Principal Researcher	Yasuhiko Tabata	**Number of Researchers**	4
Research Institution・Department・Title	Professor, Institute for Frontier Medical Sciences, Kyoto University	**Location of Institution**	Kyoto

Title of Project	Development of functional cell scaffolds and bioreactors for regenerative medicine based on stem cells
Abstract of Research Project	It is no doubt that the basic research on cells and growth factors involving the phenomena of tissue/organ regeneration is indispensable for regenerative medicine. However, even if the research of stem cells develops and the regeneration mechanism is elucidated, only by the research results, regenerative medicine will not always be realized. It is of prime importance for successful clinical application of regenerative medicine to develop the biomedical technology and methodology (tissue engineering) which enable cells to proliferate and differentiate, resulting in accelerated regeneration induction of tissues and organs. In this research project, we create functional scaffolds which have superior natures for attachment and proliferation of stem cells. In addition, we also design the bioreactors of cell culture to accelerate the cell proliferation. One of the largest barriers to achieve the cell-based regenerative medicine is the shortage of cells. The research objective is to increase the number of adult stem cells to that clinically available by combining the functional cell scaffold with the bioreactor system. Few researches on the separation and proliferation of stem cells have been done, while the related technology is still immature at home and abroad. Various cell scaffolds with 3-dimensional sponge structures are prepared from biodegradable polymers, followed by being coated and coupled with bioactive substances, such as antibody, growth factors, and adhesion molecules, to obtain functional scaffolds. In parallel, the bioreactors of agitation, rotation, and perfusion types are designed. Cell culture experiments of tissue (adult) stem cells, especially mesenchymal stem cells, under different culture conditions are performed together with the scaffold and bioreactor system to evaluate the effect of the scaffold and bioreactor characteristics on the cell proliferation in terms of cell biological and biochemical examinations.
References	・Iwakura, Y. Tabata, N. Tamura, K. Doi, K. Nishimura, T. Nakamura, Y. Shimizu, M. Fujita, M. Komeda, Gelatin sheet incorporating basic fibroblast growth factor enhances healing of devascularized sternum in diabetic rats. Circulation, 104, I-325-I-329, 2001. ・Y. Tabata, Significance of biomaterials and drug delivery systems in tissue engineering. Connective Tissue, 33, 315-324, 2001. ・Y. Sakakibara, K. Nishimura, K. Tambara, M. Yamamoto, F.L. Li, Y. Tabata, M. Komeda, Prevascularization with gelatin microspheres containing basic fibroblast growth factor enhances the benefits of cardiomyocytes transplantation. J. Thorac. Cardiovasc. Surg., 124, 50-56, 2002. ・Y. Kimura, M. Ozeki, T. Inamoto, Y. Tabata, Time course of de novo adipogenesis in matrigel by controlled release of basic fibroblast growth factor. Tissue Eng., 8(4), 603-613, 2002.
Term of Project	Fiscal years 2003-2007 . (5years)

Budget Allocation (in thousand of yen)	FY2003	FY2004	FY2005	FY2006	FY2007	TOTAL
	23,600	22,300	20,500	14,000	13,500	93,900

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