

【Grant-in-Aid for Scientific Research (S)】

Integrated Disciplines (Complex Systems)



Title of Project : **Mechanomedicine: Application of Mechanobiological Engineering to Regenerative and Reproductive Medicine**

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Research Area : Complex systems

Keyword : Biological information, mechanobiology

【Purpose and Background of the Research】

Human body perceives mechanical stress. While adequate response to the mechanical stress leads to preservation of normal physiological function, inadequate response leads to pathological condition. Therefore, mechanomedicine plays important roles to unravel causes for diseases and to develop cures. In this project, we carry out translational researches on mechanobiology-based cardiac regenerative medicine and reproductive medicine, employing a theory of mechanobiology we have developed in molecular, cellular, tissue, and individual levels. We will develop innovative mechanomedical technologies, obtaining feedbacks from medical front.

【Research Methods】

This project consists of the following two components:

1. Mechanobiology-based cardiac regenerative medicine (Figure 1)

We will develop a self-assembled vascularized cardiac tissue by applying stretch and shear stress. Effectiveness of this tissue will be examined in a preclinical study using a myocardial infarction model.

2. Mechanobiology-based reproductive medicine (Figure 2)

We will develop an artificial oviduct system replicating mechanical stress in vivo. Analysis of

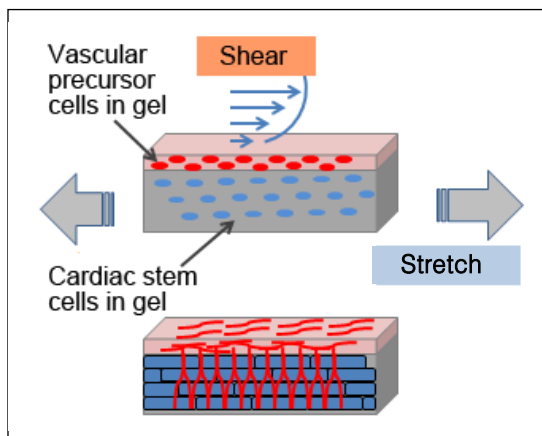


Fig. 1. Cardiac regenerative medicine

molecular mechanotransduction in fertilized eggs and a preclinical study will be performed at the same time.

【Expected Research Achievements and Scientific Significance】

Our cardiac regenerative medicine project is feasible because it is an extension of the TICAP clinical study held in Okayama University. Development of a next-generation regenerative medicine is expected by executing the mechanobiology-based projects.

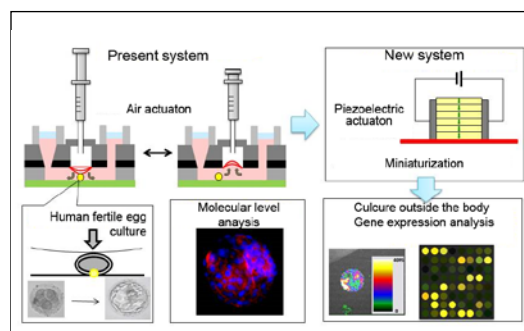


Fig. 2. Reproductive medicine

【Publications Relevant to the Project】

- TRPV2 is critical for the maintenance of cardiac structure and function in mice. *Nat Commun.*, 29(5), 3932, 2014
- A tilting embryo culture system increases the number of high-grade human blastocysts with high-implantation competence. *Reproductive BioMedicine Online.*, 26(3), 260-268, 2013
- Molecular identification of a eukaryotic, stretch-activated nonselective cation channel. *Science* 285(5429): 882-886 (1999)

【Term of Project】 FY2014-2018

【Budget Allocation】 155,200 Thousand Yen

【Homepage Address and Other Contact Information】

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