Title: Antimicrobial peptides (AMPs) from black soldier fly larvae: cecropin and DLP4 as broad-spectrum against antibiotic-resistant bacteria

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Abstract

Antimicrobial peptides (AMPs) are small cationic peptide molecules, consisting of 10 to 50 amino acids. Currently, AMPs represent a promising alternative strategy for addressing the growing problem of antimicrobial resistance (AMR). The black soldier fly (BSF; *Hermetia illucens*) is one significant source of AMPs, one of which is cecropin, commonly found in BSF larvae. Genome analysis of *H. illucens* revealed 33 cecropin genes which located on 1 chromosome. These cecropins exhibit strong antibacterial activity against Gram-negative bacteria, with the highest potency against *Escherichia coli*. The cecropin designated H3 exhibits rapid bactericidal activity, reducing *E. coli* within 20 minutes and completely killing the bacteria within 1 hour from the kinetic killing assay. This indicates that its mechanism of action involves membrane disruption observed by a scanning electron microscope.

Thus, BSF-derived cecropins are effective against Gram-negative bacteria. Additionally, AMPs from BSF also exhibit activity against Gram-positive bacteria, such as *Clostridioides difficile*, a pathogen that is highly resistant to antibiotics and the primary cause of antibiotic-associated diarrhea. The hemolymph from BSF larvae, infected via injection or feeding methods, contains defensin-like peptide 4 (DLP4), which efficiently damages the cell wall and outer layer of *C. difficile*, with pores appearing within 1 hour after exposure. Moreover, the AMPs found in BSF larvae exhibit low cytotoxicity, and their antibacterial activity is not significantly affected by environmental conditions. These observations indicate that AMPs found in BSF larvae exhibit broad-spectrum antibacterial effects antibacterial effects, and they may have potential for further development as peptide-based therapeutic.

References:

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