●Development Stage

(Fiscal Year 2008–2010)

Hiroshima Area

Development of a new health industry concerned with the prevention and diagnosis of disease, and the development of new medicine using biotechnology

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Life Sciences
IT
Environment
Nanotech Materials
Others

Framework for Project Promotion

Project Director……Kyozo Morimoto
Chief Scientist……Haruo Matsuda
Science and Technology Coordinator…Hisashi Yamada

Core Research Organizations

Hiroshima Prefectural Institute of Industrial Science and Technology,
Hiroshima Industrial Promotion Organization
Hiroshima University

Major Participating Research Organizations

Industry…Aohata Corp., Research Institute of Biomolecule Metrology Co., Ltd., Sekisui Medical Co., Ltd., Chugoku Jozo Co., Ltd., Nishikawa Rubber Co., Ltd., NEOSILK Co., Ltd., Nomura-Milk Co., Ltd., Biomarker Science Co., Ltd., Higuchi Matsunosuke Shouten Co., Ltd., Hiroshima Bio-medical Co., Ltd., Pharma Foods International Co., Ltd., PhoenixBio Co., Ltd., Yaegaki Bio-industry, Inc.
Academia…Hiroshima University
Government…Hiroshima Prefectural Institute of Industrial Science and Technology, National Institute of Health Sciences, National Cardiovascular Center, National Research Institute of Brewing, RIKEN

Aims of Project

Our aim is to accelerate development of the “Hiroshima BioCluster” by advancing the bioindustry that emerged in our area as a result of the Knowledge Cluster Initiative (2002–2006), in conjunction with traditional local brewing and food industries. To achieve this goal, we will seek to strengthen collaborations among academia, industry, and government, and concentrate our efforts on the development of sectors such as preventive medicine, diagnosis, and drug discovery by taking advantage of a wide variety of unique biological functions that we hold as technological seeds developed from basic research in the Hiroshima area.

Contents of Project

1. Development of novel functional foods and health-care products created by utilizing plant-derived lactic acid bacteria and brewing fungi
   Lactic acid bacteria (LAB) are known as “probiotics” because they improve the gut microflora and are regarded as potentially beneficial bacteria, with therapeutic health effects. In our project to date, plant-derived LAB (P-LAB) have been used to develop functional foods (FF) and health-care products (HCP). As a next step, to create FF and HCP effective against metabolic syndrome and allergy diseases, we will investigate the use of brewing fungi such as Aspergillus (A.) oryzae and A. kawachii, together with P-LAB. The parallel plural-fermentation method using both P-LAB and brewing fungi may prove to be one of the most innovative techniques in the world. The FF and HCP to be developed as part of the project are expected to contribute to combating metabolic syndrome and allergy diseases. In addition, new fermentation technology will be passed on to industries in Hiroshima, helping to stimulate the regional economy.

2. Development of low-allergen eggs (low- or non-ovomucoid) using genetic modification technology applied to chickens
   Ovomucoid is a major allergen in chicken egg white that causes a serious food allergy. We have succeeded in developing both a cell culture system for chicken embryonic stem (ES) cells and a system of genetic modification for chickens. In this project, we aim to develop low-allergen eggs (low- or non-ovomucoid) using these technologies. The low-allergen eggs will be utilized for vaccine production and as an ingredient in processed food.

3. Development of diagnostic antibody reagents for disorders related to metabolic syndrome
   With the aim of developing excellent antibody test reagents for the prevention of atherosclerosis, in this project we will develop chicken monoclonal antibodies specific to oxidized low-density lipoprotein, commonly known as “bad” cholesterol. We will also search for marker molecules from adipocytokine that are closely related to adult diseases. When such useful marker molecules are found, specific monoclonal antibodies against the marker molecules are also generated. By using chickens in this research, highly specific monoclonal antibodies against mammalian-conserved molecules could be made available.

4. Development of a molecular diagnosis system for pollinosis using microbeads ELISA
   To establish the clinical scheme for a complete cure for pollinosis, we aim to develop a novel molecular diagnosis system based on our own allergen library and a cutting-edge procedure for antibody sensing. This system also provides valuable information in exploiting tailor-made therapeutic vaccines.

5. Development of novel approaches for the generation of transgenic human hepatocyte chimeric mice
   We are currently developing a novel transgenic human hepatocyte chimeric mouse model based on our existing chimeric mouse model, with the highest known repopulation rate of human hepatocytes. This previously developed model is currently being used in evaluating the pharmacokinetic properties of medicinal compounds and as an infection model for the hepatitis virus. This novel approach will enable us to create new animal models for different types of diseases, especially enabling research into CYP polymorphism, which is considered to explain metabolic differences among races. These new models would have a greater impact on the development of novel drugs than the present chimeric mouse model alone.

6. Development of biomaterials for cell culture using silkworms
   The development of technologies for culturing human cells and tissues is urgently required in medical areas such as drug discovery and regenerative medicine. However, growth factors for human cells are expensive, and it is difficult to control their administrated concentration. Therefore, we will develop technologies for the low-cost production of high-quality fusion proteins of human gelatin as a scaffold and growth factors such as fibroblast growth factor (FGF), utilizing a basic technology for the production of recombinant proteins in the cocoons of transgenic silkworms.