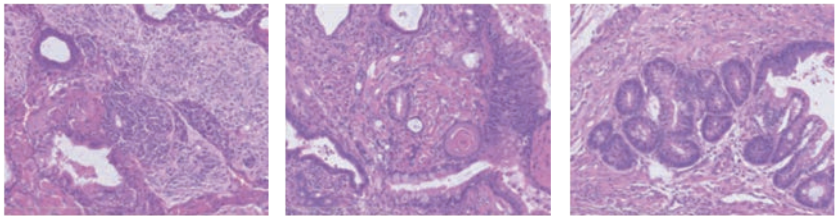
Development of an efficient method for the induction of safe iPS cells

Improvement of the efficiency of iPS cell induction by new factor Glis1

We have developed a new method for iPS cell induction to increase the safety by using novel factor Glis1. We screened more than 1,400 human transcription factors for the ability to replace Klf4 and discovered a novel transcription factor Glis1. Glis1 has the synergistic effect of Glis1 and Yamanaka 3 factors (Oct3/4, Sox2, Klf4) for iPS cell induction. Moreover this factor, enriched in unfertilized and recently fertilized eggs, could replace c-Myc to produce iPS cells from somatic cells with higher efficiency and decreased tumorigenicity. Glis1 promotes iPS cell generation effectively and specifically by activating multiple pro-reprogramming pathways. Glis1 also suppresses the proliferation of defective partially reprogrammed cells. We conclude that the improved safety and efficiency of iPS cell production using Glis1 would be beneficial for future applications of iPS cell technology.



Teratoma formation (mouse) from Oct3/4, Sox2, Klf4 and Glis1-iPS cell

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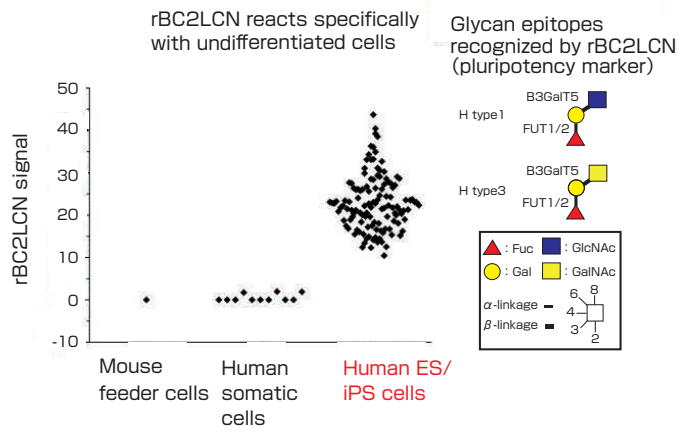
Facile diagnosis of iPS cells using glycan profiling technology

Identification of a novel pluripotency marker by high-density lectin microarray

We have developed a high-density lectin microarray and performed a comprehensive and facile glycan analysis of 114 types of human iPS cells generated from five different somatic cells, and compared their glycomes with those of ES cells (9 cell types). We found that somatic cells with originally distinct glycan profiles acquire those similar to ES cells upon induction of pluripotency. The increased expression of α2-6sialylation, α1-2fucosylation, and type1 LacNAc was found to be the characteristic glycan structural features common to human ES/iPS cells. Finally, we found that rBC2LCN with specificity to the glycans containing the above two characteristics (H type1/3: Fucα1-2Galβ1-3GlcNAc/GalNAc) reacts specifically with undifferentiated cells, which should be a useful probe to discriminate pluripotency.



rBC2LCN is a novel probe to detect undifferentiated cells.

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