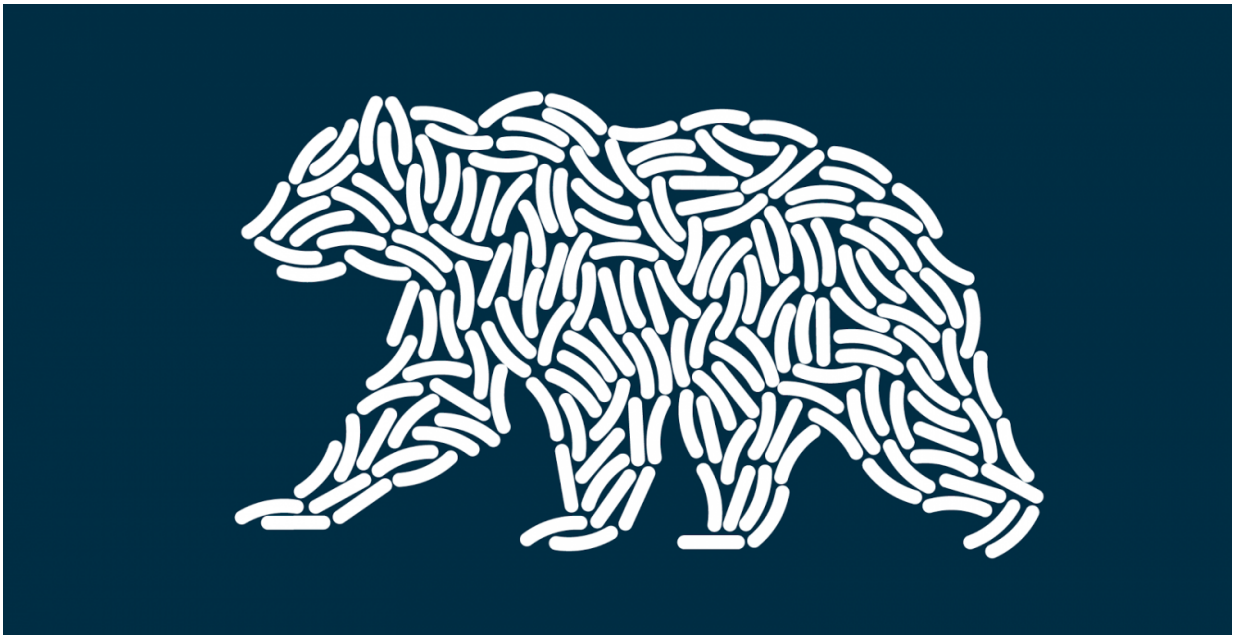


Scientists explain why Russian tuberculosis is the most infectious

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Scientists explain why Russian tuberculosis is the most infectious. Credit: Moscow Institute of Physics and Technology

A collaborative of Russian researchers conducted a large-scale analysis of the proteins and genomes of mycobacterium tuberculosis strains that are common in Russia and countries of the former Soviet Union and found features that provide a possible explanation for their epidemiological success. A paper detailing the results has been published in the prestigious journal *Scientific Reports*.

Up until the 20th century, tuberculosis was considered an incurable disease, and despite newly developed methods of treatment during its early stages, the death rate is still high. There are 22 countries, including Russia, in which the infection rate is four times greater than in the rest of the world. It is important to note that the term "tuberculosis" covers a wide range of [bacteria strains](#) that cause the disease. Strains of the Beijing family, a genotype that was first discovered in Beijing, are prevalent in Russia—every year, about 150,000 people are infected with it. To understand the reason behind the success of this strain, scientists compared proteins produced by Beijing B0/W148 with a control strain. In order to do this, separated bacterial proteins were enzymatically cleaved into smaller fragments—peptides and their mass and relative abundance were measured precisely using mass spectrometry.

After analysing the data, the scientists knew which and how many proteins there were in each strain. They found that in Beijing B0/W148 strains, 266 proteins were differentially abundant compared with the control strain. Fifty-seven of them were entirely absent in the study group and 17 were unique to it, while others differed quantitatively. Analysis of the functions associated with differing proteins revealed that in Beijing B0/W148 strains, there are more proteins producing long-chain fatty acids and fewer proteins destroying them. Bacteria use these acids to produce mycolic acids, which integrate themselves in the bacterial cell membrane and make it waxy, which is why mycobacteria can survive and even reproduce in macrophages (special human cells that destroy foreign substances).

Normally, if a bacterium is eaten by a macrophage, it dies. However, mycobacterium tuberculosis strains have evolved to reproduce within macrophages, and in doing so, they hide from the immune system. Mycolic acids not only protect bacteria, but also play a crucial role in synthesizing substances that inhibit macrophages so they stop fighting disease. These newly discovered features of lipid metabolism could

explain the success of Beijing B0/W148 [strains](#) in relation to other [tuberculosis](#) mycobacteria.

More information: Julia Bespyatykh et al, Proteome analysis of the Mycobacterium tuberculosis Beijing B0/W148 cluster, *Scientific Reports* (2016). [DOI: 10.1038/srep28985](https://doi.org/10.1038/srep28985)

Provided by Moscow Institute of Physics and Technology

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