Abstract

Biomaterials play a key role in most approaches for engineering tissues as substitutes for functional replacement, for components of devices related to therapy and diagnosis, for drug delivery systems and supportive scaffolds for guided tissue growth. Modern biomaterials could be composed of various components, e.g. metals, ceramics, natural tissues, polymers. In this last group, the hydrogels, hydrophilic polymeric gels with requested biocompatibility and designed interaction with living surrounding seem to be one of the most promising groups of biomaterials. This work deals with the development of hydrogels for various biomedical applications viz. drug delivery. The hydrogels were synthesized by esterification of hydroxyl group polyvinyl alcohol with carboxylic group of gelatin, crosslinking of corn- starch (heat-treated and non- heat treated) and polyvinyl alcohol with glutaraldehyde and esterification of hydroxyl group of carboxymethyl cellulose with acrylates. An attempt was also made to develop physical hydrogels of polyvinyl alcohol- glycine hydrogels and to characterize the same. The hydrogels were characterized by FTIR spectroscopy, XRD and DSC. Biocompatibility tests were done for the hydrogels. Diffusion studies were done for the chemically modified hydrogels and glycine release from the physical hydrogels was also studied. The hydrogels were found to be biocompatible. The hydrogels supported the growth of L929 cell line and mice splenocytes indicating its probable use in tissue engineering and wound healing where fibroblast cell proliferation plays an important role. Polyvinyl alcohol- gelatin ester hydrogels and starch hydrogels allowed diffusion of both anionic and cationic drugs indicating probable use in drug delivery systems. Starch hydrogels were found to be biodegradable in the presence of α-amylase. Carboxymethyl cellulose modified hydrogels showed pH dependent swelling and drug release indicating its enteric property. Polyvinyl alcohol- glycine hydrogels instantaneously released glycine when put in aqueous media. The *in vitro* studies indicated that the developed hydrogels could be tried for various biomedical applications.

Keywords: Hydrogels; Biocompatibility; Diffusion; Biomedical applications.