2.7.2 Laboratory: Food and Environmental Sciences

Member:	Professor	Kitabatake, Naofumi, D. Agric. Sci.
	Associate Professor	Tani, Fumito, D. Agric. Sci.
	Assistant Professor	Masuda, Tetsuya, D. Agric. Sci.
	Doctor's program	3
	Master's Program	6
	Undergraduate	3
	Researcher	3

A. Research Activities (2009.4-2010.3)

A-1. Main Subjects

a) Functional properties of food proteins

The functional properties of wheat gluten and its molecular mechanism are investigated. Wheat flour is used as a food ingredient for various food products, such as noodles, breads, pastas, confectionaries, and others. The characteristic features of these products are derived from the specific properties of its major protein component of wheat; gluten. And some enzymes in wheat flour are also affecting the properties of wheat products. We are studying such minor wheat protein as well as gluten.

Heating is necessity in the food processing of wheat flour, and proteins and starch are denatured and gelatinized by heating, respectively, which strongly influence the properties of final products. We are investigating the change in the protein molecule and starch by heating.

b) Taste properties of food proteins

The role of protein in foods is not only to make the structure of the food products and to give the physical properties of the food products, such as gelling, foaming, viscosity, texturization, and others, but also to grant some specific functions, involving enzyme activity and taste activity. We are focusing the sweet-tasting activity of some proteins. Until now we have investigated molecular characteristics of sweet-tasting protein; egg white lysozyme and thaumatin using chemical modification techniques and site-directed mutagenesis techniques. In this year we extended the study to the interaction of sweet-tasting protein molecule with sweet receptor. c) Studies on the response of innate immunity to changing environments and its regulation by foodstuff

Dendritic cells (DCs) and macrophages are the essential sentinels to sense danger signals by invaders in the gastrointestinal mucosal immunity. In order to elucidate the physiological functions of gut-associated lymphoid tissues (GALT), we are studying the immunological role on those sentinels of stress proteins such as heat shock protein 70 (hsp70) that are the major intracellular components in all kinds of living cells and functions as immunoregulatory molecules. We found stress proteins in gastrointestinal luminal contents which are derived from indigenous microflora and from exogenous foodstuff ingested. Also, using hsp70 derived from four different organisms, we revealed that the mechanism for recognition of hsp70 differently works among various types of antigen-presenting cells (APCs), depending on the sequence diversity at the C-terminal region of hsp70.

d) Digestion and physiological properties of food polysaccharides

Degradation and digestibility of starch have been analyzed in vitro and in vivo experiments using mice and humans.

A-2.Publications and presentations

a) Publications

Original Papers

- Ide N., Sato E., Ohta K., Masuda T., and Kitabatake N. Interactions of the sweet-tasting proteins thaumatin and lysozyme with the human sweet-taste receptor. J. Agric. Food Chem., (2009) 57, 5884-5890.

- Tani F., Ohno M., Furukawa Y., Sakamoto M., Masuda S., and Kitabatake N.; Surface expression of a C-terminal a-helix region in heat shock protein 72 on murine LL/2 lung carcinoma can be recognized by innate immune sentinels. Mol. Immunol. 46; 1326-1339 (2009)

Reports

- Masuda T., and Kitabatake N.; Studies on the elicitation of sweetness of thaumatin. The Japan Food Chemical Research Foundation Report 2009

- Tani F.; A New Functionality of Milk as Adjuvant Medium and Its Food Application. J Milk Report 2009

b) Conference and seminar papers presented

- The annual meeting of the Japan Society for Bioscience, Biotechnology and

Agrochemistry 2010: 6 Presentation

A-3.Off-campus activities

Membership in academic societies

- Kitabatake, Naofumi, D.Agric.Sci : Japan Society for Bioscience, Biotechnology, and Agrochemistry (Board, Board in Kansai Branch), The Japanese Society for Food Science and Technology (Board), International Food Science and Technology Research (Editorial Board)
- Tani, Fumito, D. Agric. Sci. : Japan Society for Bioscience, Biotechnology, and Agrochemistry (Board in Kansai Branch)

Research grants

1. Grants-in-aid for Scientific Research(KAKENHI)

- Scientific Research (S) : Kitabatake, Naofumi (Partial charge) : Integrated Researches on the African-type Rural Development Based on Local Case Study

- Scientific Research (C) : Tani, Fumito : Studies on the Molecular Mechanism of

Species-specific Recognition in Biological Diversity

- Young Scientists (B) : Masuda, Tetsuya : Studies on the Elicitation of Sweetness of Sweet-tasting Proteins

2. Other Research Grants

- The Cereal Science Consortium by the Graduate School of Agriculture, Kyoto University and Nisshin Seifun Group Inc.: Kitabatake, Naofumi , Masuda, Tetsuya: Studies on the Expression of Physicochemical Properties of Wheat Powder by Food Processing

- Sponsored Research Funds (J Milk): Tani, Fumito: A New Functionality of Milk as Adjuvant Medium and Its Food Application

- The Japan Food Chemical ResearchFoundation: Masuda, Tetsuya: Studies on the Elicitation of Sweetness of Thaumatin

B.Educational Activities(2009.4-2010.3)

B-1.On-campus teaching

a) Courses given

 Undergraduate level: Food Safety I (Kitabatake), Food Chemistry (Kitabatake), Introduction and Practice in the Department of Food Science and Biotechnology I (Kitabatake), Introduction to the Molecular Cell Biology II (Tani), Basic Laboratory Course in Food Science and

	Biotechnology (Tani), Laboratory Course in Chemical Engineering
	(Tani)
- Graduate level:	Advanced Course of Food and Environmental Studies (Kitabatake,
	Tani), Advanced Course of Life Sciences (Kitabatake), Food and
	Environmental Sciences Seminar (Kitabatake, Tani), Experimental
	Course in Food and Environmental Sciences (Kitabatake, Tani)

B-2.Off-campus teaching etc.

Part-time lecturer

- Kitabatake, Naofumi: Nagasaki University, Kyoto Women's University