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Exploring Galleria mellonella larval model to evaluate antibacterial efficacy of Cecropin A (1–7)–Melittin against multi–drug resistant enteroaggregative Escherichia coli

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Abstract

High throughput in vivo laboratory models is need for screening and identification of effective therapeutic agents to overcome microbial drug-resistance. This study was undertaken to evaluate in vivo antimicrobial efficacy of short-chain antimicrobial peptide- Cecropin A (1-7)-Melittin (CAMA) against three multi-drug resistant enteroaggregative Escherichia coli (MDR-EAEC) field isolates in a Galleria mellonella larval model. The minimum inhibitory concentration (MIC; 2.0 mg/L) and minimum bactericidal concentration (MBC; 4.0 mg/L) of CAMA were determined by microdilution assay. CAMA was found to be stable at high temperatures, physiological concentration of cationic salts and proteases; safe with sheep erythrocytes, secondary cell lines and commensal lactobacilli at lower MICs; and exhibited membrane permeabilization. In vitro time-kill assay revealed concentration- and time-dependent clearance of MDR-EAEC in CAMA-treated groups at 30 min. CAMA- treated G. mellonella larvae exhibited an increased survival rate, reduced MDR-EAEC counts, immunomodulatory effect and proved non-toxic which concurred with histopathological findings. CAMA exhibited either an equal or better efficacy than the tested antibiotic control, meropenem. This study highlights the possibility of G. mellonella larvae as an excellent in vivo model for investigating the host-pathogen interaction, including the efficacy of antimicrobials against MDR-EAEC strains.