diagnosis of TB pleuritis
  
  – However, the test has a sensitivity of only 78%; therefore, pleural ADA values less than 43-50 U/mL do not exclude the diagnosis of TB pleuritis

• In one study, a high level of adenosine deaminase (greater than 47 U per L [783 nkat per L]) was seen in 99 percent of tuberculous effusions.
  
  – In countries with a low prevalence of tuberculosis, such as the United States, a normal or low level of pleural fluid adenosine deaminase has a high negative predictive value and can be used to exclude tuberculous pleurisy

Pleural TB - Diagnosis

- Pleural fluid PCR for *M. tuberculosis* has a sensitivity of 80 percent and a specificity of 100 percent.
- Tuberculin skin test results are positive in two thirds of patients.

Pleural TB - Diagnosis

• Suspect TB pleuritis in patients with:
  – A history of exposure to TB
  – A positive TB skin test or IGRA
  – Patients with lymphocytic exudative effusions, especially if less than 5% mesothelial cells are detected on differential blood cell counts.

Pleural TB - Treatment

• Standard regimen
• Pleural effusion will usually resolve in 12 weeks
• The effusion may resolve without therapy, but tuberculosis later recurs
Bone and Joint TB
Skeletal TB

• Bone and joint tuberculosis may account for up to 35 percent of cases of extrapulmonary tuberculosis.

• The most common form of skeletal TB is Pott’s disease, a disease of the spine; this entity comprises approximately half of musculoskeletal TB cases.
  • thoracolumbar spine is most common site of involvement (50% of patients)

• The next most common form of musculoskeletal TB is tuberculous arthritis, followed in frequency by extraspinal tuberculous osteomyelitis
  – Tends to occur in the hip or the knee; usually, it is monoarticular.

https://www.uptodate.com/contents/skeletal-tuberculosis?source=search_result&search=skeletal%20tuberculosis&selectedTitle=1~11

http://www.wheelessonline.com/ortho/tuberculous_spondylitis
Spinal TB

- Constitutional symptoms, fever, and weight loss occur in only about 30 percent of cases
- Symptoms patients present with include:
  - Local pain
  - Fever, night sweats and weight loss
  - Paraplegia secondary to cord compression
Spinal TB - Diagnosis

• More than 50% of bone has to be destroyed before a lesion can be seen on X-ray.
• This process takes approximately six months.
• The classic roentgen triad in spinal tuberculosis is primary vertebral lesion, disc space narrowing and paravertebral abscess
• Need microscopy and culture of infected material.
• Tissue may be obtained by needle aspiration and/or biopsy.
Before and after contrast. The abscess and subsequent destruction of the T11-T12 disc interspace is marked with arrowheads.
Joint TB

• TB arthritis also occurs in weight-bearing joints and extraspinal tuberculous osteomyelitis

• 70% of musculoskeletal tuberculosis occurs in the spine, hips, or knees

• Articular tuberculosis is usually a slowly progressive mono-arthritis

• Clinical course is indolent with the following symptoms
  – Pain
  – Joint swelling
  – Decreased range of motion
Joint TB

• Draining sinuses and abscesses can be seen in chronic cases.
• Systemic symptoms usually are absent.
• Radiographic changes are nonspecific and include:
  – soft tissue swelling
  – juxta-articular osteopenia
  – joint space narrowing
  – subchondral erosions
Diagnosis

• Chest radiography shows pulmonary disease in one half of patients with osteoarticular tuberculosis, but active pulmonary disease is uncommon.

• MRI may be helpful to assess the degree of bony destruction and to identify soft tissue extension and encroachment on adjacent structures such as the spinal cord.

• Bone scan is unreliable for diagnosis of active TB (cold scans in up to 35-40%)
Joint TB - Diagnosis

- Arthrocentesis with mycobacterial cultures of synovial fluid yields positive results in up to 80 percent of patients with tuberculous arthritis.
- Synovial biopsy also may be diagnostic (caseating granulomas on histology or positive mycobacterial culture)
- **Bone biopsy** for culture and histology is required for diagnosis of tuberculous osteomyelitis.
Skeletal TB - Treatment

- Standard regimen of four drug initial phase and two drug continuation phase
- Duration of 6 to 12 months
- Surgery may be necessary to drain abscesses, debride infected tissue, or stabilize the spine and relieve spinal cord compression
Genitourinary TB
Prevalence of Genitourinary TB

• Genitourinary TB (GUTB) comprises approximately 6% of the extrapulmonary cases.
• GUTB comprises approximately 15-20% of extrapulmonary cases of TB in developing countries
• More common in men

http://emedicine.medscape.com/article/450651-overview#aw2aab6b4
Symptoms of Genitourinary TB

• The onset of genitourinary TB is usually insidious, presenting with malaise and lower urinary tract symptoms.

• GUTB often manifests as repeated urinary tract infections that do not respond to the usual antibiotics.

• Systemic symptoms (fever, weight loss) are relatively rare.

Genitourinary (GU) TB - Male

• Male genital tuberculosis usually is associated with renal tuberculosis.

• It involves the
  – Prostate
  – Seminal vesicles
  – Epididymis
  – Testes

• Patients usually present with a scrotal mass and diagnosis is made by surgery
Genitourinary (GU) TB - Female

- Female genital tuberculosis begins in the endosalpinx and can spread to the peritoneum, endometrium, ovaries, cervix, and vagina.
- Patients present with pelvic pain, infertility, and vaginal bleeding.
Genitourinary (GU) TB - Labs

- The hallmark of GUTB is sterile pyuria
- Up to 20% of patients develop a secondary coliform infection
- Gross hematuria occurs in 10% of cases and is usually total and painless
- 50% will have microscopic hematuria
Genitourinary (GU) TB - Labs

- TST is positive in about 90% of patients
- Serial early-morning urine cultures (at least 3) for acid-fast bacilli (AFB) are still considered the criterion standard for evidence of active tubercular (TB) disease, with a sensitivity of 65% and a specificity of 100%.
- Radiographic studies show both upper and lower urinary tract involvement in the form of calcifications, calyceal distortion, and infundibular and ureteral strictures strongly suggests the presence of genitourinary TB.

https://www.uptodate.com/contents/renal-disease-in-tuberculosis?source=search_result&search=urinary%20tuberculosis&selectedTitle=1~150#H4926588
Genitourinary (GU) TB - Labs

• The yield of biopsy for TB is about 45%.
  – Acid-fast bacilli (AFB) may be detected on FNA smears in up to 60% of these patients.

• PCR has been proven highly sensitive and specific

Lobar calcification in a large destroyed right kidney in a patient with renal tuberculosis. Note the involvement of the right ureter.
Miliary
Miliary TB

- Miliary tuberculosis (TB) is the widespread dissemination of Mycobacterium tuberculosis via hematogenous spread.
- Classic miliary TB is defined as millet like seeding of TB bacilli in the lung, as evidenced on chest radiography.
- Seen in 1-3% of all TB cases
Miliary TB

• Miliary TB may occur in an individual organ (very rare, < 5%), in several organs, or throughout the entire body (>90%), including the brain.

• The infection is characterized by a large amount of TB bacilli, although it may easily be missed and is fatal if left untreated.

• Up to 25% of patients with miliary TB may have meningeal involvement. In addition, miliary TB may mimic many diseases.

• In some case series, up to 50% of cases are undiagnosed antemortem.

Miliary TB – Risk Factors

• Cancer
• Transplantation
• HIV infection
• Malnutrition
• Diabetes
• Silicosis
• End-stage renal disease
• Major surgical procedures - Occasionally may trigger dissemination

Miliary TB – Symptoms

- Weakness, fatigue (90%)
- Weight loss (80%)
- Headache (10%)
- Low-grade fever (20%)
- Fever (80%)
- Cough (60%)
- Generalized lymphadenopathy (40%)
- Hepatomegaly (40%)
- Splenomegaly (15%)
- Pancreatitis (< 5%)
- Multiorgan dysfunction, adrenal insufficiency

Miliary TB – Labs

- The sedimentation rate is elevated in approximately 50% of patients.
- In approximately 30% of cases, alkaline phosphatase levels are elevated.
- The TST is often negative.
- PCR is positive in most cases of HIV-related disseminated TB; the yield is low in non-HIV miliary TB.

Miliary TB – Labs

- Culture sputum, blood, urine, or cerebral spinal fluid.
- Negative sputum smear results (even 3 negatives) do not exclude the possibility of TB.
- For mycobacterial blood cultures, findings are positive in approximately 5% of patients who do not have HIV infection.
  - Findings are positive in many patients who have HIV infection. (85% positivity rate)

Miliary TB – Labs

- Lumbar puncture should be strongly considered, even with normal brain MRI findings, and may reveal any of the following:
  - Leukocytes: Approximately 65% of patients have WBC counts with 100-500 mononuclear cells/μL
  - Lymphocytic predominance (70%)
  - CSF lactic acid levels are mildly elevated.
  - Elevated protein levels (90%)
  - Low glucose levels (90%)
  - RBCs are common
  - Acid-fast bacilli (≥40% with serial spinal taps)

Miliary TB – Radiology

• Findings are typical in 50% of cases
• Chest CT scanning has higher sensitivity and specificity than chest radiography in displaying well-defined randomly distributed nodules

Miliary TB – Treatment

• If left untreated, the mortality associated with miliary tuberculosis is assumed to be close to 100%.
  – With early and appropriate treatment, however, mortality is reduced to less than 10%

• Most deaths occur within the first 2 weeks of admission to the hospital

• Miliary TB with meningeal involvement may require prolonged treatment (up to 12 mo).

Summary
Summary

• Need a high index of suspicion for EP TB
• High risk groups
  – Foreign born
  – Biologics
  – HIV/AIDS
  – Children
• Clinical diagnosis with laboratory support