Tuberculosis Exposure in Children



KIM CONNELLY SMITH, MD, MPH



Health Science Center at Houston

McGovern Medical School

Tuberculosis Exposure in Children

- Define TB exposure
- Stages of TB
- Risk of progression to disease
- Timetable for tuberculosis
- Contact Investigation
- Evaluation and treatment of the exposed child
 - Newborns and Infants
 - Daycare
 - School age
 - Drug resistant TB exposure
- Follow up testing and treatment
- Prevention of Tuberculosis in children



Tuberculosis: How does it spread?



Tuberculosis Exposure - Defined

Close contact with a contagious adult or teen:

- Living in the same household or
- 2 4 hours close contact
- Environmental factors contribute

(crowding, poor ventilation)

- Contagious person with TB include:
 - Adults or teens with pulmonary TB disease
 - Patients with AFB smear positive, cough and cavitary disease are most contagious
 - Endobronchial and laryngeal TB are rare but contagious



The University of Texas

Health Science Center at Houston



Tuberculosis Exposure - Defined

Who's NOT contagious:

- Patients with Latent TB Infection
- Extrapulmonary TB disease (lymph node, bone, meningitis, renal, etc.)
- Children <10 years of age with TB are usually not contagious</p>
 - Low bacterial load (paucibacillary disease)
 - 98% AFB smear negative
 - Weak coughing force
 - Cavities rare in preteen children but sometimes seen in infants with severe disease



McGovern

Medical School

STAGES OF TUBERCULOSIS



RISK OF PROGRESSION TO DISEASE WITH NO TREATMENT BY AGE INFECTED OR MEDICAL CONDITION



Timetable of Tuberculosis



*Feigin & Cherry, Text of Pedi ID

Τ	REATMENT	OF T	3 IN	CHILDREN

Stages of TB	TST/IGRA	CXR/Lab Physical	Symptoms	Treatment
Exposure Child <u><</u> 4yrs (adult source)	Negative	Normal	None	Window CPX Rifampin or INH 8-10 wks Repeat TST 8-10 wks after last contact
LTBI Latent TB Infection	Positive	Normal	None	 Rif x 4-6 mo or 3HP wkly x 12 wks, DOT (directly observed therapy) or INH x 9 mo
Disease	90% Positive 50% false neg with miliary and TBM	Abnormal CXR, PE or labs	50% of children have symptoms	RIPE x 6-12 months, duration depends on site

Baby Exposed to TB Disease

- 2 month old infant
- Mother with TB disease
- How do you determine the risk to the baby?





ith TB. How do you determine the risk to the old baby?

Start the presentation to activate live content

If you see this message in presentation mode, install the add-in or get help at PollEv.com/app

Baby Exposed to TB Disease

- Mother AFB positive
- Mom just starting treatment
- Mother's CXR
- Cavitary pneumonia
- Mother is contagious



ith cough and PPD measures 0 mm. What do next?

Start the presentation to activate live content

If you see this message in presentation mode, install the add-in or get help at PollEv.com/app

is your diagnosis and treatment, given this

Start the presentation to activate live content

If you see this message in presentation mode, install the add-in or get help at PollEv.com/app



Outcome

- Diagnosis:
 - Miliary TB
 - **TB** meningitis (CSF: 27 WBC, 120 protein)
 - Brain MRI: leptomeningeal enhancement and basilar inflammation
- Treatment:
 - RIPE therapy x 12 months
 - Prednisone x 2 months
- Baby did well with normal exam and development after treatment



Medical School

PEDIATRIC PATIENT WITH TB DISEASE

• 6 month old

- 1-2 week history of fever, vomiting and sweating
- CXR abnormal
- Developed:
 - Respiratory failure was intubated
 - Seizures
 - Abnormal neurologic exam







HOSPITAL COURSE

Dx: meningitis & pneumonia 0

Family history 0

- Father hospitalized 2 months prior with <u>cavitary</u> pneumonia
- Sputum smear AFB negative
- Father sent home on Ciprofloxacin for pneumonia
- Culture grew TB 4 weeks later then reported to Health Dept
- Health Department unable to locate family (bad address)
- Long term complications
 - Hydrocephalus and VP shunt
 - Developmental delay



Medical School



Outcome

- All family members including 3 siblings tested positive for TB
- Mother had an abnormal CXR
 - Treated as TB disease
- Older siblings had normal CXR's
 - Treated for TB infection
 - Baby grew TB from tracheal aspirate and CSF
- Baby treated with standard RIPE (12 months) and steroids for 2 months
- How could this have been prevented?



The University of Texas

Health Science Center at Houston

McGovern Medical School





Start the presentation to activate live content

If you see this message in presentation mode, install the add-in or get help at PollEv.com/app



Contact Investigation - Time is of the Essence!

- TB disease should be reported when considered as a possible/likely diagnosis
- Contact Investigation (CI)
 - Health Department visits home within 7 days
 - Looking for:
 - Other people with TB disease
 - Infected individuals
 - Young children exposed to TB





Contact Investigation - Time is of the Essence!

- Screen all household and close contacts with TB skin test or IGRA blood test
 - Positive reactors (>5mm) need CXR and screening for symptoms
 - For children 4 years of age the AAP/CDC recommend the following:
 - Even if TST or blood test are negative
 - Screening history for symptoms of TB disease
 - Physical exam for signs of TB disease
 - 2 view CXR (even if no symptoms)





Window Prophylaxis or **Treatment for Possible Infection**

- Window Period:
 - It may take 8-10 weeks after infection for the TST or IGRA tests to convert
- Goal of Window Prophylaxis:
 - Prevent progression to disease during the window period
- Repeat TB skin test or IGRA blood test 8-10 weeks later
 - If positive (>5mm) continue full course of treatment for LTBI
 - If negative in immunocompetent patients, treatment may be stopped



Health Science Center at Houston

Who Needs Window Prophylaxis?

\Box Exposed children \leq 4 years of age with

- Normal CXR
- Normal physical examination
- No symptoms of TB disease
- Should be evaluated ASAP after exposure

HIV infected or immunocompromised patients

Full treatment for presumed infection is usually recommended



Follow-Up Testing and Treatment

□ Follow up TB test in 8-10 weeks to rule out infection

- □ If negative and exposure stopped, treatment may be discontinued
- If exposure still ongoing:
 - Extend the window period 8-10 weeks after the last exposure defined as:
 - Physical separation or
 - Sputum AFB smear negative x 3 consecutive samples
- □ If TST/IGRA positive, treat for latent TB infection
- Follow up on drug susceptibilities of adult source and adjust treatment if needed



TB EXPOSURE IN NEWBORNS



POTENTIAL MODES OF INOCULATION AND PATHOGENESIS OF TUBERCULOSIS IN THE NEWBORN INFANT





Scenarios for Newborns

Mother or household member with

- Latent TB Infection (LTBI)
- Newly diagnosed pulmonary TB disease
- Treated pulmonary TB disease
- Multidrug-resistant pulmonary TB disease





MOTHER WITH POSITIVE TST OR IGRA

- Mother with 15 mm TST
- CXR: calcified granuloma otherwise normal
- Mother is not on treatment
 - What is mother's diagnosis?TB Infection
 - Do mother or baby need isolation?
 - No, not contagious
 - May baby breastfeed and room with mother?

Yes





Health Science Center at Houston

McGovern Medical School

Baby Exposed to TB Disease

- Newborn infant
- Mother with TB disease
- How do you determine the risk to the baby?



BABY EXPOSED TO TB DISEASE

- Mother AFB positive
- Mom just starting treatment
- Mother's CXR
- Is mother contagious?
- What does the baby need?



Newborn Exposed to Contagious Pulmonary TB Disease

- Evaluate baby
 - 2 view CXR and physical exam to rule out congenital TB
- Start window prophylaxis once disease is ruled out
- □ If mother and baby are on therapy, baby may breastfeed
 - Some experts recommend the mother wear a mask and the baby sleep in a separate room to reduce exposure
 - Mothers with TB mastitis (rare) should not breastfeed
- If multidrug-resistant TB is likely
 - Separate mother and baby
 - Consult a TB expert



Health Science Center at Houston

McGovern Medical School

Mother with Treated Pulmonary TB

Check Maternal

- Drug susceptibilities
- AFB sputum smears
- Adherence to treatment (DOT)
- Most adults on treatment
 - Become AFB smear negative within 2-4 weeks
 - Once AFB smear negative x 3 she is no longer contagious
- If the mother is
 - On appropriate therapy and
 - No longer contagious
 - Baby does not need prophylaxis and may breastfeed





Daycare Exposure



Daycare Exposure

Teacher assistant with AFB smear positive pulmonary disease and cough for 6 weeks

135 children
4 years of age, plus adult staff members were exposed

Smith, KC. *Southern Medical Journal* 93(9):877-880, 2000





Daycare Exposure Management

Who needs TB testing?

Everyone with significant contact with the adult with pulmonary TB disease

Who needs CXR's?

 $All children \leq 4$ years of age even if TST negative

Any contacts with positive TST (\geq 5mm)

Who needs treatment?

- * Exposed children
- All contacts diagnosed with LTBI (positive TST <u>></u>5mm and normal CXR)



Health Science Center at Houston



Daycare Exposure Management

Follow up:

All children were offered on-site

- CXR's
- History and physical examinations
- Window prophylaxis by DOPT
- Follow up TST's
- Skin test results
 - Baseline: 1 adult and 3 children were positive
 - Conversions: 4 adults and 3 children
 - No patients with disease



TB Exposure in 5-10 Year Olds

- Window prophylaxis usually not indicated unless immunosuppressed
 - Children in this age range with TB infection are at low risk of progression to TB disease
- Follow up TST or IGRA 8-10 weeks after exposure
- Treat for TB infection if
 - > Baseline or follow up TST or IGRA are positive and
 - > CXR and physical exam are normal





TB Exposure: 11-18 Year Olds

Testing for close contacts

- Household, classroom, friends but may require entire school
- TST or IGRA
- □ If negative, follow up TB testing in 8-10 weeks

If not treated, infected teens have

- 15% risk of progression to TB disease
- Disseminated disease is less common in teens
- Cavitary disease may be seen in teens
- Window prophylaxis not indicated unless immunosuppressed
- Treat for TB infection to prevent further cases



McGovern

Medical School

Exposure to Drug Resistant TB Disease

- If INH mono-resistant exposure
 - May use Rifampin for window prophylaxis
- If MDR-TB exposure (INH and Rifampin resistance)
 - No consensus guidelines but many experts use window prophylaxis
 - Usually fluoroquinolone alone or in combination with EMB, ethionamide or cycloserine



Summary - Pediatric TB Exposure

- TB test may take 8-10 weeks after infection to turn positive (window period)
- Young children are at higher risk of progression to disease
 - **\square** Especially infants and children \leq 4 years
- Disseminated TB diseases such as miliary and TB meningitis:
 - May develop as soon as 1 month after infection
 - Disseminated TB is more common in infants and children <2 years of age</p>



McGovern

Medical School

Prevention of TB in Children

Screen with TB Questionnaire

✓ Order PPD or IGRA if screening TB Questionnaire positive

Contact Investigation!

Window prophylaxis
✓For children
4 years with TB exposure

Treat latent TB infection

Shorter course regimens preferred







