Study of extracellular matrix glycosignature in dictate cell fate using 3D glyco-conjugate biomaterials

Cadamuro F.[1], Chiodo F.[2], Nicotra F.[1], Russo L. [1]
E-mail: f.cadamuro@campus.unimib.it
[1] Department of Biotechnology and Bioscience, University of Milano-Bicocca, Milan, Italy
[2] Department of Molecular Cell Biology and Immunology, Amsterdam Infection & Immunity Institute and Cancer Center Amsterdam, Amsterdam UMC, Vrije Universiteit Amsterdam, Amsterdam 1081 HV, The Netherlands

Keywords: Glycans, Biomaterials, Extracellular matrix

Abstract: Both in physiological and pathological states the cell microenvironment mediates cell adhesion, survival, proliferation and differentiation. Glycans are tethered to the extracellular matrix (ECM) components as poly- or oligosaccharides and on cell surface, and they play a key and dynamic role in regulating cellular functions and behaviour, including cell-cell and cell-ECM communication. The ECM is largely studied in tissue engineering, however today the study of differential ECM glycosignature effects is limited by the lack of glyco-tools able to resemble both glycan and proteins identities. Here in this work a panel of different glycosylations were developed on collagen type I and gelatin, in order to characterize the effect of both glycosignature and ECM proteins motifs involved in recognition events. Collagen type I and gelatin have been conjugated to different glycans exploiting the primary amine group of lysine residues present in both polymers using a reductive amination reaction. The glyco-conjugate polymers will be employed in the production of 3D engineered models to control also the physical features of obtained biomaterials. The structure and degree of functionalization of glycosylated materials have been characterized with NMR, FT-IR, Ninhydrin and Anthrone assay. Moreover, the biomolecular interaction of glycoconjugate ECM mimetics were tested on solid-phase assays for the interaction with Siglect-9, Siglect-10 and DC-SIGN, carbohydrate-binding proteins expressed at extracellular level and with immunomodulatory functions.

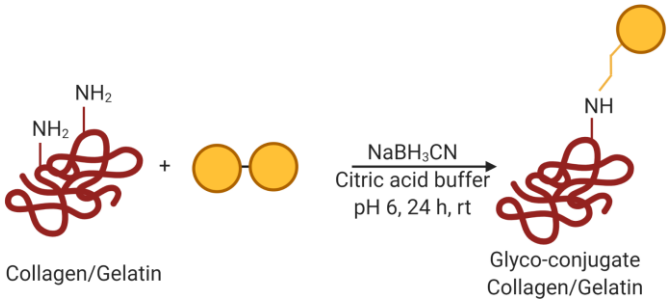

Figure 1: Example of functionalization of collagen/gelatin with glycans