

Status of Tuberculosis in South Korea and the Need for a New Method to Diagnose Active Tuberculosis



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Abstract

Tuberculosis (TB) is a global health concern even in South Korea. TB incidence in South Korea is the highest among Organisation for Economic Co-operation and Development (OECD) countries, and is supposed to be due to the Korean War in 1950. TB has not yet been eradicated, and is the most common infection and death among infectious diseases in South Korea. Therefore, there is a need for a method to diagnose active tuberculosis quickly and inexpensively on site, and the detection of mycobacterial proteins in sputum using a radioimmunoassay or membrane filtration method can be an alternative. In addition, the newly developed diagnostic method can contribute greatly to Africa, Southeast Asia, and North Korea, which have become major problems with tuberculosis.

Abbreviations: OECD: Organisation for Economic Co-operation and Development; KCDC: Korea Centers for Disease Control

Mini Review

Tuberculosis (TB)

TB caused by *Mycobacterium tuberculosis* is a global health concern for both developing and developed countries, which is approximately one-third of the world's population infected [1]. According to the World Health Organization Tuberculosis Report of 2016, the number of tuberculosis deaths was estimated to be 1.4 million out of the 2015 non-HIV infected. In addition, it was estimated that 390,000 of HIV-infected people died of tuberculosis. Tuberculosis is among the top 10 causes of death worldwide, and more deaths were made than HIV or AIDS among infectious disease. In particular, Africa, Southeast Asia, and North Korea accounted for more than 86% of all tuberculosis deaths [2].

TB incidence in South Korea

TB incidence in South Korea is the highest among Organisation for Economic Co-operation and Development (OECD) countries. The TB incidence in South Korea was 7 times higher than the average for member countries of the OECD [3]. The major reason for the high incidence is the Korean War from 1950 to 1953. Because of malnutrition, overcrowding, and a lack of access to health care, the number of deaths from TB increased drastically after the Korean War. The TB death rate was 5-fold higher than that before the Korean War. In addition, the first effective antimicrobial drugs such as

isoniazid had been developed by the 1950s. It was not until 1955 that the Korean National Center for Tuberculosis began the first official distribution of anti-TB drugs [4]. Despite the growing economy and continuous national efforts to control TB, South Korea has a disproportionately high burden of TB compared with most high-income countries [5]. The reasons for the high burden of TB in South Korea are a high prevalence of latent TB infection in the elderly population, an increasing population with diabetes, a high smoking rate, inadequate patient management, and immigrants from high-burden countries [6]. New tuberculosis patients, which have been on the rise since 2003, began to decline, peaking 2011. In 2017, the overall new tuberculosis notification rate was 55.0 per 100,000 people in South Korea. In particular, the incidence of tuberculosis in elderly people over 65 years old is 41.9%. Because TB can be fatal to the elderly with weak immunity, effective measures for eradicating TB are needed [7]. As tuberculosis is the most common infection and death among infectious diseases in South Korea, national management is being carried out through the KCDC (Korea Centers for Disease Control).

Need for New Methods to Diagnose Active TB in South Korea

Early diagnosis of an active disease is essential for eradication of an epidemic as well as effective patient management. For erad-

ication of TB, early diagnosis of active TB is the most important. Sputum is the most common specimen obtained for the diagnosis of active TB, and is directly tested through a microscopic examination or nucleic acid amplification tests. A direct microscopic examination is a fast and inexpensive method to identify acid-fast bacilli, but its sensitivity is poor [8]. For these reasons, WHO recommends a biomolecular test such as nucleic acid amplification. Xpert MTB/Rif (Cepheid, Sunnyvale, CA, USA) is the most efficient and suitable tool for a nucleic acid amplification test of TB, and provides the results in < 2 h [9]. Nevertheless, a culture remains the gold standard test for the diagnosis of TB, but it requires a long waiting time (2-6 weeks) owing to the slow growth rate of mycobacteria [10]. The reason why tuberculosis has not been eradicated in South Korea is presumed to be the difficulty in diagnosing active TB of patients who are alienated, poor, or homeless. A nucleic acid amplification test is the most appropriate for an immediate inspection of active TB on site. However, expensive equipment and a skilled inspector for the test are not available in general hospitals, with the exception of university hospitals in South Korea. Therefore, new tools for the diagnosis of active TB that can be performed on site are needed.

Methods for the diagnosis of active TB are continually evolving in order to achieve more rapid, less expensive, and accurate results. Although a number of molecular diagnostic tools have been developed, the detection of mycobacterial proteins in sputum is most likely to confirm active tuberculosis. For protein detection, a radioimmunoassay method can be useful because a large number of samples can be evaluated concurrently, and it does not take much time. A membrane filtration can also be useful because the concentration of sputum can amplify the sensitivity.

Conclusion

In South Korea, tuberculosis is prevalent in the elderly, and is the most common deadly infectious disease. This is presumably due to the difficulty in diagnosing the major infected persons with active tuberculosis. Therefore, there is a need for a method to di-

agnose active tuberculosis quickly and inexpensively on site, and the detection of mycobacterial proteins in sputum using a radioimmunoassay or membrane filtration method can be an alternative. In addition, the newly developed diagnostic method can contribute greatly to Africa, Southeast Asia, and North Korea, which have become major problems with tuberculosis.

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