

Matsunaga Lab.

[Cells to Tissue Engineering]



IIS, Center for International Research on Integrative Biomedical Systems

<http://matlab.iis.u-tokyo.ac.jp>

Bottom-up tissue engineering, Vascular tissue engineering, Organ on a chip

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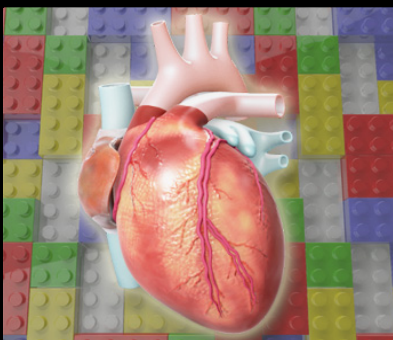
Design of Living Tissues

—Tissue Architecture from Cells—

In the field of tissue engineering, there is an increasing demand for *in vitro* models that provide us information and functions of living cell and tissue capture to understand between cells and their microenvironment. To construct the *in vitro* models, there is a need to create bio-structures that mimic the hierarchical architecture and complexity of living tissues. Therefore, controlling cell microenvironment in a highly controllable, reproducible and scalable manner is necessary. The microenvironment in a manner that is precisely controlled, reproducible and scalable.

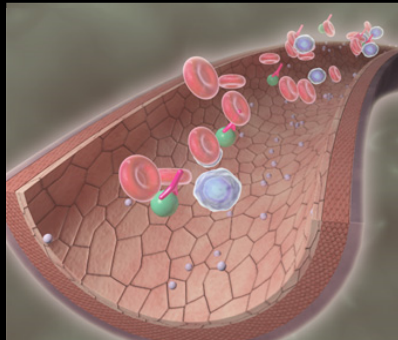
By exploiting innovative approaches including microfabrication techniques (MEMS) and soft-material science, we focus on development of three-dimensional engineered living tissues for regenerative medicine and fundamental cell biology (bottom-up tissue engineering, vascular tissue engineering and organ on a chip).

Bottom-up Tissue Engineering



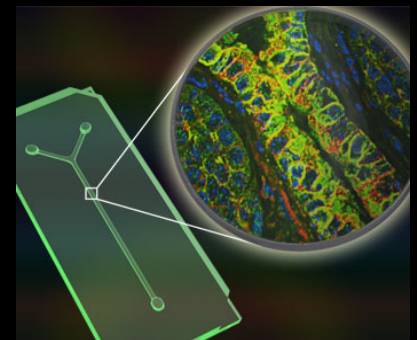
Using microfabrication techniques (microfluidics, micromolding, etc.), we focus on fabricating microtissue units with specific microarchitectural features, and use these units to engineer macroscopic tissues from the bottom-up.

Vascular Tissue Engineering



A major challenge in tissue engineering is the lack of proper vascularization of the fabricated tissues. We focus on formation of microvasculatures in engineered three-dimensional tissues that allows transport fluids inside, mimicking chemical and mechanical environment of the tissues.

Organ on a Chip



In vitro tissue model has been expected to use as major alternatives to *in vivo* animal testing. We focus on creating 'tissue chip' that researchers can use to predict the performance of a candidate drug, vaccine or biologic agent quickly and inexpensively.