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Glycomics approaches to the studies of stem cells and development of glycan-targeted cancer immunotherapy

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All cells carry an array of sugars or glycans that have the ability to modulate or mediate cellular interactions with other cells and regulate development and functions of an organism. Nearly all aspects of biology are affected by glycan-mediated events. Glycans also participate in multiple fundamental cellular mechanisms that contribute to health and disease, yet they pose a great challenge to study as glycans are extremely heterogeneous, stereochemically complex and glycosylation is not under direct genetic control. Here, we employed glycomic analysis to address two important biomedical issues: Switching of glycosphingolipid core structures during differentiation of human embryonic stem cells (hESCs) and development of glycan-targeted cancer vaccine cancer. First, we will describe a systematic survey of expression profiles of GSLs and glycoproteins in hESCs and their differentiated derivatives along various lineage specifications. Based on MALDI-MS and MS/MS analyses, we have found expressions of a number of unique GSLs in the undifferentiated hESCs and induced pluripotent stem (iPS) cells and also a close association of the GSL expressions with lineage-directed differentiation. Secondly, Globo H, a known biomarker for cancers was found to be highly expressed in undifferentiated hESCs and iPS cells but disappeared upon differentiation, making Globo H to be an ideal target for cancer immunotherapy. Our recent findings of Globo H ceramide as immune checkpoint molecules and angiogenic factors provide further impetus for Globo H-targeted immunotherapy. These studies thus suggest that bio-signatures unique for hESCs and iPS cells are potential targets for development of cancer therapeutics cancer vaccines.

Biography

John Yu is a Distinguished Chair Professor/Director, Institute of Stem Cell/Translational Cancer Research. He is also a Distinguished Visiting Research Fellow at Institute of Cellular & Organismic Biology, Academia Sinica and was the Director for the same Institute (2002-2009). He is the founding President for Taiwan Society for Stem Cell Research. He was elected to serve in many ISSCR Committees, USA, the Steering Committee of Asia-Pacific Stem Cell Network and Advisor for Stem Cell Biology, Kumamoto University. He was also the Director of Experimental Hematology (1998-2002) at Scripps Research Institute, USA. He has received an Established Investigatorship Award from American Heart Association and many other awards.

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