(Fiscal Year 2007–2009)

Saitama Metropolitan Area

Production of advanced bio-industry based upon the rational evolutionary design of proteins.

Saitama Small and Medium Enterprises Development Corporation
2-3-2 Kamiochiai, Chuo-ku, Saitama City, Saitama 338-0001 JAPAN
TEL: +81-48-857-3901

Life Sciences
IT
Environment
Nanotech Materials
Others

Framework for Project Promotion

Project Director……Akira HORIE
Chief Scientist……Yuzuru HUSIMI
Science and Technology Coordinator…Toshiatsu KUSAKI, Koji NISHIKORI

Core Research Organizations

Saitama University, RIKEN, The University of Tokyo

Major Participating Research Organizations

Industry…Chiome Bioscience Inc., Katakura Industries Co., Ltd., Taisho Pharmaceutical Co., Ltd., Asubio Pharmaceuticals, Inc., Janusys Corporation, Lifetech Co., Ltd.
Academia…Saitama University, RIKEN, The University of Tokyo, Niigata University, Toyohashi University of Technology
Government…Saitama Cancer Center, Saitama Industrial Technology Center (SAITEC)

Aims of Project

The aim of this project is to develop the seeds of drugs to combat diseases such as cancer, metabolic syndrome, and Alzheimer-type senile dementia. This will be attained by novel biotechnology based on the rational evolutionary design of advanced biomolecules developed in Metropolitan Saitama. The project also seeks to obtain new target biomolecules for drugs and the development of a new high-level bio-industry.
Cooperation is encouraged between medical organizations, universities, research institutions, major companies, and ventures, with the aim of developing high-value seeds from “antibodies” and “peptide aptamers.” Thus, the project promotes the development of new drugs, the mechanisms of which are unique and in global demand. The project also seeks to develop a regional R&D cluster that would contribute to the development of the regional economy.

Contents of Project

(Collaboration Project)

1. Development of advanced antibodies by homologous recombination techniques and clinical application

Antibodies are candidates for molecular-targeting drugs, and have been widely utilized for drugs with new mechanisms such as anti-cancer and anti-rheumatoid arthritis. In this theme, unique monoclonal antibodies are produced based on innovative techniques such as the ADLib system, a technique of producing high-quality proteins using silkworms (Superworm system), and a novel gene-targeting technique.

2. Development of specifically binding peptides (peptide aptamers) as medical seeds

In this theme, with the aim of obtaining unique seeds for drugs by evolutionary molecular engineering for peptide aptamers, trials are performed as part of the following three themes.

2-1. Development of seeds for drugs to suppress obesity

Obesity has become a major problem in relation to metabolic syndromes such as diabetes mellitus. “Ghrelin,” a hormone found in Japan in 1999, stimulates appetite. Therefore, a drug that could block its receptor(s) would be useful in combating obesity; the search to find such a drug is currently underway. This theme develops an antagonist aptamer that can bind Ghrelin receptor(s) and antagonize against its action.

2-2. Development of seeds for drugs to treat cancer

It is essential for the maintenance of life that high-level molecular information networks show excellent performance. Most cancers are known to result from the failure of such networks; in most cases, protease enzymes are important players in these systems. This theme develops peptide aptamers able to regulate the activities of cancer-related proteases such as Cathepsin E (CE).

2-3. Development of seeds for drugs to cure Alzheimer’s disease

Dementia is a serious problem in aging societies, and Alzheimer’s disease is one of the dominant forms of dementia. Recent studies have demonstrated that intrinsic amyloid β protein (Aβ) is strongly related to Alzheimer’s disease. This theme develops peptide aptamers able to bind to suppress the causal proteins of Alzheimer’s disease, such as Aβ, and a seed compound.

(Feasibility study)

In order to reinforce the collaboration project, a feasibility-study task force has been established, and we are currently searching for new themes.

Main Results

1. Development of advanced antibodies by homologous recombination techniques and clinical application

Ten candidate antigens were selected as target molecules, and four protein antigens were prepared using the Superworm system. The antibodies were prepared using the ADLib system, yielding antibodies with functions against six candidate antigens. Furthermore, Somatogenin, a newly discovered protein, has been studied for its physiological functions, yielding interesting results.

Production of drug-targeting antigens that have previously been difficult to obtain. Using these antigens, each ADLib antibody is prepared.

Superworm system:
An original Japanese technique of mass production of proteins using silkworms.

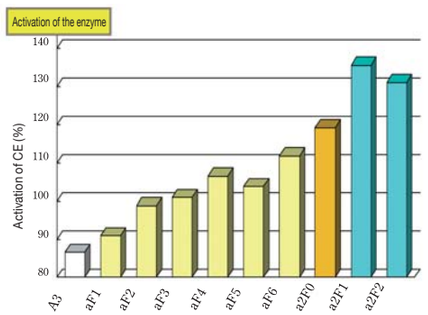
2. Development of specifically binding peptides (peptide aptamers) as medical seeds

2-1. Development of seeds for drugs to suppress obesity

A cell-based system presenting the Ghrelin receptor on the cell surface is established as a screening system for peptide aptamers.

2-2. Development of seeds for drugs to treat cancer

Cathepsin E (CE) is selected as a protease to suppress the growth and metastasis of cancers. The screening of peptide aptamers to stimulate CE activity has been successfully performed.



2-3. Development of seeds for drugs to cure Alzheimer’s disease

A measuring system to monitor the toxicity of Aβ42 was established in order to estimate the characteristics of peptide aptamers that bind to Aβ. By using this screening system, we confirmed the usefulness of peptide aptamers synthesized in a pilot study.