Peptide inhibitors of Macrobrachium rosenbergii nodavirus

ABSTRACT

Macrobrachium rosenbergiinodavirus (MrNv) causes white tail disease (WTD) in giant freshwater prawns, which leads todevastating economic losses in the aquaculture industry. Despite extensive research on MrNv, there is still no antiviral agentto treat WTD. Thus, the main aim of this study was to identify potential anti-MrNv molecules. A 12-mer phage-displayedpeptide library was biopanned against the MrNv virus-like particle (VLP). After four rounds of biopanning, two dominantphages harbouring the amino acid sequences HTKQIPRHIYSA and VSRHQSWHPHDL were selected. An equilibrium bindingassay in solution was performed to determine the relative dissociation constant (KrelD) of the interaction between the MrNvVLP and the selected fusion phages. Phage-HTKQIPRHIYSA has aKrelDvalue of 92.4±22.8 nM, and phage-VSRHQSWHPHDLhas aKrelDvalue of 12.7±3.8 nM. An in-cellELISAwas used to determine the inhibitory effect of the synthetic peptides towardsthe entry of MrNv VLP intoSpodoptera frugiperda(Sf9) cells. Peptides HTKQIPRHIYSA and VSRHQSWHPHDL inhibited theentry of the MrNv VLP into Sf9 cells with IC50values of 30.4±3.6 and 26.5±8.8 μM, respectively. Combination of both peptidesshowed a significantly higher inhibitory effect with an IC50of 4.9±0.4 μM. An MTT assay revealed that the viability of MrNv-infected cells increased to about 97 % in the presence of both peptides. A real-time RT-PCR assay showed that simultaneousapplication of both peptides significantly reduced the number of MrNv per infected cell, from 97±9 to 11±4. These peptidesare lead compounds which can be further developed into potent anti-MrNv agents.

Keyword: White tail disease; Phage display; Affinity selection; Virus-host interaction; Peptide inhibitors