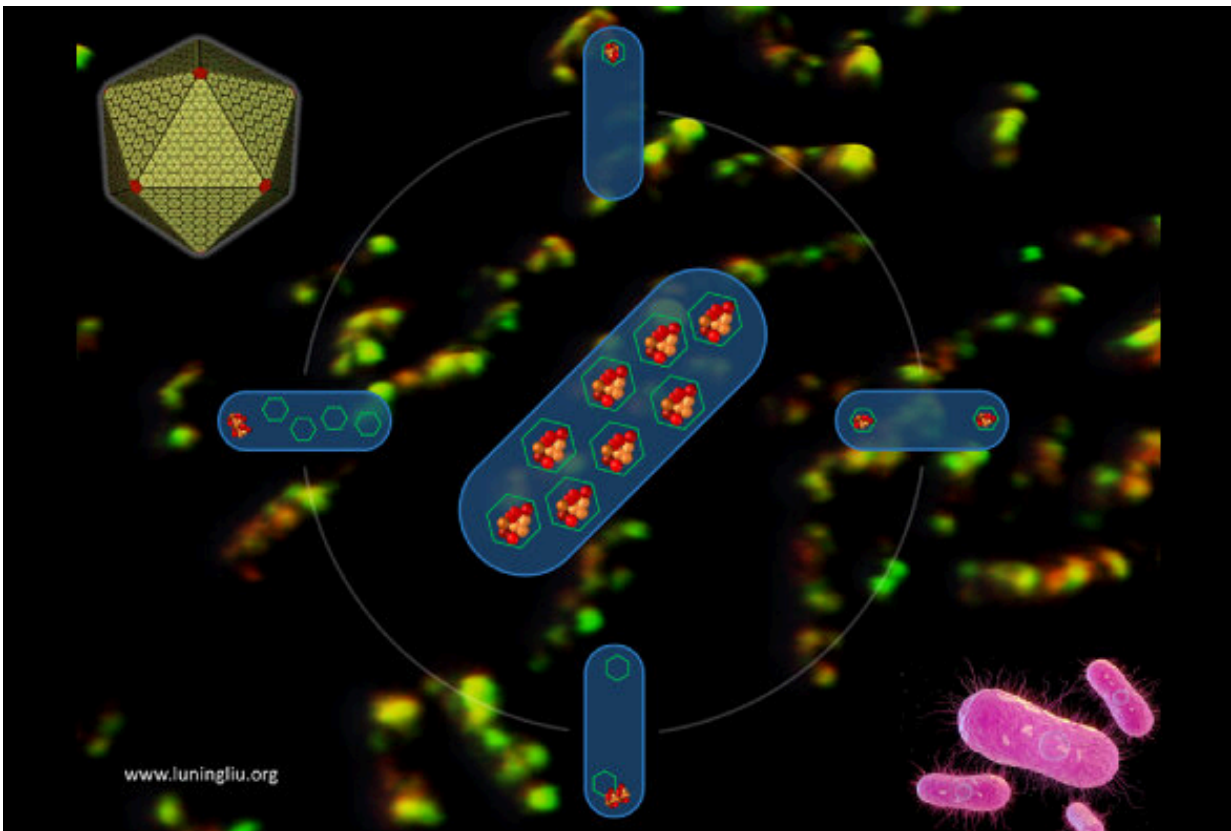


# Scientists uncover clues about the generation of nanomachines in Salmonella

June 9 2022



Credit: University of Liverpool

Researchers at the University of Liverpool have captured a clear view of the generation process of "protein machinery" that plays a key role in the colonization of pathogenic Salmonella bacteria.

The findings, published in *Nature Communications*, answer an important question about how various proteins self-assemble to create a higher-ordered functional organelle in *Salmonella* to boost metabolism.

Many [pathogenic bacteria](#), such as *Salmonella*, use specialized nano-sized organelles, or bacterial microcompartments (BMC). The BMC has a virus-like polyhedral shell made of proteins to encase multiple metabolic cargo enzymes. The protein shell provides a selectively permeable barrier which controls the passage of metabolites and sequesters the reactions in its interior. This ensures higher efficiency of the encapsulated reactions and prevents toxic products from being released into the rest of the cell, providing the pathogens a competitive advantage in human gut.

The research team, led by Professor Luning Liu from the University's Institute of Systems, Molecular and Integrative Biology, used live-cell fluorescence microscopy and [molecular genetics](#) to uncover the de novo stepwise biosynthesis process of propanediol-utilization (PDU) microcompartments, a class of BMCs that are responsible for metabolizing propanediol as a [carbon source](#) and recycling of vitamin B12.

"Following our recent work on deciphering the [protein](#) stoichiometric composition of PDU microcompartments (*Nature Communications* 2020), this systematic study provided direct experimental evidence to outline how this microcompartment is formed in *Salmonella*," said Professor Luning Liu. "We showed for the first time that the PDU microcompartment undergoes a combination of 'Shell first' and 'Cargo first' assembly, and identified the key proteins that govern the ordered assembly and encapsulation of cargo enzymes."

The first author, Dr. Mengru Yang, explained: "*Salmonella* is a dangerous pathogen, and targeting BMC-mediated metabolism will be a

promising therapeutic or prophylactic strategy that has yet to be realized. A detailed mechanistic understanding of BMCs is thus required."

Understanding how the natural microcompartment is generated and modulated in cells could lead to new ways to manipulate BMC biosynthesis in pathogenic bacteria, which could impact the development of novel therapeutic strategies to disrupt metabolism in pathogens.

**More information:** Mengru Yang et al, Biogenesis of a bacterial metabolosome for propanediol utilization, *Nature Communications* (2022). [DOI: 10.1038/s41467-022-30608-w](https://doi.org/10.1038/s41467-022-30608-w)

Mengru Yang et al, Decoding the stoichiometric composition and organisation of bacterial metabolosomes, *Nature Communications* (2020). [DOI: 10.1038/s41467-020-15888-4](https://doi.org/10.1038/s41467-020-15888-4)

Provided by University of Liverpool

Citation: Scientists uncover clues about the generation of nanomachines in Salmonella (2022, June 9) retrieved 25 April 2024 from <https://phys.org/news/2022-06-scientists-uncover-clues-nanomachines-salmonella.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.