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Press Release

Tracing the Source of the Salmonella Infection

Freiburg Biochemists Analyze a Channel that Makes the Pathogen Resistant to Cytotoxins

The bacterial pathogen Salmonella typhimurium, commonly known as the salmonella infection, is resistant to many cytotoxins the human immune system produces in order to defend itself against invaders. Scientists of the University of Freiburg have now succeeded in studying the channel that makes the pathogen resistant. Their results have been published in the current edition of the journal Proceedings of the National Academy of Sciences of the United States of America (PNAS).

Nitrogen fulfills various functions in living organisms: It can serve as a source of energy for growth, as a signaling agent, or even as a cytotoxin. The cells of the human immune system protect themselves against bacteria by producing the nitrogen compounds nitrate and peroxynitrate, which they use to damage or kill invaders. However, bacteria can also use nitrate to reproduce. They have adapted to the defense of the immune system and can absorb the cytotoxin and convert it into their own source of nitrogen, thus rendering it harmless.

Salmonella typhimurium accomplishes this with the help of its nitrate channel NirC. Salmonella bacteria that do not possess NirC cannot infect any human cells. A research team led by Prof. Dr. **Oliver Einsle** and Prof. Dr. **Susana Andrade** from the Institute of Organic Chemistry and Biochemistry of the University of Freiburg and the Freiburg Cluster of Excellence BIOSS Centre

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for Biological Signalling Studies studied the molecular mechanism of this nitrate channel.

NirC is integrated into the cell membrane and is thus particularly difficult to access. The Freiburg scientists isolated the protein and elucidated its spatial structure. In addition, they succeeded in embedding an engineered biological micromembrane into it and measuring the electric current generated by the transport of negatively charged nitrite ions through NirC. This enabled the team to analyze all properties and functions of the channel and create a three-dimensional structural model of it. This model can serve as a point of departure for further studies, for instance with regard to the search for specific inhibitors of the channel whose clinical use could potentially make the pathogen less dangerous.

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