The tuberculosis epidemic in the CNMI

JON B. BRUSS, MD, MSPH*
ARTIN MAHMOUDI, MD**

Abstract

Tuberculosis (Tb) is a serious problem in the Commonwealth of the Northern Mariana Islands (CNMI). The average case rate of 92.5 cases per 100,000 population is roughly eleven-fold higher than that of the United States.[1] The recent influx of Chinese contract workers in the island of Tinian has resulted in a serious tuberculosis epidemic on that island. The resultant strain on the island's limited medical and public health resources has been very noticeable.

Since the middle of 1993, the Tb program has instituted mandatory directly observed therapy (DOT) for all patients diagnosed with active tuberculosis. As a result, there have been marked improvements in compliance with therapy, the duration of required treatment, and treatment completion rates. However, the overall Tb burden has not lessened. Program resources are needed for case management laboratory testing, outreach work, incentives, education material and transportation.

As part of the Tb control plan there is to markedly extend field-based DOT, Tb control in correctional institutions and school-based preventive therapy. There is intend to implement active surveillance programs and provide education to, and involve the community and social groups in the various aspects of tuberculosis.

*Medical Director of Public Health. **Medical Director, Centre for Tuberculosis and Lung Disease. Both: Commonwealth Health Centre, Department of Public Health, Commonwealth of the Northern Mariana Island. Tel: (670) 234 8950, Fax: (670) 234 8930, email: jonbruss@gtepacifica.net or mahmoudi @gtepacifica.net.

Introduction

The rapid economic growth of the past decade has resulted in the influx of many foreign workers to CNMI. As a result, the current ethnic distribution of the population is quite mixed [2]. Many of these workers are from countries with high rates of Tb. The CNMI has also witnessed an explosion in population, from 16,780 in 1980 (census data) to 65,520 in 1997 (population estimate). The Public Health Department is the only facility responsible for the diagnosis and treatment of all Tb patients.

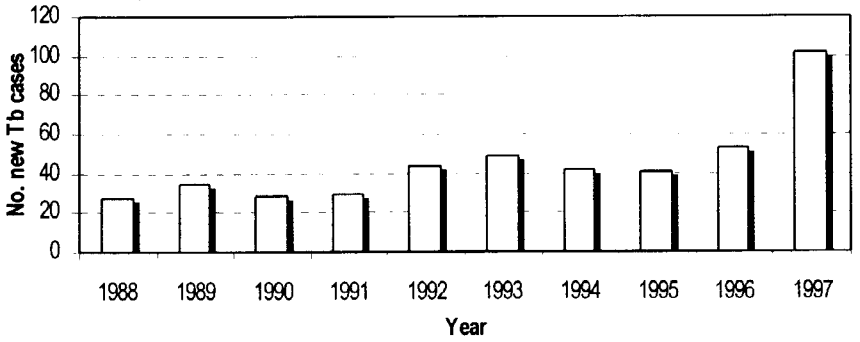
Approximately sixty percent of the patients are foreign-born nonresidents living in close and overcrowded quarters. These individuals often deny their symptoms and seek medical consultation late in the course of their illness. The indigenous population has high rates of co-morbidity. Additionally, indigenous families tend to be large and poorly defined. This poses a huge problem for contact tracing. Compliance with preventive therapy is poor. Furthermore, in 1997 we documented the first case of HIV transmission among our indigenous youth. This co-infection might seriously impede Tb control.

Given the limitation in manpower, the Tb Program has focused predominantly on the treatment of those with active Tb. The prevention of Tb in the CNMI now requires equal priority. However, the achievement of full control of tuberculosis requires urgent commitment of additional resources and manpower.

CNMI statistics

Tb infection and disease are very prevalent in the CNMI. The trend shows an increase in newly detected active cases since 19991 (Figure 1). Each year the CNMI Tb Program provides DOT to some 50 patients with active Tb and administers preventive therapy to over 400 additional individuals. In 1997, there was a dramatic increase in the number of new Tb cases prompting an investigation by epidemiologists from Centers for Disease Control.[3] The Tb cases can be divided into two broad categories: approximately 2/3 are among foreign-born contract workers; the other third are among indigenous Chamorros and Carolinians and other Micronesians (Figure 2). The proportion of active Tb cases among alien workers seems to be remaining constant (Figure 3). This indicates that the number of cases among the indigenous population is on the rise.

Figure 1. Trends in the number of new active Tb cases in the CNMI, 1988-1997



As in most of the countries of the Western Pacific, Tb is prevalent in the CNMI (Table 1). The average case rate of 92.5 cases per 100,000 population is about 11 fold higher than that of the United States.[1] Despite the small population of the CNMI (1997 population estimate: 65,520), there are more Tb cases in the CNMI than in 15 of the 50 States of the US. Analyses of restriction fragment length polymorphism patterns suggest that most of the cases in alien contract workers represent reactivated disease. [6] Prior to 1997, 55% of these developed active Tb within five years of arrival in the CNMI (Figure 4). However, examining the recent outbreak of Tb on Tinian as well as several new cases on Saipan has lead us to a different conclusion. Several of these patients have developed disease within 6 months of arrival. Most were symptomatic upon arrival. This indicates a failure of pre-arrival screening and the necessity of instituting tighter alien screening regulations and procedures. As a result, the Tb Control Program has placed a Public Health Liaison in the Department of Labor and Immigration to deal with Tb control among alien workers.

Over 70% of the active cases of Tb are diagnosed with pulmonary Tb, and an additional 8% have combined pulmonary and extra-pulmonary Tb. Most cases of active Tb among alien workers develop over 2 years after arrival in the CNMI (Figure 4). Most of the isolates over the past few years have been susceptible (85%) to standard anti-Tb medications, while the rate of MDR-Tb remains low at £ 5%.

Since the middle of 1993, the Tb program has instituted mandatory and DOT for all patients with active Tb. As a result, there has been marked improvement in compliance with therapy. For those patients who remain in the CNMI, completion rates of recommended therapy exceed 98%. Despite this success rate, the overall Tb burden in the CNMI has not lessened. (see Figures 1 & 5).

Tb among alien workers

The cases among the alien workers have limited contact with the indigenous population. However, they live in close quarters with many other alien workers. Many of these workers are paid minimum hourly wages with no allowance for time off due to illness. Most are uninsured. Furthermore, for these individuals, Tb is associated with the stigmata of uncleanness, and Tb evokes the fear of being deported back to their country. As a result, patients often deny the existence of any symptoms and delay seeking medical care and diagnosis. Contact tracing is difficult due to crowded barracks and resistance from employers. There is a high background rate of Tb infection, with at least 50% of alien workers in the CNMI already infected when they arrive. A 1987 WHO survey showed that 99.5% of 730 alien workers screened from the Philippines were infected with Tb. Many nonresident workers frequently change residences and employers. Language and cultural barriers compound these issues.

Figure 2. Tuberculosis in the CNMI, by ethnicity, 1996

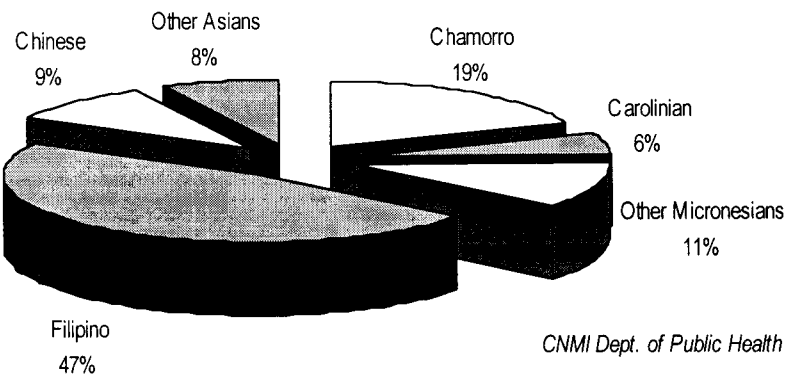
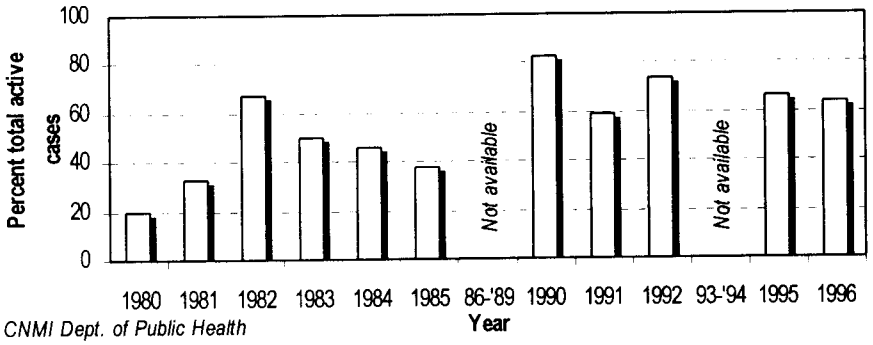


Figure 3. Proportion of active Tb cases attributable to alien workers in the CNMI, by year



CNMI Dept. of Public Health

Tb among indigenous and other Micronesians

One-third of the Tb cases occurs among the indigenous Chamorro, Carolinian, and other Micronesian populations. This group has witnessed transmission among family members with rapid progression to disease. Many have other illnesses such as diabetes and excessive alcohol intake. Among this group, a diagnosis of Tb is associated with shame and loss of status in the society. Among the elderly, Tb still evokes the fear of death. Language and cultural barriers exist among the indigenous and other Micronesian groups and hamper the delivery of effective medical care. These groups have background Tb infection rates of up to 50%. As such, widespread preventive therapy requires the commitment of a large portion of the Tb control budget, a currently impractical approach.

Tb risk factors for the CNMI

There are several factors that place CNMI at high risk of Tb:

Population Growth. Population growth in an important contributing factors for the transmission of Tb in CNMI over the past 10 years. In 1973, the total population was 14,333, with 88% being indigenous. By 1990, the total population had grown to 43,345 with an indigenous population of 17,181 (40%), while the number of alien workers had increased to 16,398 (39%). By 1995 the total population had grown to 58,846 with an indigenous population of 22,091 (38%), while Asians (mostly alien workers) numbered 30,654 (52%). The population had increased by 161% between 1980 and 1990, and increased by 135% between 1990 and 1995. The annual population growth rate in the CNMI of 5.6% is the highest in the world, and the highest ever recorded.

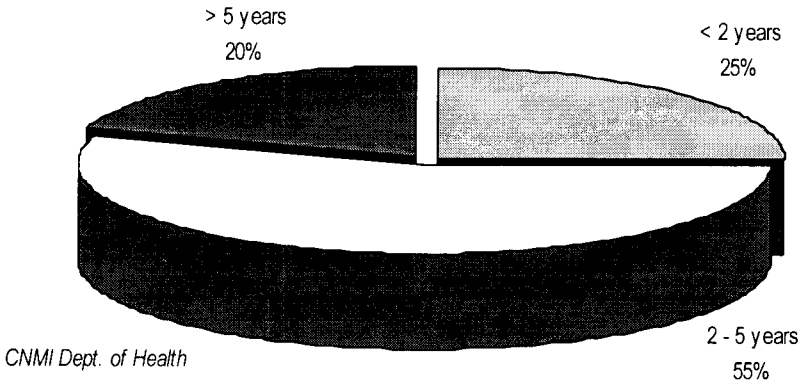
Most of these alien workers are employed in three major industries: construction, garment manufacturing, and service (including hotels, nightclubs and restaurants). These alien workers are coming mostly from Philippines, but also from China, Thailand, India, Bangladesh, and Korea

Table 1. Incidence of Tb in CNMI, 1992–1997

Year	Population	No. of cases	Rate (per 100,000 population)
1992	52,900	44	83.2
1993	55,422	49	88.4
1994	56,656	42	74.1
1995	58,846	41	69.7
1996	62,141	52	83.7
1997	65,520	102	155.7
Mean	**58,580**	**54**	**92.5**

** 74 cases represents 9 months data, 99 is estimated annual no. of cases*

Table 4. Incidence of Tb, by time since arrival in the CNMI, 1992-1997



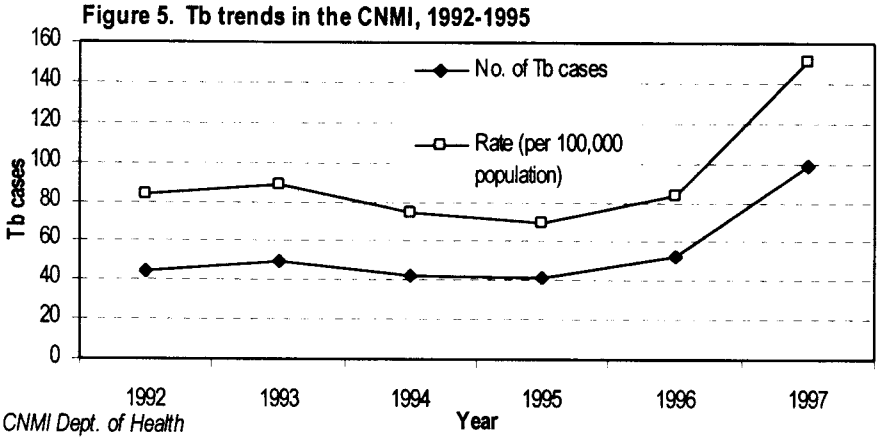
Construction Industry. The construction industry has boomed over the last 10 years, mostly due to an expansion of tourism and its related services. The major construction projects involve large hotel and shopping center projects. This is projected to further increase over the next five years with major development projects planned for Saipan, Tinian, and Rota. Tinian is aggressively pursuing the development of a large casino. There are plans for construction of possibly five casino resorts on Tinian over the next few years. Screening a large influx of construction workers for active Tb has not been adequately addressed.

There are 369 registered construction companies in the CNMI. Most of the construction workers live in barracks provided by the company. Although there are OSHA regulations as well as CNMI government regulations regarding the standards of barracks, regular review and enforcement has been sporadic. There have been several companies cited for overcrowding and poor conditions, which may lead to the transmission of Tb. Overcrowding, long work hours, poor ventilation, poor nutrition, and the stress of being away from home in a foreign country combine to provide an environment for reactivation of old Tb, and further spread.

Garment Industry. There are 24 garment factories in the CNMI. The CNMI Government have approved in 1996 the applications for an additional 12. Each of these factories may employ up to several thousand workers. Most of the garment factory workers are women, mostly from China, Philippines, and Thailand. As with the construction industry, most of these workers live in barracks and are encouraged to work long hours. There are numerous reports of garment factory women resorting to prostitution during off-hours for additional income. Overcrowding, long work hours, poor ventilation, poor nutrition, and the stress are high risks for the reactivation and transmission of Tb.

Poverty. Many workers leave the barracks to find housing out in the community. Standards are generally very poor for most of these alien workers. Overcrowding and poor conditions are problems for alien workers livalso ing outside of the barracks. There are estimates of between 5,000 and 10,000 illegal aliens in CNMI, most of whom live in poor overcrowded conditions. Neither legal nor illegal aliens qualify for government subsidized housing.

Figure 5. Tb trends in the CNMI, 1992-1995



Immigration from other Micronesian countries

The past decade has seen a large increase in the number of immigrants from other Micronesian countries, including Federated States of Micronesia, Palau, and the Marshal Islands. All of these countries have higher rates of Tb than CNMI.[4] These immigrants come to Guam and CNMI in search of employment.

Micronesians generally have large extended families. It is not uncommon to have 4 to 5 nuclear families all living together in one house, totaling as many as 20 to 30 persons. These conditions provide an environment that for the continued spread of Tb.

Goals and objectives for Tb control

Based on the above statistics and analysis, it is quite likely that the CNMI would continue to have very high rates of tuberculosis well into the next century. There is continuous and fresh influx of foreign workers with high background Tb rates. Among the indigenous population, the low rate of completion of chemoprophylaxis is a major issue. The overall Tb situation in the CNMI can be divided into three categories. Each category requires its own targeted approach.

Tb among the Indigenous Population. Tb among the resident population is due to reactivation and recent infection with accelerated progression. Over the past four years, established protocols have streamlined diagnosis and treatment of active Tb cases. It is hoped that with on going educational campaigns aimed at both the public and the health care providers, the proportion due to recent transmission would decrease over time. However, to significantly lessen the burden of Tb among this group, extra attention needs to be given to chemoprophylaxis. Due to the poor compliance with chemoprophylaxis, directly observed preventive therapy in schools, correctional facilities and other clinical settings needs to be implemented. The protective effect of isoniazid preventive therapy is long lasting and this can be cost effective.

Tb among Recently Arrived Foreign Workers. Unfortunately, the number of cases in this group has been steadily increasing. Tb among these individuals is a reflection of the failure of the pre arrival health screening programs. Resources need to be devoted for enforcement of health care screening regulations to find all active cases within this group. This necessitates close collaboration with the Department of Labor and Immigration. Another approach includes the identification in the home countries of clinic to be entrusted with screening the intended worker.

Tb among Resident Foreign Workers. Restriction fragment length polymorphism analysis (molecular fingerprinting) on isolates from the resident foreign workers has shown that Tb among this group is due to reactivation of remote infection. To better diagnose and treat this group, there must be better enforcement of health care screening regulations, provisions of incentives and enablers- such as supermarket food coupons and free rides to the clinic, and more frequent use of field-based DOT. Each strategy requires additional resources.

Although Tb was once called *"the captain of all these men of death"*, the wise and expedient support of the public health programs and infrastructure will allow the eventual reining in of the *"white plague"*.

Conclusion

Although Tb will continue to be a major burden on the public health infrastructure of the CNMI[5], timely and judicious implementation of policies and procedures can favorably impact the control of this epidemic. Some of the problems mentioned here are unique to the CNMI. However, many of the challenges facing Micronesia as they undergo economic development, will be quite similar. A significant lesson learned in the USA is that earnest allocation of resources is one essential step for control. Tb control requires many years of vigilance. Additionally, cooperation within many segments of the society such as health-care providers, industry and commerce sectors, educational institutes and the government can facilitate this task. Although Tb was once called *"the captain of all these men of death"*, the wise and expedient support of the public health programs and infrastructure will allow the eventual reining in of the *"white plague"*.

References

1. Centers for Diseases Control and Prevention. *Reported tuberculosis in the United States, 1996.* July 1997: 1-11
2. *1995 CNMI Statistical Yearbook.* Central Statistics Division. CNMI Department of Commerce.
3. Agerton TB, Valway SE, Mahmoudi A, et al. *Tuberculosis in the CNMI, a US Territory in the Pacific* (in preparation)
4. WHO. *Epidemiological review of tuberculosis in the Western Pacific region, 1991-1992.* Manila: Western Pacific Regional Office, 1993; 1-18.
5. Mahmoudi A., Abraham IJ. Tuberculosis in Micronesia: a case series. *Pacific Health Dialog* 1996; 3: 162-165.
6. Griffith EC, Mahmoudi A, Desmond EP. DNA Fingerprinting of *M. tuberculosis* Strains from Pacific Islands. *Presented at the ninety-seventh General Meeting of the American Society for Microbiology,* Miami Beach, Florida, May 8,1997. □