

## Chapter Six: Contact Investigation

### A. Principles of Contact Investigation

Identification of persons who have been exposed to persons with infectious TB—the contact investigation (CI)—is an important tool used to identify and evaluate those with TB disease and latent TB infection (LTBI). Contacts are at much greater risk than the general population of developing LTBI and TB disease. Early identification, evaluation and treatment of contacts are essential in controlling the spread of TB disease and in reducing the probability that a person with LTBI will develop TB disease. The likelihood of transmission of TB from person-to-person is determined by characteristics related to the person known or suspected of transmitting the disease (index case), characteristics related to the contact, the environment in which the exposure occurred, and the virulence of a given strain of *M. tuberculosis*. Because not all contacts are at equal risk of developing TB disease, they are assigned as higher-risk or lower-risk, depending upon the index case’s risk to transmit TB and the contact’s risk of being infected (see Table 6-1a below and Table 6-1b, page 6-2).

Finding an unknown index case—source case investigation or source case finding (SCF)—is performed when certain types of persons have recently been infected with TB. This is done if a child less than four years of age is found to have LTBI or TB disease. It may also be done if clusters of skin test conversions are found within a family or congregate living situation, such as a skilled nursing facility or prison. The investigation is performed to find an index case who may have initially transmitted *M. tuberculosis* to the contacts and determine whether this index case is still infectious.

**Table 6-1a.** Index case characteristics used to determine risk to transmit TB in contact investigations

Factor	Higher risk to transmit	Lower risk to transmit
Sputum	Smear-positive	Smear-negative
Clinical	Manifests infectious clinical symptoms as listed in Table 7-3, page 7-8.	Few or no clinical symptoms
Exposure	Significant close exposure to others <ul style="list-style-type: none"> <li>• Frequent visits</li> <li>• Prolonged visit(s)</li> </ul>	Short, occasional, or casual exposure
Environmental	<ul style="list-style-type: none"> <li>• Poor ventilation</li> <li>• Crowded living conditions</li> <li>• Unprotected exposure during cough-inducing procedure</li> </ul>	<ul style="list-style-type: none"> <li>• Good ventilation</li> <li>• Exposure which occurred outdoors</li> </ul>
Chest radiograph	<ul style="list-style-type: none"> <li>• Cavitory</li> <li>• Extensive TB</li> </ul>	<ul style="list-style-type: none"> <li>• Non-cavitory</li> <li>• Minimal disease</li> </ul>

**Table 6-1b.** Contact characteristics used to determine risk of becoming infected with TB in contact investigations

Factor	Higher risk to become infected	Lower risk to become infected
TB history	Uninfected persons who: <ul style="list-style-type: none"> <li>• Shared air in environment with smear-positive index case</li> <li>• Are in close contact to and shared air with smear-negative index case</li> </ul>	Uninfected persons who: <ul style="list-style-type: none"> <li>• Shared air in environment that did not increase infection risk</li> <li>• Shared air with an index case at lower risk to transmit TB</li> </ul> Persons with previously-documented TB infection or positive Mantoux TST
Age	Children under 4 years of age	Children 4 years of age or more
Medical risk	Persons who have HIV infection, HIV risk factors, or other medical conditions listed in Table 2-3, page 2-5.	Persons with none of the conditions that would increase his/ her risk of developing TB

In Los Angeles County (LAC), CI has a lower priority if active pulmonary TB is ruled out in persons with most forms of extrapulmonary TB. Exceptions include laryngeal TB, possibly urinary tract TB in males, and whenever a risk of aerosolization may occur such as during an autopsy on a person with extrapulmonary disease.

## B. Contact Investigation Standards

### 1. Risk Assessment and Initial Examination

#### ***Prioritizing Contact Investigations***

1. Conduct a risk assessment of every newly-suspected or confirmed TB patient.
  - A medical record review should be performed to obtain information as listed in Table 6-2, page 6-3. When it is determined that a contact investigation should be conducted, initiate the *Contact Investigation Report* (form H-289).
  - Prioritize the investigation based on whether the index case is classified as higher risk or lower risk to transmit (see Table 6-1a, page 6-1), which is based on the degree of infectiousness (sputum smear results, clinical and/or radiographic findings) of the patient.
2. Determine the time period in which to initiate the investigation.

- An index case that has a higher risk of transmission should be made the highest priority of investigation and a home visit should be made within three working days of receiving case notification to interview the index case regarding contacts.
- An index case who has a lower risk of transmission should have a home visit made within seven working days of receiving case notification to interview index case regarding contacts (see Appendix L, *Tuberculosis Control Program Contact Investigation Standards*).

**Table 6-2. Medical record review for index case**

- Site of disease
- Date of onset and type of symptoms
- Chest radiograph result
- TB medicines and start date
- AFB smear, culture, and susceptibility results
- Name of lab where specimen was sent
- Other medical conditions
- Previous TB and TB treatment history
- Employment history / work site information
- Living situation / social factors

### ***Evaluation of the Index Case***

3. Review the medical record, laboratory data, and conduct an interview with the index case. The interview should be done in person, not by telephone. A field visit must be made to examine the patient's environment. Table 6-3, page 6-5, lists important elements to be assessed when conducting the interview. Multiple interviews with the index case may need to be done to adequately complete the CI. If the index case refuses to cooperate with the interview, consult with the public health nurse supervisor (PHNS), the TB chest clinician, and the medical director. If district efforts are unsuccessful, consult the LAC TB Control Program (TBC) for recommendations on how to proceed.

4. Maintain confidentiality at all times unless doing so endangers the public health. Unless permission is given, the index case must be informed that contacts will not be given information on the identity of the index case. In certain situations where work, school, or other large groups are involved, it may be necessary for a few persons (e.g., employee health or work supervisor) to know the name of the index case to ensure that all contacts are identified and to determine their level of risk. Confidentiality may be breached only in instances to protect the public health.

### ***Prioritizing Contact Evaluations***

5. From the interview with the index case, determine as much as possible which contacts are at higher risk to become infected or to develop disease once infected (see Table 6-1a, page 6-1, and Table 6-1b, page 6-2). Contacts of smear-positive individuals, close contacts of smear-negative TB suspects, HIV-infected persons, persons with HIV risk factors, immunocompromised patients, or children under four years old should be identified as higher risk. Use the concentric circles of investigation to determine whether to expand the CI (see Figure 6-1, page 6-12).
  - Give priority to higher-risk contacts that should be evaluated as soon as possible within seven working days after the home visit with index case. A medical assessment should be completed within ten working days of home visit. For those contacts not identified during the initial home visit, screening, examination, and follow-up should be done within seven working days of being identified.
  - Evaluate lower-risk contacts as soon as possible within 14 working days after home visit with index case. Medical assessment should be completed within 28 working days of home visit. For those contacts not identified during the initial home visit, screening, examination, and follow-up should be done within 14 working days of being identified.

## **2. Medical Management of Contacts**

Standards for medical management of contacts currently differ depending upon which of two levels the contact is classified: (1) Higher risk, and (2) lower risk to become infected.

Prior to evaluation and treatment of contacts, the following should be noted:

- Contacts who are 55 years of age or older with initial negative TSTs should be considered for two-step skin testing (as described in detail in Chapter Two, page 2-15). If the second test (done seven to ten days later) is positive, interpretation of this result (past infection vs. recent infection from index case) should be done on a case-by-case basis. If the second test is negative, this indicates a negative baseline TST.

**Table 6-3. Elements of the index case interview**

- Purpose of interview and role of the PHN
- Confidentiality
- Education about TB, pathogenesis, transmission
- Explanation about the Mantoux skin test
- Information for the *Contact Investigation Report* (H-289), including information concerning home, work, or school locations. The period of infectiousness (time period during which a person with TB disease can transmit *M. tuberculosis*) should be determined in order to identify which contacts might have been exposed.
- Patient symptoms over time, culture and AFB smear results, and duration of TB treatment are factors that determine this period of infectiousness. A list of places the index case has been must be collected. The names of contacts and where they can be located should be obtained and the places the index case has been during the period of infectiousness.
- Activities during the infectious period at sites other than home, work or school, such as church, groups, bar, correctional facility, drug treatment center, or any other frequently visited sites or people

- Within three working days of obtaining the information regarding contacts living or working in other districts or jurisdictions, the PHN will notify the responsible party of the receiving district of jurisdiction who will then coordinate the medical management of the contacts within prescribed timelines based on assigned risk.
- Pregnant contacts at high risk who are candidates for LTBI treatment should not delay initiation of therapy (see page 2-13).

### **Higher Risk Contacts**

- I. For close contacts to smear-positive pulmonary TB cases, HIV-infected or those with HIV risk factors, immunocompromised, those under four years of age, and those with other high risk medical conditions (see table 2-3, page 2-5):
  1. At the initial visit, place the Mantoux TST with five (5) TU purified protein derivative (PPD) unless a documented history of a prior positive skin test or treatment of TB disease is confirmed.
  2. Arrange for or obtain immediate chest radiograph regardless of TST result.
    - If symptomatic or if chest radiograph is abnormal, manage as a TB suspect as outlined in Chapter Three, page 3-3.

- If asymptomatic and chest radiograph is normal, strongly recommend initiation of appropriate treatment for LTBI regardless of TST result. Alternative LTBI regimens may be initiated when indicated.
3. If the initial TST is five (5) millimeters or greater, the contact should complete a full course of treatment for LTBI. This is usually six or nine months of isoniazid (INH) depending upon the age and medical status of the contact (see Table 2-6, page 2-11).
  4. If the TST is less than five (5) millimeters, a repeat TST is indicated three months after the last exposure to the infectious index case or after smear conversion if exposure is continued. Begin treatment for LTBI during this window period.
    - If the repeat TST is still less than five (5) millimeters, consider the possibility of anergy in immunocompromised contacts. If it is unlikely that a negative TST is the result of anergy, LTBI therapy may be discontinued and the contact discharged from supervision.
    - If the repeat TST converts by five (5) millimeters or greater, the contact should complete the full course of LTBI therapy.
- II. For close contacts to smear-negative pulmonary TB cases, and all other contacts to smear-positive pulmonary TB cases:
1. On initial visit, place the Mantoux TST with five (5) TU PPD unless a documented history of a prior positive skin test or treatment of TB disease is confirmed.
  2. If the initial TST is five (5) millimeters or greater, obtain a chest radiograph.
    - Management of asymptomatic contacts with a normal chest radiograph is identical to that of TB class 2 patients as described in Chapter Two, page 2-8, and should be offered LTBI therapy.
    - If symptomatic or chest radiograph is abnormal, manage as a TB suspect.
  3. If the TST is less than five (5) millimeters, a repeat TST is indicated three months after the active case started treatment or after smear conversion if exposure is continued (the window period). See appendix C for definition of the window period.
    - If the repeat TST is still less than five (5) millimeters, LTBI therapy is not indicated and the contact should be discharged from supervision.
    - If the repeat TST converts by five (5) millimeters or greater, the contact should be evaluated with a chest radiograph and offered LTBI therapy if the patient remains asymptomatic and the radiograph is normal.

**Lower Risk Contacts**

Contacts not included in the above categories are considered lower risk contacts.

1. On initial visit, place the Mantoux TST with five (5 ) TU PPD unless a documented history of a prior positive skin test or treatment of TB disease is confirmed.
2. If the initial TST is ten (10) millimeters or greater, obtain a chest radiograph.
  - Management of asymptomatic contacts with a normal chest radiograph is identical to that of TB class 2 patients as described in Chapter Two, page 2-8, and they should be offered LTBI therapy.
  - If symptomatic or chest radiograph is abnormal, manage as a TB suspect.
3. If the TST is less than ten (10) millimeters, a repeat TST is recommended three months after the active case started treatment (the window period).
  - If the repeat TST is still less than ten (10) millimeters, LTBI therapy is not indicated and the contact should be discharged from supervision.
  - If the repeat TST converts by ten (10) millimeters or greater, the contact should be evaluated with a chest radiograph and offered LTBI therapy if the patient remains asymptomatic and the radiograph is normal.

Self-described contacts who do not meet the definition of higher or lower risk contacts should be evaluated as candidates for targeted testing as described in Chapter Two. Such individuals should not be identified as contacts on form H-289 (see Appendix E for example of form).

**Contacts with Previously-Documented Positive Tuberculin Skin Test**

Contacts with previously-documented positive TSTs must be screened for TB symptoms. In addition, a history of documented LTBI treatment and evaluation for HIV infection or other immunocompromised disease is necessary to determine the appropriate course of management (see Table 6-5, page 6-11).

**Contacts of Multidrug-Resistant TB**

Principles of contact investigation for multidrug-resistant TB (MDR-TB) index cases are the same as those used for index cases who have drug-susceptible TB. While MDR-TB organisms are not considered more virulent than drug-susceptible organisms, a heightened effort should be made to identify and evaluate all contacts because of the increased complexities regarding LTBI treatment or treatment of TB disease that may arise.

Very little data exist regarding the efficacy of LTBI treatment for MDR-TB contacts. LTBI treatment protocols in such persons are largely empirical, and regimens must be individualized. Because decision-making processes are complex when selecting a regimen for treating LTBI in LAC residents exposed to an MDR-TB case, consultation with TBC for expert advice is strongly recommended.

### ***Contacts Under the Care of Providers Outside the Health Department***

Providers outside of the health department may follow contacts. Private providers should follow the guidelines for medical management of contacts as described in this chapter.

In certain cases, TB exposure to an index case may occur in the workplace or other settings where employees are being followed by an employee health service. In such cases, the employee health service may elect to assist with the CI within the workplace setting.

Employee health services must follow a TBC plan that meets minimum Cal-OSHA standards.

The PHN case manager must obtain information on screening and follow-up done by private providers to ensure that the follow-up has been completed. The letter to private providers regarding contact follow-up (H-687) may facilitate obtaining this information. Thus all private providers who manage TB contacts or conduct workplace TB CIs must release required information about management and results for individual contacts that are evaluated.

### **3. Complicated Contact Investigations**

A complicated CI may involve several health districts, a jurisdiction outside of LAC, very large numbers of contacts, suspected MDR-TB cases, or any other case in which PHN resources may be limited. In these cases, consultation with TBC is recommended for assistance with coordination of the CI and additional resources. TBC is responsible to assess the quality control of aspects of a CI.

Because these investigations are often extensive and complex, the appropriate supervising PHN and/or nurse manager, in consultation with the area medical director and TB clinician may elect to assign more than one coordinating PHN to manage the investigation or assume the responsibility himself or herself. In instances where multiple persons are needed for an investigation, it is essential that all parties work as a team and appropriately communicate with everyone involved, including the TB clinician and TBC.

#### **4. Public Health Center Management of Contact Investigations and Source Case Finding**

The PHN case manager who is assigned a TB class 3 or 5 patient or an infected child less than four years of age is responsible for coordinating all aspects of a Contact Investigation (CI) or Source Case Finding (SCF). This includes follow-up on all referrals to other PHNs within the district, referrals to other districts or health jurisdictions, and referrals being investigated by the private sector. Timely and appropriate responses as well as completion of evaluations and appropriate interventions are to be done, reported to the TB clinician, and documented on appropriate forms and charts by the coordinating PHN case manager according to TBC standards and procedures.

#### **C. Source Case and Associate Investigation Standards**

SCF attempts to determine the source of infection or disease in a child or in a documented converter. Initiating a SCF may yield new cases and a high yield of infected individuals that stem from a common source of infection. Examination of the closest associates is usually all that is necessary, but the investigation may become larger if more infected persons are found and the source case is not immediately apparent.

1. The first priority is a child under the age of four years. If resources allow, source case finding can be attempted for documented converters age four and above if there is a reasonable probability of finding the source.
2. Associates should be evaluated within 14 days of identification of the child or converter. Use the concentric circle of epidemiological investigation (Figure 6-1, page 6-12) as the method of identifying which associates to evaluate first.
3. Evaluation and management of associates are identical to targeted testing of high-risk individuals as described in Chapter Two, page 2-5.
  - Those who are identified as TB class 2 should be referred for LTBI therapy.
  - Persons who have a positive TST of ten (10) millimeters or greater with an abnormal chest radiograph should be evaluated as TB suspects (TB class 5). If recent or current TB disease can be found in those individuals, the person who is closest to the child or converter should be considered the source case.

**Table 6-4.** Management of broken appointments for initial examination in contact investigations

BA	Higher-risk contact	Lower-risk contact
1 <sup>st</sup>	PHN to reschedule within one week	Close with H-1834
2 <sup>nd</sup>	Notify PHNS and PHI	
3 <sup>rd</sup>	Notify TB clinician for expedient disposition (Legal Order for Exam within 72 hours)	

## D. Management of Broken Appointments

Management of broken appointments (BA) differs between higher and lower risk contacts. While contacts diagnosed with TB Class 2 are not required to take LTBI therapy, they should be strongly encouraged to do so. At the very least, all higher-risk contacts must receive a medical evaluation in addition to a chest radiograph to rule out TB. Regardless of risk category, every effort must be made to assist contacts to follow-up within the time frames specified.

Contacts who fail to comply with an initial appointment for examination should be managed according to the schedule on Table 6-4, page 6-10. With the first BA, an attempt to reschedule a higher-risk contact is done by a PHN. With the second BA, the higher-risk contact is referred to the public health nursing supervisor (PHNS) and the district public health investigator (DPHI). With the third BA, the clinician should request a Legal Order for Examination within 72 hours as indicated. A lower-risk contact who breaks the initial appointment is closed and no further attempts are made to reschedule the patient.

Higher-risk contacts who are examined and diagnosed with TB Class 2 but refuse LTBI therapy should be counseled regarding the possibility of future disease. For very high-risk contacts, such as HIV-infected individuals, other immunocompromised individuals, or children under four years of age, the clinician may require that the contact return for periodic examinations to rule out active disease. Attempts should be made to notify these contacts' primary care physician. Documentation of referral and counseling is to be noted in the medical record. All contacts who initiate LTBI therapy with subsequent BAs are managed according to the guidelines in Table 2-8, page 2-12.

**Table 6-5.** Management of all contacts with a previously-documented positive TST. Contacts should be evaluated to determine if they have (1) TB symptoms, (2) immunocompromising factors, such as HIV, and (3) documented history of LTBI completion. Each particular circumstance corresponds to the appropriate course of management with regard to obtaining a chest radiograph and treatment of LTBI.

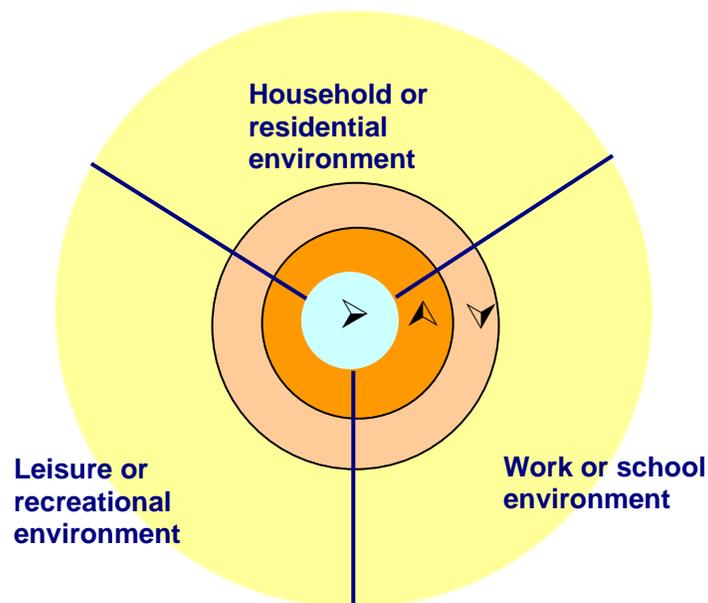
TB symptoms?	Immunocompromised?	Completed adequate course of LTBI therapy?	Management	
			Obtain CXR*	Comments
Yes			Yes	Clinically evaluate as TB class 5
No	No	No	Maybe	Clinician to assess on case-by-case basis need for CXR and/or LTBI therapy
No	No	Yes	No	No repeat LTBI treatment or further evaluation necessary unless clinical status changes
No	Yes	No	Yes	Refer for full LTBI therapy if CXR normal and active TB disease is ruled out
No	Yes	Yes	Yes	Reevaluate and consider another course of LTBI therapy as indicated

\*All patients with abnormal chest radiographs suggestive of TB must be evaluated as TB suspects

### **Fig 6-1. Concentric circles of investigation**

In a **contact investigation**, begin by examining persons in the inner circle who are at higher risk of becoming infected—those with closest exposure in the home, at work or school and in social settings. Then evaluate the results of the higher-risk contact investigation. If there is evidence of transmission to the higher-risk contacts (e.g., a higher than expected number of positive TSTs and/or converters, or secondary active cases), move to the next circle of contacts who are more casual in their exposure at home, at work, at school, or in social settings.

In a **source case investigation**, begin the investigation by examining the closest associates to the child or documented converter. Start by testing close associates in the inner circle and expand the circle if the source has not been identified.



- Index case or child under 4 years with positive TST
- ▲ Close contacts or associates—highest priority
- ▼ Casual contacts or associates—lower priority