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Myocardial tissue engineering on a collagen-base with microchannels

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Engineering myocardial tissue can give advance a new therapy, and a new model for pharmaceutical research. However, the *in vitro* scaling up of myocardial tissues is limited due to the lack of vessels supplying oxygen and nutrition, removing waste molecules. For thick tissue survival, it is inevitable to build newly capillary networks, which can increase the diffusion rates of oxygen and nutrients. We report a new strategy for preserving viable tissues using a perfusion bioreactor having a collagen-base with microchannels. When triple layered cardiac cell sheets were incubated on the collagen base with microchannels in this bioreactor, endothelial cells in the cell sheet migrate and spontaneously vascularize the collagen gel. Fresh culture medium readily flows into the cell sheet through the microchannels, and the cell sheet remains in functional condition. Additionally, to overcome the tissue thickness transport limitations, triple-layered cell sheet were repeatedly layered over the original viable cell sheet 3 different times over 5-day intervals. All layered cell sheets spontaneously integrate completely, and the entire resulting tissue construct exhibits stabilization without necrosis for 20 days of bioreactor culture. Multi-step procedure provides vascularized cardiac tissue consisting of 12-layered cell sheet. These results confirmed a route to fabricate *in vitro* engineered tissue, viable 3-D cell sheets. This technology should lead to restore damaged cardiac tissue and successful production of accurate cardiac tissue models for pharmaceutical investigation.

Biography

Katsuhisa Sakaguchi has completed his Ph.D. at the age of 30 years from Waseda University. Now, he is an assistant professor of Waseda University, School of Science and Engineering.

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