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Opinion Article

Infection and Risks with Mycobacterium Tuberculosis

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DESCRIPTION

Tuberculosis (TB) is a disease caused by bacteria that float in the air from person to person. If not treated properly, tuberculosis disease can be fatal. People infected with Mycobacterium tuberculosis that are not ill may need treatment to prevent the development of tuberculosis in the future. The bacteria that cause Tuberculosis (TB) float from person to person when a person with tuberculosis coughs, talks, or sings. People nearby can inhale and infect these bacteria. There are two types of tuberculosis conditions latent tuberculosis infection and tuberculosis. Mycobacterium tuberculosis can live in the body without getting sick. This is called a Latent Tuberculosis Infection. Most people who inhale and become infected with M. tuberculosis can fight the M. tuberculosis and prevent the growth of the M. tuberculosis. People with latent tuberculosis infection feel sick, have no symptoms, and cannot infect others with M. tuberculosis. When Mycobacterium tuberculosis becomes active and proliferates in the body, it changes from Latent Tuberculosis Infection to tuberculosis. For this reason, people with latent tuberculosis infection are often prescribed treatment to prevent the development of tuberculosis. When infected with M. tuberculosis, an individual develops either a clinical disease ("primary progressive tuberculosis") or a Latent Tuberculosis Infection (LTBI), which can later be reactivated and lead to the disease ("Reactivated tuberculosis"). The risk of illness in the first five years after infection is higher than in the next few years. After reinfection with M. Tuberculosis is being discussed to what extent LTBI protects against progressive disease. The reduced incidence of tuberculosis after reinfection compared to primary infections has important implications for understanding and predicting the epidemiology of tuberculosis. The model shows that this is an important parameter. When drug-resistant tuberculosis strains are introduced into areas of high TB burden, their spread is limited by the size of the susceptible population, which is largely determined by the level of susceptibility of potentially infected people. If latent tuberculosis provides critical protection, the pool vulnerable to infection is small and outbreaks are limited. The level of protection provided by a latent infection can also predict the effectiveness of a vaccine that mimics the host's response to tuberculosis.

The main challenge in testing M. tuberculosis reinfection is the lack of tests to detect reinfection. Tuberculin Skin Examination and interferon gamma release assay cannot distinguish reinfection from previous latent tuberculosis infections. Therefore, reinfection studies rely on surrogate measurements of re-exposure in potentially infected individuals. Today, the prevalence outside the region where high levels of Human Immunodeficiency Virus (HIV) are present is less than 3% per year, making reinfection studies difficult. In areas where the burden of HIV is high, the adverse effects of HIV on immunity can outweigh the potential protection provided by latent infections. In addition to providing effective treatment and reducing mortality, the primary goal of tuberculosis management programs in countries with high TB incidence is to reduce the transmission of infectious tuberculosis. The onset of tuberculosis in exposed people is a two-step process after infection. In most infected people, the immune system suppresses the infection and the bacteria become covered with cheesy granulomas and nodules. In about 5% of infected cases, rapid progression to tuberculosis occurs within the first two years after infection. About 10% of people with latent infection will reactivate, half within the first year, the remainder over their lifetime mostly by reactivation of the dormant tubercle bacilli acquired from primary infection or less frequently by reinfection. Overall, about 10–15% of those infected go on to develop active disease at some stage later in life, but the risk of progression is much higher at about 10% per year in HIV positive and other immunocompromized individuals.

The average annual risk of infection with M. tuberculosis is an average calculated from the observed infection rates that are close to the frequency of infection. It may provide information about the extent of infection in the community. If screening is available, you can identify trends in secular variation. A prerequisite for calculating the average annual risk is to correctly determine the infection rate. Among the difficulties encountered in tuberculin skin examinations is the logistical problem of sampling a representative portion of the population.

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Therefore, the compromise assesses the prevalence of school children as an indicator of community-wide infection. The use of the tuberculin study is further enhanced by the unpredictable specificity of the tuberculin skin test, and thus the predicted value of positive test results. Statistical approaches using mixed analysis can solve this problem to some extent, but have limited experience. Cytokine-derived assays, such as the interferon gamma release assay, have shown the potential to provide higher specificity, but require venepuncture. For young adults newly infected with M. tuberculosis, the lifetime risk of tuberculosis is estimated to be 8-10%, consistent with previous estimates. However, most people with latent tuberculosis infection in the United States were infected many years ago, and their future risk of developing tuberculosis is low. This situation stems from the long-standing success of TB control in the United States, where few people are infected compared to past levels in decades. The low lifetime risk of tuberculosis poses challenges to preventive programs, developing better ways to identify tuberculosis risk and more specific diagnostics to identify those at highest risk of future illness.