

The Investigation of Tuberculosis Cluster in a Family in Nantou County

Du-Lin Ling¹, Chiung-Wen Chang¹, Hsiu-Chuan Liu²,
Mei-Ling Chen², Pri-Fang Lai¹, Tsuey-Fong Lee¹

1. Third Branch, Centers for Disease Control, Taiwan

2. Health Bureau, Nantou County Government

From Chinese version, pp,096-102

Abstract

Tuberculosis (TB) is a chronic disease transmitted through droplet contact. Living with infectious TB cases or having a close contact might be the high risk groups for developing diseases. This paper describes that during October 2005 to March 2008, three cases in one family developed syndrom and been reported to the health authorities. RFLP (restriction fragment length polymorphism) had been applied to confirm whether the family cluster, and the result showed positive findings. The article could provide references for contact investigation in health authorities.

Keywords: tuberculosis, contact investigation, family outbreak

Introduction

In Taiwan, approximately 15 thousand confirmed TB cases of are

- Received : October 15, 2008.
- Accepted : November 27, 2008
- Correspondence : Du-Lin Ling
- Address : No.20, Wunsin S. 3rd Rd., Taichung City, Taiwan, R.O.C.
- e-mail: dolin@cdc.gov.tw



reported each year [1]. Tuberculosis is a curable chronic disease; however, if not found or not treated properly, it may lead to death and/or transmission to others [2]. Therefore, the discovery of infected persons and further treatment are the crucial tasks in preventing the spread of the disease [3]. Due to the fact that those in contact with tuberculosis patients have a higher risk of contracting the disease, health bureaus have followed up on the situations of those in contact with reported confirmed cases in order to find possible infected cases and provide proper treatment. The data of these in contact are recorded in Taiwan's National TB Registration, Centers for Disease Control (CDC).

On March 7, 2008, the 3rd Branch of CDC received a report from the tuberculosis record system that a case which was in contact with a tuberculosis patient was tested positive in a family in Nantou. This case is the third case in this family; thus, the 3rd Branch notified the Nantou County Government Health Bureau to conduct the outbreak investigation and evaluation of the possible risks of those in contact.

Epidemic Investigation

Index Case

In this reported case of 6 family members (see Figure 1), the first case reported on October 11, 2005 (as an index case) is the mother in the family, age 49 and is a housewife. After investigation, results show that the case did not have any previous history of the disease. The case was then admitted into a hospital for further treatment in August 2005. During hospitalization, the case was found to have diabetes and was also treated for that. In the same year on the 11th of October, the case was found to be

sputum culture positive for the disease and was administered with treatment immediately. Both the sputum smear and culture was tested negative (a total of 6 tests in 2 months) in February of 2006 and completed the treatment on May 29, 2006.

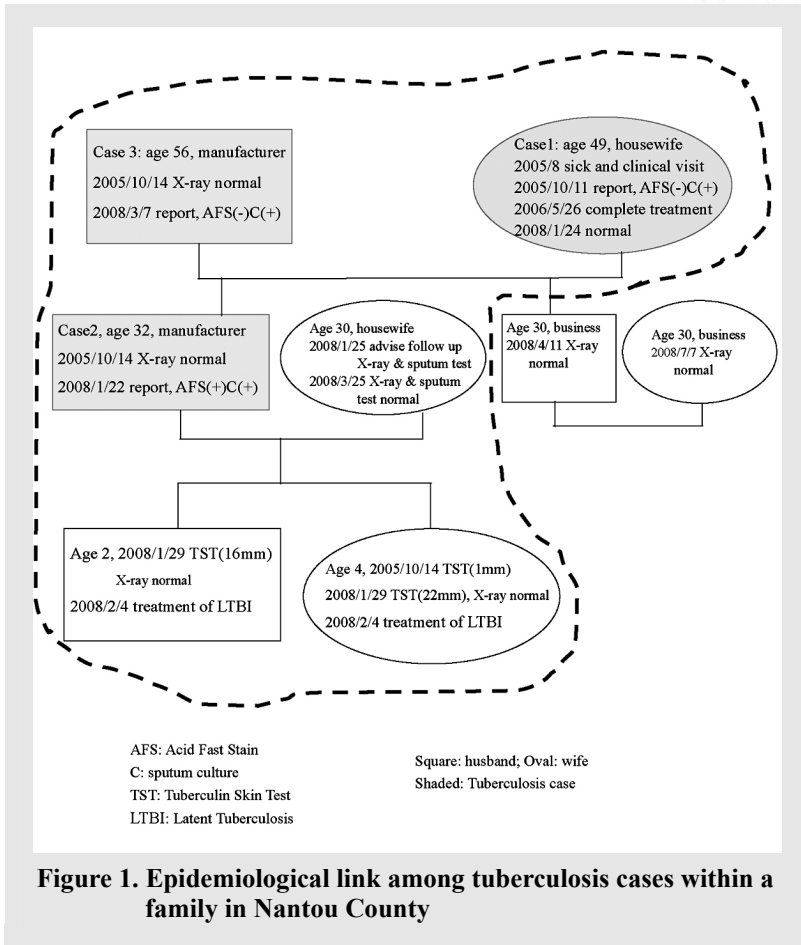


Figure 1. Epidemiological link among tuberculosis cases within a family in Nantou County



The Second Wave of Cases

The second case in this family (case 2) is a secondary case under the original index case. The case is the index case's son, aged 32 and work as a manufacturer with no other history of diseases. The case sought medical assistance due to a fever in the January of 2008 and was reported as tuberculosis due to positive results of Acid Fast Stain (AFS)¹ on January 22. The case was then quarantined and treated for 2 weeks. During this time, the case was also diagnosed with diabetes. After leaving the hospital, the case was arranged to participate in the DOTS project² and showed negative results for concessive 3 tests and the case completed treatment on November 10, 2008.

The third case (case 3) is the husband of the index case. The case is 56 years of age and works as a manufacturer. This case is healthy with no suspected symptoms or chronic illnesses. Following the report of case 2, case 3 accepted chest X-ray exams on January 25, 2008. After the discovery of mild infiltration in the lungs by the physician and because of the tuberculosis case existent in the family, he was advised to undergo sputum testing. The case was reported after the results showed positive on March 7. Due to work reasons, case 3 was unable to participate in DOTS; therefore, the health bureau urged the family to assist in supervising the consumption of the medication. After a complete tuberculosis treatment

1 Acid Fast Stain (AFS) is the easiest to conduct among laboratory tests. It uses the simplest equipment and is the fastest testing method. According to the Department of Health, Executive Yuan strain testing pamphlet, approximately each milliliter of sputum needs to contain 5000-10000 bacteria in order for it to show up in the results. If the results of this test show as positive, this means that the case is highly contagious.

2 DOTS (Directly Observed Treatment, Short-Course) was proposed by the World Health Organization in 1994. The contents include the direct observation of care workers of the patients in insuring the consumption of the medication and any other possible problems.

process, the case completed the treatment on October 15, 2008.

Contact Investigation

After the report of the index case (October 2005), the health officials found 4 family members who were in contact with the case. Among these are the husband (case 3), the son (case 2) whose chest X-rays were normal (October 14, 2005), and the daughter (14 months old and has received BCG vaccine) whose results for Tuberculin Skin Test (TST) were negative (the reaction of the TST was 1 mm). The index case's daughter-in-law did not undergo chest X-rays due to a pregnancy. Therefore, there were no suspected cases found among those in contact.

In January of 2008, when the second case was reported, there were 5 family members in contact. The index case had normal chest X-rays whereas the husband had abnormalities in the X-rays (January 25) and was reported as case 3 due to the positive results of the sputum culture on March 7. The granddaughter (3 years and 5 months old) and grandson (a year and 9 months old) showed 22 mm and 16 mm in the TST (both positive results) with normal X-rays. After evaluation showing that both had been infected with the disease, the physician advised that they undergo treatment of LTBI³ in order to reduce the chances of the disease inflicting the patients in the future [4]. Thus, preventive treatment was administered starting of February 4. Through the health official's DOTS project, the preventive treatment was completed on November 4, 2008. The daughter-in-law showed one small patch in the right upper lung. After

3 Treatment of LTBI: During the latent tuberculosis infection (LTBI) period, the strains in the body have not accumulated to a certain amount and therefore preventive measures are to be taken in order to reduce the chance of infliction in the future.



careful discussion among the tuberculosis diagnostic team, the case was advised to undergo sputum testing and two following months of monitoring. On March 25, 2008, the chest X-rays and sputum test results all showed to be normal. At this time, the family member contacted the health officials saying that two other family relatives (the index case's second son and his wife) who live in the northern part of the country would also be willing to undergo examinations. Their chest X-rays showed to be normal; thus the total of those in contact number to 7 individuals.

Laboratory Tests

There is a total of 3 cases in this investigation which are all family members living together. In order to determine whether the disease was transmitted to one another, the health bureau collected the positive cultures of the three cases from the reporting hospitals and sent them for further testing at the Kungyang Laboratory, CDC. After Restriction Fragment Length Polymorphism (RFLP) testing, the results conclude that the gene type of the three cases was the same and therefore concluding that this was a case of family outbreak (see Figure 1).

Discussion and Suggestions

Contact Investigation

Health bureaus found 4 cases of those in contact with tuberculosis patients after receiving the reports. One of the cases did not finish the tests due to the pregnancy and was not found to be a possible tuberculosis case. After 2 years and 3 months, a second family member was reported after a positive sputum smear test result. During this time, the woman who did

not complete the tests due to pregnancy did not come forward to do further testing. This shows that although there is a confirmed tuberculosis case within the family, the family did not feel threatened by the disease. After the third case appeared with the suggestions of the doctor that the two children may be at risk, the parents accepted and contacted other relatives to undergo testing for tuberculosis. Therefore, after this family underwent this incident, their awareness of the disease has been elevated.

Disease Diagnosis and Health Education

In this incident, case 1 was hospitalized for other reasons and was reported after the positive test results. Case 3 was transferred to a local hospital after he was listed as a person in contact with the disease. Although the chest X-rays showed a slight Infiltration of the lungs, the physician did not diagnose him with tuberculosis. Only after the culture showed positive results a month after was the case reported. According to the literature [5], in Taiwan, the delay in diagnosis of tuberculosis is longer than the delay of the patient in seeking medical assistance. Taiwan is still a region where tuberculosis is prevalent; therefore, it is crucial to enhance the quality and ability to diagnose tuberculosis. This should be an issue for related health officials to think about.

If a person in contact contracts tuberculosis, the chances of being inflicted is 10%. Half of these will become inflicted within 2 years, whereas the other half may become inflicted anytime in the life [6, 7]. However, we do not know when the infected will become inflicted. Therefore, health officials should also emphasize the possibility of infliction on those in contact when conducting routine checkups. They should also remind those in contact to do regular chest X-rays and sputum



tests and to notify their physicians if any suspicious symptoms occur in order to be diagnosed and treated as soon as possible. The CDC currently has regulations that state that whenever the index case shows positive sputum test results or holes in the chest X-rays, those in contact should also be tested after 12 months.

Hypothesis for Infection Source

Tuberculosis is a chronic infectious disease with a latent period from a few weeks to several decades. Therefore, it is difficult to retrieve the source of infection. In this investigation, the index case is a housewife which, according to family members, has no history of tuberculosis or contact with the disease; thus, we are unable to detect any possible infection source. In this investigation, case 2 (the son) and case 3 (the husband) were inflicted at almost the same time, and were all tested as having the same gene strain by the Kungyang Laboratory, CDC; thus showing a family outbreak.

Acknowledgements

We would like to thank the Center for Research and Diagnostics, CDC for providing the strain test results.

References

1. Taiwan CDC. Number of reported and confirmed cases, 2007. Available at: <http://www.cdc.gov.tw/public/Attachment/853013544671.pdf> (Accessed Nov 2008).
2. Dye C. Global epidemiology of tuberculosis. *Lancet* 2006; 367:938-40.
3. Centers for Disease Control and Prevention. Essential components of a tuberculosis prevention and control program. *MMWR*, 1995;44:No.RR-11:1-17.
4. Taiwan CDC. Taiwan Guideline on TB Diagnosis and Treatment. 3rd edition. Taipei, Taiwan. Centers for Disease Control, Taiwan; 2008.
5. Chiang CY, Chang CT, Chang RE, et al. Patient and health system delays in the diagnosis and treatment of tuberculosis in Southern Taiwan. *Int J Tuberc Lung Dis* 2005; 9:1006-12.
6. Comstock GW, Livesay VT, Woolpert SF. The prognosis of a positive tuberculin reaction in childhood and adolescence. *Am J Epidemiol* 1974; 99: 131-8.
7. Vynnycky E, Fine PE. Lifetime risks, incubation period, and serial interval of tuberculosis. *Am J Epidemiol* 2000; 152: 247-63.