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Cellulose as a promising cell carrier for construction of skin replacements

Radmila Kudlackova¹, Marketa Bacakova¹, Tomas Sopuch² and Lucie Bacakova¹

¹Academy of Sciences of the Czech Republic, Czech Republic

²Holzbecher, Ltd., Czech Republic

Cellulose has been widely used in biomedical applications particularly wound dressings and it is also promising material for skin tissue engineering. Therefore, we investigated the adhesion and growth of human HaCaT keratinocytes and human dermal fibroblasts on a textile form of carboxymethylcellulose (CM) sodium salt. The samples were labelled as AV1-AV7 and differed in pH (from 6.9 to 9.0) and degree of substitution (DS) of -OH groups with -CH₂-COOH groups (from 0.113 to 0.226). As revealed by fluorescence microscopy on days 1, 3 and 7 after seeding, the highest cell numbers and spreading were achieved on AV5 samples (pH 7.1) while on AV3 samples (pH 7.65, DS 0.153), these parameters were the lowest. These results were further confirmed by WST-1 test of the cell metabolic activity. For testing the potential release of cytotoxic substances from CM samples, the samples were leached for a week in the culture medium and the medium was then used for real-time monitoring of the cell growth in a sensoric xCELLigence system. The growth of cells in the extract from the AV3 sample was similar as in the control culture medium which suggested that the lowest cell performance on this sample was caused by less appropriate physicochemical properties of its surface rather than by its cytotoxicity. This was confirmed by a markedly improved cell adhesion and growth after modification of this sample by coating with fibrin and collagen. Thus, surface-modified carboxymethylcellulose seems to be a good adept for construction of skin replacements.

Biography

Radmila Kudlackova is a Master's student at the Faculty of Science of Charles University in Prague, Czech Republic. She is working on her master thesis in the Department of Biomaterials and Tissue Engineering, Institute of Physiology, Academy of Sciences of the Czech Republic. Her thesis title is "Cell Growth on Biomaterials for Skin Replacements and Wound Dressings".

KudlackovaRadmila@seznam.cz

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