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Membrane-active Peptides from Helminths: Linking Antimicrobial Activity to Molecular Mode of Action

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Considering the alarmingly rising number of multidrug-resistant microbial strains in recent decades, antimicrobial peptides (AMPs) have emerged as a potentially crucial alternative to conventional treatments. These small yet structurally diverse peptides, omnipresent in nature, have demonstrated potent antimicrobial and immunomodulatory effects. Due to AMPs rapid and multi-faceted modes of action, their particularly promising feature is rare occurrence of microbial resistance compared to classical therapeutics. Helminths, worm-like parasites, thrive in bacteria-rich microenvironments throughout their life cycles where AMPs play a crucial role in successful defense mechanisms against pathogens. Here, structural and functional properties of helminth AMPs were investigated. Identification and selection for synthesis were followed by assessments of antimicrobial activity against Gram-negative and -positive bacteria, cytotoxicity against human cells, structural analysis (circular dichroism spectroscopy) and molecular dynamics. Preliminary results indicate that these membrane-active peptides exhibit pronounced antibacterial activity against various strains, coupled with low to moderate cytotoxicity toward human cells. Thus, helminth AMPs could be considered as potentially promising candidates for further identification and development as antimicrobial and other therapeutic agents.