

A compound produced by symbiotic bacteria promotes *in vitro* protein synthesis

~Expectations for improving the efficiency of industrial production of useful substances~

<Summary>

The research team led by Associate Professor Atsushi Nakabachi of the Toyohashi University of Technology Research Center for Agrotechnology and Biotechnology revealed that the compound “diaphorin” produced by an insect symbiotic bacterium promotes the activity of an *in vitro* protein synthesis system using *Escherichia coli*-derived components. Their work clarified part of the action mechanism by which diaphorin promotes coliform growth and substance production, and it is expected to be applied to improving the efficiency of industrial production of useful substances using bacteria. The results of this research were published online in the journal *Microbiology Spectrum* on June 4, 2024.

<Details>

Diaphorin (Figure left) is a compound produced by a symbiotic bacterium of the global agricultural pest *Diaphorina citri*^{*1} and is found in the pest’s body at high concentrations of 2–20 mM. Previous research by the team showed that this compound improves the growth and substance production ability of *E. coli*^{*2}. This research is the first in the world to show that diaphorin at concentrations of 50–500 μM promotes the activity of an artificial protein synthesis system in a test tube, including ribosomes^{*3} extracted and purified from *E. coli*, various enzymes, substrates, and other substances (Figure right). This result suggests that diaphorin targets the bacterial gene expression system and exerts effects such as promoting growth and substance production. *E. coli* is actively used not only in academic research but also in the industrial production of useful substances such as insulin (diabetic medicine), interferon (anticancer drug), growth hormone, and other medicines, as well as industrial enzymes, amino acids, and alcohol including biofuels. The research result clarified part of the mechanism by which diaphorin promotes *E. coli* growth and substance production, and it opens the way for improving efficiency in the industrial production of useful substances using bacteria.

<Future prospects>

The research team aims to elucidate the molecular mechanism in more detail and continue to clarify the activity of diaphorin in a broader variety of bacteria.

<Acknowledgments>

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<Published paper>

Rena Takasu, Takashi Izu, and Atsushi Nakabachi. A limited concentration range of diaphorin, a polyketide produced by a bacterial symbiont of the Asian citrus psyllid, promotes the *in vitro* gene expression with bacterial ribosomes. *Microbiology Spectrum*, 2024 Jun 4: e0017024

(Supplementary explanation)

*1 *Diaphorina citri*

It is a pest that transmits the incurable citrus greening disease and causes fatal damage to the global citrus industry, which is a factor behind the rise in citrus prices in recent years. It originates from the tropical and subtropical regions of Asia and has spread worldwide, including the Americas, becoming a global problem.

*2 *E. coli*

It is a bacterium that lives in various environments, including the human intestine. There are many strains, only a small number of which are pathogenic. It is widely used in academic research and industrial production of useful substances since it is easy to cultivate and genes can be easily introduced into it.

*3 Ribosome

It is an apparatus that synthesizes proteins by linking together 20 types of amino acids based on the base sequence of RNA copied from genomic DNA.

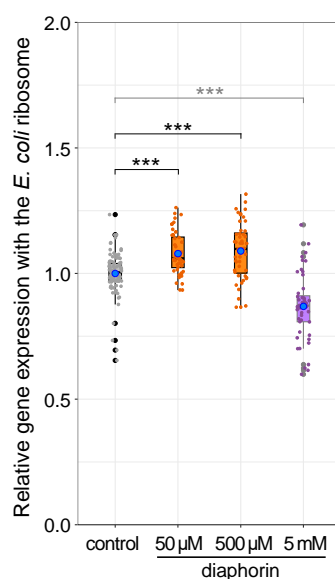
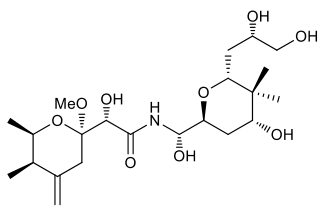


Figure: Addition of diaphorin (left) at concentrations ranging from 50 to 500 μM improves the activity of the *E. coli* derived *in vitro* protein synthesis system (right).