

Unique adaptations to a symbiotic lifestyle reveal novel targets for aphid insecticides

April 18 2012

Aphids are pests that cause millions of pounds of damage to crops in the UK, but new research led by biologists at the University of York reveals potential new targets for aphid-specific insecticides.

Because it lives exclusively on the sugary sap of plants, aphids' diet is limited in nitrogenous [essential amino acids](#). To solve this problem, the aphid must use a bacterial [symbiont](#), Buchnera, that lives inside special insect cells and supplements the animal's diet with the required nutrients.

Researchers funded by the Biotechnology and Biological Sciences Research Council (BBSRC) in the Department of Biology at the University of York and Cornell University, publish today a significant advance in our understanding of how this symbiosis works by studying the specific adaptations in the specialised bacteriocyte cells that have evolved to house the bacteria.

By using computational modelling of the metabolism of the aphid bacteriocytes, combined with experimental data, the scientists have revealed an unexpected twist in the metabolic basis of the symbiosis, namely that it is the [insect cells](#) that recycle nitrogen to build essential amino acids, rather than the [bacterial cells](#) themselves as previously thought. The work also demonstrates that the overall metabolism of the bacteriocyte has evolved to provide for the [metabolic demands](#) of its partner and also to recycle waste products produced by Buchnera metabolism.

Project lead at the University of York, Dr. Gavin Thomas said: "The research reveals enzymes that are needed by the aphid to manage its bacterial symbionts, thus also providing potential targets for aphid-specific insecticides.

On the approach that was used, he added: "The project is a great example of the possibilities of [systems biology](#), integrating transcriptomic, proteomics, metabolic models and flux balance analysis to propose and test novel hypotheses about the way these two organisms interact."

The work is published in the current issue of the *Proceedings of the Royal Society B: Biological Science* and was led by Dr Sandy Macdonald, a postdoctoral researcher in Dr. Thomas's laboratory at York working with collaborators led by Professor Angela Douglas at Cornell University.

More information: The paper 'The central role of the host cell in symbiotic nitrogen metabolism' is published at [rspsb.royalsocietypublishing.org ... b.2012.0414.abstract](http://rspsb.royalsocietypublishing.org/doi/abs/10.1098/rspb.2012.0414)

Provided by University of York

Citation: Unique adaptations to a symbiotic lifestyle reveal novel targets for aphid insecticides (2012, April 18) retrieved 6 August 2024 from <https://phys.org/news/2012-04-unique-symbiotic-lifestyle-reveal-aphid.html>

<p>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.</p>
--