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Commentary

The Identification of Ancient Microbial DNA and Lipid Biomarkers Recognizes the Palaeopathological Diagnosis

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DESCRIPTION

Tuberculosis is a leading cause of mortality, although infected patients with strong immunity can live for years, implying a long-term co-existence of host and pathogen. The discovery and characterization of ancient microbial DNA and lipid biomarkers verifies palaeopathological diagnosis. Archaeological *Mycobacterium tuberculosis* mimics modern lineages, demonstrating that evolutionary changes take far longer than previously thought. Tuberculosis was acknowledged in ancient and historical times and is today a major cause of mortality and disease on a worldwide scale. According to the World Health Organization, around 2 billion individuals, or almost one-third of the world's entire population, are infected with *tubercle bacilli*, and 1.77 million people died from the illness in 2007. Only around 10% of infected people may develop active illness, usually those with a weaker immune system, such as the very young and old, or those suffering from malnutrition, other diseases, or physical or emotional stress. This high degree of latent infection suggests that the human host and bacterial pathogen have been coexisting for a long time. Tuberculosis is caused by the *Mycobacterium tuberculosis* complex, a collection of closely related bacterial species. Other mycobacterial species are common in the environment, whereas Mycobacterium Tuberculosis Complex (MBTC) members are obligate pathogens. Many mycobacteria, including MTBC, develop at a glacial pace. Pathogenic organisms can persist and proliferate within macrophages, allowing them to avoid the host immune system. To confine and destroy the *tubercle bacilli*, a vigorous cell-mediated immune response is necessary. *Mycobacterium tuberculosis* is now the leading cause of human TB.

Mycobacterium bovis has a broader host range and is the primary cause of TB in other animals. In places where there are no successful eradication programs, unpasteurized milk and milk products are recognized as the principal route of transmission of zoonotic TB caused by *M. bovis*. Other members of the MTB complex, such as *Mycobacterium canettii*, *Mycobacterium africanum*, and species associated with certain animals such as voles (*Mycobacterium microti*), or goats, can infrequently cause human infections. Tuberculosis can affect any organ, although the most frequent clinical manifestation is pulmonary illness. In this case, infectious aerosols generated from an infected person's lungs are used to spread the disease. Inhaled *tubercle bacilli* are absorbed by macrophages in the lung alveolus and are generally confined by the host immunological response. This results in the creation of granulomas and, eventually, calcified lesions. Primary illness occurs when the bacterium spreads within a year of initial infection. The creatures, however, may stay dormant yet alive for decades. If the immune response is weakened, the germs may enter the lungs and cause reactivated pulmonary TB. In a small number of instances, the germs travel to other host tissues *via* the lymphatic system and blood, becoming disseminated throughout the body and causing miliary or extra-pulmonary TB. Primary Extrapulmonary Tuberculosis (EPTB) illness is predicted to occur in 15-20% of immunocompetent persons.

Lymph node infection causes swollen glands and is the most common clinical manifestation of EPTB. Scrofula and lupus vulgaris were historically used to describe cervical lymphadenitis and skin lesions. Pleural effusions, genito-urinary tract TB, meningitis, skeletal, ophthalmic, and abdominal tuberculosis are further clinical manifestations of the illness, particularly in areas where effective treatment is unavailable.

Swallowing contaminated sputum or ingesting infected animal products can cause gastrointestinal TB, which can be spread through faeces and urine. *M. bovis* is believed to be responsible for roughly 6% of human mortality in the past and now in the absence of successful eradication measures. Thoracic radiography, identification of acid-fast bacilli by Ziehl-Neelsen stain, and culture are the standard criteria for TB diagnosis.

The quickest diagnostic tool is microscopy. It can deliver same-day results in optimal conditions, but it is quite insensitive, giving just 10%-30% of culture-positive samples. Culture is delicate, yet even with advanced culture techniques, it might take four weeks to produce clear findings. Palaeomicrobiology, a new science, has proved particularly useful in explaining the ancient origins of *M. tuberculosis* and other members of the MTBC. The direct identification and characterization of a DNA allows for the precise date of alterations indicated by phylogenetic investigations. Data from historical sources help us comprehend human migrations, settlements, and relationships better.

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