

# Tuberculosis

factsheet for healthcare workers



TB (tuberculosis) is an infectious disease that usually affects the lungs, although it can affect almost any part of the body.

About 150 years ago it caused about one in eight of all deaths in the UK. But by the 1980s, through a combination of better housing and nutrition, the early detection and isolation of cases, and effective treatments it had become uncommon in this country.

However, TB had not been wiped out completely. In fact, TB is one of the major infectious disease problems the world faces today. Last year, more deaths occurred from TB than at any other time in history – approximately 8,000 per day.

Over the past 20 years, TB has been slowly increasing in the UK. About 7,000 cases are now newly diagnosed each year – just over one person in every 10,000 of the population.

This factsheet describes the disease, its diagnostic features, control and treatment, and provides a picture of its incidence both in the UK and around the world. It takes into account the new, more targeted recommendations for BCG immunisation in the UK, and it also includes references, a glossary and useful websites. It is aimed mainly at healthcare workers but should be shared with others who want more detailed information on TB.

## The disease, its prevention and treatment

### What is TB?

Tuberculosis (TB) is a serious, but curable, infectious disease caused by a bacterium called *Mycobacterium tuberculosis* (*M. tuberculosis* or *M. Tb* for short). It usually affects the lungs (pulmonary TB) but it can affect other parts of the body such as the lymph glands, bones, joints and kidneys. It can also cause a serious form of meningitis.

A closely related bacterium, *Mycobacterium bovis* (*M. bovis*), causes tuberculosis in animals, mostly in cattle (bovine TB). *M. bovis* can also infect people and was a common cause of TB before the introduction of milk pasteurisation and TB testing of cattle.

### What are the symptoms of TB?

Because TB can affect almost any part of the body, the symptoms are varied.

The most common form of TB is pulmonary (lung) TB. A person with TB of the lung will usually:

- lose their appetite and lose weight
- have a persistent cough, which gets progressively worse over several weeks or months
- bring up phlegm; they may also cough up blood if a blood vessel becomes damaged
- be unusually tired
- have a fever, most often at night, that can result in heavy night sweats.

## How is TB spread?

TB can only be spread by people with infectious TB in the lungs or throat. The bacteria are present in the droplets they cough or sneeze into the air. However, people with TB in the lungs are not always infectious.

## How difficult is it to catch TB?

TB is quite difficult to catch and usually requires prolonged or repeated contact with a person with infectious TB, such as living in the same household. Even then, not everyone who is infected with the bacteria causing TB will develop TB disease. The majority (about 9 out of 10) of otherwise healthy TB contacts who have been infected with the TB bacteria will completely eliminate or contain the bacteria and will not develop TB disease. The remaining 10% of infected TB contacts will develop TB disease, not necessarily immediately but at some time in their life, sometimes decades later.<sup>1</sup>

This is because the bacteria that cause TB are capable of surviving in the body for many years in an inactive state without causing disease. They can become active and cause TB later in life, particularly if a person's immune system becomes weakened, for example by old age, certain medical treatments, serious illness such as HIV or through generally poor living conditions.

For the 10% of infected people who go on to develop TB disease, the risk is greatest within the first two years following infection.

Between 1% and 5% of infected people develop TB disease soon after infection.<sup>2,3,4</sup> This is called primary disease and is more common in children. Primary TB usually passes unnoticed and resolves without treatment but can reactivate later in life. It can leave a small scar on the lung and affects surrounding lymph nodes that can only be seen by chest x-ray.

## What is the difference between TB infection and TB disease?

For most people who become infected with TB, the immune system is able to fight the bacteria and eliminate them or stop them growing. In this case, the bacteria become inactive, but remain alive in the body and can become active later. This is called latent TB infection.

People with latent TB infection:

- have no symptoms
- do not feel ill
- cannot spread TB to other people
- usually have a positive tuberculin skin test reaction
- can develop TB disease later in life.

People with TB disease ('active TB') have symptoms or signs of the disease as described on page 2.

## How serious is TB?

Untreated, TB in most healthy adults is a slowly progressive disease, which may be fatal. Some forms, such as TB meningitis, are more serious than others. One of the most severe complications of pulmonary TB, if left untreated, is haemorrhage (bleeding) from the lungs. TB can be more serious if it becomes resistant to the main drugs used to treat it, as it can then be very difficult to treat.

In the UK, TB is the cause of or contributes to about 350 deaths each year, mainly in the elderly but also in a significant number of young people.<sup>5</sup> Worldwide, where living conditions and health care are poor, the death rate is higher.

## How is TB treated?

In almost every case, TB can be cured – but only if the full course of treatment is taken as prescribed for a minimum of six months. People with TB rarely go into hospital for

treatment although they may be admitted very briefly to confirm the diagnosis and start their treatment.

The standard treatment for TB is a combination of three or four antibiotics for a period of two months, and then two antibiotics for a further four months. The four main antibiotics for treating TB are called isoniazid, rifampicin, pyrazinamide and ethambutol. They are always prescribed in combination to reduce the risk of the bacteria becoming resistant to one or more of the drugs. Once treatment has started, people normally become non-infectious after about two weeks and begin to feel better after two to four weeks, but at least six months' drug treatment is required to cure the disease. Failure to complete the prescribed course of drug treatment can lead to drug resistant or multi-drug resistant TB or MDR-TB.<sup>6</sup>

Sometimes, longer courses of treatment are needed, for example for TB meningitis or if the bacteria are resistant to one or more of the usual antibiotics and different drugs need to be used.

### What is BCG vaccine?

Bacillus Calmette-Guèrin (BCG) vaccine is used to help protect against TB. It is a modified strain of *M. bovis*, the bacterium that causes TB in cattle. The bacteria in the vaccine are alive but have been modified so that they do not cause disease (except on occasion in people with lowered immunity, which is why they are not given BCG).

BCG is given only once as a single injection into the skin with a fine needle.

### Can TB be prevented by BCG vaccination?

BCG does not prevent TB in all cases. It works best against the most severe forms of disease in children, such as TB meningitis.<sup>7</sup>

### Why has the UK's BCG vaccination programme been changed?

- BCG vaccination was introduced into the UK in 1953 at a time when TB affected all parts of the UK population. It was given at the then school-leaving age (14 years) because the greatest risk for developing TB was when young people joined the workforce. Since the 1960s, in addition to the schools' programme, BCG has been offered to UK infants at higher risk of TB.
- Since the 1950s, TB rates have declined in the indigenous UK population to very low levels indeed. TB has also changed from a disease affecting the general population to one affecting particular groups.
- The total number of TB cases has increased slightly in recent years, but this increase is confined to specific populations in major cities. Today, over most of the country, the risk from TB is very low and in most places declining. So, rather than having a universal vaccination programme, it is now more appropriate to have a selective programme identifying babies and infants at higher risk of developing TB and immunising them at an early age to ensure they are protected as soon as possible.

### Who is offered BCG vaccination?

BCG vaccine is offered to:

- all babies and infants under 12 months of age with a parent or grandparent born in a country with an annual incidence of TB of 40/100,000 of the population or greater
- previously unvaccinated children aged one to five years with a parent or grandparent who was born in a country where the annual incidence of TB is 40/100,000 or greater
- previously unvaccinated, tuberculin-negative children aged from 6 to under 16 years of age with a parent or grandparent who was

born in a country where the annual incidence of TB is 40/100,000 or greater

- previously unvaccinated, tuberculin-negative contacts of cases of respiratory TB
- previously unvaccinated, tuberculin-negative new entrants under 16 years of age who were born in or who have lived for a prolonged period (at least three months) in a country with an annual TB incidence of 40/100,000 or greater
- previously unvaccinated, tuberculin-negative 16-35 year olds in certain occupational groups likely to come into contact with TB, ie:
  - healthcare workers who will have contact with patients or clinical materials
  - laboratory staff who will have contact with patients, clinical materials or derived isolates
  - veterinary and other staff such as abattoir workers who handle animal species known to be susceptible to TB (eg simians)
  - prison staff working directly with prisoners
  - staff of care homes for the elderly
  - staff of hostels for homeless people and facilities accommodating refugees and asylum seekers.

Northern Ireland has a low rate of TB (4/100,000). Countries with annual rates of TB of 40/100,000 or greater are listed at [www.hpa.org.uk/infections/topics\\_az/tb/epidemiology/who\\_table2.htm](http://www.hpa.org.uk/infections/topics_az/tb/epidemiology/who_table2.htm)

### **Do you need a BCG immunisation if you are travelling abroad?**

BCG immunisation is recommended for previously unvaccinated, tuberculin-negative individuals under 35 years of age who are going to visit, live or work with local people for more than one month in a country where the annual incidence of TB is 40/100,000 or greater.<sup>8</sup>

### **Why do some people have a skin test before the BCG vaccine?**

Some individuals will have a skin test before the BCG vaccine (see below). This is performed to determine if the immune system already recognises TB. It involves injecting a small amount of tuberculin – a solution of purified proteins from *M. tuberculosis* – into the skin. The injection site is inspected two to three days later.

The test is positive when there is a raised red reaction at the needle site. In this case, BCG vaccine should not be given as the person has already come into contact with TB or other similar bacteria and their immune system has already responded. If the test is strongly positive then further investigation may be necessary as the person may be infected with TB or have TB disease.

### **Who needs a skin test?**

A tuberculin skin test is necessary prior to BCG vaccination for:

- all individuals six years and over
- infants and children under six years of age with a history of residence or prolonged stay (more than one month) in a country with an annual incidence of TB of 40/100,000 or greater
- those who have had close contact with a person with known TB.

### **What should be done if someone has been in contact with a person with TB?**

When someone is diagnosed with TB, the local Consultant in Communicable Disease Control must be notified so that the local TB services will assess the risk posed to other people. If a person is infectious, or if a child has developed TB and the source of the infection is unknown, then close contacts will be invited for screening. Close contacts are people living in the same household and close family members.

Sometimes casual contacts, for example work colleagues and friends, may be invited for screening but this is often not necessary.

It is extremely rare for children with TB disease to be infectious because they don't tend to get infectious TB of the lungs but are infected by TB in other parts of the body. However, their TB suggests there is an infectious adult in their vicinity.

Screening of contacts is done to identify people who may have been infected with TB or who have active disease. Screening will involve a skin test and, in some cases, a chest x-ray. In the UK, skin tests will often be mildly positive (a raised red reaction at the needle site) as a result of receiving a BCG vaccination in the past. If the skin test is strongly positive, a chest x-ray will be taken to look for signs of TB

disease. If signs of infection or disease are identified, the person will be referred to a specialist doctor and may be treated with a course of anti-TB drugs.

### **What if someone requests a BCG vaccination?**

People seeking vaccination for themselves or their children should be assessed for specific risk factors for TB. Those without risk factors should not be offered BCG vaccination but should be advised of the current policy and given written information. Further information is available at [www.immunisation.nhs.uk](http://www.immunisation.nhs.uk)

People with risk factors should be tuberculin tested and offered BCG vaccination according to local service arrangements.

## **The UK picture**

### **Isn't TB a disease of the past?**

No. TB steadily declined during most of the last century, up until 1987, but the disease never went away. There were still over 5,000 cases a year in the UK in the late 1980s when TB was at its lowest.<sup>9</sup>

Throughout the 19th and early 20th century, TB ('consumption') was common in the cities of Europe and North America. London was one of the worst affected areas. TB once caused about one in eight of all deaths in the UK.<sup>10,11</sup> The decline was achieved through a combination of better housing and nutrition, isolation of infectious cases, pasteurisation of milk, antibiotics against TB, early detection through mass chest x-ray programmes, and BCG immunisation.

### **How common is TB in the UK today?**

Cases of TB in the UK fell from 50,000 a year in 1950 to 5,745 in 1987 – the lowest recorded level. Since then, the numbers in the UK have been rising again and have increased by 27% to

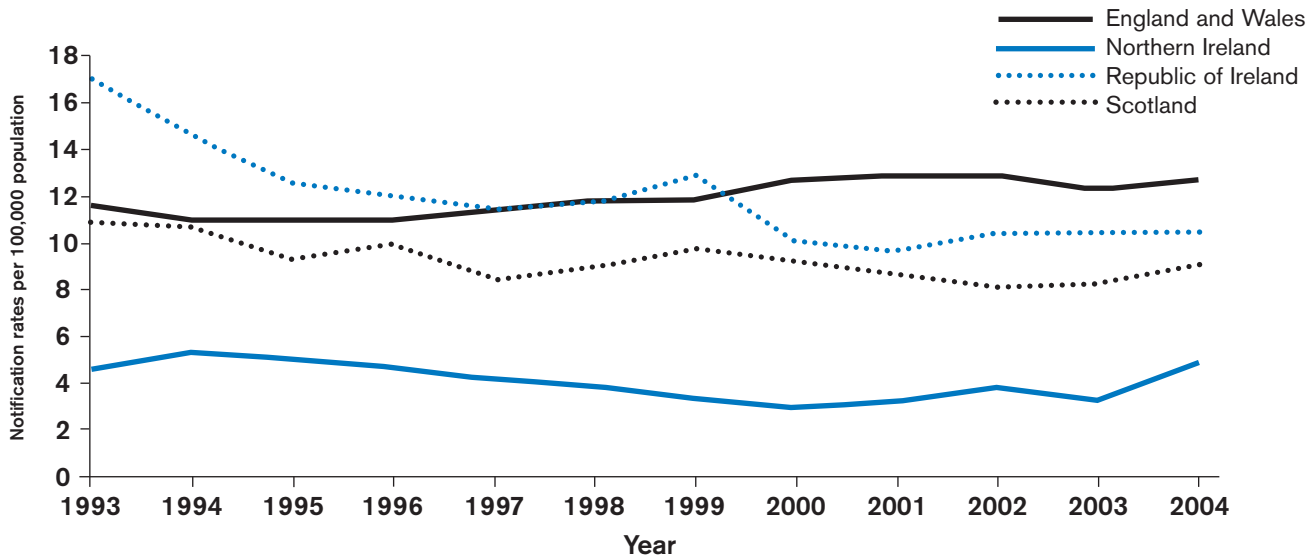
7,300 a year. In London the numbers have doubled; they now account for almost 40% (3,000) of the national total. Each year about 350 people in England and Wales die from TB.<sup>5</sup>

Northern Ireland has a lower rate of TB than the rest of the UK and the Republic of Ireland (see Figure 1). Figure 2 shows the number of clinically diagnosed cases of TB in Northern Ireland from 1980 to 2004. The number of cases of TB reported from enhanced surveillance steadily declined until 2000 when 51 cases were reported. Since then the annual number of reports has increased, with 84 being provisionally received in 2004.

### **Why is the number of cases of TB increasing in the UK?**

Like most countries, the UK is affected by the worldwide resurgence of TB. As an airborne infectious disease, it travels with affected individuals – so no part of the world can be isolated. Case numbers in the UK have begun to rise due to a combination of factors. These include

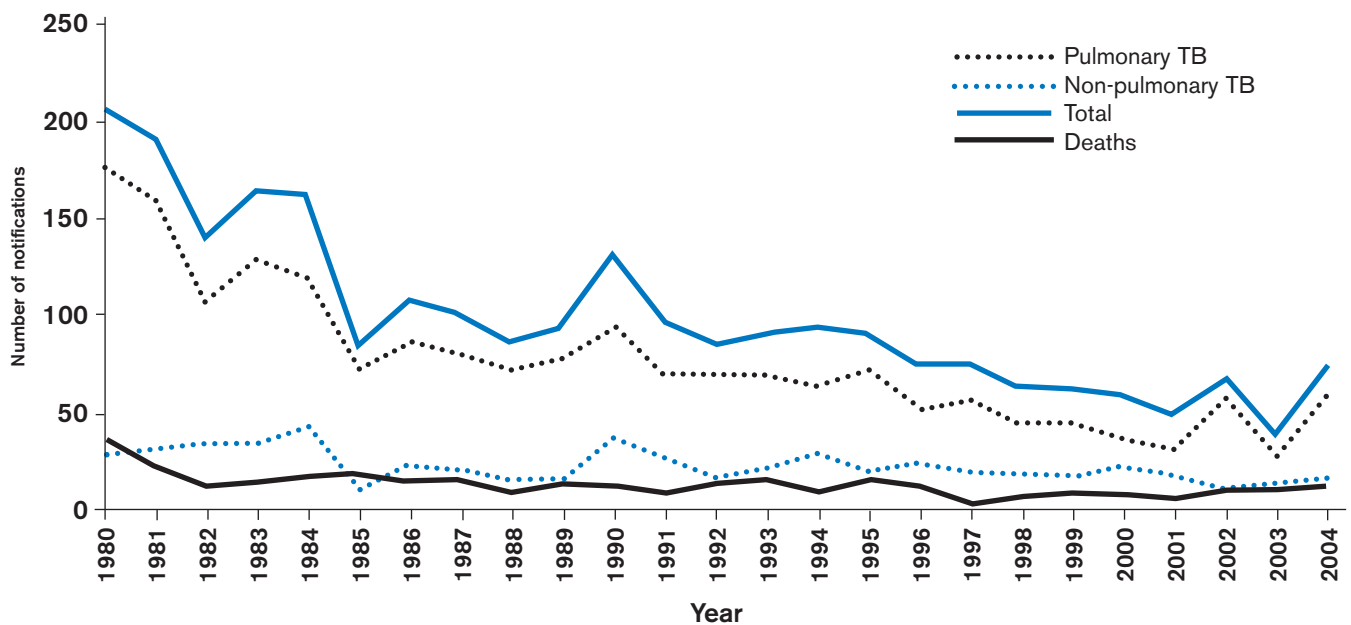
**Figure 1: TB notification rates per 100,000 population, Northern Ireland, England and Wales, Scotland, Republic of Ireland, 1993-2004**



Note: Crude rates per 100,000 pop. are stated for Republic of Ireland, Scotland, England and Wales whereas data provided for Northern Ireland are taken from Enhanced Tuberculosis Surveillance.

Sources: Northern Ireland, Communicable Diseases Surveillance Centre (Surveillance of tuberculosis in Northern Ireland 2003. Data for 2004 is provisional), England and Wales, Health Protection Agency; Scotland, ISD Scotland; Republic of Ireland, National Disease Surveillance Centre.

**Figure 2: TB notifications in Northern Ireland, 1980-2004**



Sources: Communicable Disease Surveillance Centre Northern Ireland (Statutory Notifications of Infectious Diseases), NISRA (TB deaths)

increased migration of people from areas of the world where TB is more common than in the UK, and the increased mobility of the UK population. An ageing population and the emergence of HIV have also added to this increase.

### Who is most at risk from TB?

Anyone can get TB but some people are more at risk. Although TB is increasing in the UK, it remains quite rare and is found mainly in London and the other major cities where the risk factors tend to be concentrated.

In the UK, those who are at most risk of developing TB disease are:

- children with parents or grandparents whose country of origin has a high rate of TB

also, people who:

- are close contacts of a person with infectious TB
- have visited, lived or worked for a long time in countries with a high rate of TB
- have a weakened immune system due to disease or treatment (HIV is a particular risk factor)
- are homeless or living in poor or overcrowded conditions or undernourished
- may have been exposed to TB in their youth when the disease was more common in this country
- have been in prison
- are addicted to drugs or misuse alcohol.

Young children and very elderly people are more susceptible to TB.

### **What is being done to control TB in the UK?**

TB can be controlled by:

- promptly recognising and treating people with the disease
- ensuring that people with the disease complete their treatment (not fully completing the prescribed course of treatment not only fails to control the disease but contributes to the growth of drug resistance)
- protection through BCG immunisation of those at high risk of infection
- health promotion, education and raising awareness
- concentrating these activities on those most at risk from TB.

## **The global picture**

TB caused 100 million deaths in the last century and was declared a Global Health Emergency by the World Health Organization in 1993.<sup>12</sup> It is estimated that a third of the world's population is infected and there are almost nine million new cases every year.<sup>13</sup> Someone is newly infected with TB every second.

Most people's immune systems are able to keep the infection under control so they do not go on to develop active TB. Even so, TB is the cause of around two million deaths worldwide every year, one every 15 seconds.<sup>14</sup> Of these deaths, 98% occur in the developing world and particularly in South Asia and sub-Saharan Africa.<sup>13</sup>

TB is the leading killer of young women and it creates more orphans than any other infectious disease.

### **What is being done to tackle TB globally?**

TB can be tackled only by global effort. Control of TB in any one area of the world depends on it being controlled elsewhere.

The World Health Organization promotes a global strategy called DOTS (Directly Observed Therapy Short-course) to tackle TB.<sup>15</sup>

### **Which countries have high rates of TB?**

Countries with high rates of TB are those where the annual incidence of TB is 40/100,000 of the population or greater.

These are listed at:

[www.hpa.org.uk/infections/topics\\_az/tb/epidemiology/who\\_table2.htm](http://www.hpa.org.uk/infections/topics_az/tb/epidemiology/who_table2.htm)

# Countries with annual rates of TB of 40/100,000 of the population or greater

Afghanistan	Gabon	Pakistan
Algeria	Gambia	Palau
Angola	Georgia	Panama
Argentina	Ghana	Papua New Guinea
Armenia	Guam	Paraguay
Azerbaijan	Guatemala	Peru
	Guinea	Philippines
Bahamas	Guinea-Bissau	Portugal
Bahrain	Guyana	
Bangladesh		Qatar
Belarus	Haiti	
Belize	Honduras	Republic of Korea
Benin		Republic of Moldova
Bhutan	India	Romania
Bolivia	Indonesia	Russian Federation
Bosnia Herzegovina	Iraq	Rwanda
Botswana		
Brazil	Kazakhstan	Sao Tome and Principe
Brunei Darussalam	Kenya	Saudi Arabia
Burma (Myanmar)	Kiribati	Senegal
Bulgaria	Kyrgyzstan	Sierra Leone
Burkina Faso		Singapore
Burundi	Lao People's Democratic Republic	Solomon Islands
	Latvia	Somalia
Cambodia	Lesotho	South Africa
Cameroon	Liberia	Sri Lanka
Cape Verde	Lithuania	Sudan
Central African Republic		Suriname
Chad	Madagascar	Swaziland
China	Malawi	Syrian Arab Republic
China, Hong Kong SAR	Malaysia	
China, Macao SAR	Maldives	Tajikistan
Colombia	Mali	Tanzania
Comoros	Marshall Islands	Thailand
Côte d'Ivoire	Mauritania	Timor-Leste
Croatia	Mauritius	Toga
	Micronesia (Federated States of)	Turkmenistan
Democratic People's Republic of Korea	Mongolia	
Democratic Republic of Congo	Morocco	Uganda
Djibouti	Mozambique	Ukraine
Dominican Republic		United Republic of Tanzania
	Namibia	Uzbekistan
Ecuador	Nepal	
El Salvador	New Caledonia	Vanuatu
Equatorial Guinea	Nicaragua	Venezuela
Eritrea	Niger	Viet Nam
Estonia	Nigeria	
Ethiopia	Northern Mariana Islands	Yemen
		Zambia
		Zimbabwe

For an up-to-date list of countries with high rates of TB, check the website [www.hpa.org.uk/infections/topics\\_az/tb/epidemiology/who\\_table2.htm](http://www.hpa.org.uk/infections/topics_az/tb/epidemiology/who_table2.htm)

# Glossary

**antibiotics** – special medicines used to treat infections that work either by killing bacteria or by stopping them multiplying.

**bacterium/bacteria** – single cell micro-organisms (germs), some of which cause disease. Others are essential for our bodies to work properly.

**BCG** – Bacillus Calmette-Guèrin, the vaccine that helps protect against TB, named after the two scientists who developed it. Although it does not work in all cases, it is most effective against the more severe forms of disease in children such as TB meningitis.

**chemotherapy** – the use of particularly strong drugs over a period of time to cure a disease. In the case of TB, the drugs used are special antibiotics.

**clinical isolation** – people being treated in hospital for TB need to stay in a special room on their own while they are infectious so they do not infect other people.

**DOTS strategy** – Directly Observed Therapy Short-course, or DOTS for short, is the name given to the World Health Organization's strategy to get TB under control worldwide. At its core is recognition of the need to supervise every patient with TB until they have completed their treatment.

**drug-resistant TB** – TB due to strains of *Mycobacterium tuberculosis* (the germ that causes TB) that are resistant to one of the usual TB antibiotics; different types of treatment may be needed. Multidrug-resistant (MDR) TB is resistant to several TB antibiotics and is particularly difficult to treat.

**haemorrhage** – a discharge of blood from a blood vessel.

**Mantoux skin tests** – tests carried out to help diagnose TB or before immunisation to see if someone is already immune to TB and therefore does not need a BCG injection.

**immune system** – the body's system for fighting infectious disease.

**inactive state** – some bacteria can live in the body in an inactive state for many years without causing any disease (latent infection). They may later become active and cause the disease.

**lymph nodes** – parts of the lymph system of the body that collect lymphatic fluid, filter it and return it to the blood stream. They also contain special types of white blood cells that destroy bacteria and viruses.

**Mycobacterium tuberculosis (M. Tb)** – the bacterium (germ) that causes TB.

**pasteurisation** – the partial sterilisation of milk by heating to kill the *Mycobacterium bovis* bacteria that cause TB in cattle (bovine TB) but can also affect man.

**primary disease** – the first TB infection in an individual. It usually passes unnoticed and clears up without treatment. However, some people, especially children, develop TB within months or even weeks of being exposed to the bacteria.

**pulmonary TB** – TB affecting the lungs. People with pulmonary TB are infectious if the TB bacteria can be seen in their sputum (phlegm) when it is examined under a microscope.

**screening** – a process where people are checked to see if they are already infected with TB. This can consist of a tuberculin skin test, and/or a chest x-ray. In the future a blood test may be used.

**TB meningitis** – swelling of the lining of the brain caused by TB infection.

**TB sputum microscopy** – examining someone's sputum (spit or phlegm) under a microscope to see if they have TB infection.

**tuberculin** – a solution of purified proteins from *Mycobacterium tuberculosis* that is used in the Mantoux test. The tuberculin is injected into the arm to see if the body recognises the bacterium. A weak reaction in the form of a raised red area where the tuberculin was injected means the person may have been exposed to TB or similar germs in the past and immunisation against TB is not required. A strong reaction may mean the person has TB.

**tuberculosis (TB)** – a serious, but curable, infectious disease caused by the bacterium *Mycobacterium tuberculosis*. It usually affects the lungs but can affect other parts of the body such as the lymph glands, bones and kidneys. It can also cause meningitis.

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## For further information

To find out more about TB you can visit:

[www.cdscni.org.uk](http://www.cdscni.org.uk)

[www.dh.gov.uk](http://www.dh.gov.uk)

[www.dhsspsni.gov.uk/phealth](http://www.dhsspsni.gov.uk/phealth)

[www.hpa.org.uk](http://www.hpa.org.uk)

[www.immunisation.nhs.uk](http://www.immunisation.nhs.uk)

[www.tbalert.org](http://www.tbalert.org)

[www.who.int](http://www.who.int)