

Toxin-producing bacteria integrated into a pest insect

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Adult Asian citrus psyllid. Credit: Atsushi Nakabachi

A small cicada-like insect called the Asian citrus psyllid (*Diaphorina citri*) threatens the world's citrus industries, transmitting an incurable and lethal citrus disease. This notorious pest harbors two bacterial species

within cells specially prepared for the purpose of symbiosis. Whereas these symbionts are believed to be essential for the host psyllid, their functional roles are not known.

Now, Atsushi Nakabachi at Toyohashi University of Technology and his colleagues have demonstrated that one of the symbionts, named *Candidatus Proffotella armatura*, is an unprecedented type of symbiont that is fused into the host animal and plays a protective role to deter host's [natural enemies](#).

The [whole genome sequencing](#) of the *D. citri* symbionts revealed that the both genomes are drastically reduced to the level that rivals those of cell organelles such as mitochondria and chloroplasts, indicating their ancient and mutually indispensable association with the host. Such an intimate relationship was known only for 'nutritional symbionts' that provide the host with [essential nutrients](#). But surprisingly, the genomic structure showed that *Proffotella* is a 'defensive symbiont' that produces a protective toxin. This novel toxin was extracted, structurally and pharmacologically characterized, and designated diaphorin. Purified diaphorin showed a potent activity to inhibit proliferation of cells derived from human cancer.

With this cytostatic activity, diaphorin is promising as a key compound for the development of [novel pharmaceuticals](#) including antitumor drugs. The team has started to investigate this possibility, in addition to a project to develop highly selective and safe pest control methods that target this dual symbiotic system.

More information: Nakabachi, A. et al. Defensive bacteriome symbiont with a drastically reduced genome, *Current Biology* 23, 1-7 (2013).

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Provided by Toyohashi University of Technology

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