Insects beware: The sea anemone is coming

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As insects evolve to become resistant to insecticides, the need to develop new ways to control pests grows. A team of scientists from Leuven, Belgium have discovered that the sea anemone's venom harbors several toxins that promise to become a new generation of insecticides that are environmentally friendly and avoid resistance by the insects. Since these toxins disable ion channels that mediate pain and inflammation, they could also spur drug development aimed at pain, cardiac disorders, epilepsy and seizure disorders, and immunological diseases such as multiple sclerosis. This finding is described in the December 2012 issue of *The FASEB Journal*.

"Are toxins friend or foe? The more we understand these toxins, they are more friend, and less foe," said Jan Tytgat, Ph.D., co-author of this study from the Laboratory of Toxicology at the University of Leuven in Leuven, Belgium. "Toxicology shows us how to exploit Mother Nature's biodiversity for better and healthier living."

To make this discovery, Tytgat and colleagues extracted venom from the sea anemone, Anthopleura elegantissima, and purified three main toxins present in the venom. The toxins were characterized in depth, using biochemical and electrophysiological techniques. This provided insight into their structure, functional role and mechanisms of action. The discovery of these toxins may be considered similar to the discovery of a new drug, as they are compounds which could lead to new insecticides and possibly new treatments for human diseases.

"Because these toxins are aimed at important ion channels present not

only in insect cells, they form the leading edge of our new biotechnology. Discovery of this useful marine toxin should provide additional incentive to preserve the fragile coral reefs where anemones thrive," said Gerald Weissmann, M.D., Editor-in-Chief of *The* FASEB Journal, "But, given current attitudes, I suspect there's a better chance of a sea anemone killing a stink bug than for us to reverse our inroads on ocean life."

More information: Steve Peigneur, László Béress, Carolina Möller, Frank Marí, Wolf-Georg Forssmann, and Jan Tytgat. A natural point mutation changes both target selectivity and mechanism of action of sea anemone toxins. *FASEB J* 26:5141-5151, doi:10.1096/fj.12-218479

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