Host influences bacterial metabolism

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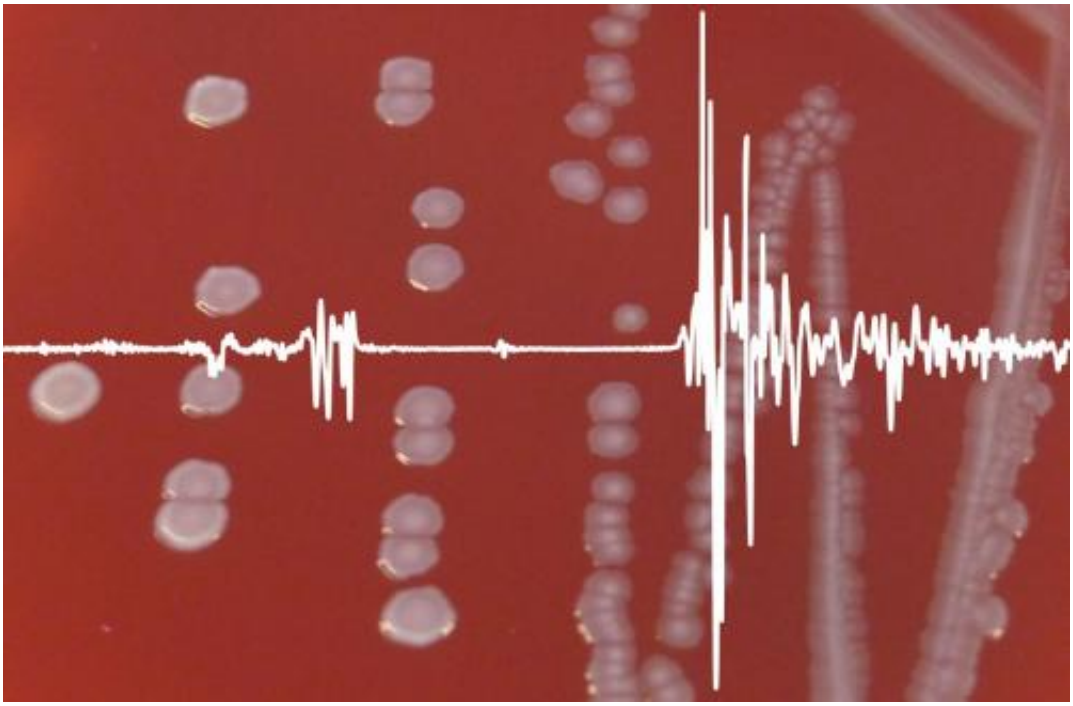

Bacteria on a plate and the respective FTIR spectrum in front. Credit: Tom Grunert/Vetmeduni Vienna

Bacteria are masters in adapting to their environment. This adaptability contributes to the bacteria's survival inside their host. Researchers at the Vetmeduni Vienna now demonstrated that the bacterial pathogen Listeria monocytogenes adapts its metabolism specifically to the host genotype. The bacterial metabolic fingerprint correlated with the susceptibility of the infected mouse strain. The researchers published their results in the journal *Plos One*.

Bacteria are known to specifically adapt to host environments. Understanding these adaptation mechanisms is crucial for the development of effective therapeutics.

Mouse lineage influences bacterial metabolism

Monika Ehling-Schulz's group from the Institute of Microbiology, together with Mathias Müller's group at the Institute of Animal Breeding and Genetics studied the influence of host organisms on bacterial metabolism. The researchers infected three different lineages of mice with the bacteria Listeria monocytogenes. The mouse strains showed significant differences in their response to the infection and in the severity of the clinical symptoms.

The researchers isolated the bacteria days after infection and analysed them for changes in their metabolism. They used a specific infrared spectroscopy method (FTIR) to monitor metabolic changes. The chemometric analysis of the bacterial metabolic fingerprints revealed host genotype specific imprints and adaptations of the bacterial pathogen .

"Our findings may have implications on how to treat infectious diseases in general. Every patient is different and so are their bacteria", first author Tom Grunert states.

Memory effect in bacteria

After isolation from the mice, all bacteria were cultured under laboratory conditions. After prolonged cultivation under laboratory conditions all three bacterial batches switched back to the same metabolic fingerprint. "Based on our results it can be assumed that bacteria have some sort of memory. It takes some time under host-free

laboratory conditions for this 'memory effect' to vanish," explains the head of the Institute, Monika Ehling-Schulz.

Vibrating molecules decipher bacterial metabolism

The researchers employed a technique known as Fourier-transform infrared (FTIR) spectroscopy to monitor the metabolism in the bacteria. An infrared beam directed through the bacteria causes molecules such as proteins, polysaccharides and fatty acids to vibrate. The molecules variably allow more or less light to pass. The different molecular composition in the bacteria yields different spectral data providing information about the molecules inside.

"This method is used especially in microbiological diagnostics to identify bacteria. But we refined the method to decipher and monitor differences in the metabolic fingerprint of the same bacteria," says Grunert.

In the future, the researchers want to extend the concept to other species of bacteria and further study the impact of host organisms on pathogens. In a next step, the team plans to find out what exactly it is, that leads to metabolic changes in bacteria.

More information: "Deciphering Host Genotype-Specific Impacts on the Metabolic Fingerprint of Listeria monocytogenes by FTIR Spectroscopy" by Tom Grunert, Avril Monahan, Caroline Lassnig, Claus Vogl, Mathias Müller and Monika Ehling-Schulz was published in the journal *PLOS One*. journals.plos.org/plosone/arti … journal.pone.0115959

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