Bacteria cellulose hydrogels carrying GM3- and Gg3-trisaccharides to probe carbohydrate-carbohydrate interactions between GM3 and Gg3

Mizuki Tobito,[1] Katsunari Hiroki,[2] Keisuke Yoshida,[1] and Teruaki Hasegawa[2,3]

[1] Guraduate School of Life Sciences, Toyo University, [2] Department of Life Sciences, Toyo University, and [3] Bio-Nano Electronics Research Centre, Toyo University

Glycosphingolipids (GSLs) aggregate laterally in cell membranes to form GSL-enriched microdomains. As a result, they construct densely packed carbohydrate clusters (glycoclusters) on their cell surfaces. Face-to-face adhesions between such glycoclusters are now extensively considered as the very first step for the induction of cell–cell adhesions, and these interactions are now referred to as carbohydrate–carbohydrate interactions (CCIs). For example, specific CCIs between G_M3 and Gg3 was reported to induce the migration of cancer cells, implying that CCIs can potentially introduce new strategies to prevent various diseases that are triggered by unfavourable cell–cell adhesions.

Despite their importance, only limited information has been obtained at the molecular level on CCIs thus far owing to the fluidic nature of the cell membranes and owing to fluctuations in their GSL levels. To obtain detailed information on CCIs, some research groups developed various artificial glycoclusters. Among such artificial glycoclusters, the most frequently used ones was glycoclusters immobilized on gold nanoparticles (GNP-sugar). For example, Penadés et al. developed GNPs carrying multiple Le^X-trisaccharides (Le^X_3, Galβ1,4(Fucα1,3)GlcNAcβ) and utilized them for probing the selective Le^X–Le^X interactions. In this previous study, transmission electron microscopic (TEM) observations visualized the Ca^{2+}–mediated association of the GNPs carrying Le^X_3 (GNP–Le^X_3).

As shown above, the artificial glycoclusters developed thus far for probing CCIs (*e.g.*, GNP-sugar) had sizes at the nanoscale or subnanoscale. Thus, special monitoring devices (*e.g.*, TEM) were essential for probing the CCIs using these artificial glycoclusters. Such monitoring devices are quite expensive and require highly specialized techniques for their operation. To overcome these problems and to facilitate the investigation on CCIs, new artificial glycoclusters that are suitable for easy and quick monitoring of CCIs are highly required. To this end, we focused on bacterial cellulose (BC) hydrogels with sizes at the millimeter scale, and constructed new artificial glycoclusters for probing the CCIs with the naked eye. One of the most common BC hydrogels are the *nata de coco*, or jelly-like foods, that originate in the Philippines. During this past decade, chemical modifications of BC have attracted increased research interest because of their unique physical, chemical, and biological properties. Recently, we successfully prepared BC hydrogels carrying GM3- or Gg3-trisaccharides and monitored the aggregation of these hydrogels induced by GM3-Gg3 interactions. The latest data will be presented in the poster session.