Developing Novel Peptide Sequences to Produce Antimicrobial Hydrogels for Potential Wound Treatment

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Slow wound healing increases the risk of serious bacterial infection. Yearly, 6.5 million people in the world are diagnosed with chronic wounds causing 265,000 fatalities. Previous research showed that applying peptide-based hydrogels to wounds is an economical and effective treatment. In this research project, two novel peptide sequences (CH-01 and CH-03) were developed to produce hydrogels loaded with silver nanoparticles to counter bacterial infection. CH-03 incorporated cysteine was used as a novel method to impact the distribution of silver within the hydrogel that led to a better antimicrobial activity. The peptides were synthesized through Solid Phase Peptide Synthesis (SPPS). In Situ synthesis of silver nanoparticles (AgNP) was done by mixing silver nitrate ($AgNO_3$) solution with a peptide solution, then exposing the mixtures to UV-Radiation. Bacterial suspension, bacterial zone of inhibition, and live/dead staining assays were conducted for both peptide sequences in vitro and these tests indicated the peptides impact on bacterial viability compared to untreated bacteria. However, CH-01 and CH-03 had different effects on bacterial suspension with OD absorbance of 0.3, and 0.2 respectively. The CH-03 caused more bacterial death as seen by live/dead staining than CH-01. No difference was in the zone inhibition assay between the two peptides. These results show that CH-03, due to impacting AgNP distribution, exhibited better antimicrobial activity than CH-01. Currently CH-03 is being applied to test its efficacy for wound healing. Other potential applications include therapeutic contact lenses and fillers after surgery.