Insect gut detects unhealthy meal

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Plant leaves and surfaces are teeming with microbial life, yet the insects that feed on plants lack adaptive immune systems to fend off any intruding microorganisms they eat along with their greens. Now research published in the online open access journal, *BMC Biology* shows how food-borne bacteria affect an insect's immune system.

Study authors Dalial Freitak, David Heckel and Heiko Vogel from the Max Planck Institute for Chemical Ecology in Jena, Germany along with Christopher Wheat from the University of Helsinki, Finland, deliberately fed insects with non-infectious microorganisms. The researchers watched to see how the herbivorous insect, the cabbage semilooper Trichoplusia ni (Lepidoptera), detected and responded to a diet laced with nonpathogenic, non-infectious bacteria. In most studies to date, lab reared insects have been injected with bacterial strains, whereas in nature the insects' main exposure would be from eating plants.

The larvae were reared on diets with or without an added helping of Escherichia coli and Micrococcus luteus bacteria. In the bacteria-fed larvae, general antibacterial activity was enhanced, although the activity of one key enzyme related to immune response - phenoloxidase - was inhibited. Among the eight proteins highly expressed in the hemolymph of the bacteria-fed larvae were the immune-response-related proteins arylphorin, apolipophorin III and gloverin. Significantly, the pupation time and pupal mass of bacteria-fed larvae was negatively affected by their unhealthy diet.

The authors conclude that even non-pathogenic bacteria in food can

trigger an immune response in insects with significant effects. “Trichoplusia ni larvae are able to detect and respond to environmental microbes encountered in the diet, possibly even using midgut epithelial tissue as a sensing organ,” says Vogel. Although this reaction to microbes comes at a price, it may be offering protection from serious infection. “These results show that microbial communities on food plants represent a dynamic and unstudied part of the coevolutionary interactions between plants and their insect herbivores,” he adds.

Source: BioMed Central