



## Koji Hisatake

Faculty of Medicine

E-mail : [kojihisa@md.tsukuba.ac.jp](mailto:kojihisa@md.tsukuba.ac.jp)

Lab web page : <http://www.md.tsukuba.ac.jp/basic-med/biochem/gene/>

Forest of Scholars : <https://ura.sec.tsukuba.ac.jp/unit-members?kid=70271236>

Kakenhi : 70271236

Orcid : 0000-0002-5795-3115

Affiliation : Laboratory of Gene Regulation, Faculty of Medicine,

### Theme

- Gene Regulation
- Stem Cell Biology

**Keyword** iPSC, ESC, adipocyte, chondrocyte, transcription factor, epigenetics, chromatin

### Highlight

#### Major Scientific Interests of the Group

Our group studies the regulation of eukaryotic gene expression, focusing on how transcription regulates cell differentiation. In particular, we are studying the roles of transcription factors and epigenetic changes in regulating iPSC generation, iPSC differentiation, as well as differentiation of adipocytes and chondrocytes.

#### Projects for Regular Students in Doctoral or Master's Programs

- 1) Mechanistic analyses of the functional roles for Oct4, Sox2, Klf4 and c-myc during iPSC generation.
- 2) Analyses of epigenetic changes during iPSC generation.
- 3) Functional analyses of regulatory factors involved in adipocyte and chondrocyte differentiation.

- 4) *In vivo* imaging and mechanistic analyses of beige adipocyte differentiation in mouse

#### Study Programs for Short Stay Students (one week ~ one trimester)

- 1) Analysis of transcriptional regulation during adipocyte differentiation.
- 2) Induction of iPSCs using a Sendai virus-based vector.

#### Other Faculty Members

Associate Professor: Aya Fukuda

Associate Professor: Ken Nishimura

### Applications and Prospects

- We have established *in vitro* systems for generating iPSCs and for differentiating iPSCs into neural stem cells. Moreover, we also developed systems to generate adipocytes and chondrocytes from mesenchymal stem cells and iPSCs. Our systems are applicable for screening and testing chemical compounds for potential drug development.

### Literature, intellectual property, work

- Bui PL, Nishimura K, Seminario Mondejar G, Kumar A, Aizawa S, Murano K, Nagata K, Hayashi Y, Fukuda A, Onuma Y, Ito Y, Nakanishi M, Hisatake K. Template Activating Factor-1 $\alpha$  Regulates Retroviral Silencing during Reprogramming. *Cell Rep.* 29(7): 1909-1922 (2019).
- Fukuda A, Honda S, Fujioka N, Sekiguchi Y, Mizuno S, Miwa Y, Sugiyama F, Hayashi Y, Nishimura K, Hisatake K. Non-invasive *in vivo* imaging of UCP1 expression in live mice via near-infrared fluorescent protein iRFP720. *PLoS One* 14(11): e0225213 (2019).
- Nishimura K, Aizawa S, Nugroho FL, Shiomitsu E, Tran YTH, Bui PL, Borisova E, Sakuragi Y, Takada H, Kurisaki A, Hayashi Y, Fukuda A, Nakanishi M, Hisatake K: A role for KLF4 in promoting the metabolic shift via TCL1 during induced pluripotent stem cell generation. *Stem Cell Reports* 8(3), 787-801 (2017).