

1 Development of myocardial regenerative therapy using cell sheets

Regenerative therapy investigated for various organ failures has recently been attracting attention as a therapy for severe heart failure. Among myocardial regenerative therapies, cell transplantation of myoblasts to the heart muscle has been reported to clinically improve cardiac function, and we have started a clinical study of myocardial regeneration by transplantation of skeletal myoblasts and bone marrow monocytes in patients with severe ischemic cardiomyopathy. We have also performed a development study of myocardial regenerative therapy using cell sheets, and clarified significant recovery of cardiac function and inhibition of remodeling. At present, self-skeletal myoblasts are considered to be appropriate for clinical application as a cell source both ethically and to supply the required amount, and a preclinical study of the usefulness of myoblast sheets for myocardial regeneration is being performed.

Development of the new medical treatment method using the left Cardiac ventricle auxiliary equipment and the self origin Cell transplantation for late ischemic Heart Disease

Muscle bud cell + Marrow single nuclear sphere cell transplantation

Bridge to Recovery

The muscle bud cell which is transplanted

control

Muscle bud cell transplantation + Marrow single nuclear sphere cell transplantation

Regeneration with Myoblast sheet for critical Heart failure

Myoblast 100±10µm x200

Transplantation for infarction Heart

Transplantation for Pig infarction sample

Before After

Transplantation for dilated cardiomyopathy

Transplantation Myoblast sheet for infarction Heart

Myocardial cell seat

Before After

HEdyeing

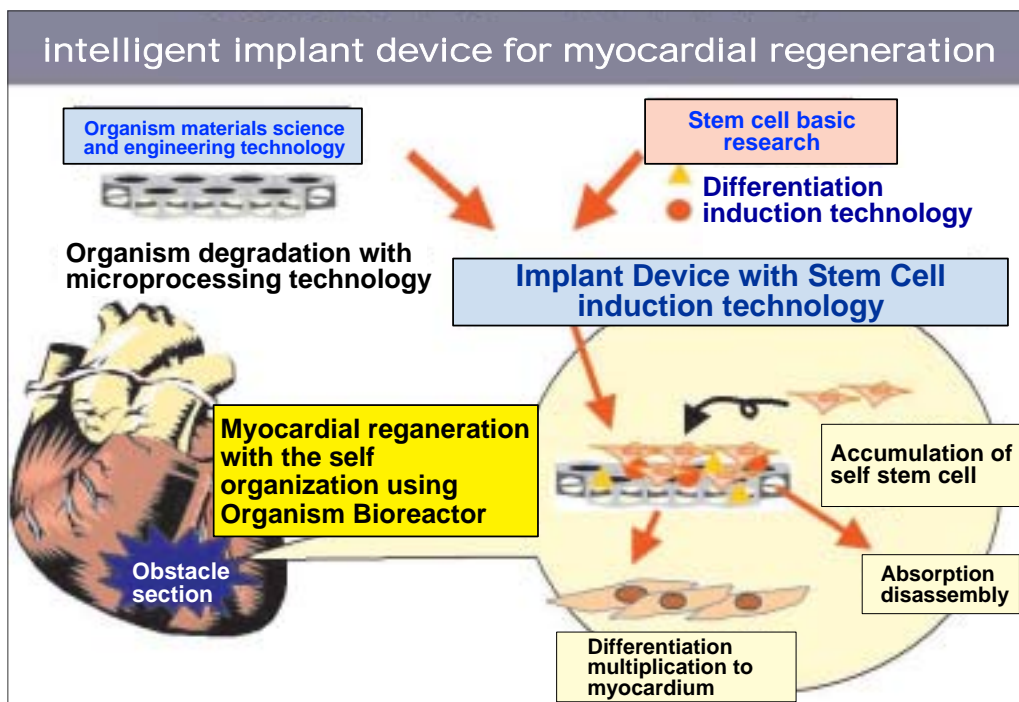
2

Development of an intelligent implant device for myocardial regeneration by induction of stem cells

Medicine-engineering cooperation combining engineering techniques such as recent biomaterials, and medical techniques such as stem cells and cell engineering, has recently been rapidly progressing, and clinical application is expected.

Development by medicine-cooperation for clinical needs may be particularly important. Thus, measures of medicine-engineering cooperation on standpoint of promotion and development of advanced medicine centering regenerative medicine and its industrialization, that is view of exit, should be discussed, and this is the basis of this COE.

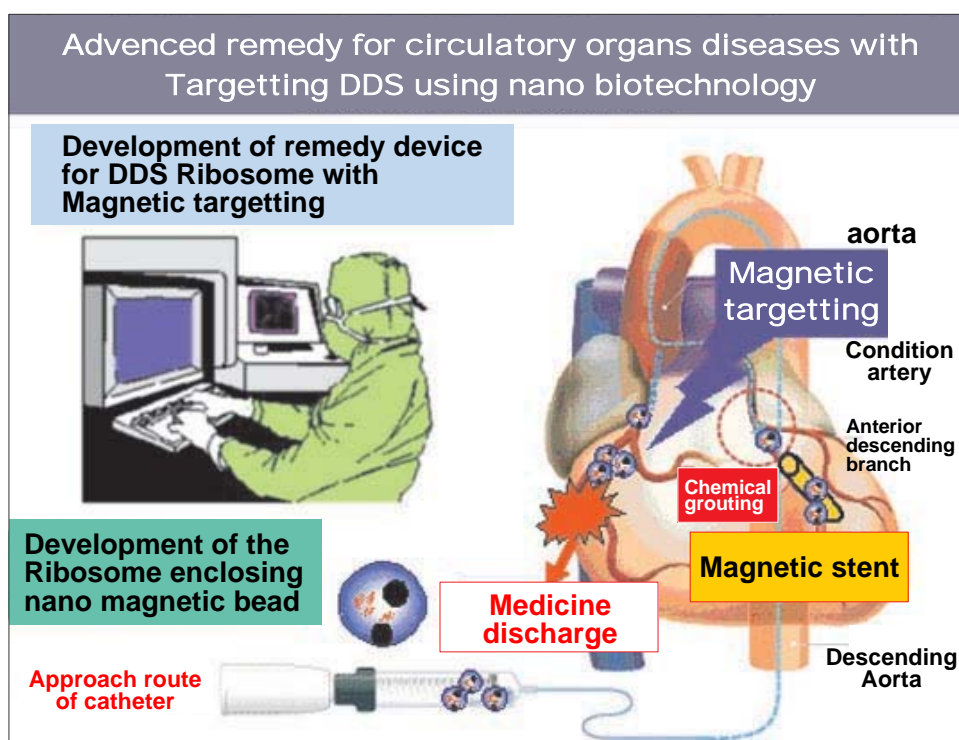
Therefore, development of an intelligent implant device for myocardial regeneration by full use of combined techniques of biomaterial and stem cytology would be an ideal regenerative therapy. These devices could be used in an emergency due to the absence of necessity of a cell culture process, lack of ethical issues, and ease in commercialization and clinical trial.



3

Development of cardiac-muscle-targeting DDS by nanobiotechnology

Nanobiotechnology combining recent nanotechnology and biotechnology has recently been developing rapidly. However, only a few techniques have achieved medical application in this field, and the main cause may be insufficient development by medicine-engineering cooperation in view of clinical needs. Thus, on standpoint of promotion and development of advanced medicine and its industrialization, that is view of exit, development of targeting DDS by nanobiotechnology for treatment of circulatory disorders is important.



Other study contents of Matsuda / Sawa laboratory

- Gene therapy in the circulatory field
- Development of a non-cell biological valve by tissue engineering
- Basic study of reperfusion of myocardial ischemia and the development of a new myocardial protection method
- Elucidation of the development mechanism of cardiac hypertrophy and development of a therapy
- Development of biodegradable artificial blood vessels by biomaterial engineering
- Development of low-invasive cardiac surgery: robot-assisted heart surgery
- Support and promotion of translational research at the Medical Center for Translational Research