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An insight into pluripotency and cellular aging through glycan analysis

Hirabayashi J[1]

Abstract

All kinds of cells from all kinds of organisms (i.e., animals, plants, fungi and bacteria) are covered by a dense layer of glycans. The origin of glycans or carbohydrates is not known[1], however, the above fact implies that they are widely and closely associated with various biological phenomena based on cellular communications, which include development, differentiation, morphogenesis, carcinogenesis, immunity and infection. It is also notable that glycoproteins, one of existing forms of glycans (i.e., glycoconjugates) are generally synthesized in lumen sites of endoplasmic reticulum and the following Golgi apparatus, distinct from cytoplasmic proteins, which are not subjected to glycosylation, a major event of posttranslational modifications. In fact, glycan structures largely depend on a series of (e.g., >200 in human) glycol-genes, which are defined as genes involved in glycan synthesis (e.g., glycosyltransferases, sulfotransferases, nucleotide sugar transporters), of which expressions differ under different conditions. Because expression of each glycol-gene differs in different cell types (e.g., biological origin, tissue) and states (e.g., developmental stage, malignancy), glycans can be a good marker for cell typing (e.g., SSEA-1) and serum diagnosis (e.g., cancer biomarker such as CA19-9). However, glycan preparation as well as its analysis and total understanding are much more difficult compared with other major disciplines like genomics and proteomics. As a result, most of non-glycoscientists tend to hesitate glycomics, i.e., “glycophobia”. Nevertheless, glycoscience is a very important field of life science, particularly in the future, without which many remaining issues will not be solved. In this plenary lecture, a novel approach to glycan profiling[2] and its applications to biomarker investigation and regenerative medicine[3] will be described.

References

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This lecture was delivered in the Plenary Session of NCRM NICHE 2018. NCRM NICHE (www.ncrmniche.org) is a day of commemorative events to celebrate the inaugural Anniversary of Nichi-In Centre for Regenerative Medicine, conducted every year since 2006 in the month of October. NCRM NICHE provides a platform that augments the interaction of scientists and clinicians. It enables them to exchange ideas in order to arrive at synergies while working towards a common goal of discovering clinically applicable solutions for diseases without a definitive treatment to yield relief to numerous patients. Conducted in India till 2016, it has been conducted in Japan from 2017 onwards. NCRM NICHE has two components: 1. Active Knowledge Gaining (AKG) events which refer to any knowledge gaining activity in which the participant plays an active role before and during the event instead of being a passive listener to a lecture by a speaker or a conversation among third parties. AKG events of NCRM NICHE include a. Fujio Cup Quiz (FCQ); b. Oral Presentation session and c. Tour to Premier Institutes and Inter Disciplinary Conclave (IDC); 2. Passive Knowledge Gaining (PKG) events which refer to an event, where there is no mandatory preparation by the participants before the event. During the event, they have to merely be a passive listener to others either delivering a lecture or interacting among third parties. PKG events of NCRM NICHE include a. Lectures & Orations and b. Inter-Disciplinary Interactions and Solutions (IIDIAS) Session. NCRM NICHE 2018 was conducted at the Shibaura Institute of Technology, Tokyo, Japan from 21 ~ 23 October 2018.

Author Names in full: Jun Hirabayashi

[1] *Biotechnology Research Institute for Drug Discovery, National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan*

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