

# Chapter 4

## Advances in Clinical Diagnosis of Tuberculosis: Past, Present, and Future

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### ABSTRACT

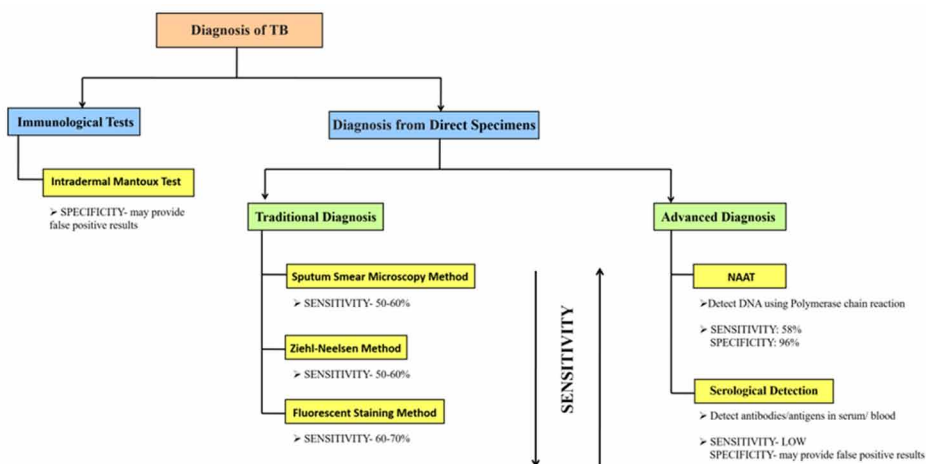
*Tuberculosis (TB) holds a central and deadly platform around the globe, affecting mankind with around one-third of the world being affected by latent TB. TB progresses in the body through inhalation process and has a critical discrimination in terms of affecting individuals depending upon age, sex, socio-economic status, and even the stature of nation (developed or developing). The biggest challenge in TB management is accurate, direct, early diagnosis, and an ability to differentiate the type of mycobacterium. The most common and reliable direct methods include tuberculosis skin test (TST), smear microscopy, nucleic acid amplification tests (NAAT), and immuno-chromatographic-based methods. However, culturing the specimen on a mycobacterium specific media is considered the 'gold standard' for diagnosis of TB by the WHO. Mycobacterium cultures are used extensively for bacilli differentiation and also for predicting drug susceptibility testing in multi-drug-resistant TB. This chapter discusses the merits and demerits of many approaches to distinguish and identify the type of mycobacterium.*

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## INTRODUCTION

Tuberculosis (TB) disease is a global public health malady, claiming almost 1.5 million lives annually. Putting India on a global scenario, it is found that one-fifth of the global incidence of TB occurs in India (Central TB division 2010). Tuberculosis is caused by members of the *Mycobacterium tuberculosis* (Fig. 1) complex [MTBC], which includes *M. tuberculosis*, *M. bovis*, *M. africanum*, *M. canetti*, and *M. microti*. TB is a major concern in industrialized countries due to their socio-economic factors such as immigration, a rapid increase in poverty, malnutrition, war, and limited medication access. To address this grave disease, the most important aspects are its effective treatment, and its proper diagnosis. The management of TB includes a 4-drug regime, and the treatment period is about six months long. To reduce transmission of this disease, and to achieve disease elimination, early, and accurate diagnosis followed by proper treatment is vital. However, there are still a lot of challenges associated with the diagnosis of TB with specificity, and sensitivity.

Figure 1. Structure of *Mycobacterium*



## 1. MOST COMMON IMMUNOLOGICAL TESTS OF TB

The most commonly used method for TB diagnosis is the tuberculosis Skin Test. This test is popularly known as the intradermal Mantoux test. It is the oldest diagnostic test, which is still included in the WHO latest recommendations for TB control (Lalvani 2007). The tuberculin fraction most widely used in this test is purified protein derivative (PPD), derived from cultures of *M. tuberculosis*. The reaction to

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