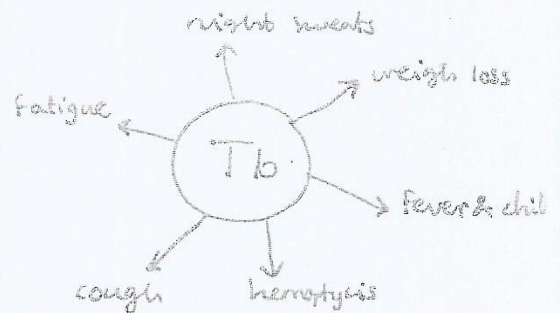


HANDOUT # 1TUBERCULOSIS

Tuberculosis (TB) is a contagious disease caused by the bacilli *Mycobacterium tuberculosis*, which usually attacks the lungs but can also attack the brain, spine, and other parts of the body. TB was once the leading cause of death in the United States but is much less deadly today due to the development of drugs and combination therapies to treat it; however, the development of drug-resistant strains of TB is cause for concern. Worldwide, TB remains a major cause of morbidity and mortality, particularly in Africa and South East Asia.

TB is spread primarily through the air, when a person with active TB puts the bacilli in the air through coughing or sneezing and other people breathe in the bacilli. When a person breathes in TB, the bacilli may settle in the lungs and from there can move to other parts of the body. TB is not a highly contagious disease, and in fact only 20% to 30% of people exposed to TB bacilli become infected. Infection is most common among people who have daily or frequent contact with a person with active TB, such as a family member or coworker. The symptoms of active TB include persistent cough, coughing up blood, weakness and fatigue, weight loss, chills, fever, and night sweats.



Tuberculosis

The most common test for TB is a skin test that involves inserting a small amount of fluid under the skin of the forearm; after 2 or 3 days the skin test is "read" by a health care worker to determine if it is positive or negative. A positive skin test generally indicates exposure to TB, but does not mean that the person has active TB. In fact, most people who test positive for TB have only an inactive or latent infection, meaning that they are not currently sick but that the TB bacilli are present in their body, so they are at heightened risk of developing TB later in their lives. Persons with latent TB have no symptoms and cannot spread the disease to others. Risk factors for developing active TB include age (babies and young children are at greater risk), gender (males are more at risk during infancy and after 45 years of age, women in adolescence and early adulthood), occupational exposure to silicosis, and stress. Any condition that weakens the immune system also places a person with latent TB at risk: Today a common cause of diminished immunity is infection with HIV, and the combination of the two diseases has worsened the global TB burden. Persons with latent TB infection are often advised to take medication to prevent the latent infection from becoming active, and persons known to have weakened immune systems are sometimes treated prophylactically if they have frequent contact with someone known to have active TB.

Active TB is usually treated with a combination of drugs, the most common of which include streptomycin, isoniazid, rifampin, ethambutol, thiacetazone, and pyrazinamide. In most cases, a course of treatment must be continued for at least 6 months to kill all the TB bacilli in a person's body. However, because the person often feels better with only a few weeks of treatment, he or she may cease to take medications on schedule, therefore risking the chance of becoming ill again and also of breeding drug-resistant strains of TB. Directly observed therapy, in which a TB patient takes medications in the presence of a health care worker, has become common for at least initial TB treatment and is recommended by both the Centers for Disease Control and Prevention (CDC) and the WHO.

History

TB is an ancient disease: It was known to the ancient Greeks as *phthisis* and to the Romans as *tubercula*, and evidence of TB has been detected in Egyptian

mummies and remains of Neolithic man in Germany, France, Italy, and Denmark. It was established in Western Europe and the Mediterranean states by AD 100, but became a major health concern with the mass population migrations to cities beginning in the 17th century: The crowded city environment created excellent conditions for spreading the disease. In the United States, TB arrived with the *Mayflower* and was well established in the colonies by the 1700s. TB was largely unknown in Africa until the early 1900s, when it was spread by European colonists. Robert Koch identified the *Mycobacterium tuberculosis* in 1882 and received the Nobel Prize in 1905 in recognition of this discovery.

Early treatment of TB involved rest, exercise, dietary changes, bloodletting, and sometimes a change of climate (such as moving to the mountains or the seaside), none of which may have had any effect on the disease. In the late 1850s, sanatorium treatment became popular, and TB patients were often sent to live in institutions built in mountainous or rural areas solely for that purpose, a practice that may not have helped the patients (beyond what could have been gained by normal bed rest in any climate) but did decrease the probability of their spreading the disease to others. The first effective treatment developed for TB was streptomycin, introduced in 1946. However, streptomycin-resistant strains appeared within months of its introduction. Other early drugs demonstrated to be effective against TB were sulfanilamide, isoniazid, and para-aminosalicylic acid. The success of pharmacological treatment of TB led many in the medical community to believe that the disease was a thing of the past, at least in the industrialized world.

Neglect of TB control programs, coupled with emergence of HIV, led to resurgence in TB rates in the 1980s, both in the industrialized world and in developing countries. The WHO in 1993 declared TB to be a global health emergency, which led to increased efforts toward TB control. Particularly in developing countries, the high prevalence of latent TB infection, high prevalence of HIV infection, and the emergence of drug-resistant strains of TB make the disease particularly difficult to control.

A vaccine for TB was developed in 1921 by Albert Calmette and Camille Guérin; their vaccine, known as BCG (Bacille Calmette Guérin), was first put into common use in France in 1924. Vaccination became common in Europe, until the "Lübeck Disaster" of 1930 in which a number of children were accidentally

vaccinated with virulent tubercle bacilli and many died. After World War II, use of the BCG vaccine was reinstated in Europe and today is a standard vaccine in the WHO Expanded Programme on Immunization and is used in most countries in the world but is not recommended by the CDC for use in the United States except under very limited conditions. The BCG vaccine has variable effectiveness in different populations and on average probably prevents about half of infections. A BCG-vaccinated individual will be positive for a skin test while the vaccine is still effective. Therefore, its use complicates the identification of individuals with latent or newly acquired disease in low-risk areas such as the United States.

Incidence, Prevalence, and Mortality

The WHO collects and reports data on global TB annually: Reporting is voluntary but nearly all countries in the world participate. The WHO estimates that one third of the world's population, approximately 1.9 billion people, is infected with TB. It is the 8th leading cause of death in the world and caused approximately 1.8 million deaths in 2003, more than any infectious disease other than HIV. Most TB cases occur in the developing world, where it causes 25% of adult preventable deaths.

The WHO annual TB reports are presented by geographic region, which somewhat confuses the picture because some regions include countries with both high and low incidence. Africa has the highest annual incidence (new cases) rate, with 345 cases per 100,000 people, followed by South East Asia (including India, Pakistan, Bangladesh, Nepal, the Maldives, Thailand, Indonesia, Timor-Leste, Myanmar, and North Korea) with 190 cases per 100,000. The WHO estimates that 60% to 70% of adults in the African and South East Asian regions are infected with latent TB. The incidence of TB is lowest in Europe and the Americas, with 50/100,000 and 43/100,000 cases, respectively, although there is wide variation by country within these regions.

In the United States, data on TB have been collected by the CDC, in cooperation with state and local health departments, since 1953. In 2005, 14,097 cases of TB were reported, for a case rate of 4.8/100,000. Asians (25.7/100,000) had the highest case rate among ethnic groups, and the rate was much higher for foreign-born (21.9/100,000) than for U.S.-born

(2.5/100,000) persons. Approximately, 1.0% of the U.S. cases were of primary multidrug-resistant TB.

—Sarah Boslaugh

See also Epidemiology in Developing Countries; Public Health Surveillance; World Health Organization

Further Readings

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