Salmonella's sweet tooth predicts its downfall

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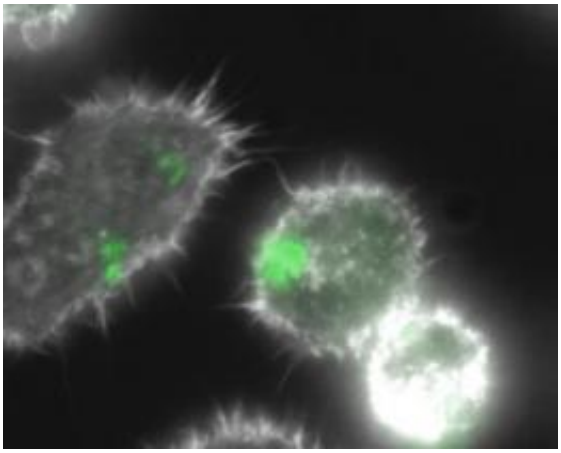

This is *Salmonella*, colored green, inside macrophage cells. Credit: Isabelle Hautefort, IFR

For the first time UK scientists have shown what the food poisoning bug *Salmonella* feeds on to survive as it causes infection: glucose.

Their discovery of Salmonella's weakness for sugar could provide a new way to vaccinate against it. The discovery could also lead to vaccine strains to protect against other disease-causing bacteria, including superbugs.

"This is the first time that anyone has identified the nutrients that sustain *Salmonella* while it is infecting a host's body," says Dr Arthur Thompson from the Institute of Food Research.

The nutrition of bacteria during infection is an emerging science. This is one of the first major breakthroughs, achieved in collaboration with Dr. Gary Rowley at the University of East Anglia.

Salmonella food poisoning causes infection in around 20 million people worldwide each year and is responsible for about 200,000 human deaths. It also infects farm animals and attaches to salad vegetables.

During infection, *Salmonella* bacteria are engulfed by immune cells designed to kill them. But instead the bacteria multiply.

Salmonella must acquire nutrients to replicate. The scientists focused on glycolysis, the process by which sugars are broken down to create chemical energy. They constructed *Salmonella* mutants unable to transport glucose into the immune cells they occupy and unable to use glucose as food. These mutant strains lost their ability to replicate within immune cells, rendering them harmless

"Our experiments showed that glucose is the major sugar used by *Salmonella* during infection," said Dr Thompson.

The mutant strains still stimulate the immune system, and the scientists have filed patents on them which could be used to develop vaccines to protect people and animals against poisoning by fully virulent *Salmonella*.

Glycolysis occurs in most organisms including other bacteria that occupy host cells. Disrupting how the bacteria metabolise glucose could therefore be used to create vaccine strains for other pathogenic bacteria, including superbugs.

The harmless strains could also be used as vaccine vectors. For example, the flu gene could be expressed within the harmless *Salmonella* strain

and safely delivered to the immune system.

The next stage of the research will be to test whether the mutants elicit a protective immune response in mice.

In Germany the nutrition of bacteria is the subject of a six-year priority programme of research to investigate why bacteria are able to multiply inside a host's body to cause disease.

Source: Norwich BioScience Institutes