

● Basic Stage

(Fiscal Year 2006-2008)

Yonago and Sakaiminato Area

Construction of Evaluation System of Food that Prevents Lifestyle-Related Diseases through Chromosomal Engineering and Development of Food Products

Framework for Project Promotion

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Core Research Organizations

- Tottori University, Tottori Institute of Industrial Technology

Major Participating Research Organizations

- Industry.....Kirin Holdings Company, Limited, Koyo Chemical Company Limited, Kanda Giko. LTD., Kaisanbutu No Kimuraya. LTD., BTS COMPANY, LTD., chromocenter Inc., Daimatsu Co. Ltd., Advantec MFS, Inc., NIPPON CHEMIPHAR CO., LTD., MARUZEN PHARMACEUTICALS CO., LTD., Japan Micro System Co., Ltd.
- Academia.....Tottori University
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Aims of Project

A screening model involving the evaluation of the functional elements that prevent lifestyle-related diseases is created utilizing technologies, developed by Tottori University, that are related to medicine, veterinary medicine, and engineering including chromosome engineering, and the techniques applied to fishery products by local companies. The technologies are used to produce functional food materials through testing on humans and animals. Moreover, taking advantage of the abundance of marine resources in Yonago and Sakaiminato cities, we will establish a business concerning lifestyle-related disease prevention making use of this evaluation model.

Contents of Project

- Development of models for evaluation of functional elements using human artificial chromosome (functional expression gene transfer)
A human chromosome is modified, and the evaluation systems of functional elements are established using both in vivo and in vitro models with an artificial chromosome vector that can insert a target gene into the specific region as a cassette. It is also combined with an automated analyzer, such as robot, to enable efficient screening of a variety of materials at one time.
- Development of evaluation of functionality using animal and human clinical cases
The preventive and therapeutic effects of biologically active substances obtained through oral consumption of marine resources are confirmed in model animals of human lifestyle-related diseases. The biologically active substances are also provided to patients and blood and urine samples are measured once a day for clinical evaluation in order to develop functional foods. In addition, a rapid biomarker monitoring system has been developed to identify the beneficial effects of marine resources on patients with lifestyle-related diseases.
- Development of functional food materials and foods from marine resources
Marine resources are categorized scientifically, and the effects of the alleviation of the symptoms of lifestyle-related diseases by the ingredients, which will be used for the development of functional food materials with the potential to prevent lifestyle-related diseases, were confirmed.

Main Results

- Mice with human drug-metabolic enzyme P450 were produced using a human artificial chromosome (HAC). The tissue-specific marker genes were isolated and their insertion construct into the HAC was made.
- To establish an assay system of biofunctional substances, we constructed the HAC vector bearing the luciferase reporter gene that is expressed in response to functional foods or drugs.
- As a result of the oral administration of collagen peptides in animal models of experimental injury to cartilage, subcondral bone and tendo Achillis, wound-healing acceleration effects were confirmed in the joints and the tendon.
- We found that the oral administration of FUCOIDAN significantly alkalized the urinary pH in patients with hypertension, while hypertensive patients revealed aciduria. In addition, we developed a home-monitoring system that enables patients to easily determine urinary protein by themselves. We applied the home-monitoring system to hypertensive patients to monitor their urinary protein levels throughout the day and found that hypertensive patients showed proteinuria more frequently at noon and in the evening rather than in the morning.
- Techniques for lowering the molecular weights of collagen, chitin, and fucoidan and for extracting chondroitin sulfate with high molecular weight have been developed. The large-scale production of some of the above compounds was achieved.

