NAME OF SCHOLAR – ANJALI

NAME OF SUPERVISIOR – Dr. SAIQA IKRAM

TITLE OF THESIS - DEVELOPMENT OF CHITOSAN BASED WOUND DRESSING

DEPARTMENT - CHEMISTRY

Wound management has seen many changes over the past few decades. A myriad of dressings have been applied to wounds since ancient times. The list of naturally occurring materials include spider webs, dung from various animals and insects, leaves, tree bark, honey, vinegar, beer and wine. The 20th century has seen a revolution in wound management. As research and understanding improves at the cellular level we are better able to assist the body not only by covering the wound to protect it but also by providing wound dressings to aid the healing process. The conversion of dihydroxyl groups to dialdehyde by periodate oxidation is a useful method widely used in derivatization of cellulose to active the polymer at further reactions [6]. Periodate oxidation is a highly specific reaction to convert 1, 2-dihydroxyl (glycol) groups to paired aldehyde groups without significant side reactions and is widely used in structural analysis of carbohydrates [7-13]. When applied to glucose in the carboxymethyl cellulose chain, this reaction cleaves the C2–C3 bond, according to the mechanism of Malaprade reaction [14, 15]. The resulting compound is the dialdehyde cellulose (DAC) [16, 17]. The application or the quantitative understanding of this reaction has been hampered by complication arising from hemiacetal formation of aldehyde and crystalline nature of cellulose [18-20]. Aldehyde groups of Oxidized carboxymethyl cellulose interact with amino group of chitosan and their interaction results in the formation Schiff's base which is insoluble in aqueous medium with enhanced properties of both the polymers i.e. of chitosan and carboxymethyl cellulose. Dissolution of chitosan has been carried out in 2% lactic acid

solution with varying amounts of solute and solvent, 0.5 wt % to 2 wt% of chitosan solution were prepared and finally 1 wt% was found to be the appropriate one for fabrication pure chitosan film because of its good solubility and optimum viscosity otherwise it's a very viscous solution. OCMC is added in chitosan solution and stirred solution for more 6 h for the proper interaction of chitosan with OCMC. 1% solution with different amount of chitosan and OCMC has been prepared, Interaction of chitosan and oxidized carboxymethyl cellulose (OCMC) has been carried out with three combinations i.e. 5 wt%, 10 wt% and 15 wt % OCMC with rest of chitosan. The CS/OCMC film gets swell in aqueous medium but it is insoluble in this medium which shows very good interaction of OCMC with chitosan which make the CS/OCMC film insoluble in aqueous medium. Resulting solution of CS/OCMC has been used for film formation through freeze drying process, for the development of porosity at temperature –81ºC. X-ray diffraction has been applied to mark the crystallinity changes in the structure of chitosan with CS-OCMC freeze dried films. Film surface morphology was examined using scanning electron microscopy. Density, porosity, swelling, WVTR, bending length and mechanical properties has also been measured for the resulting film. Interaction of chitosan and OCMC make the resulting compound more useful with enhanced properties which is a water insoluble covalently crosslinked compound with very good thermal stability. The wound healing characteristics of nanosilver contained CS-OCMC dressing was evaluated using a rat model. In the study, female Wistar rats were divided into two groups consisting of six animals in each group. The nanosilver contained CS/OCMC dressing showed significant ($p<0.05$) decrease in the wound area on 21st day of the post wounding day and % increase in wound area contraction on 4th and 12th day of the post wounding days. It also showed maximum wound healing activity at day 21**.** We developed a chitosan carboxymethyl cellulose based nanosilver contained wound dressing which possesses all the qualities of an ideal wound dressing.