

●Basic Stage

(Fiscal Year 2005–2007)

Tokachi Area

Development of Technology to Add Value to Tokachi Agricultural and Livestock Products Which Increases the Functionality

- Major Participating Research Organizations**
- Industry: COSMO FOODS Co., Ltd., Tokachino Fromages, Marukatsu Co., Ltd., and others
 - Academia: Obihiro University of Agriculture and Veterinary Medicine, Nayoro City University, Hokkaido Shihoro High School, and others
 - Government: Tokachi Area Regional Food Processing Technology Center, National Agriculture and Food Research Organization-National Agricultural Research Center for Hokkaido Region, Memuro Upland Farming Research Station, Shihoro Food Products Research Centre, and others

Overview of Project

By applying highly original science and technology to the agriculture and livestock industries in the Tokachi Area, we aim to develop regional systems for the advanced utilization of agricultural materials (e.g., the extraction of functional components) as well as achieving food safety. We seek to clarify the in vivo functionalities and active mechanisms of the special agricultural products and livestock materials of the Tokachi Area (e.g., potatoes, buckwheat, beans, Chinese yams, and dairy products). These results will be applied in upgrading and adding higher value to regional products (e.g., the development of new healthy foods, improvements in product quality). In clarifying the active mechanisms of the components of food materials in vivo, we are establishing systems to rapidly and comprehensively evaluate functionalities at a molecular level. The results of these projects will promote sustainable production of high-value-added foods from agricultural and livestock products in the Tokachi Area, and lead to the creation of new industries and businesses in the fields of food and medicine.

1. Development of the production technology for a useful peptide from potato

- Technologies for the advanced utilization and development of new food products from waste produced by the starch industry in the Tokachi area
- Analysis of the functional mechanism of potato peptides
- Analysis of the functional mechanism of potato peptides when mixed with other functional matter
- Development of functional food products using potato peptides

2. R&D into healthy and functional buckwheat and bean sprouts

- Development of technology for the production of buckwheat and bean sprouts
- Analysis of the functional mechanism of buckwheat and bean sprouts
- Technological development for low-cost GABA production
- Technological development for the production of GABA-containing buckwheat and bean sprouts
- Conduct market research regarding consumer preferences for various sprout products



3. Development of functional foods using Chinese yam

- Analysis of the functional mechanism of Chinese yam
- Analysis and identification of the quality parameters of Chinese yam
- Development of functional foods using Chinese yam



TOKACHI PURE VINEGAR (Chinese yam vinegar) was awarded the Grand Prize of the [Hokkaido New Technology and New Product Development].

4. Improvement in the quality of locally produced natural cheese and development of the technology to ensure safe dairy products

- Development of a high-quality natural cheese using a yeast specific to the region
- A kit will be developed using the LAMP method to detect Staphylococcus aureus-producing enterotoxin
- A kit will be developed using the ELISA method to detect New Quinolone
- Development of cheese with gas-related holes
- Technological development of the maturation of Camembert cheese using meat-quality-inspection technology
- Technological development of the maturation of cheese with gas-related holes using ultrasonography

5. Establishment of an evaluation system of food functionality using a DNA microarray method

- Analysis of the functional mechanisms of agricultural and livestock products of the Tokachi area using the DNA microarray method
- Analysis of the functional mechanisms of agricultural and livestock products of the Tokachi area based on animal experiments
- Establishment of a database of the health functions of agricultural and livestock products of the Tokachi area determined using the DNA microarray method

Main Results of City Area Program

1. Success in developing the potato-peptide product "POTEAJI" from waste of starch industry !

Potato peptides were found to improve lipid metabolism and cecal flora in rats. We succeeded in developing the potato-peptide product "POTEAJI." Utilization of the POTEAJI product is expected in a wide range of foods (e.g., seasonings, supplements, and functional foods) and in other areas such as the development of high-quality culture medium.



POTEAJI

2. Success in producing high-quality natural cheese using yeast specific to the region !

We succeeded in developing high-quality natural cheese using the yeast "G. geotrichum13-13" developed by researchers at Obihiro University. We also succeeded in devising the technology required to control the maturation of Camembert cheese. Eleven high-quality natural cheese products have been successfully developed from Tokachino Fromages of the Tokachi Area.



「BRIE CHEESE TOKACHINO」
: Made with newly developed yeast



Life Sciences

●Basic Stage

(Fiscal Year 2005–2007)

Chiba/Tokatsu Area

Dual Approach to the Prevention of Lifestyle Diseases Based on Genome Health Science

- Major Participating Research Organizations**
- Industry: DYNACOM Co., Ltd., SKYware Corporation, BIO MATRIX RESEARCH, INC., and others
 - Academia: Chiba University, Tokyo University of Science, The University of Tokyo
 - Government: Chiba Prefecture, Public Health Promotion Center - Health Department - Health and Welfare Bureau - Chiba City Government, International Medical Center of Japan

Overview of Project

This project aims to combine the basic technical results obtained previously as part of the "Starting Stage" with the high-level technical capabilities and excellent technologies accumulated in the Chiba/Tokatsu area, with the intention to utilize these regional characteristics in forming a bio-cluster. The project theme "Dual Approach to the Prevention of Lifestyle Diseases Based on Genome Health Science" was established as two large-scale industry-academia-government joint-research projects. The details and goals of the project are as follows.

- The goal of Joint Research I was to develop an effective, customized bidirectional health-care support system to overcome metabolic syndrome and to develop a device for the evaluation of arteriosclerosis status over time, based on the minimal artery change of the fundus. These programs were mainly carried out by Chiba University.
- The goal of Joint Research II was to discover an early-diagnosis serum marker for lifestyle-related diseases as well as serum markers for incurable early-stage cancer. The key technologies of this project are a ground-breaking, comprehensive, and rapid antibody-preparation technique, and the development of antibody microarray systems that will revolutionize the conventional proteome-analysis method. The main contributors to this project were the Tokyo University of Science and The University of Tokyo.
- Considering the strong relationship between Joint Research I and II, cooperative research on the early-diagnosis serum marker is being carried out in the Chiba/Tokatsu Area, with research exchange being further promoted by the scheduling of events such as industry-academia-government exchange meetings.

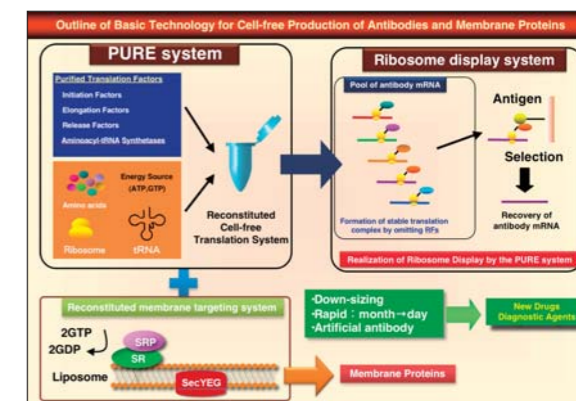
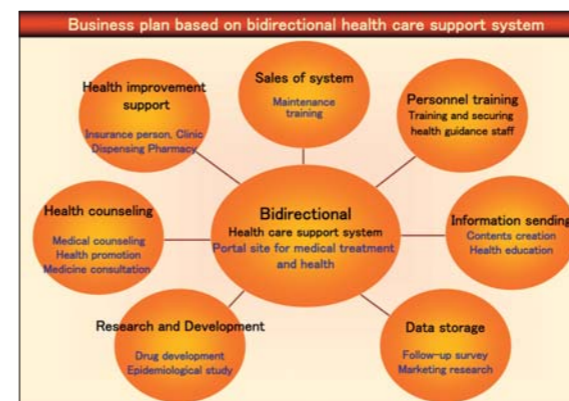
Main Results of City Area Program

Development of a "Personalized 24-hour bidirectional health-care support system accessible from all areas"

Joint Research I produced a bidirectional health-care support system based on cell-phone access. The development of this product led to the formation of a venture company by Chiba University. This system can be applied not only to the newly established business of health check-ups and health support systems for overcoming metabolic syndrome (as initiated in April of 2008 following a revision of health insurance law), but also for the training of health-guidance staff.

Establishment of an "Advanced platform technology for a cell-free translation system (PURE system) useful for low-molecular-weight antibody drugs, including artificial antibodies, and for a new drug-discovery system"

In Joint Research II, the development of a ribosome-display method using a cell-free translation system (the PURE system) was successful in facilitating the prompt and efficient preparation of single-chain antibodies (scFv) and the functional expression of membrane protein receptors. This remarkable outcome is expected to assist in the development of advanced platform technology for the development of drug-discovery methods based on next-generation antibodies. An entrepreneurial bio-venture is currently being established based on this technology, which is anticipated to be extensively applied in therapeutic medicines, diagnostic drugs, molecular imaging probes, drug-discovery research tools, etc.



Life Sciences

●Basic Stage

(Fiscal Year 2005–2007)

Yokohama Waterfront Area

Proteomics of Disease-associated Cells Using a New Technology System

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TEL: +81-45-825-3487

Core Research Organization

Yokohama City University

- **Major Participating Research Organizations** Industry...Toray Industries, Inc., FANCL CORPORATION, CellFree Sciences Co., Ltd., and others
- Academia...Yokohama City University
- Government...Kihara Memorial Yokohama Foundation for the Advancement of Life Sciences

Overview of Project

The aim of this project is to rapidly and exhaustively detect those proteins related to diseases, aging, food allergy, and other health factors using a newly developed proteome analysis technology. We will also seek to efficiently detect disease-associated proteins after improving the conventional analytical method, and will then clarify the relationship between disease and detected proteins by analyzing their expression pattern and function. We shall also analyze the interaction between disease-associated intranuclear proteins and drug candidate compounds, and collect data relevant to drug discovery. Based on the above research results, we will seek to develop diagnostic reagents, diagnostic systems, functional foods, cosmetics, and new drugs.

1. Detection and identification of disease-associated proteins

We will seek to identify more than 50 types of proteins whose quantities vary with the incidence of disease (mainly cancer). Among these, 5–10 types of candidate proteins will be selected as diagnostic markers.

2. Functional analysis of disease-associated proteins

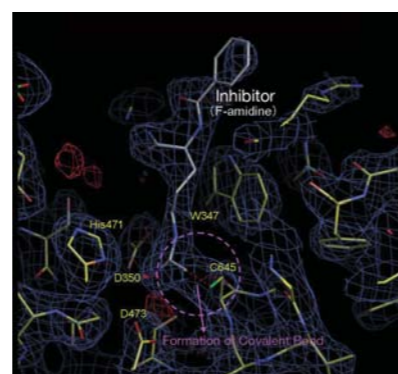
We will establish an evaluation system that correlates with disease by detecting new diagnostic markers and candidate molecules for application to the diagnosis of diseases such as cancer. This will contribute to the development of treatments and regenerative remedies.

3. Structural analysis of complex compounds

After identifying intranuclear cDNAs that relate to human diseases, we will construct the expression system and prepare large quantities of the corresponding proteins. We will estimate the function of each protein based on its structure, and identify the targeted compound that binds to each protein.

Main Results of City Area Program**1. Discovery of new biomarkers for the diagnosis of breast cancer and ovarian cancer !**

We established a mouse model of early-stage breast cancer with the deletion of aPKC in the breast epithelium cell. Based on proteome analysis of a specimen derived from the mouse model and a specimen of human breast cancer, we identified candidate marker proteins for the diagnosis of early-stage breast cancer. We also identified several proteins (whose expression was markedly altered by clear cell carcinoma of the ovary) as candidate markers for the diagnosis of ovarian cancer.



Structure between the active site of PAD4 and compounds with inhibiting activity against PAD4

2. Development of anti-rheumatoid arthritis agents

We detected the active site of peptidylarginine deiminase4 (PAD4), which is considered one of the causative proteins of rheumatoid arthritis. Based on the structure between the active site of PAD4 and compounds with inhibiting activity against PAD4, we established a new screening system for the development of anti-rheumatoid arthritis agents.



●Basic Stage

(Fiscal Year 2005–2007)

Southern Ishikawa Area

Creation of New Industry Based on Both Traditional Industry and State-of-the-art Technology
"Industry Creation Project Involving the Rediscovery of Tradition by Studying New Technology"

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Core Research Organizations

Japan Advanced Institute of Science and Technology,
Industrial Research Institute of Ishikawa

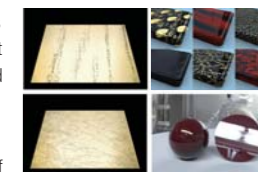
- **Major Participating Research Organizations** Industry...Ishikawa Kutani Pottery Commerce and Industry Association, Yamanaka Lacquerware Cooperative Association, Wajima Urushi Ware Commerce and Industry Cooperative Society and others
- Academia...Japan Advanced Institute of Science and Technology, Kanazawa College of Art and others
- Government...Industrial Research Institute of Ishikawa, Ishikawa Prefectural Institute for Kutani Pottery, Design Center Ishikawa and others

Overview of Project**1. Development of a Kansei evaluation system for design support based on user's needs**

Based on the collection of Kansei evaluation data for materials used in traditional crafts and modeling the degree of correspondence among different textures, we developed a Kansei evaluation system. For this purpose, we developed a mathematical method to analyze Kansei data, taking into account vagueness in the evaluation approach and dependence on the situation. We then developed models that express the correspondence between Kansei words and materials or products. Moreover, to consider the marketing of Kansei, we investigated issues in technology development for Kutani ceramics and Yamanaka lacquerware.

**2. Development of a multi-dimensional measuring system and visual simulation method for craft materials**

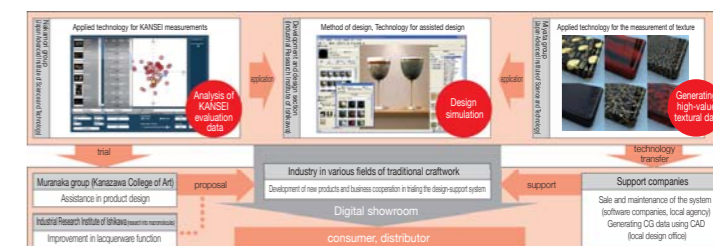
This research unit developed the following visual simulation methods and application systems for traditional craft materials: (1) measurements of the physical properties of craft materials, (2) construction of a materials database, and (3) the accurate representation of craft materials (e.g., gold leaf and Japanese lacquer) using measured data.

**3. Textural expression of craft materials and research into the design exploration approach based on Kansei evaluation**

This research unit seeks to develop a design-support system that enables the high-definition textural expression of craft materials and that evaluates the user's sensitivities in developing a digital showroom in which we can enjoy a virtual experience of a trial manufacture, display, and stock based on a database of the texture and form of traditional craftwork. The system is used for research into the design of products in new fields and to establish business by an industry-academia-government collaboration. By developing products in new fields, we aim to evaluate the system's practical use and accumulate examples of research results. We are also investigating the enhanced functioning of craft materials in support of the development of industrial products, and interior and exterior products with high sensitivity.

**Main Results of City Area Program****1. Development of a digital-showroom-mounted design-support system with high-definition textural expression of craftwork materials and evaluation of the user's preferences**

We developed a digital-showroom-mounted design-support system with high-definition textural expression of craftwork materials and evaluation of the user's sensitivity. In addition, with the goal of commercialization, we improved the supporting system. We have completed industrial development research, including creating new items and promoting the acceptance of order to be adapted to user preferences or sensitivity, and established an autonomous and lasting industry-academia-government collaboration base.

**2. Development of new items via an industry-academia-government collaboration and promotion of the development of new fields such as industrial products or the construction of interior materials using craftwork materials**

We undertook trial evaluations and developed a new field of products as part of an industry-academia-government collaboration for the practical application of a digital showroom. This led to the accumulation of practical cases of the design support system used by traditional craft companies, cooperation between various industries (e.g., universities and manufacturers of consumer electronics), and the development of a new field of interior materials.



Examples of new products



●Basic Stage

(Fiscal Year 2005–2007)

Western Tono Area

Development of Next-generation Manufacturing Technology for Ceramic Ware

- Major Participating Industry... Yamase Co., Ltd., and others
- Research Organizations Academia... Nagoya Institute of Technology
- Government... Gifu Prefectural Ceramics Research Institute, and others

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Core Research Organizations

Nagoya Institute of Technology
Gifu Prefectural Ceramics Research Institute



Others

Overview of Project

The western Tono area of Gifu Prefecture, including the cities of Tajimi, Toki, and Mizunami, promotes itself as Japan's leading production center of pottery/porcelain representative of "Mino-yaki." Recently, however, the production value of such pottery has fallen sharply due to intense competition from low-cost products imported from abroad, including those from China. Under these difficult circumstances, it is urgently required to stimulate industry in this area by advancing manufacturing technology and developing new production technology for pottery/porcelain. In this context, the Gifu Research and Development Foundation launched a collaborative industry-academia-government research project ("Development of Next-generation Manufacturing Technology for Ceramic Ware") based on the use of technical seeds developed by the both the Nagoya Institute Technology and the Gifu Prefectural Ceramics Research Institute. This project has seen a number of advances in the technologies required for the production of pottery/porcelain, especially in the manufacturing technique of porous lightweight ceramics and fine decoration techniques using ink-jet printing. These technologies have been transferred to local industries.

1. New production technique for porous ceramics

We further refined the gel-casting method developed by the Nagoya Institute of Technology and the production technique for porous ceramics using hollow particles, leading to the development of various lightweight and eco-friendly ceramic products. By applying these new technologies in local industries, we sought to stimulate the pottery/porcelain industry and develop new industry.

2. Development of the technology required for the production of inorganic nano-pigment particles

To advance the ink-jet printing technique and contribute to the growth of new industry in the field of ceramics, we used technology based on the liquid state/solid state reaction method (as developed by the Gifu Prefectural Ceramics Research Institute) to synthesize inorganic nano-pigment particles as a new type of ink for ink-jet printing. Based on this improvement in the ink-jet printing system, we investigated the application of the technology as highly ultrafine ink for decorating pottery/porcelain both over and beneath the glaze.

Main Results of City Area Program**1. Success in the commercialization of "Earthenware rice-cooking pot based on a Universal Design"**

An earthenware rice-cooking pot was produced based on a universal design: the bottom part was made of traditional clay (which is thermally conductive), and the sides and lid made of porous material. This two-part structure means that the handle remains cool during use, making it possible to safely handle with bare hands.

(*Universal design: designed to enable ease of use by all, including the young, old, and disabled)
Design registration number: 1315520 (2007)



Earthenware rice-cooking pot produced with a universal design

2. Success in the development of finely decorated ceramic products fabricated by firing after decoration by ink-jet printing using inorganic nano-pigment particles

(*inorganic nano-pigment particles: superfine oxide particles)

Ceramic products such as tiles were made on an experimental basis by firing after decorating with newly synthesized inorganic nano-pigment particles.



Tile obtained by firing after decorating with ink-jet printing using synthesized inorganic nano-pigment particles

●Basic Stage

(Fiscal Year 2005–2007)

Saga Ariake Sea Coastal Area

Development of an Environmentally Friendly Nori Culture System and Creation of a Zero Emission System for the Nori Industry of the Ariake Sea

- Major Participating Industry... NISHIHATSU INDUSTRY Co., Ltd., Togami Electric Mfg. Co., Ltd., TENZAN SAKE BREWER Co., Ltd., and others
- Research Organizations Academia... Saga University, Kyushu University, Nishikyushu University, and others
- Government... Saga Prefectural Ariake Fisheries Research and Development Center, Industrial Technology Center of Saga, Saga Prefectural Livestock Experiment Station, and others

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Core Research Organizations

Saga University, Saga Prefectural Ariake Fisheries Research and Development Center, Industrial Technology Center of Saga



Environment Life Sciences

Overview of Project

This project, which promotes R&D into the cultivation and industrial use of "nori," a special product of Saga Prefecture, aims to establish an environmentally friendly nori culture system and create a zero emission system for the nori industry of the Ariake Sea. This is expected to lead to the creation of a globally competitive industry and the development of an industrial cluster.

We then undertook research into environmentally friendly nori production and the industrial use of non-standard nori (e.g., discolored nori), in collaboration with a network of businesses, universities, and local government research institutes, making use of the combined technology and knowledge accumulated by each of the organizations in the network.

1. Research into the stable production of nori and environmental conservation of the Ariake Sea

This research is based on the results of joint industry-academia-government research into establishing cultivation technology for the stable production of nori while maintaining the marine environment. Application of the results has revealed the cause of disease and the affect of nori cultivation on the surrounding environment. Three research groups have been established, each with a specific research topic (see below). R&D is being undertaken within each group, and each team works on the development of an environmentally friendly nori-cultivation system.

- *Control and prevention of disease to ensure stable production
- *Establishment of a novel, environmentally friendly nori-cultivation system
- *Research into and application of useful bacteria for nori decomposition

2. R&D into functional materials derived from nori for industrial use

Saga Prefecture is the main area of nori cultivation in Japan, and nori sheets from the Ariake Sea, Saga Prefecture, are sold under the "Saga Nori" brand. In recent years, however, reduced quality arising from disease and discoloration has become a serious problem, leading to reduced income for nori producers.

Research efforts were divided into the following three themes with the aim of reusing non-standard nori in a zero-emission industrial system, and to develop new industries in an effort to stimulate the regional economy.

- *Development of food materials with health benefits related to porphyran (POR) and related materials
- *Development of functional food materials that make the most of characteristics of water-soluble low molecular extract
- *Development of functional feed to enhance the immunity of laying hens and increase egg production

Main Results of City Area Program**1. Research into the stable production of nori and environmental conservation of the Ariake Sea**

*We established an early-stage detection method for Red rot disease and Chytrid disease, and conducted indoor tests to confirm the effectiveness of the removal of bacteriophage infected with Suminori disease.

*A new acid treatment agent [Saga TE] was developed for the cultivation of nori before being prepared for the market, with certification by the National Federation of Japan Fisheries Cooperatives. Furthermore we have improved the acid treatment machine and confirmed the reduction of the usage of the treatment agent.

*We established a method to isolate and fix useful bacteria that decompose the nori adhered to nori nets, and filed for a patent. We confirmed the ability of the bacteria to decompose nori in a series of field tests.

2. Research into the development of functional materials derived from nori for industrial use

*Clinical tests regarding the usefulness of POR extracted from nori as a functional food material with health claims revealed that it acts to reduce neutral fat.

*We filed for a patent for antioxidant active materials isolated from a water-soluble low-molecular-weight extract used in the structural analysis and evaluation of bioactivity.

*We clarified that the residue after water extraction from POR and discolored nori used in animal feed is effective in increasing the concentration of β carotene in egg yolk and improving the immune system of laying hens. We filed for a patent for this technology.



Newly developed acid-treatment agent



Above: Eggs produced by chickens raised on regular feed (without nori ingredients)
Below: Eggs produced by chickens raised on feed containing 3% nori