A Synthetic Bioactive Peptide (MastoparanR1) With Antibacterial Activity

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INTRODUCTION: Due to a growing concern about microbial infections, several peptides have been studied regarding the defense process against pathogenic microorganisms. Mastoparan, firstly isolated from wasps' venom, has shown great biotechnological potential due to its multifunctional properties, including cell signaling and antimicrobial activities. **OBJECTIVE:** Here we elucidate the antimicrobial potential and structure of a new mastoparan analogue with low hemolytic effect generated by a bioinformatics algorithm. **MATERIAL AND METHODS:** MastoparanR1 was designed by JOKER algorithm, which searched to enhance the antimicrobial potential of a parental mastoparan sequence, also reducing its hemolytic properties. MastoparanR1 was synthesized by Fmoc and further analyzed on MALDI-ToF. The minimum inhibitory concentration of mastoparanR1 was accessed by microplate dilution against susceptible/resistant *Escherichia coli* and *Klebsiella pneumoniae* and susceptible *Pseudomonas aeruginosa, Enterococcus faecalis* and *Staphylococcus aureus. Ab initio* modeling and dynamics were performed to predict the 3D conformation of mastoparanR1 and to determine its trajectory in water, during 200ns, using the CHARMM27 force field. **RESULTS AND DISCUSSION**: MALDI-ToF analyses revealed a 1636.1 Da peptide with purity degree >95%. MastoparanR1 was able to inhibit the growth of susceptible/resistant *E. coli,* susceptible *P. aeruginosa* and *E. faecalis* at 8 to 64 $\mu g.mL^{-1}$. None hemolytic activities were observed up to 200 $\mu g.mL^{-1}$. Theoretical physicochemical calculations by HeliQuest server showed that mastoparanR1 is an amphipathic peptide with net charge +6 and hydrophobic moment of 0.775. Molecular modeling studies indicated that mastoparanR1 present a well-defined α-helix. Interestingly, after 200 ns of molecular dynamics in water, mastoparanR1 could preserve a great portion of its helical content, presenting a few fluctuations on the N- and C-terminus. **CONCLUSION:** MastoparanR1 has shown promising antibacterial activities against non-resistant and resistant strains, without presenting high hemolytic activities as its precursor. Furthermore this peptide revealing to be structurally stable in hydrophilic conditions, which might favors its application in pharmacological procedures such as drug delivery and coating strategies.

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