

# TUBERCULOSIS

- Tuberculosis is a bacterial disease that caused illness in an estimated 8.8 million people globally in 2010 and led to 1.45 million deaths.
- The most recent statistics (2010) indicate that there were 8,483 cases of tuberculosis in the UK.
- The UK harbours one of the highest incidence rates of tuberculosis in the EU (ranked 19 out of 27 members).

## OVERVIEW

Tuberculosis (TB) is a debilitating and sometimes fatal disease caused by the bacterium *Mycobacterium tuberculosis*. The most important form of the disease is pulmonary TB, an infection of the lungs and respiratory tract. Symptoms include a persistent cough, breathlessness, weight loss, fever and extreme tiredness. Children are especially vulnerable. The disease is usually treatable with antibiotics, but it remains a health threat in Britain and around the world due to the increasing prevalence of antibiotic-resistant bacterial strains, the cost and difficulty of diagnosis and the absence of a wholly effective vaccine. In 2006, the Stop TB Partnership set up The Global Plan to Stop TB; the Plan sets out the actions and funding needed to accelerate progress in diagnosis, drug and vaccine development so that the vision of a TB-free world can be achieved by 2050.

## HOW TB SPREADS

TB is spread from person to person through the air. When a person with active TB coughs, talks or sneezes, mucus and saliva loaded with the infectious organism are propelled into the air. A single sneeze could release millions of TB bacteria. This means that one person with active TB can infect a further 10–15 people over a year. In most cases, individuals exposed to the bacterium do not become ill as their immune system is able to control the initial infection. However, the bacterium may not be completely eliminated from the body (latent TB). Depressed immunity, due to ageing, a poor diet, or HIV infection, can increase the likelihood of latent bacteria reactivating and the individual falling ill (active TB).

## TB AS A HEALTH PROBLEM

World Health Organization (WHO) figures indicate that the number of TB cases is declining globally. In 2010, there were 8.8 million cases of TB and 1.45 million deaths. TB incidence rates per 100,000 people have been falling at 1.3% per year since 2002. TB nevertheless remains a major health problem in many parts of the world, especially in Africa and Asia. In Britain there is also evidence for a recent decline in numbers. In 2010, the Health Protection Agency recorded 8,483 cases of tuberculosis, compared to 8,917 in 2009; the burden of disease is highest in the inner city areas of London and the West Midlands.

## TB AND HIV

There is a connection between HIV infection and the symptoms of TB. People with HIV who also harbour a TB infection are about 21–34 times more likely to develop the debilitating symptoms of active TB, compared with those who are HIV-negative. In Africa, it is estimated that more than two-thirds of the 2.3 million people who developed TB in 2010 were HIV-positive. In the UK, due to highly effective monitoring and treatment of HIV, the connection between the two diseases is less pronounced. In 2010 in England, Wales and Northern Ireland, only 4.9% of TB cases in those aged 15 or over were HIV-positive. This continues the downward trend seen since the proportion of HIV-positive TB cases peaked at 9% in 2003–2004.

## EXISTING SOLUTIONS TO TB

Individuals can be vaccinated against TB with the Bacille Calmette-Guérin (BCG) vaccine, and there are methods to diagnose the disease and drugs to treat it. However, the BCG vaccine has limited protective efficacy, diagnosis still takes too long and there is a growing tide of antibiotic resistance.

The BCG vaccination against TB was widely used in British schools between 1953 and 2006. Current best evidence suggests that the vaccine is effective in preventing TB infection in very young children and that it may also protect against pulmonary TB in school-aged children. However, its effectiveness in older teenagers and adults, where the burden of disease now largely falls, remains unproven.

Diagnosis relies upon microscopic examination of sputum, skin reactivity testing and chest X-rays. Unlike HIV, there has been no rapid, straightforward diagnostic test for TB that can be delivered in a standard doctor's office. This is a problem in low-resource settings,

particularly in the developing world, where the burden of disease is highest. The WHO now supports the use of a new rapid diagnostic test, Xpert MTB/RIF®; it provides accurate results in less than 2 hours so that patients can be offered treatment the same day, but it tells the doctor what *will not* work not what *will*.

TB can be successfully treated with antibiotic drugs, with 90% of cases clearing up completely after 6 months of treatment. However, the emergence of antibiotic-resistant strains, in particular the multidrug-resistant (MDR) and extensively drug-resistant resistant (XDR) strains of TB, complicates treatment worldwide. There are no definitive global data on antibiotic resistance, due to the absence of rapid diagnostic tests. However, in the UK, it is known that about 6–7% of TB infections are resistant to standard antibiotics. Patients suffering from resistant infections can be treated with other, more toxic, combinations of drugs. In a small proportion of cases (about 1% in the UK), bacteria prove resistant to the majority of antibiotics, making treatment long and difficult.

## UK-LED TUBERCULOSIS RESEARCH

Microbiologists in British universities, hospitals and research institutes conduct vital basic research into TB. Current projects include:

- The REMoxTB project – the first regulatory clinical trial of a new treatment regimen in 40 years that will, if successful, cut the length of treatment by 30%
- The TB Drug Discovery Consortium – a leading group of chemists, microbiologists and clinicians who are developing new drugs for TB
- Analysing the body's immune response to the disease
- Developing better diagnostic methods
- Studying the biology of the bacterium
- Developing new TB vaccines, such as the 'MVA85A' vaccine developed at the Jenner Institute in Oxford, that is currently undergoing large-scale clinical trials in South Africa and Senegal

## SGM BRIEFINGS

The Society for General Microbiology (SGM) aims to highlight the important issues relating to microbiology to key audiences, including parliamentarians, policy-makers and the media. It does this through a range of activities, including issuing topical briefing papers. Through its many members, the SGM can offer impartial, expert information on all areas of microbiology.

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