DOI 10.18699/SBB-2022-482

Curdlan/Chitosan/Ag NPs foams for healing chronic wounds

Permyakova E.S.[1]*, Shtansky D.V.[1], Manakhov A.M.[2], Solovieva A.O.[2]
[1] *National University of Science and Technology "MISiS", Moscow, Russia*
[2] *Research Institute of Clinical and Experimental Lymphology – Branch of the Institute of Cytology and Genetics, SB RAS, Novosibirsk, Russia*
** permyakova.elizaveta@gmail.com*

Key words: superabsorbent dressings, diabetic wound regeneration, curdlan, chitosan, silver nanoparticles

Motivation and Aim: The healing of burns and wounds is one of the most common health problems. Metabolic and physiological disorders affect the normal process of skin reparation, resulting in ulcers, bedsores, and amputations. To enhance rate of healing process it is necessary to provide good oxygenation, sterility, and deletion excessive exudate.
Methods and Algorithms: We developed Ag-contained foams based on curdlan and chitosan polymers (CUR/CS/Ag). To obtain a foam-like structure mixture of polymers with Ag NPs was subjected to a lyophilization process. The structure and chemical composition of materials were studied by optic/scanning electron microscopy and XPS/FT-IR analysis respectively. The defects on the back of Mice with genetically determined type 2 diabetes mellitus were covered with either curdlan/chitosan or curdlan/chitosan/Ag dressings for 10 days. After that, the wounds were photographed until one of the wounds healed (24 days). The histology analysis of the wound after 24 days was also obtained.
Results: The wounds treated with CUR/CS/Ag showed complete healing after 24 days, which was accompanied by the formation of new vessels of different diameters and significant re-epithelialization. At the same time, CUR/CS-induced healing was only 20 %, and the untreated control showed an increase in the area of the wound by 20+ %.
Conclusion: The developed CUR/CS/Ag foams could meet the needs for clinical practice and may have future medical applications for wound care especially in diabetic patients.
Acknowledgements: This work was supported by the Russian Science Foundation (grant No. 18-75-10057). Part of this work (SEM analyzes) was carried out during the implementation of the strategic project, "Biomedical materials and bioengineering", within the framework of the Strategic Academic Leadership Program "Priority 2030" at NUST "MISiS".