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Design of *in situ* gelling systems containing natural ingredients for treatment of periodontitis

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Periodontitis is an infectious and inflammatory disease resulting in destruction of periodontal tissues and ultimate bone loss. Anaerobic gram-negative and gram positive bacteria are responsible for progression of this disease. A number of antibiotics are currently used as first line therapy in dentistry. Essential oils are also reported as effective anti-inflammatory and analgesic agents against bacteria residing in oral cavity. Long term oral administration and side effects associated with high dose of antibiotics are the main hurdles to treat periodontal disease effectively. Hence, this study aims to formulate antibiotics and essential oils containing nanostructured lipid carriers (NLC) loaded in an *in situ* gelling system carrying hydrophilic antibiotics for periodontal cavity administration. The system is based on sodium alginate as the gelling agent and hyaluronic acid as a co-polymer. NLC will be prepared by homogenization method and then optimized formulation will be loaded in an ion activated *in situ* gelling system. The formulation will be investigated for particle size, poly dispersity index, zeta potential and entrapment efficiency of NLC. Characterization of the formulation such as drug content, solubility, pH, gelling characteristics, injectability, bioadhesiveness will be performed. Antimicrobial efficacy studies will provide a clear picture of effectivity of natural extracts against bacteria. *In vitro* release studies will depict the sustain release of active content from NLC and NLC loaded formulation. FTIR, DSC of gelling system will ensure the stability of system and compatibility of formulation contents. Conclusively, an *in situ* gel system with enhanced, prolonged, and sustained antibacterial activity will be obtained for the management of periodontitis.