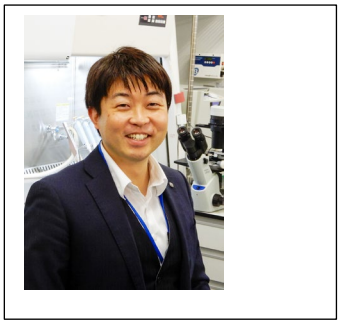
Research field: Cell Engineering



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Major Scientific Interests of the Group

We aim to understand fundamental biological systems of reprogramming into pluripotent stem cells and to develop disease modeling using human induced pluripotent stem cells (iPSCs). We have been studying intractable diseases using patient-derived iPSCs and the molecular mechanisms of iPSC generation for basic research and drug development. We also generate genetically modified iPSC lines including mutation-introduced iPSC lines from healthy-donor iPSC lines, mutation-corrected iPSC lines from disease-specific iPSC lines, and reporter-introduced iPSC lines. By combining cutting-edge technologies, such as AI (artificial intelligence), photonics, and materials with our expertise in stem cell biology, genomics, and developmental biology, we will explore new views of research and development in biomedical fields.

Projects for Regular Students in Doctoral or Master's Programs

1) Generation and characterization of disease-specific iPSCs
2) Disease modeling using disease-specific iPSCs
3) Development of new technologies in iPSC generation

Study Programs for Short Stay Students (one week – one semester)

1) Generation of human iPSCs from somatic cells
2) Characterization of human iPSCs for their self-renewal, pluripotency, genomic information
3) Genome editing of human iPSCs for making mutants or fluorescent reporters

Selected Publications

1) Nakade K, Tsukamoto S, Nakashima K, An Y, Sato I, Li J, Shimoda Y, Hemmi Y, Miwa Y, **Hayashi Y**. Efficient selection of knocked-in pluripotent stem cells using a dual cassette cellular elimination system. ***Cell Rep Methods.*** 2023 Dec 18;3(12):100662. doi: 10.1016/j.crmeth.2023.100662.

2) Song D, Takahashi G, Zheng YW, Matsuo-Takasaki M, Li J, Takami M, An Y, Hemmi Y, Miharada N, Fujioka T, Noguchi M, Nakajima T, Saito MK, Nakamura Y, Oda T, Miyaoka Y, Hayashi Y. Retinoids rescue ceruloplasmin secretion and alleviate oxidative stress in Wilson's disease-specific hepatocytes. **Hum Mol Genet.** 2022 Oct 28;31(21):3652-3671. doi: 10.1093/hmg/ddac080.

3) Borisova E, Nishimura K, An Y, Takami M, Li J, Song D, Matsuo-Takasaki M, Luijkx D, Aizawa S, Kuno A, Sugihara E, Sato TA, Yumoto F, Terada T, Hisatake K, **Hayashi Y**. Structurally-discovered KLF4 variants accelerate and stabilize reprogramming to pluripotency. ***iScience.*** 25(1):103525, 2021.