Protein sharpens salmonella needle for attack

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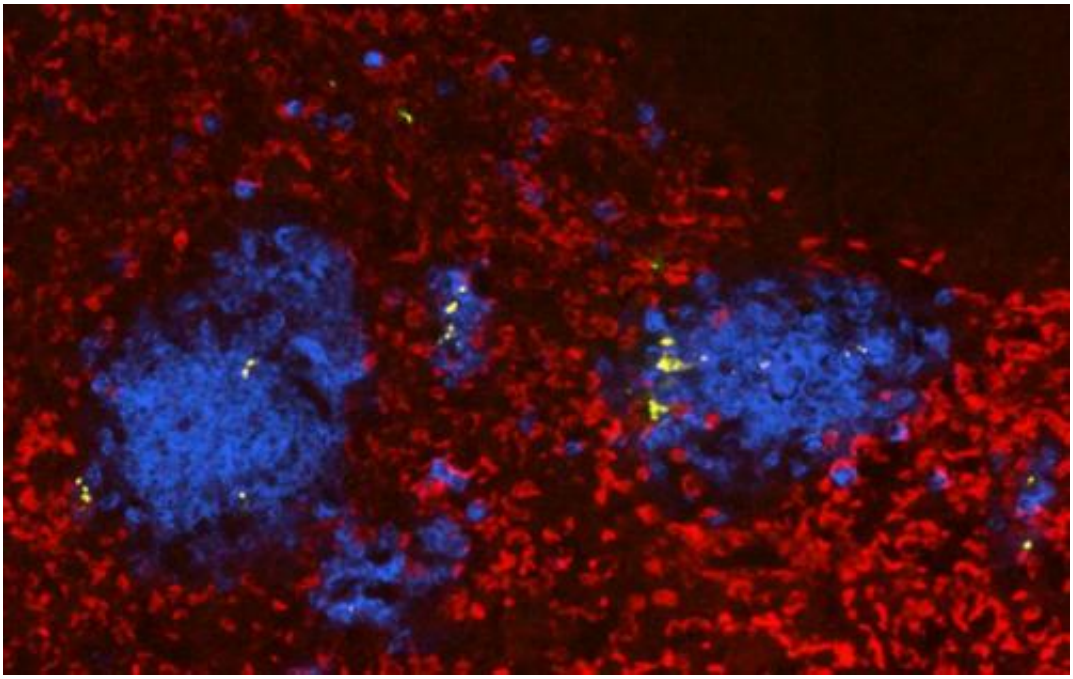

This image depicts a section of a *Salmonella* infected spleen in yellow, red blood cells in red and neutrophils in blue. Credit: University of Basel, Biozentrum

A tiny nanoscale syringe is *Salmonella*'s weapon. Using this, the pathogen injects its molecular agents into the host cells and manipulates them to its own advantage. A team of scientists at the Biozentrum of the University of Basel demonstrate in their current publication in *Cell Reports* that a much investigated protein, which plays a role in *Salmonella* metabolism, is required to activate these needles and makes the replication and spread of *Salmonella* throughout the whole body possible.

The summer months are the prime time for *Salmonella* infections. Such an infection is caused by the ingestion of contaminated food, for instance ice cream or raw eggs, and can cause severe diarrhea. *Salmonella* can even cause life-threatening illnesses such as typhoid fever.

For several years, Prof. Dirk Bumann, from the Biozentrum of the University of Basel, has been studying the infection mechanisms of *Salmonella*. Together with his team, he has discovered that the bacterial protein EIIAGlc is not only responsible for the uptake of nutrients, which was previously known, but also plays a central role in *Salmonella* colonizing the host organism.

New function discovered for well known protein

Salmonella possesses a sophisticated injection apparatus, the type III secretion system. With this molecular syringe, it injects toxins directly into the host cells. These toxins manipulate host cell processes to create optimal growth conditions for the bacteria in hiding. Unforeseen, Bumann and his team uncovered an important teammate in the infection process, the protein EIIAGlc. The protein was already known for its many functions in bacterial metabolism, such as in the uptake of sugars molecules.

The researchers' attention was attracted by the fact that when EIIAGlc is defective *Salmonella* completely loses its capacity for intracellular replication and to spread throughout the organism. Further investigations finally brought the scientists from Basel onto the right track. The protein EIIAGlc docks onto the injection apparatus in the bacterium, stabilizes it and finally activates the release of the toxins. "We can clearly demonstrate that the activation of the secretion system is the main function of the protein EIIAGlc, while the many other described metabolic functions play a minor role in the occurrence of illness", says

Bumann bringing his findings to the point.

Target molecule for antibiotic treatment

It is estimated that each year about 16 million people worldwide contract a life-threatening *Salmonella* infection that affects the whole organism. The spread of the bacteria in the host is highly dependent on the functional capacity of the injection system. "In EIIAGlc, we have found a new potential therapeutic target", says Bumann. By inhibiting the protein, one could strategically put the infection apparatus out of action. As this injection needle is primarily found in pathogens, infections could be effectively and specifically fought without harming the natural intestinal microflora.

More information: The central metabolism regulator EIIAGlc switches Salmonella from growth arrest to acute virulence through activation of virulence factor secretion *Cell Reports*, published online 15 May 2014

Provided by University of Basel