Title:
Fabrication and Investigation Antibacterial Properties of (chitosan- polyvinyl alcohol)/ Gum Tragacanth Scaffold for Tissue Engineering Applications

Abstract:
One of the methods for fabricating tissue engineering scaffolds is the use of the freeze-drying method. Chitosan as a natural polymer, and due to its biocompatibility and antibacterial activity, is a good choice for a wide variety of tissue engineering applications. It is possible to improve the mechanical, biological and bioactivity properties of the chitosan by combining it with other biologically active substances or synthetic polymer. Polyvinyl alcohol is a synthetic linear, semi-crystalline, hydrophilic, biocompatible and biodegradable polymer that has special physicochemical properties and many applications in the field of biomaterials and tissue engineering. Gum tragacanth is a natural compound of polysaccharides and alkaline minerals with a small proportion of protein and a small amount of starch and cellulosic material. Gum tragacanth is natural, biodegradable, bioactivity, antibacterial and available polymer. These properties have led to the fabrication of Gum tragacanth scaffolds, along with other synthetic polymers, for use in skin regeneration, drug delivery applications and regeneration of periodontal defects. In this research, scaffolds of chitosan, polyvinyl alcohol, and Gum tragacanth were fabricated by the freeze-drying method and then the structural and antibacterial properties were evaluated. Scaffolds were characterized by SEM, FTIR, XRD and compressive strength test. To investigate porosity percentage, immersion in alcohol method was used. Bioactivity test was done in the SBF solution and biodegradability test was determined in Ringer solution. The antibacterial test was done by growth inhibitory investigation of E.coli and Staphylococcus aureus bacteria. The results showed that the scaffold with 25% Gum tragacanth has spherical and regular pore morphology with a compressive strength of 0.18 ± 0.03 MPa and less degradability than scaffolds with 50% and 75% of gum tragacanth. XRD and FTIR results were proved hydrogen interactions and also the formation of leucine, isoleucine and alanine amino acids. Antibacterial properties were increased by increasing the gum tragacanth percentage. Fabricated scaffolds have bioactive properties and formation of apatite particles was proved by SEM.

Keywords:
Tissue engineering, Scaffolds, Freeze-drying method, Chitosan, Polyvinyl alcohol, Gum tragacanth, Escherichia coli, Staphylococcus aureus