Department of
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Tissue engineering of hair follicle germsand organoids

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Abstract

A person's appearance is greatly influenced by their hairstyle; therefore, the demand for hair loss treatment is considerable throughout all generations, regardless of age or sex. Hair regenerative medicine has emerged as a promising therapy option for hair loss. Hair follicle morphogenesis is induced during embryonic development by the production of hair follicle germs (HFGs) via interactions between epithelial and mesenchymal cells. Considering the hair follicle development, we have successfully developed techniques for producing large numbers of HFGs using self-organization (1), bioprinting (2), and microfluidics processes (3). Transplantation of engineered HFGs can regenerate hair follicles with high efficiency and generated hair shafts repeated multiple hair cycles. These technologies hold tremendous promise as a scalable method for producing transplantable tissue for hair regenerative medicine.

We recently developed a culture system (termed hair follicle organoid) to regenerate mature hair follicles in vitro at very high efficiency (~100% efficiencies) (4). Incorporating hair growth promoting drug candidates (e.g. minoxidil) into the culture medium significantly improved the growth of the hair follicle sprouting (5); therefore, hair follicle organoids may be useful for screening hair drug candidates for treating hair loss disorders. In this presentation, we will introduce our technologies to prepare HFG or hair follicle organoid for hair regenerative medicine and drug testing.

References
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Biography

Dr. Tatsuto Kageyama is a researcher at Kanagawa Institute of Industrial Science and Technology (2018–Present) and an assistant professor at Yokohama National University (2020–Present). He was previously a researcher at the Japan Science and Technology Agency (JST-PRESTO) from 2019–2022. He received his M. Eng. Degree in 2014 from the University of Tsukuba and Ph.D. in 2017 from Yokohama National University. His primary research interest is the development of tissue engineering technologies for hair follicle regeneration. He has published 40 academic articles and received over 20 awards from various academic societies. The University of Tsukuba President's Award (2012), the Journal of Materials Chemistry B poster prize (2016), and the TERMIS-AP Best Poster Presentation Award (2022) are among his most notable accolades. He has served as the primary investigator on over ten research projects, including a Japan-Singapore joint project grant.

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