

# Multi-drug Resistant Tuberculosis in Chuuk State, Federated States of Micronesia, 2008-2009

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## Abstract

Multi-drug resistant tuberculosis (MDR TB) is a growing public health concern, particularly for the Pacific, where rates of tuberculosis infection are extremely high. In May 2008, a cluster of patients with MDR TB were identified in Chuuk State, Federated States of Micronesia. A multi-agency investigation led to the eventual discovery of 21 cases, and over 100 latent TB infections. Incomplete implementation of Directly Observed Therapy (DOT) and contact investigation were major contributors to the outbreak. The problem of MDR TB in Chuuk was controlled only after a concerted effort on the part of multiple agencies coupled with the highest level of political commitment.

## Introduction

Multi-drug resistant tuberculosis (MDR TB) is defined as tuberculosis infection that is resistant to at least two of the most important first-line TB drugs, isoniazid and rifampicin.<sup>1</sup> In 2008, an estimated 500,000 persons in the world developed MDR TB, largely as a result of inadequate TB control activities.<sup>1</sup> Treatment of MDR-TB requires a regimen of second-line TB drugs, which requires injections, causes more frequent side effects, and is enormously costly: drug treatment for MDR TB is approximately \$20,000 for a single patient, as compared with \$20 for treating regular TB).<sup>2</sup>



Tuberculosis is endemic in the Federated States of Micronesia (FSM), including in Chuuk State. The limited resources of the Chuuk TB Program have historically precluded active case-finding via routine contact investigations, or the administration of directly observed therapy (DOT), which is critical to controlling TB and preventing the emergence of drug resistance through incomplete or inadequate treatment.

In May 2008, the Federated States of Micronesia (FSM) Department of Health and Social Affairs (DHSA) received a request for assistance from the Chuuk State Department of Health Services (DHS) in order to investigate four cases of culture-confirmed MDR TB, the first ever in Chuuk (there had previously been one case in Pohnpei State). In response to this request, DHSA requested assistance from the US Centers for Disease Control and Prevention (CDC), other US Government agencies, the World Health Organization (WHO), the Secretariat of the Pacific Community (SPC), and other partners. From July 8 to July 25 2008, a joint investigation was conducted in Chuuk State, involving local and national authorities and the external partners.

The investigation sought to describe the epidemiology of MDR TB in Chuuk State; identify and treat any additional active cases or contacts with latent infection, and develop recommendations to prevent further transmission of MDR TB. A detailed report of the initial findings of this investigation was published previously.<sup>3</sup>

## The Investigation

The investigation involved medical record reviews, review of data from the local laboratory and regional reference laboratories, interviews with case patients or proxies, and investigation of high-risk contacts of infectious cases.

Beyond the original four MDR TB cases, one additional known TB case was confirmed to be MDR during the investigation. Four of the five identified patients were deceased. All five were residents of Weno, the main island of Chuuk. Three had had prior exposure to a drug-resistant (not MDR) TB case. None had previously been treated for TB. All five had pulmonary TB, and one case, a two-year-old girl, had also had disseminated disease. The five patients were grouped into two clusters by genotype analysis: one cluster of three patients, and one cluster of two. The index patient in the first cluster had previously worked in the garment industry in the Commonwealth of the Northern Mariana Islands (CNMI), which employed many workers from Southeast Asian countries, where MDR TB is common.<sup>1</sup> MDR in the second cluster is thought to be a secondary development of multi-drug resistance after contact with the non-MDR drug-resistant case.

The contact investigation involved the evaluation of nearly 250 high-risk contacts, defined as those who lived with, cared for, or spent considerable time indoors with one of the patients. As a result of the initial contact investigation and a subsequent re-evaluation carried out in January 2009, an additional 16 cases were identified, for a total of 21. Additionally, more than 100 latent TB infections (LTBI, defined as a person with a positive TB skin test in the absence of signs or symptoms of TB) were identified.



## Control Measures

All known infectious patients were identified and have undergone isolation in the newly constructed Chuuk State Hospital 22-bed TB Ward. Treatment plans for the active MDR TB cases and the contacts with LTBI were developed in conjunction with experts from the Francis J. Curry TB Center in San Francisco, USA, and the CDC.

Second-line drugs were obtained from the US HHS Supply Service Center (Perry Point, Maryland) with financial assistance from the US Department of the Interior. All MDR TB cases are initially hospitalized for at least six months while undergoing treatment with IV and oral medication with second-line TB drugs. Additional treatment with oral medication follows for two years.

As a result of the investigation, an additional 20 outreach workers were hired with assistance from SPC to assist the Chuuk State TB Program and institute strict DOT. All TB staff received on-site training on providing DOT and conducting contact investigations. The Program also acquired three additional vehicles to assist in field work.

The 100 exposed contacts with LTBI are being treated with daily Directly Observed Preventive Therapy (DOPT) in their villages for a period of one year.

Patients will be discharged only when they are proven no longer infectious, to limit further transmission. Staff and visitors are required to maintain strict infection control precautions. Additionally, FSM is currently exploring the possibility of creating a “no-fly list” to prevent infectious patients from boarding an airplane and bringing MDR to other jurisdictions. This development is in response to the recent travel of an MDR TB-infected patient from Chuuk, who signed out against medical advice and surreptitiously travelled to Guam, placing persons there at risk for MDR TB.

Finally, the Chuuk State Hospital laboratory has been upgraded to be able to process a greater number of TB specimens and ship them regularly for further testing, and the radiology department has obtained a digital x-ray machine to allow faster processing of films and sharing of images with experts at the Curry Center.

## Discussion

This outbreak highlights some of the challenges faced in trying to diagnose and control TB in a resource-limited Pacific island setting. The emergence and transmission of MDR TB in Chuuk was caused by the inability to follow standard TB control practices – particularly DOT and contact investigations – due to a lack of staffing; the delay in diagnosis due to limited lab capacity; limited capacity for patient isolation; and the inability to provide appropriate second-line drugs in a timely manner.

As a result of the international attention attracted by this outbreak and the subsequent infusion of resources, most of these issues have been resolved. Additional workers have been hired so that all patients are now treated with 100% DOT, and all their contacts are fully investigated; sufficient second-line drugs have been procured; a new TB isolation ward has been built; diagnostic capacity has been increased; and there



is increased political commitment to TB control. A long-term commitment to sustaining the increase in resources is critical to prevent a reversal of the progress that has been made in controlling MDR TB in the region. Other resource-limited jurisdictions should take heed of the importance of assigning adequate resources to routine TB control (including strict DOT, complete contact tracing and rigorous infection control), in order to prevent the much more costly and difficult to control MDR TB.

There were several additional issues raised during this investigation. Among these was the issue of stigma associated with TB; for example, one neighborhood which had several cases was branded "TB Village" by locals. Stigma must be overcome if proper case finding is to occur, as people may otherwise be reluctant to come forward. Furthermore, maintaining compliance with TB drugs for over two years requires not only the commitment of the individual and the DOT worker, but the whole community, including traditional and religious leaders. This is not possible if the patient is stigmatized. Education is therefore a critical component of a successful TB program, and should be an important aspect of the DOT worker's daily routine.

An additional challenge has been attending to the well-being of the hospitalized patients. Unlike with regular TB, which can be treated at home after a brief initial hospitalization, MDR TB requires six months of inpatient treatment because one drug must be injected. Therefore, a TB Program must be prepared to provide comfortable living arrangements, including the provision of entertainment (e.g., televisions with DVD players), adequate visitation with family members, emotional support, and, in the case of pediatric patients, ongoing schooling in the hospital. Chuuk was fortunate to have substantial support from the community, including supplies donated locally and from CNMI, and the volunteer time of a dedicated schoolteacher. Because of the highly transmissible nature and severity of MDR TB, communication with nearby jurisdictions and international authorities is paramount, particularly if there is concern that an infectious case may have travelled outside the local area. During this outbreak, the FSM DHSA, under its obligation to the International Health Regulations (IHR 2005), worked with the WHO and other partners to prevent the international spread of MDR TB while avoiding unnecessary interference with international traffic and trade. Despite intense efforts to contain the threat in Chuuk, the recent unauthorized travel of a Chuukese patient to Guam demonstrates the possibility of transborder movement of infectious patients. A high level of vigilance, multilateral collaboration, and compassion are required in order to maintain appropriate treatment of infected patients and control the problem of MDR TB across borders.

## Conclusion

The problem of MDR TB in Chuuk was controlled only after a concerted effort on the part of multiple agencies coupled with the highest level of political commitment.

As of this writing, a new threat of MDR TB looms in the Republic of the Marshall Islands, where at least six cases have been diagnosed in the last five years. A similar infusion of resources will likely be needed to control MDR TB in the Marshalls, and in any other Pacific jurisdictions in which it is identified in the future.



## Acknowledgments

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*If you ask God for strength, he will give you a mountain. If you ask God for courage, he will give you a Lion. If you ask God for Love he will give you opportunity, "the rest is up to you".*

*Eloisa Finch*



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