Genetic susceptibility and resistance to tuberculosis

This study investigated possible biomarkers of susceptibility and resistance to Mycobacterium tuberculosis, identifying gene expression profiles associated with active tuberculosis (TB). Among a South African cohort, genome-wide transcription profiles of whole blood were obtained from 35 TB patients, 54 healthy donors latently infected with M tuberculosis (LTBI) and 9 healthy non-infected donors (NIDs). Cluster analysis of genes demonstrated pronounced differences among TB patients compared with the LBTI and NID groups, with no significant difference in clustering between the LBTI and NID groups.

Reverse transcriptase PCR identified Fcγ receptor 1B (FCGR1B) as the most strongly differentially expressed gene in the TB group compared to LTBI. This gene, combined with four other more prominently differentiated genes—CD64, Lactoferin, guanylate binding protein 5 and Granzyme A—allowed discrimination between TB and LTBI groups with a sensitivity of 94% (30/32 patients) and specificity of 97% (33/34 patients). Functional annotation clustering demonstrated distinct differences between TB and LTBI groups with increased expression of macrophase-associated genes and reduced expression of natural killer-associated genes as well as reduced apoptosis in TB patients compared to the LBTI group.

This research demonstrates the importance of genetic control over the innate immune system in the development of active TB. Defining a genetic biosignature of resistance or susceptibility to M tuberculosis identifies targets for future drugs and vaccines, an approach critically important in reducing the significant burden of TB disease worldwide.