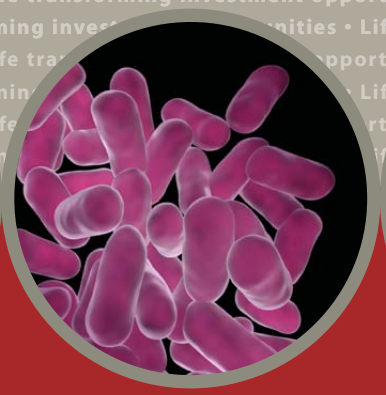
World Health Organization

EXECUTIVE SUMMARY



Diagnostics for tuberculosis

Global demand and market potential

FIND FOUNDATION FOR INNOVATIVE NEW DIAGNOSTICS

Special Programme for Research & Training in Tropical Diseases (TDR) sponsored by UNICEF / UNDP / World Bank / WHO

CHAPTER 1

Global agenda for tuberculosis control

The magnitude of the global TB problem is immense, with 8.8 million new cases annually and 2 million deaths. HIV is fuelling the epidemic in many countries and multidrug-resistance is a growing threat. Rapid and accurate diagnosis is at the core of the international strategy to control TB, but existing tests leave millions undiagnosed and untreated. World leaders, public health officials and international donors have taken action against TB, and financial resources for control and research have increased dramatically in recent years. Furthermore, several public–private partnerships to combat global health issues have emerged. Public sources of funding are available through national research institutes and through small business technology programmes around the world. There is an expanding international infrastructure and network capable of influencing national policy, clinical practice and the purchase and delivery of diagnostics, providing a gateway for manufacturers. Thus, it is an auspicious time for the development and implementation of new tools.

CHAPTER 2

Overview of current diagnostics

Depending on where you are in the world, the range of available TB diagnostic tools may vary, as may testing priorities. The highest priority for TB control in high-burden settings is detection of active TB cases excreting large numbers of infectious bacteria. In such settings, sputum smear microscopy is the predominant diagnostic test in use. High-tech molecular techniques and rapid culture systems, which can detect cases with many fewer organisms in clinical specimens, have penetrated markets in industrialized countries, where the TB burden is low, and where diagnostic priorities encompass all forms of active disease (infectious and non-infectious), as well as latent infection. Such tests have not been implemented in high-burden developing countries to any significant degree, mainly because the level of sophistication and cost has, to date, made their routine application unfeasible. The advantages and limitations of each of the currently available methods for diagnosing latent, active and multidrug-resistant tuberculosis are described in this chapter, as are the priority testing needs in different regions of the world. It is clear that no test is yet available that meets target specifications, and new methods that can overcome limitations and respond to the challenges posed will be well received.

CHAPTER 3

Current TB diagnostics market

Commercial interest in TB diagnostics has been limited by a lack of detailed information on the size and character of the TB diagnostic market. An international network of contacts and investigators has, for the first time, yielded a strategic overview of the current global market for TB diagnostics, encompassing testing for active disease caused by TB, as well as detecting latent infection, monitoring response to treatment, and drug-susceptibility testing (DST). This analysis indicates that annually over US$ 1 billion is spent worldwide on TB diagnostics, a figure over twice as large as the current market for TB drugs. One third (US$ 326 million) of this money is spent outside of the established market economies (EME), where 73% of TB diagnostic testing takes place. Lower labour costs primarily account for the lower cost per test performed in developing countries. Sputum smear microscopy and chest radiography for active disease are by far the most common tests performed in middle-income and low-income countries (83 million, 47 million tests, respectively) and eclipse the use of higher performance but more complex and expensive tests, such as culture and nucleic acid testing (NAT). Skin testing with purified protein derivative (PPD) is the highest volume TB diagnostic test used in the EME (40 million tests), where it makes up half the total market, reflecting the importance of detection of latent infection in those countries.

CHAPTER 4
Improving the technology

Capitalizing on market opportunities will require the development of tools that respond to the medical need at an affordable price. More than one type of new diagnostic test is needed to assist in TB care and control. The primary need is for simple confirmatory or screening tests for use in health clinics to distinguish active tuberculosis from all other conditions that may cause the same symptoms. Tests are also needed to monitor treatment response, to determine whether there is bacterial resistance to specific drugs and to detect latent infection in people at greatest risk for progression to active TB following exposure. New TB diagnostic tests may target different levels of the health system depending on their degree of sophistication. Two detailed customer requirement documents are included that describe the requirements for tests to detect active TB in peripheral clinics and for resolution testing in urban centres. By matching customer requirements to opportunities presented by emerging technologies, a set of 7 sample new products is generated that illustrates the range of tests which could be feasibly developed in the coming 3 to 10 years. The development and evaluation costs for several recently developed products, on different technology platforms, are included. Total R&D costs in the example products range from US$ 1 to 10 million. Opportunities for public sector partnerships to defray costs, accelerate development, ease evaluation and assist market entry for improved diagnostics are described.

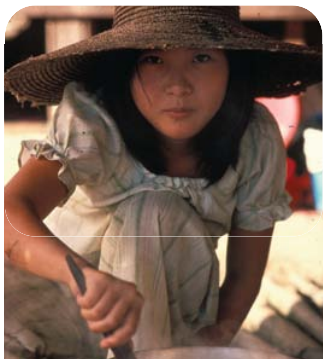
CHAPTER 5
Potential market for new TB diagnostics

The persistent TB epidemic and expanding global population ensure that the total market for a range of TB diagnostic products is likely to grow over the coming decades. The portion of this market that will be accessible to new products depends on the interplay of performance and operational characteristics of the new product, end-user preferences, and the market conditions in specific geographical areas. In this chapter, the potential available markets (PAM) for seven hypothetical new TB diagnostic products (point-of-care screening, smear replacement, culture replacement, monitoring response to treatment, MDR-TB detection and latent infection replacement (with and without predictive capacity)) covering the three major TB testing indications are estimated for the year 2020.

Worldwide, we estimate that the largest potential available market for a new TB diagnostic would be for a test that both detects latent infection and predicts progression to active disease (767 million patient evaluations/year). Such a test, if widely implemented and accompanied by successful treatment, could revolutionize TB control. The infrastructure to achieve this globally is not available. Capturing 25% of the total available market (TAM) by 2020 would result in some 200 million patient evaluations/year. The next largest total available market is for a point-of-care screening test (193 million patient evaluations/year), of which 70% (137 million patient evaluations/year) is concentrated in the 22 high-burden countries. We estimate that 40% of this TAM (57 million patient evaluations/year) could be captured by 2020. Substantial markets also exist for less revolutionary 'replacement technologies', for which there are already good candidates in the pipeline or for which testing platforms already exist. Specifically, the total available markets for smear, culture, monitoring and DST replacement tests are 83 million, 57 million, 40 million, and 6 million patient evaluations, respectively. Compared to the 25–40% TAM capture for the new testing approaches described above, we estimate that replacement technologies could capture greater proportions of the market by 2020: smear 59% (49 million), culture 35% (20 million), monitoring 58% (23 million) and DST 45% (3 million). Without exception, between 70–90% of the potential available markets for these replacement technologies are in the 22 high-burden countries. The continued emphasis on improving market conditions will encourage market growth in the high-burden countries and increase the accessibility to new products.

CHAPTER 6

The socioeconomic burden of TB



Investment in improved TB diagnostic tools could be life-transforming for both test developers and the ultimate end-users–TB sufferers. TB imposes a tremendous economic and social burden on societies, communities and individuals of all ages and in all social classes. Inadequate diagnostic tools perpetuate financial and opportunity losses through delays in diagnosis, and the need for repeat testing and misdiagnosis. Patients may spend between 30–40% of their annual income on TB diagnosis and treatment, and in many countries where TB is highly stigmatized, women with TB may be ineligible for marriage and/or may be forced to send their children to work. In 1999, India estimated the local economic impact of TB to be US$ 3 billion. In the 1980s, prompted by an outbreak of deadly multidrug-resistant TB particularly in HIV infected persons, New York City spent US$ 1 billion rebuilding a TB control programme. What is striking is that, the world over, patients find ways to mobilize funds necessary to cover the expenses incurred by the TB diagnostic process. This fact should not diminish the importance of finding affordable tests; however, it builds confidence that new tools that are more accurate and/or require fewer clinic visits will be well received and will lead to cost savings and health benefits for TB sufferers.

CHAPTER 7

The business environment for TB diagnostics

Introducing a new product line or a new method of diagnosis to the marketplace is always a challenge. In the case of TB products, the greatest success will be won through gaining wide acceptance in both private-pay and public-tender sectors of a worldwide market. Obstacles to market entry can be reduced by (i) gaining a better understanding of how purchase and pricing decisions are made, particularly in developing country settings, (ii) understanding current distribution mechanisms for TB commodities and trends for the future and (iii) using the extensive global Stop TB Partnership as a gateway to broad acceptance of new products.

COUNTRY PROFILES

National profiles are presented for 14 important or representative markets (Australia, Brazil, China, Canada, France, Germany, India, Indonesia, Japan, Russian Federation, South Africa, Uganda, United Kingdom, and the United States). They describe:

- the size and nature of the health care system and the degree of privatization;
- the local epidemiology of tuberculosis;
- the strength of the national TB control programme and the quality of the laboratory diagnostic infrastructure;
- the laboratory workload;
- the estimated in vitro diagnostics market;
- the national regulatory policies for in vitro diagnostics;
- the intellectual property rights issues (accordance with TRIPS) and
- the contact information for local industry associations.

DIAGNOSTICS FOR TUBERCULOSIS

Rapid and accurate diagnosis is critical to the care of tuberculosis (TB) patients and to the arrest of disease transmission. Despite a global strategy for diagnosing and treating TB implemented in over 182 countries worldwide, a minority of the nearly 9 million new TB sufferers each year receives a laboratory-confirmed diagnosis. Since the discovery of the TB bacillus in 1882, microscopic examination of stained sputum has remained the cornerstone of pulmonary TB diagnosis throughout most of the world. Diagnostic test manufacturers, in large part, have not invested in the development of new tests targeting the needs of developing countries, where 90% of all TB patients live. The target market is perceived to be too small, too fragmented, or too difficult to access to ensure a return on investment. For the investor, this perception of risk is compounded by anecdotes of complex regulatory policies and weak intellectual property rights protection in developing countries, ultimately resulting in a 'no-go' investment decision.

In Diagnostics for tuberculosis: global demand and market potential, the World Health Organization's Special Programme for Tropical Diseases Research (WHO/TDR), in collaboration with the Foundation for Innovative New Diagnostics (FIND), has compiled existing epidemiological data and generated a wealth of new data on the availability of TB laboratory services, variations in physician diagnostic practices, workloads of national laboratory networks, and manufacturers' sales to authoritatively document the volume and market value of TB diagnostic testing in nearly 200 countries. Customer requirements and research and development (R&D) opportunities are clarified in the document, and the major scientific, financial and market entry challenges specific to TB diagnostic development are presented alongside short-term and long-term strategies and solutions. Furthermore, the potential future TB diagnostic market is estimated for a range of hypothetical new diagnostic tests covering the three major testing indications. Fourteen countries are profiled in detail to complement the global perspective. This report, drafted with extensive input from experts in tuberculosis and public health as well as from private industry, provides essential data and knowledge to dispel common myths and inform investment decisions by industry, foundations, government organizations and world health and financial organizations.

The report comprises 7 chapters, 14 country profiles and an annex addressing global in vitro diagnostic regulatory practices and classification schemes. The key findings are summarized below. All monetary values are in United States dollars.



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