

FUNDING PROGRAM FOR NEXT GENERATION WORLD-LEADING RESEARCHERS

Project Title: Novel development of hybrid ex vivo expanded endothelial progenitor cell therapy for diabetic ulcer

Name: Rica TANAKA

Institution: Juntendo University

1. Background of research

Diabetes impairs wound healing, causing a major problem for patients and physicians who treat these wounds. However, there is no effective treatment to cure diabetic ulcers that has become the worst. The pathogenesis of diabetic wound healing is multifactorial, but impairment of new blood vessel growth (neovascularization) plays a major role. Recent reports state that peripheral blood stem cells called endothelial progenitor cells (EPCs) may be an effective alternative therapy. However, autologous (self) cell therapy for diabetic patients are thought to be not as effective with the usage of dysfunctional EPCs. In addition, the therapeutic modality of EPC therapy is the inefficient isolation techniques and limited number of available cells.

2. Research objectives

We have recently described the efficacy of our hybrid ex vivo expansion system to restore diabetic EPC dysfunction and obtaining sufficient number of EPCs in mice. From our preliminary studies, we believe that autologous EPC therapy with hybrid ex vivo expanded EPCs may circumvent the current major limitations of therapeutic vasculogenesis for diabetic patients and will become a novel, viable option for treatment of problematic diabetic wounds and may prevent the need for amputation.

3. Research characteristics (incl. originality and creativity)

Hybrid ex vivo expansion system is a novel system developed originally by our group. If this novel technique is fully developed, we will be able to isolate enough number of functional diabetic EPCs from small amount of peripheral blood non invasively. Autologous diabetic EPC therapy with Hybrid ex vivo expanded cells will be the firstly developed non invasive effective cell therapy for diabetic patients.

4. Anticipated effects and future applications of research

At the completion our study, we will demonstrate that hybrid ex vivo expansion also restores human diabetic EPC dysfunction and expanding enough number of cells. In addition, transplantation of ex vivo expanded EPCs to diabetic wound patients will result in improvement of tissue repair compared to transplantation of non expanded EPC therapy as well as no cells. This study will not only demonstrate the efficacy of ex vivo expansion system for diabetic patients, but autologous ex vivo expansion therapy may become the ideal and most effective therapy for complicated diabetic wounds that has been difficult to achieve for many years.

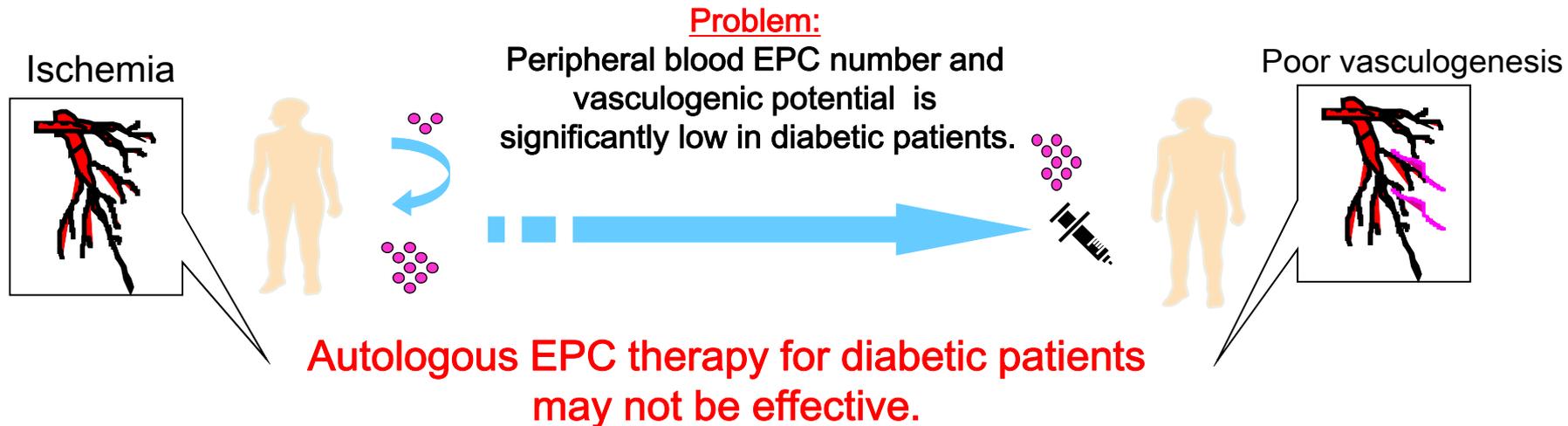
Necessity of vasculogenic regenerative medicine for diabetic foot

< Epidemiology >

- Diabetic patients : 2.5 0 million (Japan)
- Diabetic foot patients : 0.2 5 million (10%)
- Diabetic foot is the major reason for amputation



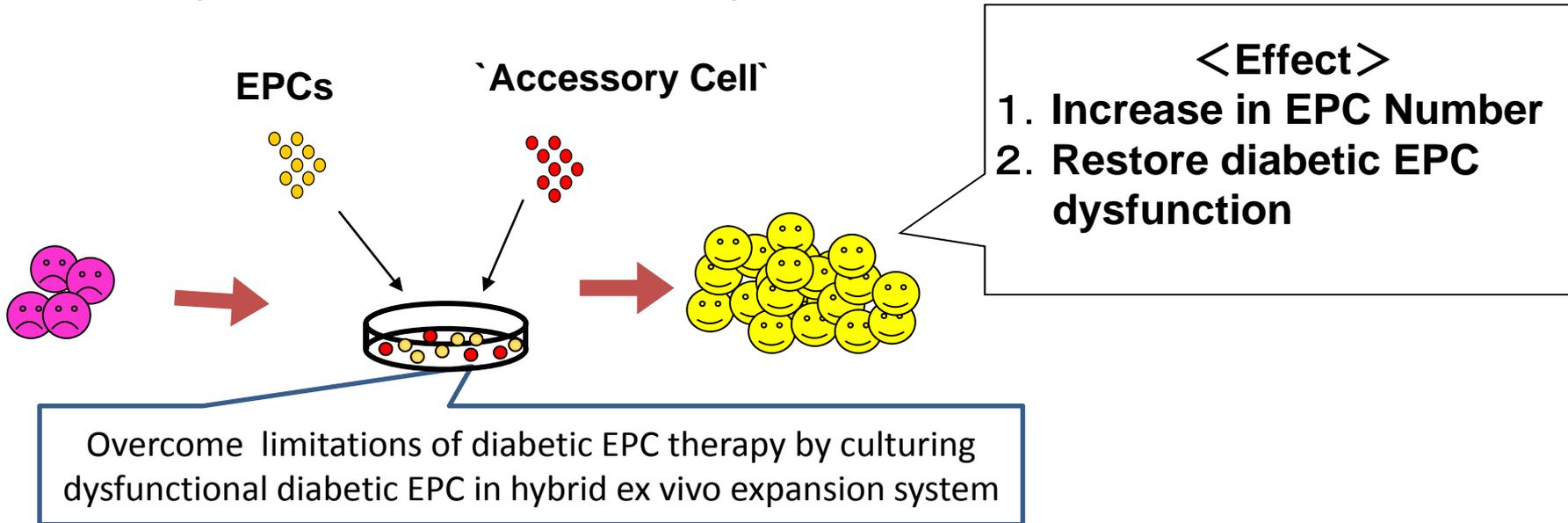
Autologous EPC therapy for non healing diabetic foot



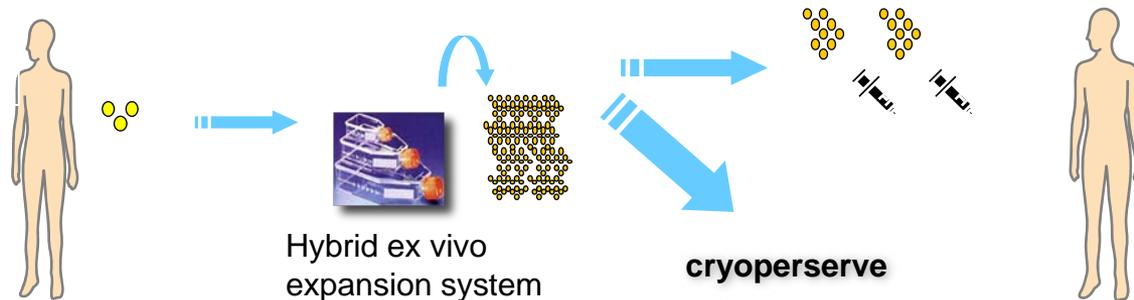
Development of Novel Vasculogenic Stem Cell Therapy for Diabetic Patients

Ex vivo EPC expansion is a more effective approach to improve diabetic wound healing.

Novel EPC therapy: Hybrid Ex Vivo Expansion System



Future Vision



Hybrid ex vivo expansion system requires small amount of blood and will generate large number of functional cells for treatment and also be cryopreserved for future application.