Online International Symposium of FSMILE 2020

Current Trends on Food Processing, Safety and Nutrition

Date: November 24-25, 2020

Venue: Meeting room of each organization connected by Zoom Online

Program and Abstracts

Co-organized by Iwate University, Shanghai Ocean University, Kagoshima University, Zhejiang University, Bangabandhu Sheikh Mujibur Rahman Agricultural University, University of Maryland Extension, Republic of Turkey The Ministry of Agriculture and Forestry, Izmir Province Directorate, Tohoku University, Hokkaido University, Nanchang University, Jiangxi Normal university, Dalian Ocean University.

Organizer & Contact: Dr.Chunhong Yuan (Iwate University, Japan) E-mail: chyuan@iwate-u.ac.jp

Sponsored by NPO FSMILE

国際食育交流促進協会
FOOD SOCEITY OF MODERN INTERNATIONAL LIFESTYLE EDUCATION

Organizer & Contact: Dr. Chunhong Yuan (Iwate University, Japan) E-mail: chyuan@iwate-u.ac.jp

Online International Symposium of FSMILE 2020

Nov 24th-25th, 2020

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Zoom ID: 659 283 7473 **(Time zone: GMT+9:00, Tokyo time)**

Nov 24h Morning Session:8:30-12:00 Chair: Dr. Chunhong YUAN (Iwate University), Dr. Hong-shun YANG (National University of Singapore)

8 : 30 - 8 : 45 online registration

8 : 45 - 9 : 00 Opening remarks (Satoshi OGAWA, President, Iwate University)
(Noriyuki TANAKA, Vice-Director, NPO FSMILE)

9	: 00	- 9	: 35	KS	1	Youling L. XIONG	Professor	University of Kentucky	Plant Polyphenols as Natural Additives to Inhibit Oxidation and Mitigate Toxicants in Muscle Foods
9	: 35	- 10	: 10	KS	2	Emiko OKAZAKI	Professor	Tokyo University of Marine Science and Technology	DEVELOPMENT OF PROCESSING TECHNOLOGY OF SEAFOOD IN JAPAN
10	: 10	- 10	: 35	IS	1	Hong-shun YANG	Associate Professor	National University of Singapore	Application of metabolomics in seafood quality and microbial safety
10	: 35	- 11	: 00	IS	2	Yuya KUMAGAI	Assistant Professor	Hokkaido University	Healthy functional materials in red algae
11	: 00	- 11	: 15	O	1	Yuki NISHIDA	M1	Hokkaido University	Efficient extraction and monthly variation of mycosporine-like amino acids from red alga dulse in Japan
11	: 15	- 11	: 30	O	2	Jiayin HUANG	M3	Zhejiang University	Functional characteristics improvement of HPMC modified PVA film incorporating roselle anthocyanins for shrimp freshness monitoring
11	: 30	- 11	: 45	O	3	Meiyu CHEN	M3	Zhejiang University	Evaluation of beef (Wenling-Gaofeng cattle) tenderness during Sous vide cooking: a water phase transition and myofibrillar protein structural perspective
11	: 45	- 12	: 00	O	4	Sijia Peng	M3	Nanjing Normal University	Effects of sterilization pretreatment combined with natural chemicals and/or ultra-high pressure on the quality and safety of pickled raw mud snails (Bullacta exarata) after storage at −20°C

Food and Break

Nov 24h afternoon Session:13:00-18:00 Chair: Prof. Yaqin HU (Zhejiang University), Prof. Wenhui WU (Shanghai Ocean University)

13 : 00 - 13 : 35	KS	3	Yoshihiro OCHIAI	Professor	Tohoku University	Scientific aspects of the traditional seafood processing in Japan
13 : 35 - 13 : 55	KS	4	Ruhsan ozdemir CIFCI	District Director	Republic of Turkey The Ministry of Agriculture and Forestry, Izmir Province Directorate,	Studies for reduction of fruit and vegetable loses throughout the supply chain at the global scale and evaluation for Turkey
13 : 55 - 14 : 15	IS	3	Golam RASUL	Assistant Professor	Bangabandhu Sheikh Mujibur Rahman Agricultural University	Chemical composition and nutritional value of dried fish in Bangladesh
14 : 15 - 14 : 30	IS	4	Muhammad Ananta NURYANSYAH	Iwate University entrance examinee	Indonesia	SITUATION AND CONSUMPTION TREND OF SEAFOOD PRODUCTS IN INDONESIA
14 : 30 - 14 : 45	O	5	Yan-li XU	D2	Tohoku University	Effect of temperature on metmyoglobin reduction by the mitochondrial fraction of tuna dark muscle
14 : 45 - 15 : 00			Break time			
15 : 00 - 15 : 15	O	6	Athira JOHNSON	D3	National Taiwan Ocean University	Antimicrobial Agents Containing Hydrogel and Nanoparticle against Experimental Periodontitis in Sprague -Dawley Rats
15 : 15 - 15 : 30	O	7	Yi Chia LIN	M2	National Taiwan Ocean University	Effect of Caulerpa lentillifera Polysaccharides-rich Extract Improves Male Reproductive Functions in Diabetic Mice
15 : 30 - 15 : 45	O	8	Wei En CHEN	M2	National Taiwan Ocean University	The Effect of Micro-Nanoencapsulated Ethanol Extract of Echinacea Purpurea on Osteoarthritis of High-fat fed Rats after Meniscal/Ligamentous injury
15 : 45 - 16 : 00	O	9	Jerrell FELIM	M2	National Taiwan Ocean University	Antimicrobial effects of Antibiotic Loaded Cellulose Nanofiber and κ- Carrageenan Oligosaccharide Composite Hydrogels for Periodontitis treatment
16 : 0 - 16 : 15	O	10	Chun Yu HSU	M2	National Taiwan Ocean University	Effects of Hydrolysate from Hippocampus kuda on Reproductive Function in Diabetic Male Rats
16 : 15 - 16 : 30	O	11	Bailei LI	D2	Shanghai Ocean University	Construction of composite index estimation method for marine chitosan as biomaterial
16 : 30 - 16 : 45	O	12	Jingyu WANG	M3	Shanghai Ocean University	Ultrasound-assisted extraction combined with reversed-phase high-performance liquid chromatography for the determination of nine biogenic amines in canned
16 : 45 - 17 : 00	O	13	Ting ZHANG	M3	Shanghai Ocean University	Physical modification and chemical modification of gelatin and their application in emulsion development
17 : 00 - 17 : 05	P	1	Rui SUN	M3	Shanghai Ocean University	Effect of steaming on lipid profile of tilapia muscles
17 : 05 - 17 : 10	P	2	Lina TAO	M3	Shanghai Ocean University	Ionotropic Gelation Electrospraying Technique for the Preparation of Multicore Millimeter-Sized Spherical Capsules to Specifically and Sustainedly Release Fish Oil
17 : 10 - 17 : 15	P	3	Lijie LIU	M3	Shanghai Ocean University	Preparation and characterization of gelatin/Vitamin C core-shell nanofibers based on electrospinning technology
17 : 15 - 17 : 20	P	4	Guoyong BIAN	M3	Shanghai Ocean University	Triterpenoids from Stem Explants of Akebia trifoliata exert hypoglycemic effects by inhibiting
17 : 20 - 17 : 25	P	5	Ruijie WANG	M3	Shanghai Ocean University	Resveratrol and celastrol loaded Collagen dental implants regulate periodontal ligament fibroblast
17 : 25 - 17 : 30	P	6	Yuling CAO	M3	Shanghai Ocean University	Regulation of the FGFC1 synthesis pathway based on genomic De novo assembling and preliminary analyses
17 : 30 - 17 : 35	P	7	Xin YANG	M1	Shanghai Ocean University	Action Mechanism of Chitosan on Saprophytic Staphylococcus

17	: 35	-	17	: 40	P	8	Ludan TU	M3	Shanghai Ocean University	Effects of dietary protein levels on non-volatile taste substances of swimming crab (Portunus trituberculatus)
17	: 40	-	17	: 45	P	9	Ai LANG	M1	Shanghai Ocean University	Effects of pectin-plant essential oil on the quality of large yellow croaker (Pseudosciaena crocea) with vacuum packaging during iced storage
17	: 45	-	17	: 50	P	10	Qiannan PAN	M2	Shanghai Ocean University	Rapid detection of FWA VBL in flour by in-situ formation of deep eutectic solvent
17	: 50	-	17	: 55	P	11	Xinyu ZHAO	M1	Shanghai Ocean University	Effects of chitosan combined with apple polyphenols on the microbial diversity of large yellow croaker (Pseudosciaena crocea) during ice storage by High-
17	: 55	-	18	: 00	P	12	Liu LIN	M2	Shanghai Ocean University	Effect of ice-glazing and rosemary (Rosmarinus officinalis) extract on preservation of pompano (Trachinotus ovatus) during frozen storage

Nov 25h Morning Session:9:00-12:35 Chair: Prof. Rui DUAN (Jiangsu University), Prof. Guimin FU (Nanchang University)

9	: 00	-	9	: 35	KS	5	Catherine (Chengchu) LIU	Professor	University of Maryland Extension	Challenges and opportunities of seafood production and consumption in the United States
9	: 35	-	10	: 10	KS	6	Guimin FU	Professor	Nanchang University	Analysis of spatial distribution of bacterial community associated with accumulation of volatile compounds in *Jiupei* during the brewing of special-flavor liquor
10	: 10	-	10	: 35	IS	5	Hayato MAEDA	Associate Professor	Hirosaki University	Anti obesity and anti diabetic effects of fucoxanthin from brown algae
10	: 35	-	11	: 00	IS	6	Hui WANG	Associate Professor	Nanchang University	Effect on the allergiicityof the protein with nonthermaltreatment and glycation reaction
11	: 00	-	11	: 15	IS	7	Xuelan CHEN	Professor	Jiangxi Normal University	Advanced applications of engineered M13 phages in food safety
11	: 15	-	11	: 30	IS	8	Xiaoyang LI	Professor	Nanchang University	Construction of Artificial Metalloenzyme Catalyst with Size-Dependent Activity and the Application in the Synthesis of Chiral Drugs
11	: 30	-	11	: 45	IS	9	Xiaolin HUANG	Assistant Professor	Nanchang University	A new journey of aggregation-induced emission luminogens in food safety detection
11	: 45	-	12	: 00	O	14	Yake LI	M3	Jiangxi Agricultural University	Isolation and characterization of an alkaline resistant virulent Escherichia coli O157:H7 bacteriophage JN01 and its application on milk and beef
12	: 00	-	12	: 15	O	15	ZhiWen GUO	M1	Jiangsu Ocean University	Sirius Red method for determination of collagen denaturation temperature
12	: 15	-	12	: 20	P	13	YaRu SUN	M2	Jiangsu Ocean University	Characterization of gelatin from pink salmon (***Oncorhynchus gorbuscha***) skin
12	: 20	-	12	: 25	P	14	Bizhen ZHONG	D3	Nanchang University	Effect of microwave irradiation nonuniformity on the digestion and allergenicity of the glycated ovalbumin
12	: 25	-	12	: 30	P	15	Yanhong SHAO	D3	Jiangxi Normal University	Influence of ultrasound pretreatment on the allergenic potential of β-lactoglobulin
12	: 30	-	12	: 35	P	16	Zizi HU	D2	Jiangxi Normal University	Effect of extraction process on identification of porcine gelatin

Food and Break

Nov 25h afternoon Session:13:30-18:00 Chair: Dr.Yuqing WANG (Kyushu University), Dr.Hayato MAEDA (Hirosaki University)

13 : 30 - 14 : 05	KS	8	De-xing HOU	Professor	Kagoshima University	Innovation of local food resources for human health: From lab bench studies to healthy table
14 05 - 14 : 20	IS	10	Kefeng YU	Dr	Iwate University, Sanriku Fisheries Research Center	Application of nondestructive measurement for fish and shellfish freshness evaluation and its limitations
14 20 - 14 : 35	O	16	Misaki UEMURA	M2	Kitsato University	Changese in thermally induced gel properties of japanese codling meat past during two-step heating procedures
14 : 35 - 14 : 50	O	17	Hongli YI	M3	Dalian Ocean University	Improving freshness quality of farmed turbot at the local market (Dalian, China)
14 : 50 - 15 : 05	O	18	Yanan ZHAO	M2	Shanghai Ocean University	Effects of Different Thawing Methods on Quality Changes of Frozen Pompano (Trachinotus ovatus)
15 : 05 - 15 : 20	O	19	Han WU	M3	Shanghai Ocean University	Comparison of physicochemical properties and myofibrillar protein changes of grass carp between brine injection and brining
15 : 20 - 15 : 35	O	20	Hui YAO	M2	Shanghai Ocean University	Micro-nano particle formation and transformation mechanisms of broth in meat braised processing
15 : 35 - 15 : 50	O	21	Wen-sheng YANG	M3	Tongji University	Properties of modulation and immunoregulation of LMPs from Lactobacillus on inflammatory bowel disease
15 : 50 - 16 : 05	O	22	Guangming XIE	D2	Tongji University	Eurotium cristatum polysaccharides from black tea affect the homeostasis of intestinal inflammation by activating C-type lectin receptors
16 : 05 - 16 : 20			Break time			
16 : 20 - 16 : 35	O	23	Keyu CHEN	D2	Kagoshima University	Garlic as potential prebiotics to prevent gut microbiota dysbiosis and dyslipidemia
16 : 35 - 16 : 50	O	24	Mizuki NAKAMURA	M2	Kagoshima University	Synthesi and characterization of quercetin-zinc complexes and evalution of in vitro anti-cancer activity
16 : 50 - 17 : 05	O	25	Shiliang DONG	D1	Iwate University	Effect of Super-chilling Storage on Maintenance of Quality and Freshness of Pacific oyster *Crassostrea gigas*
17 : 05 - 17 : 10	P	17	Jiahui CHEN	M2	Shanghai Ocean University	Effect of four types of thermal processing methods on the aroma profiles of tilapia muscles using gas chromatography-ion mobility spectrometry
17 : 10 - 17 : 15	P	18	Jintao DU	M1	Shanghai Ocean University	Effects of chitosan coating on quality and protein characteristics of large yellow croaker (Pseudosciaena crocea) during ice storage

17	: 15	-	17	: 20	P	19	Haiyuan HUANG	M3	Shanghai Ocean University	Effects of different drying methods on the quality and nonvolatile taste compounds of Black Carp
17	: 20	-	17	: 25	P	20	Yixin WANG	M3	Shanghai Ocean University	Comparison on the flavor substances and protein degradation of black carp (Mylopharyngodon piceus) pickled products during steaming
17	: 25	-	17	: 30	P	21	Yuqing SUN	M2	Shanghai Ocean University	Pectin combined with plant essential oils inhibit water migration, myofibril proteins degradation and muscle tissue enzyme activity of vacuum packaged large yellow croaker (Pseudosciaena crocea) during ice storage
17	: 30	-	17	: 35	P	22	Qiu-yu HAN	M2	Tokyo University of Marine Science and Technology	Effect of different types of collagen peptides derived from shortbill spearfish (Tetrapturus angustirostris) on hyaluronidase inhibition activity
17	: 35	-	17	: 40	P	23	Seika OGASAWARA	M2	Iwate University	Effect of post-catch handling on freshness of farmed Cherry salmon (*Oncorhynchus masou*)
17	: 40	-	17	: 45	P	24	Akira MUTO	M2	Iwate University	Changes in freshness of ascidian *Harocynthia roretzi* in various storage conditions

17 : 45 - 18 : 00 Closing ceremony (Matsuo UEMURA, Dean of UGAS, Iwate University)

Keynote Speaker

Youling L. XIONG

Prof. Youling L. Xiong, Ph.D.
University of Kentucky
Lexington, KY, USA

Dr. Xiong received his B.S., M.S., and Ph.D. degrees from, respectively, Jiangnan University (1982), Oregon State University (1985), and Washington State University (1989). After completion of postdoctoral training at Cornell University, he joined the faculty of University of Kentucky in 1990. Dr. Xiong teaches food chemistry and meat processing and leads an internationally renowned research program on natural antioxidants and protein chemistry, functionality, and applications. Dr. Xiong has mentored over 70 graduate students and postdocs, published 280 original research papers and 28 book chapters, and given more than 140 invited/keynote presentations throughout the world. He has served on numerous global food and nutritional science committees, chaired the IFT Muscle Foods Division, and organized countless international symposia. As a career achiever, Dr. Xiong has received many national and international awards, notably the Young Scientist Award (American Chemical Society), Distinguished Research Award (American Meat Science Association), Lectureship Award (IFT Food Chemistry Division), Bertebos Prize (Royal Swedish Academy of Agriculture and Forestry), and University Research Professor Award. Dr. Xiong is an elected Fellow of IFT, ACS AGFD, and IUFoST. He currently serves as the editor for Food Bioscience and is on the editorial boards of other scientific journals.

Keynote Speaker

Emiko OKAZAKI

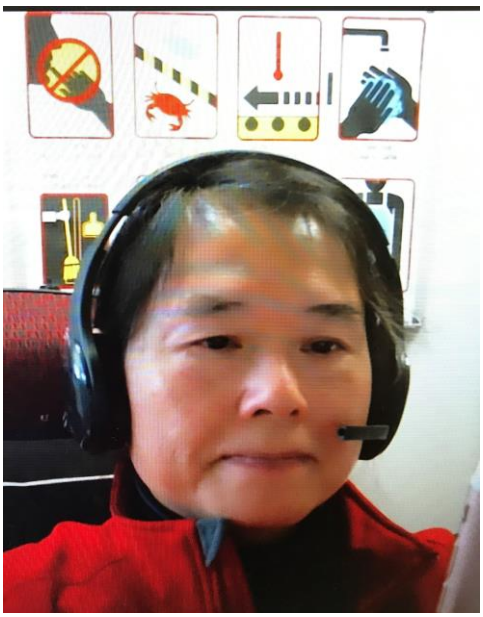
Invited Professor,
Tokyo University of Marine Science and Technology,
Japan

She has worked successively as a researcher at the National Research Institute of Fisheries Science, Fisheries Research Agency (-2008), director of the Seafood Processing and Development Center of the Nagasaki Prefectural Institute of Fisheries (2008-2010), and a professor of Tokyo University of Marine Science and Technology (2010-). Her main research interests are focused on (1) Emulsified surimi, especially the comprehensive utilization of lipid and protein from fish and shellfish; (2) Nondestructive and fast testing technology for food quality and safety; (3) Processing and utilization technology of aquatic products, including the freezing of seafood, freshness maintenance, and the development of new products with added value.

Keynote Speaker

Dr. Chengchu LIU

Seafood Technology Specialist
University of Maryland Extension
Maryland, USA



Dr. Liu is a tenured Seafood Technology Specialist at University of Maryland Extension (UME) with 28 year experience in seafood science and technology education, research, extension and outreach service. Her major tasks at current position are to provide certification training and conduct applied research to support seafood industry (**https://www.youtube.com/watch?v=vs6Ew-yu3zY**).

Before joining the UME, Dr. Liu was a full Professor and Director for the Marine Bioresouce Utilization Division in the College of Food Science at Shanghai Ocean University. Dr. Liu is the IFT Aquatic Food Products Division past chair and serves on the National Seafood HACCP Alliance Steering Committee. She has been an invited speaker in the USA, Canada, Singapore, Vietnam, China, and Japan. She holds five patents, published over 80 peer-reviewed articles, and received numerous awards at regional, national and international levels.

Keynote Speaker

Yoshihiro OCHIAI

Professor
Graduate School of Agric. Sci., Tohoku University
Japan

He graduated from Graduate School of Agricultural Science, The University of Tokyo, where he got Ph.D. He worked as an assistant professor there, and then as a postdoctoral fellow at Brandeis University (MA, USA). In 1991, he moved to Ibaraki University as an associate professor, and came back to Department of Aquatic Biosciences, The University of Tokyo in 2001. He then moved to Department of Marine Science and Technology, Tokai University as a professor, and in 2015, he was assigned to the present affiliation.

His professional interests are in the field of biochemistry and effective utilization of aquatic organisms. Especially, he has been occupied with the studies on muscle proteins for a long time.

Keynote Speaker

Guiming FU

Professor
Nanchang University
China

He graduated from Nanchang University, where he got Ph.D, and worked as a professor. He has served as an executive vice president of International Food Innovation Research Institute of Nanchang University, and director of Department of Food Fermentation and Bioengineering of School of Food Science, Nanchang University. His major researches focus on (1)Brewing technology and brewing microorganisms of modern food, (2) Mechanism and regulation of fermented food flavor generation.

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Keynote Speaker

Ruhşan ÖZDEMİR ÇİFÇİ

Agriculture and Forestry Director of Bornova District
Ministry of Agriculture and Forestry
Turkey

She is the Director of Bornova District, Ministry of Agriculture and Forestry. She carries out the duties of collecting the necessary information and make proposals for the preparation of the programs and projects for the development of the district and the increase of the income and life quality of the farmers. She also prepares and implements extension programs for the training of farmers, performs food and feed inspection activities in the district and fight diseases and pests in order to protect plant and animal health. She got the Master degree (Agricultural Economics) from Ege University, Turkey in 2019. She has worked as an official Food Inspector and HACCP Trainer of Ministry of Agriculture and Forestry, Turkey to carry out food and food contact materials inspection activities in İzmir Province in 2004-2015. She has also attended a training program of Sustainable Fish Stocking Policies in 2011-2012, Kagoshima University, Japan.

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Keynote Speaker

De-Xing HOU

Professor, Dr. De-Xing Hou

Kagoshima University, Japan

He is a Professor of Food Function and Nutrigenomics at Kagoshima University of Japan. He graduated from Hunan Agricultural University (1981), and received two kinds of Ph.D. from both Kagoshima University (1991) and The University of Tokyo (2006). He worked on transcriptional factors at RIKEN of Japan as a postdoc from 1991-1997. Then, he was appointed to the Department of Food Science and Biotechnology, Kagoshima University from an Associate Professor to Professor. Dr. Hou also worked at Cornell University, Pittsburgh University and NIH-NCI of U.S.A as Visiting Scientist (2006-2007). His current research interests include the identification of chemopreventive effects and molecular mechanisms of dietary foods and bioactive natural products using molecular and multi-omics analysis. Dr. Hou has published more than 170 peer-reviewed papers. His research in transcriptional factors are published in some highest-ranking journals such as *Nature, Nature Genetics* and *EMBO Journal,* and his works on bioactive natural products are highlighted in *Carcinogenesis, Free Radic Biol Med, Antioxid Redox Signal.* He is the Founding President of *Food for Health International Society (FOHIS)* and Associate Editor of several journals and member of editorial boards of journals.

Invited Speaker

Hongshun YANG

Associate Professor
National University of Singapore

He is an Associate Professor at the National University of Singapore (NUS). He obtained his Ph.D. in Refrigeration and Cryogenics Engineering from Shanghai Jiao Tong University in 2005 and worked as a Research Fellow at Auburn University from 2006 to 2008. He obtained his second Ph.D. in Food Science from the University of Minnesota in 2012 and was a faculty research assistant at the University of Maryland before joining NUS in 2013. Dr. Yang's research interests include food processing, safety engineering and foodomics, especially in seafood, fruit and vegetables, and cereal products. He is an Editor of *LWT-Food Science and Technology* and an editorial board member for *Journal of Food Science*. He is Chair Designate of IFT Aquatic Food Products Division.

Invited Speaker

Hui WANG

Associate Professor
Food College, Nanchang University, China

Dr Wang received her B.S., M.S., and Ph. D. degrees from, respectively, Jilin University (2004), Nanchang University (2008), and Nanchang University (2011). She has been working ten years at Nanchang University and she interests in food processing include fish products, protein allergenicity and reduction methods. She has gained 10 project grants and published 80 papers. She has received 7 science and technology awards.

Invited Speaker

Md. Golam RASUL

Assistant Professor, Md. Golam RASUL
Bangabandhu Sheikh Mujibur Rahman Agricultural University

He is a promising young researcher in fisheries science. He started his service in 2014 as a Lecturer in the Department of Fisheries Technology of Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur, Bangladesh. Now, he is working as an Assistant Professor in the same department of BSMRAU. Rasul has a number of publications in scientific journals. He holds membership in quite number of professional societies. His major researches focus on biochemical and microbiological aspects of fish processing; quality, shelf life enhancement, microbiology and food safety of fish and fishery products.

Invited Speaker

Xuelan CHEN

Professor
school of Life Science, Jiangxi Normal University, China

She obtained her Ph.D degree from Jiangnan University in 2005, and then jointed the Jiangxi Normal University. Dr. Chen obtained the title of professor in 2014 and her researches focus on the metabolic engineering of amino acids and food safety monitoring.

Invited Speaker

Hayato MAEDA

Associate Professor
Faculty of Agriculture and Life Science,
Hirosaki University, Japan

He graduated from Graduate School of Fisheries Sciences, The Hokkaido University, where he got Ph.D. He worked as an assistant professor at Faculty of Agriculture and Life Science Hirosaki University in 2008. Then he was assigned to the present affiliation in 2016.

His professional interests are in the field of food sciences, food nutrition, and oil chemistry. In particular, he has been studied food ingredients preventing obesity and obesity related diseases. He have reported anti-obesity and anti-diabetic effects of several carotenoids contained in seaweeds, vegetables, and fruits.

Invited Speaker

Xiaoyang LI

Professor
Nanchang University
China

She received her B.S. degree from the School of Chemistry and Chemical Engineering, South China University of Technology in 2015 and received her Ph.D. degree from the Department of Chemical Engineering, Tsinghua University in 2020. She joined the School of Food, Nanchang University in 2020. Her research focuses on the Enzymatic Catalysis, Enzyme immobilization, Chemoenzymatic cascade reactions and their applications in food processing and safety control.

Invited Speaker

Yuya KUMAGAI

Assistant Professor
Graduate School of Fish. Sci., Hokkaido University
Japan

He graduated from Graduate School of Fisheries Science, Hokkaido University, where he got Ph.D. He worked as a postdoctoral fellow at Research Institute for Biological Sciences, Okayama, Graduate School of Agriculture, Hokkaido University, Technical University of Denmark and National Agriculture and Food Research Organization. In 2018, he was assigned to the present affiliation.

His professional interests are in the field of biochemistry of marine organisms. Especially, he has been studied on polysaccharide-degrading enzymes from marine bacteria and the protein functions from red algae.

Invited Speaker

Xiaolin HUANG

Professor
Nanchang University
China

He obtained his Ph.D. degree in Nanchang University in 2018. In 2016, Dr. Huang joined the Laboratory of Molecular Imaging and Nanomedicine (LOMIN), National Institute of Biomedical Imaging and Bioengineering (NIBIB), National Institutes of Health (NIH), as a pre-doctoral fellow under the supervision of Dr. Xiaoyuan (Shawn) Chen. In 2018, Dr. Huang joined the Nanchang University as a “Young Jinggang Scholar” Professor. After that, he worked with Prof. Benzhong Tang as a postdoctoral fellow at the Hong Kong University of Science and Technology (HKUST). His research interest focuses on the fabrication of high-sensitivity optical nanoprobes for biosensing, bioimaging and theranostics. Dr. Huang currently serves as a Guest Editor of Frontiers in Chemistry.

Invited Speaker

M Ananta Nuryansyah

Fresh Graduated Student.
The National Forestry Vocational High School-Kadipaten, Indonesia.

Muhammad Ananta Nuryansyah, from Surabaya, East Java, Indonesia. Now he is living in Kitakami city since January 2020. He is 20 years old and just graduated from The Forestry Vocational High school with a major in natural resource conservation. He studied diving, fish species classification and fish breeding as well as learning about sea turtles living at the Takabonerate Marine National Park for about 3 months in 2018. He loves outdoor activities, and he is interested in fisheries and conservation, especially to keep better our surrounding environment.

Invited Speaker

Kefeng YU

Research Fellow, Ph.D.
Sanriku Fisheries Research Center, Iwate University
Japan

Dr Yu, is presently working as Research fellow at Sanriku Fisheries Research Center, Iwate University. Dr. Yu received his B.S., M.S., and Ph.D. degrees from, respectively, Shanghai Ocean University (1998), Hokkaido University (2005), and Tokyo University (2008). He specialized in seafood biology and processing. In recent years, he has increasingly focused his research on the seafood nutrients, keeping of freshness, and Sanriku fisheries resources utility. Facing climate change and the impacts on Sanriku fisheries, his work combines fisheries aquaculture and food science contributing to food security and nutrition.

KEYNOTE SPEECH

Plant Polyphenols as Natural Additives to Inhibit Oxidation and Mitigate Toxicants in Muscle Foods

Youling L. Xiong

Department of Animal and Food Sciences, University of Kentucky, Lexington, Kentucky 40546, U.S.A.

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Abstract

Spices and herbs as well as their phenolic extracts are common ingredients used to modify muscle food flavors. Examples of spices are rosemary, licorice, black pepper, cumin, and tea extracts; and examples of phenolic compounds are catechins, chlorogenic acid, and gallic acid. They are applied to sausage, salami, frankfurters, and a wide range of deli-type luncheon meats. In addition to the primary role as flavoring agents, many of these natural compounds can function as antioxidants due to their ability to scavenge free radicals and donate protons. Plant extracts and individual phenolic compounds have been tested for their efficacy to block free radical chain reactions thereby inhibiting oxidative processes in muscle foods. Their potential for inhibiting toxicant formation (e.g., heterocyclic aromatic amines) has also been demonstrated in more recent studies. On the other hand, quinones, which are reactive with electron-dense groups in proteins (e.g., thiol and amine groups), could initiate protein aggregation thereby promoting structural development in comminuted muscle foods. Plant phenolics contribute to the overall quality and safety of meat products through the suppression of lipid and protein oxidation, enhancement of gelling and emulsifying capacity of muscle proteins, and disruption of chemical pathways in heat-induced toxicant formation.

DEVELOPMENT OF PROCESSING TECHNOLOGY OF SEAFOOD IN JAPAN

Emiko Okazaki*

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As an example of a typical technique that enabled effective utilization of unused and low-valued resources, we can mention the development of frozen surimi. Frozen surimi was developed for the purpose of effective utilization of walleye pollock whose meat tends to be exacerbated by freezing and freshness deterioration. By the frozen surimi technology, the preservation of fish meat as a fresh intermediate material for the production of surimi-based product became possible on a large scale. As a result, the Japanese traditional manufacturing in small scale was changed to a modern large-scale production. Furthermore, in the 1970s, crab-meat analog as a new style of surimi-based product was developed and then its consumption and production has spread rapidly around the world. Since the 1980s, many regional fish species in the world came to be used for the production of frozen surimi and many new technologies were introduced. Currently, frozen surimi is marketed as an important international merchandise in the world. In this symposium, some topics of the researches on seafood utilization and processing towards the effective use of fish resources will be introduced.

Scientific aspects of the traditional seafood processing in Japan

Yoshihiro Ochiai

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Traditional Japanese cuisine “和食 wa-shoku” has been registered as an Intangible Cultural Heritage in 2013. Japanese people have been utilized fish and shellfish in many ways. Since raw fish and shellfish are very perishable, many methods have been established for processing and preservation basically based on trials and errors. Although seafood is absolutely an excellent source of proteins and the other nutrients. scientific analyses of the processing and preserving technologies have started only several decays ago. In this review, some representative examples of traditional Japanese seafood processing from a scientific point of view.

‘Umami’ or savory taste is brought about in the extracts ’dashi’ from dried bonito, dried kelp, etc. The essential principles for seasoning in wa-shoku have already been recognized worldwide. Konbu-jime (raw fish stored in moistened kelp) is considered to be a surprizing method of processing and preserving raw fish based on the antibacterial activity of seaweed.

Fish paste gel ‘kamaboko’ gives considerably different texture which is greatly different from that of fish muscle. Tremendous efforts have been made to understand the gelation mechanisn based on protein science. Still a lot of questions should be addressed to understand the mechanism involved. It should be noted that the marvelous decoration techniques is worth admiration as the artwork.

The toxicity of tetrodotoxin in the pufferfish ovary is dramatically reduced by pickling in rice bran. Fermented seafood such as pickled fish in rice called ‘nare-zushi’ is known to have longer shelf life. Raw fish in soy sauce ’zuke’ is useful to improve the flavor and taste of fish flesh and to extend the shelf life.

Many other delicacies are also worth further investigation. Understainding of the traditional methodologies forseafood processing and preservation will make it possible to improve the quality and commercial values of the traditional seafood, and to establish a novel category of processed seafood for the future. In addition, all these technologies will be useful to make the best of underutilized aquatic bioresources. Science makes perfect.

Keywords: Processing, preservation, taste active compounds, Japanese traditional seafood

EVALUATION OF LOSSES ON FRUIT AND VEGETABLE PRODUCTION: CASE OF IZMIR

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The main purpose of this study is to evaluate the food losses occurring along the supply chain in fruit and vegetable production. For this purpose, grapes, cherries, figs, tomatoes, cucumbers and green pepper, which are fruit and vegetable products of high production value in İzmir, were determined and surveys were conducted with the producers in rural neighborhoods where production amount of these products was high.

The aim of the study was to determine the causes and extent of pre-harvest, harvest and post-harvest losses in the agricultural production and to propose solutions that could be effective in reducing losses.

Other purposes of the research are listed below;
- Identify the causes of food losses in the fruit and vegetable supply chain in the World and Turkey,
- Determine the extent of food losses in fruit and vegetable supply chainin the World and Turkey,
- Examine the works of international organizations on the subject,
- Determine the contribution of Good Agricultural Practices (GAP) and HACCP, which ensure food safety, to the prevention of food losses,
- Evaluate the impact of rural development supports and other supports on reduction of food losses,
- Determine training and extension activity needs at the problematic stages of the fruit and vegetable supply chain and develop solutions,
- Contribution of the Food Banking Systems to the prevention of food losses and assess the current situation in Turkey

Challenges and Opportunities of Seafood Production and Consumption in the United States

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https://www.youtube.com/watch?v=vs6Ew-yu3zY

[Abstract]

The United States (US) is one of the world's largest coastal nations and the six largest seafood producer in the world. However, Americans consume on average about 7.3kg of seafood per year. That's 4.5kg less than the recommendation published in the 2015-2020 Dietary Guidelines for Americans. When comparing per capita meat consumption, Americans eat 23 kg of pork, 26 kg of beef, and 50 kg of chicken annually. This calls for a drastic shift in the American diet to vary protein sources and include more seafood products in order to receive the most health benefits. This presentation will provide an overview of major challenges and opportunities associated with US seafood supply chain from water to table. The purpose of this presentation are to convey science-based information on seafood from production to consumption and promote discussion on future collaborative strategies for enhancing seafood science and technology education, research, extension and outreach service. Five major seafood topics will be discussed during this presentation, including (1) US fisheries and aquaculture production, (2) seafood safety including seafood fraud, (3) consumer attitude about seafood consumption, (4) the role of seafood nutrition in healthy diets, and (5) potential opportunities for collaboration to promote healthy diets by increasing seafood consumption.

Keywords: fisheries, aquaculture, seafood, production, consumption, food safety, nutrition security

Analysis of spatial distribution of bacterial community associated with accumulation of volatile compounds in *Jiupei* during the brewing of special-flavor liquor

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[Objective]

Special-flavor liquor is a unique Chinese liquor in Jiangxi Province of China, which uniqueness mainly depends on the unique production process of special-flavor Baiji. The objective of this study was to investigate the dominant bacterial community in different parts of *Jiupei* (JP) of the special-flavor liquor. Besides, fingerprints of microbial metabolites and accumulation of volatile compounds in different fermentation periods were studied. And evaluation of the relationship between the physicochemical properties of JP, the dominant bacteria and the accumulation of volatile compounds was also investigated in order to provide an insight of the mechanism of volatile compounds generated by the special-flavor liquor.

[Method]

In this study, we utilized general physicochemical experiments to determine the physicochemical parameters of different parts of JP. Illumina MiSeq sequencing methods were used to analyze the microbial structure of special-flavor liquor JP, and HS-SPME-GC-MS was used to analyze the accumulation of volatile compounds in special-flavor liquor JP. And the correlation between microbial community structure and volatile compounds was studied.

[Result]

A significant difference ($P < 0.05$) of the physicochemical parameters between the surface JP (SJP) and under JP (UJP) was observed and measured, including temperature, moisture content, total acidity, contents of reducing sugars and amino nitrogen. Lactobacillales and Bacillales were the predominant bacterial communities in the JP, and there was no significant difference ($P>0.05$) in bacterial communities between the SJP and UJP. A total of 46 volatiles were detected by HS-SPME-GC-MS, including 32 esters, 7 alcohols and 7 acids. Acids, alcohols and esters had large contents compared with other volatile compounds in the JP. Among them, the esters had the highest content, while the acids showed the lowest content. In addition, it was found that Lactobacillus genus were the key factor responsible for the accumulation of esters compounds, and there were close correlations between the Lactobacillus genus, and contents of acids and alcohols.

[Conclusion]

There were significant differences in the physicochemical parameters of the SJP and UJP of special flavor liquor. Lactobacillales and Bacillales were dominant in the bacterial community of SJP and UJP of the special-flavor liquor, but no significant difference was found between them. Total content of the volatile compounds in the SJP was higher than that of the UJP, and there was a high correlation between the Lactobacillus genus and volatile compounds in JP. We expect our research will help readers to understand the fragrance features of Chinese liquors, especially the special-flavor liquor, and provide a basis for further research on the mechanism of flavor accumulation in the processing of Chinese liquors.

Key words: special-flavor liquor, *Jiupei*, bacterial community, volatile compounds

Innovation of local food resources for human health: From lab bench studies to healthy table

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[Objective]

Local food resources are abundant variety and traditionally favourite for local people. On the other hands, the nutrients and bioactive components are unclear fully, especially, there are few data regarding how to combine various local foods for food diets to meet nutritional and functional requirements for human health. Therefore, we chose Kagoshima area of Japan as pilot case to investigate local food resources from laboratory studies to healthy dinner table.

[Method & Result]

Kagoshima is located in the south of Kyushu island of Japan with mild climate and a diversity of food resources, which include local domestic animals, colour vegetables and fruits, and fermented foods. We have established a comprehensive evaluation system for nutrition and functions of local foods. First of all, we analysed the contents of major nutritional components, and special functional components of local foods. Then, we investigate *in vitro* functions of local foods including antioxidant activity (DPPH scavenger activity and ORAC activity), inhibitory activities of intestinal lipase and alpha-glucosidase. The third is to investigate the *in vivo* healthy functions, using animal model, which contains two parts. One is to investigate the preventive effects of some local foods or their functional compounds on metabolic syndrome including higher blood levels of glucose, triglyceride, cholesterol, and insulin resistance. Another is to investigate the preventive effects of some local foods or their functional compounds on disturbance of gut microbiome-induced by Western Diet (higher contents of sugar, high fat and cholesterol). To move lab bench studies to health dinner table, we finally developed healthy food diet menu from local foods with balanced nutrition and healthy function, based on the results of above three studies.

[Conclusion]

In this Online International Symposium, I shall report our studies results on the representatives of local foods including local domestic pigs (Kagoshima Kurobuta), local vinegar (Kagoshima Kurozu), local loquat tea (Nejime biwacha), local vegetable (Kuroyasai) . Finally, I will show you the “Satsuma Kurozen”, a healthy food menu of lunch box with a variety of local foods optimized by nutrition and function.

Keywords: local food, functionality, health food diet

Acknowledgements

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INVITED SPEECH

Application of Metabolomics in Seafood Quality and Microbial Safety

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Abstract

Metabolomics is a systematic approach that provides comprehensive metabolic profiles of food samples. As an emerging metabolomics technique, nuclear magnetic resonance (NMR) is a rapid, non-destructive and reproducible technic which can reveal the metabolic profiling of food and microorganisms. In this talk, the application of NMR-based metabolomics in characterising the responses of foodborne pathogens and seafood upon different processing conditions will be elaborated. Case studies including *Listeria innocua* as a surrogate for revealing the metabolic response of *Listeria monocytogenes* upon sanitation treatments including electrolysed water and mild heat treatment, and antimicrobial effects of nisin and grape seed extract (GSE) against *L. monocytogenes* inoculated on seafood. Significant decreases in threonine, cysteine, ATP etc. were observed, whereas a few of metabolites such as lactic acid and λ-aminobutyric acid (GABA) increased after nisin-GSE treatment ($P < 0.05$). Pathway analysis further revealed that the nisin-GSE inhibited the survival of *L. monocytogenes* by blocking the TCA cycle, amino acid biosynthesis and energy-producing pathway. Overall, the results indicate the effectiveness of NMR-based metabolomics in elucidating seafood quality and microbial safety.

Healthy functional materials in red algae

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[Objective]

Seaweeds are healthy foods for us, and the healthy materials in seaweeds are mainly though as mineral and dietary fiber. On the other hand, seaweeds contain many valuable materials. We will introduce some healthy functional materials from red algae in regard to bioactive peptides and the prediction method using chloroplast proteins and prebiotic effect of marine xylooligosaccharides, which possesses unique structure.

[Method]

Soluble proteins from red algae powder were extracted by water, and the peptides were prepared by protease digestions. Inhibitory activity against angiotensin I converting enzyme (ACE) by the peptides was determined by *in vitro*. Complete chloroplast genome was determined by next generation sequencer. *In Silico* analysis was performed in chloroplast proteins. Xylan was extracted from red alga dulse by heating, and xylooligosaccharide (DX3) was prepared by commercial enzyme digestion. DX3 structure was determined by NMR. Prebiotic effect of DX3 was evaluated using 10 enteric bacteria. The metabolic mechanism of DX3 was speculated by preparing recombinant enzymes.

[Result]

Peptides from soluble proteins showed ACE inhibitory activity. The activity of peptides depended on proteases. Using bioactive peptide database, *in silico* analysis showed the high correlation with *in vitro* results by use of protein concentration in sample. Structure of DX3 was determined as β-(1,3)-xylosyl-β-(1,4)-xylobiose. Prebiotic effect of DX3 was found in *Bacteroides* sp. and *Bifidobacterium adolescentis*. Among them, *B. adolescentis* grew quickly, and the metabolization of DX3 by the bacterium was occurred using a series of proteins from arabino-xylooligosaccharide utilization cluster.

[Conclusion]

Seaweeds have been known as healthy foods. Our results will increase the value of seaweeds. We will try to find the functionality of seaweeds and contribute to spread seaweeds as heath food.

Keywords: red algae, dulse, prebiotics, peptides, oligosaccharide, antioxidant

Chemical composition and nutritional value of dried fish in Bangladesh

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ABSTRACT

Now-a-days, people are very conscious about health and nutritional issues and they concern about the nutritional value of the dried fishes when they buy these foods for their household consumption. The review article mainly focused on the chemical composition of dried fishes of Bangladesh including protein and amino acid, fats and fatty acid profile, and minerals along with their health benefits. Therefore, the review article is prepared by reviewing the various published articles, books, proceedings, abstracts and other online sources. The data reviewed in the article reveled that dried fish is a special processed fishery product along with high nutritional value and health benefits due to important nutritional components. The principal components of dried fish are high quality protein and amino acids. It also contains lipids, polyunsaturated fatty acids especially eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) richer mainly in marine dried fish. Small dried fishes contain more mineral content like calcium, iron, potassium, sodium, phosphorus, zinc etc. than the larger one. Therefore, consumption of dried seafood has beneficial effects on human health, especially helps in forming body tissue, antibody and enzymes, repairing of worn out tissues, with the decreased risk of coronary heart and cardiovascular diseases, inflammatory disease such as arthritis and prevention of cancer, lower insulin resistance, triglyceride and obesity, improve hyperglycemia etc. where-as under- nutrition is still negatively affecting the health and well- being of many people. Based on proximate composition, amino acids, fatty acid profile and minerals, it can be concluded that dried fish can be a good source of health beneficial nutrients for human.

Keywords: dried fish, protein, lipid, mineral, health benefits

SITUATION AND CONSUMPTION TREND OF SEAFOOD PRODUCTS IN INDONESIA

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[Objective]

There have been many notes and it's generally accepted that the trend of fisheries potential in Indonesia is relatively large, continues to increase throughout the year and has opportunities in the development of processed marine products. It makes Indonesia to be a highest fisheries production especially in Southeast Asian. The objective of this study is to introduce the situation and consumption trend of seafood products. In Indonesia.

[Method]

This scientific paper uses and reprocesses various secondary data relating to the development of situation trends and consumption of seafood products in Indonesia. Most of the information data in this study were obtained and processed from the Central Statistics Agency (BPS) and also from the Ministry of Marine Affairs and Fisheries (KKP) as the main source, especially considering that the main authority for fisheries in Indonesia is the Ministry of Marine Affairs and Fisheries (KKP) as well as books, reports and documents and other data related to this scientific paper.

[Result]

Indonesia has a lot of potential natural resources. The results showed that overall, the production of marine products, especially fish and fish consumption in Indonesia from year to year shows an increasing trend, but fish consumption in Indonesia is still lower than other countries in the Asia Pacific. Marine product processing activities in Indonesia are an integral part of increasing productivity, added value and competitiveness of fishery / seafood products.

[Conclusion]

Indonesia has tremendous potential for marine resource wealth, especially in the fisheries sector, which shows an increase in the production and export of Indonesian fishery products. Fish consumption in Indonesia shows a trend of increasing consumption in line with the increasing number of campaigns.

Keywords: fisheries potential, consumption trend, seafood product

Anti obesity and anti diabetic effects of fucoxanthin from brown algae

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Obesity, which results from an imbalance between energy intake and energy expenditure. It becomes a major health risk factor, causing numerous and various diseases such as diabetes, hypertension, and cardiovascular diseases. Fucoxanthin is a specific carotenoid found in brown algae such as Undaria pinnatifida, Saccharina japonica, and Sargassum fusiforme. Recently, fucoxanthina has garnered much attention for its anti obesity and anti diabetic effects.

1 Anti obesity effects of fucoxanthin

Adipocytes secrete adipocytokines that are involved in the induction of obesity-related diseases. Reducing excess fat in adipose tissue is important way to prevent these diseases. Fucoxanthin up-regulates energy expenditures in abdominal white adipose tissue (WAT). This effect is partly attributable to the induction of uncoupling protein 1 (UCP1) in abdominal WAT (1,2). UCP1 is normally expressed only in brown adipose tissue (BAT), not in WAT. BAT is related to energy and heat production in tissues by the contribution of UCP1.

2. Anti diabetic effects of fucoxanthin

Fucoxanthin shows anti-diabetic effects by changing of adipocyte cells properties (3-5).

Dietary fucoxanthin improves insulin resistance and ameliorates blood glucose levels in obese model mice. Further it adjusts adipocytokine secretion, which is related to insulin resistance and chronic inflammation in adipose tissues. Anti obesity effects of fucoxanthin have been reported from clinical studies.

3. Utilization of seaweed resources

Several companies have begun to industrialize fucoxanthin as a functional food products. Consequently, it is diluted from natural algae such as Saccharina japonica (Makonbu), Cladosiphon okamuranus (Mozuku), and Sargassum horneri (Akamoku). Additionally, fucoxanthin contents of algae differ among species (6). Algae containing high concentrations of fucoxanthin are sought as ingredients of commercial products. Algae fucoxanthin is a beneficial compound for the prevention of the metabolic syndrome.

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Insight into the Mechanism of Reduced IgG/IgE Binding Capacity in Ovalbumin as Induced by Glycation with Monose Epimers through Liquid Chromatography and High-Resolution Mass Spectrometry

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ABSTRACT: Ovalbumin (OVA) is one of the major food allergens in hen eggs. In this work, it was demonstrated that glycation with D-glucose and its epimers, including D-mannose, D-allose, D-galactose, and L-idose, could effectively attenuate the IgG/IgE binding of OVA, which was attributed to the covalent masking by sugars and to its structural changes. The glycation sites were determined, and their average degree of substitution was found using liquid chromatography coupled with high-resolution mass spectrometry. Fluctuations in OVA conformation were monitored by conventional spectrometry. Compared to those of OVA-Man and OVA-Glu, OVA-All, OVA-Gal, and OVA-Ido showed a higher glycation extent, and the alterations on their steric layouts were more drastic, suggesting that the configuration of hydroxyl groups at positions C-3, C-4, and C-5 in sugars might be important for the glycation reactivity; as such, their capabilities in binding with IgG/IgE decreased more significantly. Attempts were made to provide valuable information for in-depth understanding of the differences in biochemical functionality among epimeric sugars. These insights would be helpful for designing sweetened food products with a desirable level of safety.

KEYWORDS: OVA, mild condition, glycation, HRLC-MS, epimer

Chemical modification of M13 bacteriophage as nanozyme container for dramatically enhanced sensitivity of colorimetric immunosensor

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ABSTRACT:

Herein, a sulfydryl modification of M13 bacteriophage was introduced as bio-functional component including biological recognition, and nanozyme container for enhancing sensitivity of colorimetric immunsensor, where the seven peptide sequence fused on the p3 protein of M13 was used to mimic deoxynivalenol (DON) antigen for recognizing the anti-DON monoclonal antibody, while the sulfydryl groups modified on capsid proteins were used to load numerous Ag coated Au nanoparticles (AuNP@Ag) for improving the peroxidase-like activity of AuNP@Ag. Owing its great loading capacity, the M13 bacteriophage assembled AuNP@Ag nanocomposites (M13DON@AuNP@Ag) showed approximately 48- and 105-fold enhanced catalytic efficacy to hydrogen peroxide and tramethylbenzidine than those of natural horse radish peroxidase (HRP). Using the M13DON@AuNP@Ag as signal amplifier, the proposed immunosensor exhibits a very high sensitivity for DON detection with the 50% competitive inhibition concentration (IC50) and detection limit (LOD) of 2.03 ng/mL and 13.67 pg/mL, respectively. These values are about 26- and 947-fold lower than those of conventional HRP based ELISA method (IC50 and LOD values = 52.43 ng/mL and 12.95 ng/mL, respectively). In addition, the proposed method also showed good specificity and accepted accuracy for DON detection in real corn samples. Moreover, the reliability of this novel strategy was further confirmed through compared with the high performance liquid chromatography method. All in all, the M13 bacteriophage exhibits a promising potential as nanozyme container for enhancing the sensitivity of immunosensor, and this novel signal amplification system can be easily extended for highly sensitive detection of other analytes by altering specific mimic peptide sequence.

KEYWORDS:

M13 bacteriophage; nanozyme container; silver coated gold nanoparticles, deoxynivalenol, colorimetric immunsensor.

Construction of Artificial Metalloenzyme Catalyst with Size-Dependent Activity and the Application in the Synthesis of Chiral Drugs

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[Objective]

Building a bridge between enzymatic and heterogeneous catalysis provides new cascade industrial processes for manufacturing. However, the reaction conditions of enzymatic and heterogeneous catalysis mutually cause deactivation of catalysts. Here, we overcame this challenge by developing a special protocol for the synthesis of hybrid catalysts.

[Method]

In this study, we utilized single lipase–polymer nanoconjugates as confined nanoreactors for the in situ generation of Pd NPs. This approach permits the construction of lipase–Pd nanohybrids. We succeeded in downsizing the Pd NPs from 2.5 to 0.8 nm using the confined environment created by the single protein–polymer nanoconjugate. The structure of Pd/CALB-P nanohybrids were characterized by HAADF-STEM, XAFS, (nanoESI)-MS, ect.

[Result]

The 0.8 nm Pd nanoparticles exhibited increased activity in racemization of (S)-1-phenylethylamine. At 55 °C, which matches the optimum temperature of lipase, the activity is more than 50 times that of commercial Pd/C. It was found that the Pd–O coordination in Pd subnanoclusters contributed to the high activity. In the dynamic kinetic resolutions of pharmaceutical intermediates (±)-1-phenylethylamine, (±)-1-aminoindan and (±)-1,2,3,4-tetrahydro-1-naphthylamine, the lipase–Pd nanohybrids displayed 7.6, 3.1 and 5.0 times higher efficiencies than the combination of commercial immobilized lipase Novozym 435 and Pd/C. The lipase–Pd nanohybrids can be reused without agglomeration and activity loss.

[Conclusion]

Based on the above results, it can be concluded that the design of lipase–Pd nanohybrids allowed the Pd activity and lipase activity to be closely matched at a relatively low temperature, which results in an increased efficiency in the combined enzymatic and heterogeneous catalysis. We suggest that this study provides a promising strategy to construct enzyme–metal hybrid catalysts for enzymatic and heterogeneous cascade reactions.

Keywords: food processing, chemoenzymatic catalysis, size-dependent activity, artificial metalloenzyme, chiral drugs

AIEgens: an Emerging Fluorescent Sensing Tool to Aid Food Safety and Quality Control

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[Background]

As a global public health problem, food safety has attracted increasing concern. To minimize the risk exposure of food to harmful ingredients, food quality and safety inspection that covers the whole process of "from farm to fork" is much desired.

[Scope and approach]

Fluorescent sensing is a promising and powerful screening tool for sensing hazardous substances in food and thus plays a crucial role in promoting food safety assurance. However, traditional fluorphores generally suffer the problem of aggregation-caused quenching (ACQ) effect, which limit their application in food quality and safety inspection. In this regard, luminogens with aggregation-induced emission property (AIEgens) showed large potential in food analysis since AIEgens effectively surmount the ACQ effect with much better detection sensitivity, accuracy, and robustness.

[Key findings and conclusions]

Currently, numerous pioneering works on the design and development of diverse AIEgens for food safety and quality control have been made and reported. However, to our best knowledge, a discussion about the sensing application of AIEgens in the field of food analysis is still lacking. Hence, a systematic and comprehensive review that can cover the emerging AIEgen-based fluorescent sensing technologies, and their current applications in food quality and safety detection, is necessary and meaningful. In this contribution, we focus on the latest developments in advanced AIEgen-based sensing strategies implemented in food analysis, with an emphasis on the underlying sensing mechanism. We hope this paper can motivate new research ideas and interest to aid food safety and quality control, and facilitate more collaborative endeavors to advance the state-of-the-art sensing developments and reduce actual translational gap between laboratory research and industrial production.

Keywords: aggregation-induced emission; fluorescence; food safety detection; quality control

Application of nondestructive measurement for fish and shellfish freshness evaluation and its limitations

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It is well-known that marine products are vulnerable and perishable, especially compared to land animals. Freshness is a fundamental concept directly affecting the quality of fish and shellfish, which can be evaluated by post-mortem physical, chemical, biochemical and microbiological changes. The characteristics of fish freshness includes good appearance, flavor, low level of volatile compounds, low protein hydrolysis level, absence of oxidation process, low microbial counts, absence of decomposition amines and aldehids, with good physical properties such as texture. It is very important to evaluate the freshness instantly with low cost and non-destructive techniques (machine-vision techniques, instrumental sensors) during the distribution. Electrical impedance spectroscopy (EIS) is a method to analyze electrical properties of materials and systems by inducing alternating electrical signals at different frequencies into them and measuring the responding signals. Application this technology, bio-impedance analysis has the potential for wide application in fisheries as a tool to evaluate the biochemical changes in tissue to estimate the freshness of fish.

The post-mortem changes in the typical fish species (Black rockfish *Sebastes schlegelii*, Spotted mackerel *Scomber australasicus*, Japanese scallop *Mizuhopecten yessoensis*, Ascidian *Halocynthia roretzi* and Brown hakeling *Physiculus maximowiczi*) in Sanriku area were studied with different post-catch handling and storage condition by measuring bioelectrical impedance, as well as other traditional freshness indicies such as pH, K-value, sensory evaluation and myofibrillar microscopic imaging analysis. The changes in bioelectrical impedance were recorded by multiple frequency channel at 2-100 kHz. The ratio of impedance between 2 and 100 kHz was 1.92, 1.84, 1.16, 1.29,3.18 average value for those 5 fish species shortly after landing, respectively, whereas it increased to 3.9, 2.2 for black rockfish and spotted mackerel respectively. However, it decreased to 2.03 for brown hakeling, and kept unchanged for scallop and ascidian after 2 d cold storage. In all, the state of the fish after death changes with time, and the impedance also changes in a way that reflects this. For the spotted mackerel the impedance at 2 kHz increased in the two days storage after killing and then dropped. But black rockfish can keep high impedance in 5 days with iced storage.

As described above, changes in the resistance ratio and the resistance difference of 2 kHz and 100 kHz are species-specific. These findings also suggest that there is a correlation between the bio-impedance and K value. Bio-impedance could be used to measure fish freshness non-destructively during ice storage, further research on other species should also be carried out for enhanced understanding of using impedance to predict freshness in fish and shellfish. Challenges of impedance analysis for freshness evaluation include the data interpretation for the factors of variation between fish tissue and condition. These challenges still need to be carefully verification on the distribution real-time application.

Keywords: freshness, bioelectrical impedance, ATP, K value, pH, marine products

ORAL PRESENTATION

Efficient Extraction and Monthly Variation of Mycosporine-like Amino Acids from Red Alga Dulse in Japan

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[Objective]

Mycosporine-like amino acids (MAAs) are the ultraviolet (UV)-absorbable compounds, which are naturally produced by cyanobacteria and algae. Not only these algae but also marine organisms utilize MAAs to protect their DNA from UV-induced damage. On the other hand, the content of MAAs in algae is changed by the environmental condition and season. The UV-protected function and the antioxidant capacity of MAAs can apply to the cosmetic sunscreen materials and anti-cancer for human health. Seaweeds contain low content of MAAs (up to 14 mg g^{-1} dry weight). In order to use MAAs from algae for biotechnological applications, it is necessary to develop the efficient extraction method. However, little has been reported on the efficient extraction from macro algae. In this study, we developed the efficient extraction method of MAAs from red alga dulse in Usujiri (Hokkaido, Japan) and investigated the monthly variation (January-May 2019).

[Method]

We employed the successive extraction method of water and methanol extraction for 2-24 h and 2 h, respectively. The content of individual MAAs was determined using Lambert-Beer law. Using the purified individual MAAs, the relationship between the content of MAAs and HPLC peak area was determined. The results were expressed as μmol g^{-1} DW (dry weight).

[Result]

The content of MAAs was maximized by water extraction for 6 h, which was higher than that by 2 h (1.13-fold) and 24 h (1.04-fold). The sample of February 25 showed the highest absorbance (6.930 μmol g^{-1} DW), while that of January 23 exhibited the lowest absorbance (2.649 μmol g^{-1} DW). The monthly variation of the content of MAAs was increased sharply from January to February, stable from February to April (6.623 μmol g^{-1} DW) and gradually decreased from April to May (4.972 μmol g^{-1} DW).

[Conclusion]

Based on the above results, it was revealed the large content of MAAs were obtained by water extraction for 6 h from Usujiri dulse collected in late February. We hypothesized that not only increase of solar radiation, but also the decrease of nitrogen supply from seawater due to spring bloom affected monthly variation in the content of MAAs in Usujiri dulse. It is necessary to conduct a multi-year investigation to validate this hypothesis.

Keywords: red alga, dulse, mycosporine-like amino acids, efficient extraction, monthly variation

Functional characteristics improvement of HPMC modified PVA film incorporating roselle anthocyanins for shrimp freshness monitoring

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[Objective]

Intelligent packaging, which can provide consumers with real-time food information by visible color changes, has been attracted much attention nowadays. The objective of our study is to prepare an indicator film with better functional characteristics by structural modification for shrimp freshness monitoring.

[Method]

Indicator films incorporating roselle anthocyanin extracts (RAE) were developed by solution casting, and Hydroxypropyl methylcellulose (HPMC) modified polyvinyl alcohol (PVA) was applied as film-forming substrates. The film structural properties were characterized by rhelogical behavior studies, FT-IR and SEM, physical properties were characterized by mechanical and hydrophobic performances, while indication properties were characterized by pH-responsive ability and film color stability. Furthermore, the indicator film was applied on shrimp real-time freshness monitoring.

[Result]

Structural characterization results suggested RAE, HPMC and PVA were well dispersed. The addition of HPMC would improve film functional characteristics, and the films with a ratio (HPMC-to-PVA) of 3:1 exhibited better physical properties and larger color variations in response to pH changes. Furthermore, the films were applied for shrimp freshness real-time monitoring. The film color changed from rose-red to light green at 4 d, corresponding to the onset of spoilage, and then turned into yellow at 8 d, when the shrimp was severely spoilage. In addition, the strong correlation between film color and chemical spoilage indexes ($P<0.05$) was observed, indicating the feasibility of indicator film on freshness monitoring.

[Conclusion]

The incorporation of HPMC could improve film functional characteristics by structural modification of new interaction formation, and the PVA/HPMC/RAE film could be applied as indicator film for real-time shrimp freshness monitoring.

Keywords: functional characteristics, freshness monitoring, intelligent packaging

Evaluation of beef (*Wenling-Gaofeng cattle*) tenderness during *sous vide* cooking: a water phase transition and myofibrillar protein structural perspective

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[Objective]

It's generally accepted that *sous vide* cooking is an efficient method to improve meat texture by vacuum sealing of food and heating in mild temperatures. The objective of this study is to evaluate the influence of water phase transition and myofibrillar protein structural transformation on beef (*Wenling-Gaofeng cattle*) tenderness by *sous vide* cooking.

[Method]

Beef samples (25 g) were treated at the temperature of 65 ℃ for 0-90 min, and its tenderness was described as the texture profile analysis (TPA). The water phase transition was based on the distributed exponential result of low field nuclear magnetic resonance (LF-NMR). Structural changes of myofibrillar protein were investigated by sodium dodecyl sulphate–polyacrylamide gel electrophoresis (SDS-PAGE) and circular dichroism (CD).

[Result]

The result showed that the beef tenderness increased between 0 and 30 min, and turned down as time prolonged to 90 min. Three distinct water phases were found by LF-NMR: T_{2b}, T_{21} and T_{22}. The T_{22} population and time shown a significant decreased while T_{2b} and T_{21} increased with the extension of heating time. A high correlation was found between the time of T_{21} population and the tenderness of beef. The results of SDS-PAGE and CD revealed a denaturation of myofibrillar protein and a significant change in secondary level ($p<0.05$), as indicated by marked decrease in α-helicity during sous vide cooking.

[Conclusion]

Based on the above results, it can be concluded that improved tenderness of beef in prolong time at low temperature is partly caused by water phase transition and myofibrillar protein structural transformation and denaturation.

Keywords: *sous vide* cooking; beef (*Wenling-Gaofeng cattle*); tenderness; low-field nuclear magnetic resonance (LF-NMR); myofibrillar protein

Effects of sterilization pretreatment combined with natural chemicals and/or ultra-high pressure on the quality and safety of pickled raw mud snails (*Bullacta exarata*) after storage at −20°C

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[Objective]

Pickled raw mud snails (*Bullacta exarata*) typically host a large number of microorganisms and are frequently contaminated with pathogenic bacteria during processing, resulting in a higher risk for foodborne illness with consumption. The objectives of the present work were to (a) compare the sterilization effects and select the optimal conditions of different pretreatment methods for sterilization treatment of mud snails, (b) evaluate the effects of natural chemicals and/or UHP on the quality and safety of pickled raw mud snails, and (c) determine the bacterial diversity of pickled raw mud snail before and after 12 months of storage at −20 °C based on a combination of treatments.

[Method]

The sterilization effects of different pretreatment methods, including the use of natural chemicals, ultrasonic cleaning (USC), and ultra-high pressure (UHP), on the quality of pickled raw mud snails were investigated by assessing the total viable count (TVC), total volatile base nitrogen (TVB-N) content, thiobarbituric acid-reactive substance (TBARS), and pH value of the products after 12 months of storage at −20 °C.

[Result]

Pretreatment with 200 W USC for 5 min was the most effective approach for reducing TVC in mud snails, with a minimal change in food quality. Natural chemical treatment or UHP treatment significantly inhibited the increase in TVC, pH, and TBARS and TVB-N accumulation compared with the control group; however, their combined treatment had no synergistic effect. In contrast, the combined chemical treatment was more effective in inhibiting changes in the above indices in pickled raw mud snails than was UHP treatment alone or combined chemicals + UHP treatment. In addition, the bacterial diversity of pickled raw mud snails before and after 12 months of storage at −20 °C was determined using Illumina MiSeq sequencing.

[Conclusion]

Our results indicated that USC combined with natural chemicals can be utilized commercially to maintain the quality and safety of pickled raw mud snail during storage at −20 °C.

Keywords: Bacterial diversity, Natural chemicals, Quality, Safety, Sterilization pretreatment, Ultra-high pressure

Effect of temperature on metmyoglobin reduction by the mitochondrial fraction of tuna dark muscle

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[Objective]

Myoglobin (Mb) is the primary protein pigment responsible for meat color, which exists in three forms: the two ferrous forms, oxymyoglobin (OxyMb) and deoxymyoglobin (DeoxyMb), and the ferric form, metmyoglobin (MetMb). DeoxyMb, when bound to oxygen, becomes OxyMb, which can transfer oxygen to mitochondria for energy production. However, when ferrous Mb is converted to ferric MetMb, Mb cannot bind oxygen and turns into an undesirable brownish color irreversibly, due to spontaneous oxidation. It is generally accepted that MetMb reductase plays an essential role in live tissues to keep the physiological functions of Mb. In the previous study, MetMb reductase system has been found in the mitochondrial fraction prepared from the dark muscle of tunas. The objective of this study was to investigate the effects of temperature on the MetMb reduction.

[Methods]

The mitochondrial fraction prepared from the dark muscle of bigeye tuna (*Thunnus obesus*) was used. The muscle was homogenized with 5 volumes of iced-cold grinding solution (0.5 M sucrose; 10 mM EDTA Na_2; 1 mM DTT; 50 mM Tris-HCl buffer, pH 7.5), and centrifuged at 1,000×g, 4 ℃, for 10 min. The supernatant was centrifuged further at 10,000×g for 20 min to precipitate the mitochondria. The mitochondria were suspended in 40% sucrose, and were collected at the boundary of the 40% and 60% sucrose solutions by centrifugation at 120,000×g for 1 hour, and was retrieved to a 1 ml needle (0.60 ϕ ×25 mm). The MetMb reduction activity was measured at 10℃, 15℃, 20℃, 25℃, and 30℃, based on the changes in the visible absorption spectra of the assay mixture containing purified horse Mb.

[Results]

MetMb reduction was increased in a temperature dependent manner significantly (p <0.05, Tukey-Kramer), and showed the highest activity at 30℃. However, previous studies showed that purified MetMb reductase from tuna muscle has an optimal temperature at around 25℃, and was inactivated above 30℃. Thus, it was speculated that MetMb reductase presented in the mitochondrial fraction has higher stability than the purified one. On the other hand, there was no significant difference in changes in MetMb ratio (p >0.05, Tukey-Kramer). In conclusion, elevated temperature did promote the MetMb reducing activity of the mitochondrial fraction, but did not influence the MetMb reducing capacity.

Keywords: MetMb reduction, tuna, color stability, temperature, mitochondria.

Antimicrobial Agents Containing Hydrogel and Nanoparticle against Experimental Periodontitis in Sprague-Dawley rats

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Objective

The objective of this study is to examine the in vivo anti-inflammatory properties of antimicrobials loaded κ- carrageenan oligosaccharides linked cellulose nanofibers (CO-CNF) based nanoparticle and hydrogel for the treatment of periodontitis.

Method

Periodontitis were induced by injecting 10 µl (1mg/ml) of lipopolysaccharide (LPS) on the palatal gingiva thrice in a week to induce periodontitis. The samples were applied to the infected area by using oral swabs. Doxycycline was taken as a positive control. After 4 weeks of treatments, rats were sacrificed and the sample analysis was performed.

Result

The results showed that both hydrogel and nanoparticles reduced the level of cytokines such as tumor necrosis factor- α (TNF-α) and Interleukin- 1β (IL-1β) in addition to myeloperoxidase (MPO). Moreover, the reduction in oxidative stress has been confirmed by determining the production of nitric oxide (NO) and malondialdehyde (MDA). Besides, the structure and integrity of the gingival tissues were restored after treatment.

Conclusion

Based on the above results, it can be concluded that the proposed materials have a beneficial effect on periodontitis management.

Keywords: periodontitis, nanoparticle, hydrogel, anti-inflammatory

Effect of *Caulerpa lentillifera* Polysaccharides-rich Extract Improves Male Reproductive Functions in Diabetic Mice

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Objective

The objective of this study is to evaluate the effect of *Caulerpa lentillifera* (CL) extract on reproduction function of male BALB/c mice with diabetes mellitus induced by high fat diet (HFD) and streptozotocin

Method

The sample (*Caulerpa lentillifera*) dried powder extracted with freeze-drying, identified the proximate chemical composition and sugar composition by phenol-sulfuric acid. The animal experiments (male BALB/c mice) were performed with streptozotocin (30 mg/kg) as a model of diabetes and feeding with the high-fat diet. The groups were divided into 5 groups such as; control group, diabetic group, positive control group (Metformin 200 mg/kg), and diabetic with treatment CL1 (600 mg/kg), CL2 (1000 mg/kg) for 6 weeks.

Result

The results showed that the CLE administration improved hyperglycemia and insulin resistance. Pro-inflammatory cytokines (IL-1β and TNF-α) were found a decrease in CLE-treated groups. Additionally, CLE showed improved sperm motility and testis morphology.

Conclusion

Caulerpa lentillifera extract (CLE) composed of a high level of polysaccharide. CLE administration was able to reduce pro-inflammatory cytokines, lipid peroxidation, oxidative stress, and insulin resistance. Additionally, CLE showed improved sperm motility and seminiferous tubule morphology. According to these conditions, *Caulerpa lentillifera* extract successfully prevents diabetes-induced male reproductive dysfunction in mice models. This extract also can be used as a dietary supplement and alternative treatment for diabetes management.

Keywords: *Caulerpa lentillifera*, diabetes mellitus, high-fat diet, male reproduction, streptozotocin

The Effect of Micro-Nanoencapsulated Ethanol Extract of *Echinacea Purpurea* on Osteoarthritis of High-fat fed Rats after Meniscal/Ligamentous injury

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Objective

The objective of this study is to examine the *in vivo* and *in vitro* anti-inflammatory properties of *Echinacea purpurea* ethanol extract nanoparticles (Nano-EE) show a better drug delivery system than *Echinacea purpurea* ethanol extract (EE) on Osteoarthritis (OA) progression of high-fat fed rats after meniscal/ligamentous injury.

Method

OA Rats were induced with a 40% high-fat diet, then operated the surgery by anterior cruciate ligament tear and meniscus injury on the right knee joint. We validate the encapsulation efficiency and loading capacity of Nano-EE were 69.1% and 36.1%, respectively. EE was taken as a positive control. All of samples were applied to fed by using oral gavage. Moreover, after 6 weeks of treatments, rats were sacrificed and the sample analysis was performed.

Result

The results showed that nano-EE can reduce the pain caused by OA and decrease the loss of articular cartilage proteoglycan. Nano-EE accurately inhibited the expression of pro-inflammatory factors, such as tumor necrosis factor- α (TNF-α), Interleukin- 1β (IL-1β) and matrix metalloproteinases in the blood plasma of obese OA rats by interfering with the NF-κB pathway. Moreover, the reduction in oxidative stress has been confirmed by determining the production of nitric oxide (NO) and malondialdehyde (MDA). Besides, the structure and integrity of the chondrocytes were restored after treatment.

Conclusion

Based on the above results, it can be concluded that Nano-EE is better than EE on multiple indicators. Therefore, our study confirmed that Nano-EE can enhance better efficiency on the OA than EE and therefore Nano-EE can be used as a suitable drug delivery system for OA treatment.

Keywords: Osteoarthritis, *Echinacea purpurea*, nanoparticles, anti-inflammatory

Antimicrobial effects of Antibiotic Loaded Cellulose Nano-fiber and κ-Carrageenan Oligosaccharide Composite Hydrogels for Periodontitis treatment

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Objective
The objective of this study is intended to formulate antimicrobials loaded hydrogels formulated by cellulose nanofibers (CNF) and κ-carrageenan oligosaccharides (CO) nanoparticles for the treatment of periodontitis.
Methods
Two antimicrobial agents such as surfactin and Herbmedotcin were assigned as the antimicrobial agents and the hydrogels were formulated based on the increasing concentration of surfactin. This study was continued by examining the *in vitro* antibacterial properties of the hydrogels against periodontal pathogens such as *Porphyromonas gingivalis*, *Fusobacterium nucleatum*, and *Pseudomonas aeruginosa*.
Results
The formulated substance has high thermal stability, and water absorption capability. This material also has strong antibacterial activity against periodontal pathogens such as *Porphyromonas gingivalis*, *Fusobacterium nucleatum*, and *Pseudomonas aeruginosa.* This substance also significantly increases malondialdehyde (MDA) production and reducing biofilm formation and metabolic activity of bacteria.
Conclusion
The hydrogels were successfully formulated and proved to have antibacterial and properties for the treatment of periodontitis. Therefore, it has potential for periodontitis treatment.

Keywords：antimicrobial, hydrogel, periodontitis, nano-fiber, oligosaccharides

Effects of Hydrolysate from Hippocampus kuda on Reproductive Function in Diabetic Male Rats

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Objective

(Hippocampus kuda) is in traditional Chinese medicine well known for its beneficial effects on reproductive system. Recently, several studies have been shown that enzymatic hydrolysate of seahorse has multiple pharmacological activities. Therefore, this study aims to investigate that seahorse hydrolysate (SH) has positive effects on the diabetic induced male reproductive dysfunction. Seahorse hydrolysate digests (SHD) was obtained by simulated gastrointestinal digestion.

Method

SHD (125-250 μM/mL) and SHD fractions (62.5-250 μg/mL) significantly reduced nitric oxide production and increased the level of testosterone in H2O2 (800 μM) induced LC- 540 cell model. The in vivo studies were carried out with three different doses of SH and the diabetes condition was induced by administrating with fed 40% high fat diet and streptozotocin (35 mg/kg). The groups were divided into a control group, a diabetic group (DM), a positive control group (Metformin, 200 mg/kg), DM + SH 1 (4 mg/kg), DM + SH2 (8 mg/kg), and DM + SH 5 (20 mg/kg) for six weeks. The results indicated that 20 mg/kg SH increased inhibited lipid peroxidation, antioxidant enzyme activity, and restored seminiferous tubules morphology in testis.

Result

The results showed that both hydrogel and nanoparticles reduced the level of cytokines such as tumor necrosis factor- α (TNF-α) and Interleukin- 1β (IL-1β) in addition to myeloperoxidase (MPO). Moreover, the reduction in oxidative stress has been confirmed by determining the production of nitric oxide (NO) and malondialdehyde (MDA). Besides, the structure and integrity of the gingival tissues were restored after treatment.

Conclusion

These results suggested that SH can improve diabetic induced male reproductive damage.

Keywords: diabetes, seahorse, enzymatic hydrolysate, male reproduction

Construction of weighted composite index method for marine chitosan as biomaterial

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[Objective]

The objective of this study is to evaluate the biomedical quality of chitosan by constructing the weighted composite index of marine chitosan, and provide theoretical basis for the quality gist control and better development and utilization of chitosan that acquire from different resources.

[Method]

The comprehensive evaluation index system including 15 key indicators from three representative dimensions of physical and chemical properties, structural integrity and thermal stability was constructed with literature analysis and expert consultation. The method of analytic hierarchy process(AHP) was adopted to determine the weight coefficients of the corresponding indicators. Weighted comprehensive index method was used to construct comprehensive evaluation model to evaluate the quality of chitosan obtained from different marine biological resources.

[Result]

The results showed that the evaluation results were consistent with the actual quality of chitosan from different marine organisms. The β - chitosan extracted from Argentinean squid was significantly better than the α - chitosan extracted from crab shell.

[Conclusion]

Based on the above results, it can be concluded that the weighted composite index method can reflect the quality of chitosan scientifically, objectively and comprehensively.

Keywords: chitosan, quality, weighted composite index method, evaluation

Ultrasound-assisted extraction combined with reversed-phase high-performance liquid chromatography for the determination of nine biogenic amines in canned seafood

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Abstract This work describes an ultrasound-assisted extraction method combined with reversed-phase high-performance liquid chromatography (UAE-RPLC) for the determination of nine common biogenic amines (BAs) in canned seafood. The pretreatment extraction solvent, ultrasonic treatment duration, and derivatization conditions were optimized. Primary secondary amine sorbent and octadecylsilane sorbent are used as dispersive adsorbent to eliminate the matrix interference. The method was validated on the basis of the limit of detection (LOD), limit of quantification (LOQ), precision, and accuracy and successfully applied to analyze four canned fish, two canned shrimp and four canned shellfish samples. LODs of 0.04–0.38 mg kg^{-1} were achieved, and the correlation coefficient of determination was 0.9992–0.9998. The method had high precision and accuracy, with relative standard deviations (RSDs) and recoveries of 0.54 to 7.03% and 70.35 to 99.87%, respectively, suggesting the feasibility of UAE-RPLC for determining trace BAs in canned seafood.

Keywords: biogenic amines; canned seafood; HPLC; ultrasound-assisted extraction

Physical modification and chemical modification of gelatin and its application in emulsion

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[Objective]

In the past two decades, many studies have worked to understand the relationship of gelatin structure with its function properties and to explore the possible molecular modification methods to improve its emulsion stabilization ability.

[Method]

The *Tilapia* fish skin gelatins were extracted by three types of methods and determined by AFM, SDS-PAGE, FTIR, and circular dichroism. Gelatins were modified by small molecule surfactants and OSA, then the modified gelatins were used to stabilize emulsions. Macroscopic and microscopic characteristics of emulsions were characterized by digital camera, optical microscope and CLSM.

[Result]

The results showed all the gelatins extracted by three types of methods from *Tilapia* skin showed a typical secondary structure of gelatins and could stabilize fish oil-load emulsions [1-2]. Gelatins and four types of surfactants were synergetically (Span 80 and soybean lecithin) or competitively (Tween 80 and SDS) adsorbed on the oil/water interfaces. The adsorption behaviors affected emulsion stability (creaming, liquid-gel transformation, and droplet coalescence behaviors) and size distribution of emulsion droplets [3-5]. OSA can be successfully applied to modify gelatins and change their isoelectric points. Moreover, the degree of succinylation logarithmically increased with OSA-gelatin mass ratios in the chemical reaction process. OSA modification had no obvious effects on the initial emulsion droplet sizes of fish oil-loaded emulsions. The increase of DS could increase the emulsion droplet stability [6].

[Conclusion]

Based on the above results, molecular modification can effectively improve the interfacial structure characteristics and emulsion stability of gelatin. Elucidation of the relationship between molecular modification, interfacial structural characteristics and emulsion stability can provide basic information on the structure-function relationship of gelatins and can guide the research and development of gelatins as emulsifiers in the future.

Keywords: gelatin; physical modification; chemical modification; emulsion; stability

Isolation and characterization of an alkaline resistant virulent *Escherichia coli* O157:H7 bacteriophage JN01 and its application on milk and beef

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[Objective]

It's generally accepted that bacteriophage is a specific natural bacteriostatic agent against bacteria. The objective of this study is to isolate， characterize and applicate a virulent phage capable of controlling *Escherichia coli* O157:H7 in food storage and preservation.

[Method]

Using double-layer agar method to isolate and characterize the multiplicity of infection (MOI), one-step growth curve, thermal and pH stability of phage JN01. Spot test was determined the host-range. Phage morphology was observed by transmission electron microscope (TEM). The effect of purified phage on the growth of *E. coli* O157:H7 in milk and beef was measured by plate count.

[Result]

The results showed that JN01 exhibited lytic activities against 16 of 20 strains of *E. coli*, 11 of which are more than three multi-drug resistant strains. The biological characteristics of JN01 showed that its MOI was 0.1, with 15 min and 85 min for the latent period and lysis period, respectively. The burst size of JN01 was about 134 PFU/cell. JN01 was relatively stable under stressed conditions such as temperatures (30 ℃–70℃) and pH (4–13). The genome of JN01 is 88,360-bp double-stranded DNA molecules, with a total of 130 open reading frames (ORFs) and 38.76% of G + C content. Importantly, no known virulence-associated, antibiotic and lysogeny-related genes were identified in the genome of JN01. Morphological and phylogenetic analyses confirmed that JN01 belongs to the *Myoviridae* family. Viable cell counts of *E. coli* O157: H7 were reduced in milk and beef samples when treated with JN01 at 4 ℃.

[Conclusion]

Based on the above results, it can be concluded that JN01 may be a potential natural biological control agent for *E. coli* O157: H7 in food.

Keywords: *Escherichia coli* O157:H7, alkal-resistant bacteriophage, isolation and characterization, genome, biological control

Sirius Red method for determination of collagen denaturation temperature

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[Objective]

The denaturation temperature of collagen has been determined using several methods, such as CD, FTIR, and DSC, etc. Such methods need specific equipment or more than 75 mg samples, which means higher inspection costs. Therefore, it is important to propose a denaturation temperature measurement method which does not require special equipment and mass samples.

[Method]

100 μL collagen solutions (1 mg/mL) were accurately placed in 1.5 mL centrifuge tubes, which were bathed in Constant temperature incubator at different temperatures (5–60 °C) for 5 min to denature the collagen. Then the Sirius Red staining solution (1 mL) was added to 100 μL treated collagen solution. The mixture was reacted at room temperature for 30 min and then centrifuged at 12,000 r/min for 20 min. After centrifugation the supernatant was discarded, and 1 mL of 0.5 M acetic acid was added to the precipitate and thoroughly oscillated for 1 min. Then the mixture was centrifuged again. The precipitate was fully dissolved with 1 mL of 1 M NaOH. The Abs of the solution was measured at 550 nm by spectrophotometer. Finally, we calculate the content of remaining collagen in the solution under different processing conditions based on the Abs.

[Result]

The results showed that this method was suitable for the determination of the denaturation temperature of collagen from terrestrial, aquatic and amphibian animals. Analysis of variance and t-test revealed that no significant difference was found between Sirius Red and viscosity methods.

[Conclusion]

The Sirius Red method needs simpler equipment and less sample than viscosity and other methods. So it could be used as a convenient approach to determine the denaturation temperature of collagen.

Keywords: collagen, denaturation temperature, new method, Sirius Red

Changese in thermally induced gel properties of Japanese codling meat paste during two-step heating procedures

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[Objectives]

We previously demonstrated that Japanese codling (*Physiculus japonicus*) has a very high gel-forming ability (Watabe et al., 2020). Based on this finding, research and development of kamaboko made from Japanese codling is currently underway. However, it is difficult to mold its meat paste into desired shapes, because it easily forms soft gel even at low temperatures below 10ºC. Hence, in this study, we analyzed changes in rheological properties of Japanese codling during heat treatment, including those during the soft gel formation called setting or suwari in Japanese, in association with myosin polymerization.

[Materials and Methods]

Frozen surimi including 6% sucrose at moisture of 87% was prepared from Japanese codling and stored at -30ºC. The frozen surimi was partially thawed and then ground with a hood cutter in the presence of 0.5M NaCl. Yielded meat paste was subjected to two-step heating procedures, namely preheated at various temperatures from 0-70ºC for 30 min, whereas the preheated gels were then heated at 85ºC for 20 min (main heating). The preheated and main-heating gels were measured for their rheological properties. Proteins were extracted from these gels with 8M urea containing 2% SDS, and subjected to SDS-PAGE. Temperature dispersion analysis from 4ºC to 80ºC was performed for meat paste using MCR-300 rheometer, where changes in storage moduli (G'), loss moduli, and tangent δ (tan δ) were determined.

[Results]

The breaking strength and breaking strain rate of preheated gels were low at 0-25ºC, but increased sharply from 30ºC to 45ºC with increasing temperatures, showing the maximal value above 45ºC. Meanwhile, the breaking strength of the main-heating gels showed high values at 30-55ºC and decreased at 60ºC and above. The breaking strain rate of the main-heating gels also decreased at 60ºC and above. In SDS-PAGE, myosin heavy chain monomer and dimer bands were detected at 0-25ºC and these bands became thinner at 30-55ºC with both the preheated and main-heating gels. The amount of proteins extracted with the SDS-urea solution decreased at pre-heating from 0ºC to 30ºC for both preheated and main-heating gels. G' increased with increasing temperature to 35ºC, then decreased to 45ºC, and increased again from 45 ºC. Tan δ showed two peaks at 23ºC and 39ºC.

[Conclusion]

Rheological values increased for both preheated and main-heating gels when preheated from 30ºC to 55ºC in association with myosin polymerization by covalent cross-linking. In addition, the amount of proteins solubilized with the SDS-urea solution and that of myosin heavy chain monomer decreased at 0-25ºC, suggesting that suwari occurred even in this low temperature range.

Keywords: fish meat paste, Japanese codling, surimi, suwari, thermal gels, two step heating

Improving the freshness quality of farmed turbot（*Scophthalmus maximus*）at local market in Dalian, China

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Abstract

[Objective]

In order to improve the freshness quality of farmed turbot (*Scophthalmus maximus*) at local market in Dalian, the effects of slaughtering methods and handling during quality determination period (QDP) on muscle quality of mariculture turbot were investigated.

[Method]

Samples were divided into 4 group, live fish, dying fish, asphyxiation treatment and iced storage after spinal cord cut fish, and ATP and related compounds, glycogen, pH and protein component were analysed. Then, pH, whiteness, nucleotide compounds, muscle microstructure and non-targeted metabolomics were investigated between different bleeding condition of the spinal cord cut fish, ice sea water to cool down and normal temperature seawater.

[Result]

(1) The ATP in the muscle of spinal cord cut fish was 2.95μmol/g, while that in asphyxiation fish was totally depleted. The contents of glycogen were 5.28 mg/g in spinal cord cut fish and 3.06 mg/g in asphyxiation fish. And the muscle pH were 7.10 and 6.61, respectively.

(2) The iced storage after spinal cord cut fish had excellent stability quality with the degradation of ATP and accumulation of IMP in the early stroage of iced storage. The maximum of IMP reached to 9.81 μmol/g on 2th day, and remained at a high level (6.52μmol/g) during 6 days.

(3) The qualities of live and dying turbot from local market were unsatisfactory comparing with the iced-storage fish. The ATP in the muscle of live turbot was only 1.70 μmol/g, and almost none in dying products.

(4) The pH values were ranged from 7.02 to 6.60 within 3 days in ice sea water bleeding group, while dropped into 6.6 at 1st day in normal temperature seawater bleeding group.

[Conclusion]

The results showed that spinal cord cut fish had excellent stability quality during iced storage comparing with local market products. And muscle quality was improved after ice sea water bleeding during QDP. The lock freshness handling during QDP have great significance to improve the muscle quality of fish.

Keywords: *Scophthalmus maximus*; fish welfare; quality determination period; muscle quality.

Effects of Different Thawing Methods on Quality Changes of Frozen Pompano (*Trachinotus ovatus*)

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[Objective]

The effects of different thawing methods (Ultrasonic thawing (UT), radio frequency thawing (RFT), hydrostatic thawing (HT), microwave thawing (MT) and cold storage thawing (CST)) on the freshness and quality changes of pompano (*Trachinotus ovatus*) were investigated in this study.

[Method]

The freshness evaluation of *Trachinotus ovatus* with different thawing methods was analyzed by these parameters including pH value, total volatile basic nitrogen (TVB-N), colour difference and scanning electron microscope (SEM). The changes of degradation and thermal stability of fish protein with thawing were evaluated by the SDS-PAGE and differential scanning calorimetry (DSC), respectively. Raman spectra and low-field nuclear magnetic resonance (LF-NMR) were utilized to analyze protein secondary structure and water migration.

[Result]

The results showed that thawing treatment could accelerate the destruction of protein stable structure and decrease of quality in *Trachinotus ovatus*, especially MT which had more changes in all indexes. Compared with other thawing methods, RFT could slow down the increase of pH, TVB-N and colour difference, which had desirable thermal stability and more stable protein secondary structure. The free water with different thawing methods had no significant changes. The myofibril bundles in RFT were also straight and smooth by SEM observation.

[Conclusion]

Based on the above results, compared with other thawing methods, radio frequency thawing was a desirable thawing method for maintaining the thermal stability of *Trachinotus ovat*us.

Key words: *Trachinotus ovatus*; Thawing methods; Quality changes

Comparison of physicochemical properties and myofibrillar protein changes of grass carp between brine injection and brining

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[Objective]

Salting is one of the main processing methods to preserve grass carp. Brine injection has been used widely in the processing industry of pork, beef, and chicken. However, the feasibility of brine injection to fresh water fish have rare research. The objective of this study was to investigate the comparison of changes in physicochemical index and properties of myofibrillar protein between brine injection and brining.

[Method]

Salt and water content was measured by national standard, water holding capacity was measured by centrifugation, water status was measured by LF-NMR. Total and active sulfhydryl was measured by Ellman method, solubility was measured by centrifugation and secondary structure was analysed by FT-IR spectra.

[Result]

The results showed that the salt and water content was increased with extending salting time and brine injection was higher than brining. The brine injected into the muscle lead to a higher water and salt content. Water holding capacity was increased and then decreased by both two methods. The immobilized water was the main water population and it increased with extending salting time. The free water and bound water was decreased. With extending of the salting time, the free water and bound water was transferred into the immobilized water. This could explain the increase of water holding capacity. Solubility was increased before 5 h in brining group and 3 h injection group. This could partly responsible for the increase of the immobilized water because of salting-in effect strengthen the bind between the water and protein. Active sulfhydryl was decreased after 0.5 h because the internal sulfhydryl were exposed to the surface without had not been oxidized initially. Total sulfhydryl was decreased because of formation of disulfide bonds through oxidation of sulfhydryl or disulfide interchanges. The percentage of α-helices and β-turns was decreased, β-sheets and random coils was increased in two groups. That means the structure of myofibrillar protein was became loose and the network structure was damaged due to the protein denaturation as the salting time increased.

[Conclusion]

Based on the above results, it can be concluded that lightly salting could increase the solubility of the myofibrillar protein, which could lead to the increase of water holding capacity. Brine injection could speed up salting and got the higher yield. The structure of myofibrillar protein was more disorder with extending salting time. Brine injection groups was more loose than brining groups at the same time because of the higher salt content.

Keywords: physicochemical index, myofibrillar protein, water dynamics, secondary structure

Micro-nano particle formation and transformation mechanisms of broth in meat braised processing

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[Objective]

It's generally accepted that colloidal particles are present in food system but few reports on the molecular mechanisms of micro-nano particles (MNPs) in broth. The objective of this study was to systematically investigated the formation and transformation mechanisms of MNPs in broth during meat braising through a sophisticated controlled process.

[Method]

Morphological characteristics of MNPs in the broth were observe by optical microscopy and transmission electron microscopy measurements. The exact change of particle size was confirmed by nano particle size analysis. To identify the ingredients of MNPs, Nile red dye and WGA-488 dye were mixed with samples at a ratio of 1:10 and 1:100 to mark the triglyceride and glycoconjugates in broth, respectively, and observed by laser confocal microscopy. Then, spatial distribution of triglycerides and glycoconjugates in MNPs were analysis by Fourier transform infrared spectroscopy imaging.

[Result]

The results showed that MNPs formed as circular-shape colloidal systems with an aggrandizing tendency for particle number and size and gradually stabilize eventually. Specifically, the major MNP size gradually increased from <400 nm to ~1500 nm, and those particles intrinsically rich in triglycerides and glycoconjugates spontaneously gathered together.Continuous formation of MNPs in broth progressively facilitated the spatial coalescence and self-assembly of free substances, and consequently principal nutrients and flavor compounds accumulated in the MNPs by braised processing.

[Conclusion]

Based on the above results, it can be concluded that MNP formation and transformation mechanisms of broth in meat braising process by combining the morphology, composition and spatial distribution, which also would be beneficial for further exploring and understanding the relationship between MNPs and flavour of broth.

Keywords: Braising, Broth, Micro-nano particles, Formation, Transformation

Properties of modulation and immunoregulation of LMPs from *Lactobacillus* on inflammatory bowel disease

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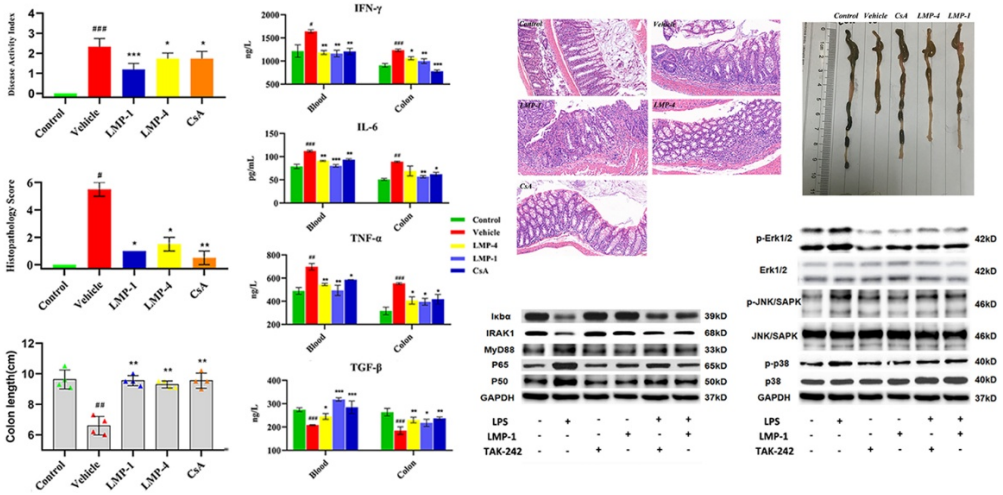
[Objective]
Inflammatory bowel disease (IBD), as an intestinal inflammatory reaction, can be caused by the abnormal innate and acquired immunity, and in present microecological agents have been focused on becoming a new way in the intervention of IBD gradually. They possess ameliorating intestinal flora imbalance in IBD patients, and then put off the occurrence of inflammation. Herein, we have isolated series active membrane peptides from *Lactobacillus plantarum* (LMPs) that compete with invasive pathogenic *Escherichia coli* to adhere to intestinal epithelial cells. This study aims to further evaluate the activities and properties of LMPs *in vivo*, in the hope of developing a type of immunoregulator active substance and novel potential functional food from *L. plantarum*.

[Method]
IBD model was established through chemical induction with 2.5% dextran sulfate sodium for one week in male C57BL/6 mice. Assay preliminarily the symptomatology indicators during administration of LMPs, including body weight and disease activity index. At the end of treatment, the mice were sacrificed, and the colon was taken to characterize the morphology and the histopathology, while inflammatory cytokines in colon tissue and peripheral blood were determined by ELISA, in order to evaluate the immunoregulation activity of LMPs. In addition, proteomics analysis was performed in colon samples, and establish co-culture model of Caco-2/LPS to investigate the mechanism on immune activity of LMPs through Western Blot.

[Result]
Our results showed that LMP-1 can significantly improve the symptoms and colon shortening in IBD mice, whose mortality has a downward trend. The observation on LMP-4 demonstrated that it can also inhibit the weight loss and ameliorate intestinal condition. Furthermore, LMP-1 and LMP-4 both reduce the colonic histopathological score, and may regulate the expression disorder of inflammatory cytokines through TLR4-related pathway, against the occurrence of ulceration and inflammation.

[Conclusion]
Overall, LMP-1 and LMP-4, isolated from *L. plantarum*, demonstrate excellent bioactivities of anti-inflammatory and immunoregulation in IBD mice, which provides evidence that LMPs may become an attractive candidate for further testing as a potential functional food for IBD patients.

Keywords: LMPs, anti-inflammatory, immunoregulation, inflammatory bowel disease, functional food



Eurotium cristatum polysaccharides from black tea affect the homeostasis of intestinal inflammation by activating C-type lectin receptors

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[Objective]

Eurotium cristatum is the most important probiotics in black tea. This article aims to explore the preventive and therapeutic effect and mechanism of polysaccharide extract from *Eurotium cristatum* on inflammatory bowel disease induced by DSS.

[Method]

The mouse model of inflammatory bowel disease induced by DSS was established, and the experimental group and control group were intragastrically treated with the fermented extract of *Eurotium cristatum* and PBS, respectively.Among them, the experimental group was given 100mg/kg of polysaccharides from *Eurotium cristatum* once a day for a week. Observe the changes of mouse body weight, stool characteristics, colon length, number of fungi, number of bacteria and other indicators. Raw264.7 macrophages were treated with different concentrations of *Eurotium cristatum* polysaccharides and LPS. RT-PCR and western blot were used to detect the changes in C-type lectin receptor and downstream transcription and protein levels.

[Result]

In the animal model, the body weight of the experimental group recovered faster, the stool character was better, the degree of hematochezia was lower, the length of colon was longer, the number of fungi was lower, the level of inflammation and the degree of pathological injury were lower in the experimental group than in the control group. The phosphorylation level of SYK and the expression of CARD9 in RAW264.7 cells treated with polysaccharide were significantly increased .($p < 0.05$)

[Conclusion]

The polysaccharides extract of *Eurotium cristatum* could significantly reduce the degree of inflammation and reduce the inflammatory injury in the model of inflammatory bowel disease induced by DSS. The *Eurotium cristatum* polysaccharides can activate C-type lectin receptor and downstream NFκB signal pathway in macrophages, exert antifungal immune activity and regulate intestinal homeostasis.

Keywords: Black tea, *Eurotium cristatum*, Polysaccharides,C-type lectin receptor, Inflammatory bowel disease

Garlic as potential prebiotics to prevent gut microbiota dysbiosis and dyslipidemia

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[Objective]

Garlic (*Allium sativum* L.) has long been used in food and medicine. Most of garlic's beneficial functions are due to organosulfur compounds (OSCs) and fructans. Garlic contains about 65% fructans and 1.1–3.5% OSCs, which is much higher than that in other plants food. OSCs are complex mixture in garlic, which generally refers to alliin, SAC, GSAC, allicin, in which allicin have strong antibacterial effect. The complex ingredients of garlic seem to impart a paradoxical result on the gut microbiota. The primary purpose of this study is first to clarify the preventive effects of garlic on dyslipidemia and gut microbiota dysbiosis using a mouse model fed with high-fat diet and garlic supplement, and dextrin which is a polysaccharide used as positive control. Moreover, since allicin is a bridge intermediate in the reaction of various OSCs derivatives in garlic, thus, we manufactured allicin-free garlic (AFG) to eliminate the multi-factor interference of OSCs derivatives, and further investigated its effects on gut microbiome and dyslipidemia.

[Method]

C57BL/6N male mice were randomly divided into several groups: normal diet (ND), NDG (5% garlic in ND), NDD (4% dextrin in ND), high-fat diet (HFD), HFDG (5% garlic in HFD), HFDD (4% dextrin in HFD), or ND+AFG (allicin-free garlic supplement) with different concentration of 1% or 5%, HFD+AFG with different concentration of 1% or 5%, respectively. After 11-12 weeks of feeding, mice were sacrificed after overnight fasting. The fresh feces were collected at the beginning and the end of the experiment. The blood serum, liver and intestinal organs were also collected at the end of the experiment.

[Result]

Supplementation with whole garlic attenuated HFD-enhanced ratio of serum GPT/GOT, levels of T-Cho (total cholesterol), liver weight and liver fat rate. In addition, supplementation with AFG also attenuated HFD-enhanced ratio of serum GPT/GOT, and liver fat rate. In terms of gut microbiota, the α-diversity of the gut microbiota was increased by whole garlic, while decreased by AFG. Moreover,the ratio of p-*Firmicutes* to p-*Bacteroidetes*, an indicant of gut microbiota dysbiosis which was increased by aging and HFD was reduced by 5%AFG. In particular, the relative abundance of g-*Akkermansia* and f-*Lachnospiraceae* which were closely related to host mucosal integrity and anti-inflammatory activity, that was enhanced by whole garlic and AFG.

[Conclusion]

In conclusion, our data demonstrated that whole garlic and 5%AFG supplementation could meliorate the HFD-induced burden of liver and dyslipidemia. In addition, supplementation with whole garlic and AFG altered the gut microbiota, and 5%AFG was more effective than whole garlic in relieving gut microbiota dysbiosis.

Keywords: garlic; gut microbiota; high-fat diet

Reference:

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Synthesis and characterization of quercetin-zinc complexes and evaluation of *in vitro* anti-cancer activity

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[Objective]

Quercetin is representative of polyphenols, and various bioactive effects have been reported. It is well known that polyphenols such as quercetin has a chelating effect to exhibit physiological activity. Among them, it has been reported that the metal complex of quercetin improves the ability to bind naked DNA compared to non-complexes. However, there are few reports to evaluate a their anti-cancer activity on Human cell lines. In this study, we aim to synthesize the quercetin zinc-complex (Zinc-Q) to further improve the anti-cancer activity of quercetin and zinc.

[Method]

The synthesis of Zinc-Q was modified from previously reported method. (Tan et al. 2009) The cell growth inhibitory effect was measured by MTT method. The induction of apoptosis was quantitatively analyzed using DNA fragmentation assay and Annexin V & PI staining. To evaluate the direct involvement of complexes quercetin in DNA, a comet assay was performed that detects DNA damage in cells.

[Result]

The successful complexation of quercetin with zinc ions was confirmed by analyzing the characteristic peaks of the products formed using FTIR, UV-Vis spectroscopy and ESI-MS analysis. Compared with quercetin, Zinc-Q showed significant difference in its ability to inhibit cell proliferation and induce apoptosis, indicating an improvement in anti-cancer activity due to complexation. No significant DNA damage was observed during the comet assay in any of the samples, indicating that the metal complexes of quercetin did not cause direct damage to DNA.

[Conclusion]

The quercetin zinc complex was successfully synthesized according to our method. Zinc-Q showed higher anti-cancer activity than quercetin by inducting of apoptosis. The present study suggested no direct involvement of Zinc-Q in DNA, which indicates that more detailed elucidation of the interaction between the metal complex and DNA is required. Based on these observations, we suggest that Zinc-Q may serve as new anti-cancer property.

Keywords: Quercetin, metal ion, flavonoid, anti-cancer activity

Effect of Super-chilling Storage on Maintenance of Quality and Freshness of Pacific Oyster (*Crassostrea gigas*)

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[Objective]
The pacific oyster (*Crassostrea gigas*) is one of the most popular shellfish in Japan and usually sold in fresh. Both shelled and shucked oysters are delivered to consumers under refrigerated conditions (0-10 ºC). As fresh seafood, oysters have a short shelf-life (4-5 days), improvements in the shelf-life can have an important economic impact by reducing losses. With the increased demand of live oysters for raw consumption, there is an essential need for enhancing safety and quality in the preservation. Microbial growth is the most important factor limiting the shelf life and quality of fresh food products. At super-chilling temperatures, microbial activity is reduced and most bacteria are unable to grow. The objective of this study is to investigate the effects of super-chilling storage at -1 ºC on maintenance of quality and freshness of pacific oyster (*Crassostrea gigas*) by analyzing several indexes including pH value, the concentrations of ATP and its related compounds, free amino acids (FFA) and microbiological test.

[Method]
Pacific oyster samples were divided into 2 groups: one stored with shelled (SL) and one shucked (SK) before storage. ATP-related compounds in adductor muscle, mantle, gill and body trunk were measured by HPLC. Adenylate energy charge (AEC) values and K, K' values were calculated from the levels of ATP-related compounds to evaluate the freshness of oysters. Moreover, *E.Coli*, viable bacteria count and *Vibrio parahaemolyticus* were also detected as index for oyster quality evaluation.

[Result]
The results showed that the microbial growth was inhibited effectively at -1 ºC. The most probable number of coli-group bacteria per 100g of oysters were less than 18 during the whole storage. Most of the SL groups were alive and fresh until 21 days, but SK groups were regarded as acceptable until day 7. The pH values of fresh oysters were detected around 6.5. The initial AEC value of SL was 44%, and increased to 48% in first 2 days and then decreased to 15% on day 21 in the adductor muscle, while in other 3 tissues by day 21were remained at around 60%. For SK groups, K or K'values in the adductor muscle increased linearly with the time went on. In other 3 tissues, AEC values decreased gradually during the storage. No significant changes ($p > 0.05$) in FAAs of both two groups were measured during -1 ºC storage

[Conclusion]
According to the results, super-chilling storage (-1 ºC) confirmed to maintain freshness of pacific oyster. The shelf life of shelled and shucked oysters was largely extended to 21 days and 7 days, respectively. The AEC values in the adductor muscle could be used as freshness index for SL group evaluation. Meanwhile, the K or K'values in the adductor muscle and AEC values in the other 3 kind of tissues could be used as the freshness index of the SK group.

Keywords: Shelled oyster, Shucked oyster, ATP related compounds, Free amino acids, pH, microbial growth

POSTER PRESENTATION

Study on the effect of lipids in steamed tilapia fillets

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[Objective]

Tilapia, as a dominant species of tropical and subtropical fish, is rich in nutritional value and is very beneficial to human health. At present, the research focus of aquatic product nutrition is mainly on the nutrients that are beneficial to human health, and the high-quality lipids rich in tilapia as an important part of nutrition research are paid attention to by domestic and foreign food research. This article uses organic reagents to extract the lipid components of tilapia by steaming, and explores the change process of free fatty acids and complex lipids in tilapia after steaming. It is better for people to eat tilapia and its processing. Changes in nutrition, flavor, texture and appearance play a very important role.

[Method]

Thaw the tilapia fillets at room temperature, dry the surface water . Use an induction cooker to heat the water in the pot until it boils, then add the fish, use the steaming mode to heat, take out the fish at different time periods, cool, weigh, and beat into surimi. Using Folch and Bligh method for lipid extraction, add 5 mL of chloroform/methanol to 1.0 g of tilapia meat, mix with a vortex mixer at room temperature for 1 minute, and then shake with a constant temperature shaker at 250 rpm and 25°C for 10 minute. Then centrifuge in a high-speed refrigerated centrifuge at 2000 rpm and 4°C for 5 minutes to collect the separated liquid. Repeat the above operation cycle twice. In the third time, the centrifuge speed was 12000 rpm, the collected supernatant was concentrated to form a lipid film, the tube was sealed and stored at -20°C.

[Result]

The results show that in controlling the steaming process, the quality reduction of tilapia meat is caused by the free fatty acids and complex lipids separated from the water flowing out during the steaming process. Qualitatively and partially quantitatively, it can be seen that the lipids in tilapia are distributed regularly, and the best cooking time for steamed tilapia can also be determined.

[Conclusion]

Based on the above results, the changes of free fatty acids and complex lipids in the body of tilapia during steaming were summarized, and the optimal processing time was determined. Use the law of lipid changes to explore the effect of lipids on tilapia quality changes, improve its edible value, and ultimately apply to the actual processing of tilapia.

Keywords : Tilapia; steaming

Ionotropic Gelation Electrospraying Technique for the Preparation of Multicore Millimeter-Sized Spherical Capsules to Specifically and Sustainedly Release Fish Oil

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[Objective]

It's generally accepted that centimeter-sized capsules and micro/nano capsules are the mainstream encapsulation techniques in the academic and industry fields. The objective of this study is to prepare multicore millimeter-sized spherical capsules for specific and sustained release of fish oil by ionotropic gelation electrospraying technique.

[Method]

The capsule shapes were photographed by a digital camera, an upright optical microscope, a confocal laser scanning microscope, and a scanning electron microscope. For OM observation, the samples were prepared by transferring the capsules from the $CaCl_2$ solution to Petri dishes. For CLSM observation, Nile Red was added to the alginate/oil mixtures prior to homogenization and the Nile Red-loaded fish oil droplet solution was used to prepare millimetre-sized capsules. The oil contents in the capsules were measured by the Rose-Gottlieb method with some modification. Two simulated gastro-intestinal tract digestion models were used to simulate the biological fate of ingested samples in people with full stomachs.

[Result]

The results showed that the ionotropic gelation electrospraying approach could control the diameters of spherical capsules from 0.35 mm to 2.05 mm by adjusting the applied voltages. The capsules could be classified into two types: (1) even multicore capsules; (2) uneven multicore capsules. The capsules had reasonable fish oil loading ratios and fish oils could be specifically and sustainedly released in the small intestinal phase of in vitro gastro-intestinal and small intestinal tract models. Moreover, the sustained release behaviours could be controlled by the applied voltages.

[Conclusion]

Based on the above results, it can be concluded that alginate is an FDA-approved food additive, the ionotropic gelation electrosprayed millimetre-sized capsules are particularly suitable for specifically and sustainedly delivering fish oil to, small intestines through oral administration and exhibit significant and broad application potentials in food and drug industries.

Keywords: alginate; ionotropic gelation electrospraying; fish oil; millimetre-sized spherical capsule; multicore; specific and sustained release

Preparation and characterization of gelatin/Vitamin C emulsion core-shell nanofibers based on electrospinning technology

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[Objective]

It's generally accepted that electrospinning, as a simple and promising technique, has been used to fabricate micro- and nanofibers from a variety of polymers. The objective of this study is to prepare core–shell nanofibers by electrospinning of fish oil emulsion stabilized by gelatin, and explore the oxidation stability of nanofiber membranes with different Vitamin C concentrations.

[Method]

The nanofibers shapes were photographed by a digital camera, an upright optical microscope, a fluorescence microscope, and a scanning electron microscope. For OM observation, the electrospun fibers were directly collected on microscope glass slides. For FM observation, Nile Red was added to the gelatin/ Vitamin C/oil mixtures after homogenization and the Nile Red-loaded fish oil emulsion was used to prepare core–shell nanofibers. The peroxide value of fish oil was determined by the method of ferrus oxidation xylenol orange assay.

[Result]

The results showed that the dyed fish oil is observed to be encapsulated in the fibers in the fluorescence microscope image, proving the core-shell nanofiber structure. Increasing the Vitamin C concentration from 5% to 40% Vitamin C resulted in a smoother surface of the electrospun fiber. It was observed in scanning electron microscope (SEM) images that: 1 day later, compared with the electrospun fiber film formed by emulsion without Vitamin C, except for the adhesion of the fiber film with 40% Vitamin C concentration, the morphology of the fiber film with different Vitamin C concentration basically did not change. The fish oil encapsulated in the emulsion-based fiber mat has an increased antioxidant capacity as the Vitamin C concentration increases.

[Conclusion]

Based on the above results, it can be concluded that it will promote the development of functional foods, and provide new ideas for the application of electrospinning technology in the food field.

Keywords: gelatin, fish oil, Vitamin C, emulsion electrospinning, core-shell nanofibers, oxidation properties

Triterpenoids from Stem Explants of Akebia trifoliata exert hypoglycemic effects by inhibiting α-glucosidase and enhancing glucose uptake in insulin-resistance HepG2 cells

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[Objective]

The objective of this study was to identifying the important potential triterpenoid phytochemicals from the stem explants of Akebia trifoliata, and evaluate it's hypoglycaemic effects through various biological assays.

[Method]

A phytochemical investigation on the stems of this herb was carried out, whereby three triterpenoid saponins have been extraction, isolation and identified by TLC, HPLC, H/C-NMR methods. Furthermore, the possible inhibition patterns and the inhibitory mechanism of their on α-glucosidase were analysed by enzymatic kinetics study and molecular docking analysis. Additionally, insulin resistance (IR)-HepG2 cells were also performed as a model system for the study of the glucose uptake.

[Result]

The results showed that three triterpenoids **1-3** have been identified as: (**1**) arjurnolic acid, (**2**) 3-epiakebonoic-acid, (**3**) hederagenin. Compounds **1-3** all exhibited the strongest α-glucosidase inhibitory activity compared with positive control acarbose. In enzyme kinetics study, Line weaver-Burk plot and Dixon plots for α -glucosidase indicates the inhibition type and constant K*i* value of triterpenoids **1-3** were (mixed, mixed and competitive type), and (3.22, 5.37 and 28.7 μM). Correspondingly, the above molecular simulations give us rational explanation of the interactions triterpenoids (**1-3**) and α-glucosidase, which provided valuable information for further development of α-glucosidase inhibitors. In addition, insulin-resistance model were conducted in this study was: 10^{-7} M insulin administered to the HepG2 cells during 24 h, and the results indicated that arjurnolic acid can significantly promoting of glucose uptake in IR-HepG2 cells.

[Conclusion]

These findings indicate that the stem explants of A. trifoliata rich in bioactive triterpenoids which are promising for exploitation as functional food ingredients or to be developed as effective and safe agents for the prevention and treatment of diabetes mellitus.

Keywords: triterpenoids, akebia trifoliata, diabetes mellitus, molecular docking, enzyme kinetics

Resveratrol and celastrol loaded Collagen dental implants regulate periodontal ligament fibroblast growth and osteoclastogenesis of bone marrow macrophages

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[Objective]

It's generally accepted that collagen is widely used for dental therapy in several ways such as films, 3D matrix, and composites, besides traditional Chinese medicine (TCM) has been used in tissue regeneration and wound healing application for centuries. The objective of this study is to fabricate collagen film with TCM such as resveratrol and celastrol in order to investigate the human periodontal ligament fibroblasts (HPLF) growth and bone marrow macrophages (BMM) derived osteoclastogenesis. Further, the physicochemical, mechanical and biological activities of collagen-TCMfilms crosslinked by glycerol and EDC-NHS (1-ethyl-3-(3-dimethylaminopropyl)carbodiimide-N-hydroxysulfosuccinimide) were investigated.

[Method]

The films characterization was observed by Texture analyzer and differential scanning calorimeter and FTIR etc. Morphological changes of HPLF cells cultured in control and collagen films were observed by SEM. The effect of collagen films on HPLF cells was observed by (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) assay. The effect of collagen films in osteoclast formation was observed by the BMM was cultured with collagen FFS in presence of osteoclastogenic inducers, RANKL and mCSF.

[Result]

The results showed that collagen film characterization was significantly regulated by the nature of plasticizers like hydrophobic and degree of polarity. The collagen film's denaturation temperature was increased by EDC-NHS than glycerol. The addition of resveratrol upregulated the proliferation of HPLF cells, while osteoclastogenesis of BMM cells treated with mCSF-RANKL was significantly downregulated by celastrol.

[Conclusion]

Based on the above results, it can be concluded that the collagen-TCMfilm could be an interesting material for dental regeneration especially it's a therapeutic target to restrain the elevated bone resorption during osteoporosis.

Keywords: Collagen-Traditional Chinese medicines, Periodontal ligament fibroblast, Dental regeneration

Regulation of the FGFC1 synthesis pathway based on genomic De novo assembling and preliminary analyses

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[Objective]

The small molecule FGFC1, a diindole alkaloid with significant fibrinolytic activity, has potential as a therapeutic agent in the treatment of thrombotic diseases, this article aims to reveal and regulation the biosynthetic pathway of FGFC1 from the perspective of molecular biology.

[Method]

The genome extracted from the Stachybotrys longispora FG216 was analysed by DENOVO sequencing. Key enzymes in the FGFC1 predict synthesis pathway were localized according to the annotated information from KEGG, enzyme inhibitors were added to the medium for positive and negative regulation.

[Result]

The results showed that isoprenoid structure of FGFC1 is mainly synthesized by the mevalonate pathway, whereas the isoindole ring structure is synthesized by various tryptophan metabolic pathways.

[Conclusion]

Based on the above results, it can be concluded that the regulation of HMG-CoA reductase (HMGCR) had a significant effect on the FGFC1 product, is metabolic regulator.

Keywords: secondary metabolism, natural product, metabolic regulation.

Action mechanism of chitosan against *saprophytic Staphylococcus*

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[Objective]

In order to analyze the action mechanism of chitosan against *staphylococcus saprophyticus*, the minimum inhibitory concentration (MIC) of chitosan against *staphylococcus saprophyticus* was determined by absorbance value and the clarification degree of bacterial culture solution.

[Method]

The effects of chitosan in MIC and 2MIC on the growth of *staphylococcus saprophyticus*, the integrity of cell wall, the permeability of cell membrane, biofilm formation and intracellular protective enzyme were measured respectively. Meanwhile, the effects on the cell morphology were observed by Scanning Electron Microscopy (SEM), so as to evaluate the effects of chitosan against *staphylococcus saprophyticus* comprehensively.

[Result]

The MIC of chitosan on *staphylococcus saprophyticus* was 1.25 mg/mL. After treated with MIC and 2MIC, the growth of *saprophytic staphylococcus* was inhibited, the cell wall was destroyed, the permeability of membrane was changed, the activities of catalase (CAT) and malate dehydrogenase (MDH) were decreased as well, the effects were positively correlated with the concentration of chitosan. The results of SEM showed that compared with CK group, the bacteria treated with MIC was irregular in shape and wrinkles on the surface. Vesicles were produced on the surface of bacteria with obvious adhesion under chitosan in 2MIC. It indicated that chitosan had damaged the cell wall of *Saprophytic staphylococcus*, which inhibited the growth of bacteria and caused its death eventually.

[Conclusion]

The results showed that chitosan can delay the growth of *Staphylococcus saprophyticus*, inhibit the formation of biofilm, damage the cell wall structure, enhance the permeability of the cell membrane, and then enter the cell, destroy the protective metabolic enzyme system, and lead to the cell death ultimately.

Key words: Chitosan, *saprophytic staphylococcus*, Action mechanism

Effects of dietary protein levels on non-volatile taste substances of swimming crab(*Portunus trituberculatus*)

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[Objective]

The purpose of this paper is to explore the effects of Effects of dietary protein levels on non-volatile taste substances of swimming crab(*Portunus trituberculatus*).

[Method]

A 120-d feeding trial was conducted using iso-nitrogenous and iso-fatty diets to evaluate the effects of dietary protein level on non-volatile taste substances of swimming crab, *Portunus trituberculatus*. Four experimental diets(recorded as Diet 1~Diet 4 respectively) were formulated to contain four protein levels(32.16%, 36.13%, 39.59%, 41.24%) with dietary protein to energy(P/E) ratio arranging from 16.89 to 21.07 g protein MJ^{-1}. The contents of free amino acids, umami active nucleotides, non-protein nitrogen(NPN) and inorganic ions in the meat of female *Portunus trituberculatus*, cultured by four kinds of fattening feeds, were determined and compared by electronic tongue, amino acid autoanalyzer, high performance liquid chromatography(HPLC), nitrogen analyzer and HPLC-Inductively coupled plasma mass spectrometry (HPLC-ICP-MS). The taste intensity was evaluated by taste active value(TAV) and equivalent umami concentration(EUC) methods.

[Result]

The results showed that the meat of crabs(average body weight was 10.98±0.28 g) cultured by dietary protein were not distinguished effectively with the electronic tongue. The highest content of NPN, umami and sweet amino acids, IMP and AMP were observed in the meat of Diet 3. The content of Mg in the diets with 41.24% protein was lower than others. The equivalent umami concentration(EUC) of Diet 3 was the highest, suggesting that the umami taste is better.

[Conclusion]

Based on the above results, it can be concluded that the diet containing 39.59% protein was optimal for juvenile swimming crab.

Keywords: *Portunus trituberculatus*, protein level, inorganic ions, FAAs, nucleotide, NPN

Effect of pectin-plant essential oil on the quality of large yellow croaker (*Pseudosciaena crocea*) with vacuum packaging during iced storage

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[Objective]

In order to extend the shelf life of large yellow croaker (*Pseudosciaena crocea*) with vacuum packaging by using Pectin-Oregano essential oil (PO) and Pectin-Ginger essential oil (PG) coating.

[Method]

Samples were divided into 4 groups, which impregnated in PO, PG, sterile water (CK) and 25% ethanol (E) for 2 min, respectively. Then each group was drained for 15 min with vacuum packaging, then placed in the ice layer of foam box and stored at 4℃. Different indexes, such as microbial (total viable count (TVC), *Shewanella* bacteria counts), physicochemical (texture profile analysis (TPA), color difference, pH value, total volatile basic nitrogen (TVB-N), K value, Thiobarbituric acid (TBA)), combined with sensory evaluation were analyzed at day 0, 3, 6, 9, 13, 17, 20, 24, 27 respectively.

[Result]

The results showed that PO and PG could was inhibited the increase of TVC, *Shewanella* bacteria counts, color difference, pH, TVB-N, K value and TBA significantly. Among them, PO treatment has the best effect. Besides, PO and PG group could slow down the decline of springiness and resilience, which had desirable acceptable sensory scores at 21 d.

[Conclusion]

Based on the results, when samples were treated with PO and PG, the shelf life of *Pseudosciaena crocea* could increase by 20 to 27 days and 24 days, respectively.

Key words: Oregano essential oil; Ginger essential oil; vacuum packaging; *Pseudosciaena crocea*; ice storage; quality change

Rapid detection of FWA VBL in flour by in-situ formation of deep eutectic solvent

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[Objective]
It's generally accepted that the viscosity, elasticity, whiteness of wheat flour are the standards for evaluating the quality of flour and the adulterants are added into the flour illegally and endanger people's health. The objective of this study is to detect the trace FWA VBL in wheat flour effectively by formatting deep eutectic solvent.
[Method]
The wheat flour was sieved with 150 meshes and added with different concentrations of FWA VBL. In order to extract FWA VBL in flour, the mixed samples were placed in a glass centrifuge tube containing deionized water. The sample solution was extracted by sonicating and centrifuged at 10000 rpm. Then, the supernatant was transferred to the glass centrifuge tube containing hydrogen bond donor. After mixing under 80℃, the deep eutectic solvent was formatted in-situ. Finally, the samples were detected by fluorescence spectrophotometry.
[Result]
The results showed that FWA VBL in wheat flour could be extracted by formatting deep eutectic solvent and detected by fluorescence spectrophotometry.
[Conclusion]
Based on the above results, it can be concluded that extracted by formatting deep eutectic solvent could pre-enrich and purify the FWA VBL in wheat flour, which could simplify the procedure of detection and refine the result of detection. The method could detect illegal adulterants in food by formatting different deep eutectic solvent.

Keywords: Deep eutectic solvent, FWA VBL, Flour, Fluorescence spectrophotometry

Effects of chitosan combined with apple polyphenols on the microbial diversity of large yellow croaker (*Pseudosciaena crocea*) during ice storage by High-throughput sequencing

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[Objective]

The objective of this study is investigate to the effects of chitosan (CS) combined with apple polyphenols (AP) on quality and microbial diversity of large yellow croaker (*Pseudosciaena crocea*) during ice storage.

[Method]

The quality and microbial diversity of large yellow croaker was analyzed by several indexes including microbiological analysis, biogenic amines analysis and high-throughput sequencing.

[Result]

The results showed that CS+AP inhibited the growth of *Pseudomonas* and H_2S-producing bacteria and the production of biogenic amines. Moreover, the CS treatment concentration was positively correlated with the bacteriostatic effect. The results of high-throughput sequencing showed that microbial diversity was changed with the increase of storage time. For the CK group, *Sphingomonas*, *Methylobacterium*, *Phenylbacillus* and *Stenotrophomonas* were predominant in the early storage, while *Shewanella* became predominant as storage time increased. Additionally, CS+AP decreased the relative abundance of *Shewanella* in the middle-period of storage and *Pseudomonas* became the predominant microbiota at the end of storage.

[Conclusion]

Based on the the above results, CS+AP improved the quality of large yellow croaker during ice storage, which was mainly due to it changed the microbial composition.

Key words: Chitosan; Apple polyphenols; *Pseudosciaena crocea*; ice storage; quality; Microbial diversity

Effect of ice-glazing and rosemary (*Rosmarinus officinalis*) extract on preservation of pompano (*Trachinotus ovatus*) during frozen storage

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[Objective]

The effects of rosemary extract (RE) with ice-glazing (IG) on the quality and protein characteristics change of frozen *Trachinotus ovatus* at -20°C for 5 months were evaluated.

[Method]

Physicochemical indicators (pH, total volatile basic nitrogen (TVB-N), thibabituric acid (TBA), texture profile analysis (TPA)), protein properties (total sulfhydryl and carbonyl content), low-field nuclear magnetic resonance (LF-NMR) and magnetic resonance images (MRI) were measured, respectively.

[Result]

The results showed that there was no significant difference *($P \geq 0.05$)* of pH values in all samples at the end of the storage. Besides, RE with IG could delay the increase of TVB-N and TBA value, especially the IG with 1.0 g/L RE treatment had the lowest value of them. Furthermore, the decrease of total sulfhydryl and carbonyl content in samples treated with IG could be deferred. Meanwhile, the samples in IG with 1.0 g/L RE treatment were most effectively retained during frozen storage.

[Conclusion]

Based on the above results, it could be obtained that the IG could protect the quality of the samples and reduce the degree of deterioration. In particular, the comprehensive effect of IG with 1.0 g/L RE was the best.

Keywords: *Trachinotus ovatus*; Glazing; Frozen storage; Quality; Protein characteristic

Characterization of gelatin from pink salmon (*Oncorhynchus gorbuscha*) skin

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[Objective]

In the United States, the production of pink salmon is approximately 200,000 tons in good harvest years, accounting for 60% of the total salmon production. Deep processing products of pink salmon include various peeled canned on frozen fillets and segments. The skins are usually discarded. The objective of this study is to improve the added value of fish processing and reduce the environmental pollution caused by improper disposal.

[Method]

The pink salmon skin (PSK) collagen was dissolved in 0.5 M acetic acid, and mixed with the loading buffer. The final collagen sample concentration was 1 mg/mL. Electrophoresis samples were prepared by boiling the mixed solution for 5 min. The running gel was 7.5%. After electrophoresis, the protein bands were stained with Coomassie brilliant blue G250.

The 6.67% (w/v) gelatin gel (frozen at -80 °C and sliced) with a thickness of 2-3 mm were fixed with 2.5% (v/v) glutaraldehyde in 0.2 M phosphate buffer (pH 7.2) for 1 h. The samples were rinsed with distilled water three times and dehydrated in ethanol with a serial concentration of 30%, 50%, 70%, 80%, 90%, and 100% (v/v). Dried samples were mounted on a bronze stub and sputter-coated with platinum þ palladium. The specimens were observed with a SEM at an acceleration voltage of 30 kV.

[Result]

The results showed that the PSK collagen was type I, and the T_d was approximately 16.0 °C. The foaming capability and stability of PSK gelatin were 48.6% and 32.1%, respectively. The melting point was approximately 20.7 °C, and the minimum solidification concentration was 2.4%. The pores of PSK gelatin were larger than freshwater fish gelatin, indicating that the structure is fragile and easy to collapse.

[Conclusion]

It can be concluded that gelatin from pink salmon skin has great potential in food processing applications.

Keywords: pink salmon, gelatin, characterization

Effect of Microwave Irradiation Nonuniformity on the Digestion and Allergenicity of the Glycated Ovalbumin

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[Objective]

The glycated OVA by microwave irradiation was digested by different methods (gastric digestion, intestinal digestion, and two-step digestion). Digestibility properties change of glycated OVA after digestion were evaluated in this work.

[Method]

Glycated products of OVA were obtained by microwave heating. Digestion characteristics, antioxidant activity and antigenicity of the products were studied in gastric, intestinal, and two-step digestion.

[Result]

The results showed that the samples were mainly digested in the stomach and they were hardly hydrolyzed by trypsin. Glycated OVA digested in stomach or in intestines produced more free amino groups than that by two-step digestion. Calcium ion chelating ability of glycated OVA was much higher than OVA when digested in stomach and intestines; glycated OVA had stronger ferrous ion chelating abilities by intestinal digestion. Glycated OVA after being digested hold the better antioxidant activity than the digested OVA, especially the Sample 3. IgG and IgE binding of all samples after intestinal digestion and two-step digestion were lower than that by gastric digestion. The IgG binding of glycated OVAs were lower than OVA, the result of the IgE binding was the opposite.

[Conclusion]

The results showed that microwave can unfold the structure of OVA and promote glycation. The OVA was digested more easily in gastric fluid than intestinal fluid. More calcium and ferrous ions attached to the glycated samples and the glycated samples had better antioxidant abilities. As for the allergenicity, glycation could reduce the IgG binding while increasing the IgE binding.

Keywords: ovalbumin, glycation, digestion, microwave

Influence of ultrasonic pretreatment on the allergenic potential and predominant peptide digestion products of β-lactoglobulin during digestion in-vitro

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[Objective]
The objective of this study was to employ the influence of ultrasonic pretreatment on the allergenic potential and predominant peptide digestion products (PPDPs) after in-vitro simulated gastrointestinal (GI) digestion of β-lactoglobulin (β-Lg).

[Method]
In this study, we utilized Gel filtration chromatography and high-performance liquid chromatography (HPLC) for digestibility. Additionally, the identity of PPDPs of the incubations was determined by mass spectrometry. Furthermore, the IgE binding activity was analyzed by ELISA with sera from patients with cow's milk allergy.

[Result]
The GI digest was fractionated into four fractions by Sephadex G-25 gel filtration column, and fractions were showed different allergenic potentials. The fraction with the lowest allergenicity was produced by ultrasonicated β-Lg after GI digestion, which depend on the proteolysis promoted by ultrasonic, which produces many small molecule peptides and reduces the IgE activity and basophil histamine release of the digested product. HPLC-MS/MS analysis showed that the PPDPs obtained before and after ultrasonic have similar peptide profiles.
[Conclusion]
Based on the above results, it can be concluded that ultrasonic pretreatment can promote the further hydrolysis of PPDPs, and thus have a smaller molecular weight than samples without ultrasonic. The purpose of this study is to better understand in GI digestion process of ultrasonicated β-Lg and to evaluate the role of this process in the production of low-allergen hydrolytic products.

Keywords: Ultrasonic, β-lactoglobulin, in vitro digestion, allergenic potential, predominant peptide digestion productsChemical modification of M13 bacteriophage as nanozyme container for dramatically enhanced sensitivity of colorimetric immunosensor

Microbial transglutaminase (MTGase) modified fish gelatin-γ-polyglutamic acid (γ-PGA): rheological behavior, gelling properties, and structure

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[Objective]

The objective of this study was to increase the gelling properties of γ-PGA-fish gelatin (γ-PGA-FG)further with MTGase because MTGase can cross-link gelatin and improve the degree of cross-linking in polymer matrices. We anticipated this paper could provide some useful information for the production of high-quality FG which can replace mammalian gelatin.

[Method]

In this study, we used γ-polyglutamate (γ-PGA) and microbial transglutaminase (MTGase) combined to modify FG to improve its gelling properties. The γ-PGA at 0.04% (w/v) and MTGase of different concentrations (0.02–0.08%, w/v) were used to modify FG, and the effects of complex modification on the gelling properties and structure of FG were studied. The structure of modified FG was characterized by FTIR, SEM, ect. A schematic model was also proposed to illustrate the complex modifications of FG by MTGase and γ-PGA.

[Result]

The complex modification of γ-PGA and MTGase could improve the functional properties of FG. The gel strength of FG gradually increased with increasing concentrations of MTGase—especially after the concentration reached 0.04%. The gel strength became higher than PSG. The complex modification of MTGase and γ-PGA also improved the gelation temperature, melting temperature and viscosity of FG. The FG had a higher viscosity value (η_{50}) when the concentration of MTGase was 0.08%. In addition, FTIR and scanning electron microscopy analysis showed that complex modification could enhance the gel network structure of FG.

[Conclusion]

Based on the above results, it can be concluded that the complex modification of MTGase and γ-PGA can improve the gelling properties of FG and is even higher than mammal gelatin in some indicators. We suggest that this study provides a promising strategy to promote the wider application of FG in various fields.

Keywords: fish gelatin; γ-polyglutamic acid; microbial transglutaminase; gelling properties; rheological behavior; structure

Effect of four types of thermal processing methods on the aroma profiles of *Tilapia* muscles using gas chromatography-ion mobility spectrometry

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[Objective]

It's generally accepted that volatile organic compounds (VOCs) significantly impact food aroma. The objective of this study is to analyze the effects of four types of thermal processing methods (microwaved, roasted, steamed, and boiled) on the aroma profiles of Tilapia muscles by gas chromatography-ion mobility spectrometry.

[Method]

Frozen tilapia fillets were natural thawed in the laboratory at room temperature. Then Tilapia muscle pieces with sizes of 2×2 cm were cut in the middle position of every whole Tilapia fillet and the pieces were adjusted to weights of 7.91 – 8.08 g each. Then the fish muscle pieces were microwaved, roasted, steamed, or boiled. The fish muscle piece was immediately cut into fragments with maximum lengths of less than 3 mm, was put in 20 mL headspace bottle, and the VOCs emitted from fish muscle fragments were analyzed by GC-IMS. Data analyses were performed using the commercial VOCal-0.1.1 software with four types of plugins from G.A.S.

[Result]

The results showed that there are four alcohols, eight aldehydes, three ketones, and one S-containing in raw muscles. Four types of thermal processing methods had obvious and different effects on the aroma profiles. Four VOCs (3-Pentanone, 2-Pentanone, 2-methylpropanal, and 2-Heptanone) significantly appear after roasting.

[Conclusion]

Based on the above results, it can be concluded that the appearance of ketones might be the main reason for the special and unique flavour of roasted muscles, which suggest roasting might be the best thermal processing method to increase the muscle flavour. No new VOCs significantly appear after other three types of thermal processing methods. This work can provide useful knowledges for understanding food flavour of aquatic products.

Keywords: thermal processing aroma profiles, gas chromatography-ion mobility spectrometry, Tilapia muscle

Effects of chitosan coating on quality and protein characteristics of large yellow croaker (*Pseudosciaena crocea*) during ice storage

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[Objective]

The effects of chitosan (CS) coating on quality and protein characteristics of large yellow croaker (*Pseudosciaena crocea*) during ice storage were studied.

[Method]

Fresh samples were washed, and then coated with 10 g/L and 20 g/L chitosan respectively. Samples treated with 1% acetic acid (AA) and sterile water (CK) were as control group. Physicochemical (total volatile basic nitrogen(TVB-N), thiobarbituric acid(TBA), texture profile analysis(TPA)), microbial (total viable counts(TVC) and *psychrophilic* bacteria counts (PBC)), protein characteristics (total sulfydryl(-SH), Ca^{2+}-ATPase content) indexes, which also combined with Fourier transformed infrared (FTIR) and Fluorescence spectrometer analysis, were used to evaluate the effects of CS on the quality and protein characteristics of large yellow croaker (*Pseudosciaena crocea*) during ice storage comprehensively.

[Result]

CS could effectively inhibit the endogenous enzyme activity and microbial growth of *Pseudosciaena crocea* during ice storage, maintain the better hardness value, which was consistent with the reduction degree of -SH and Ca^{2+}-ATPase. With the extension of storage time, the amide I band and amide II band in the protein structure of CK group were changed significantly, which indicated that α-helix might be transformed into β-fold or random coil. The samples coated with chitosan had better protective effects on the secondary structure of protein and hydrogen bonds, which could maintain its structure stability. The protective effect was positively correlated with the concentration of chitosan.

[Conclusion]

Chitosan treatment could effectively inhibit the activity of endogenous enzymes and microbial growth, which also protect the invariability and structural changes of proteins in large yellow croaker (*Pseudosciaena crocea*) during ice storage.

Keywords: Chitosan, Large yellow croaker, protein characteristics

Effects of different drying methods on the quality and nonvolatile taste compounds of Black Carp

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[Objective]

Drying is one of the commonly used preservation methods for aquatic products. Different drying methods will bring different qualities to the dried products. The objective of research is to explore the changes in quality and nonvolatile taste compounds of black carp during hot air drying and vacuum drying

[Method]

The black carp dorsal meat was chosen as the subject. Effects of moisture content, texture, color, microstructure, amino nitrogen content, ATP-related compounds, free amino acid, and Equivalent Umami Concentration changes of black carp during hot air and vacuum drying process were studied.

[Result]

Results showed that the b* and hardness increased with the drying time extended and vacuum drying could effectively delay it. Whiteness, amino nitrogen content, ATP-related compounds, free amino acids and Equivalent Umami Concentration increased at first and decreased when arriving at a certain time. Hot air drying changes more dramatically.

[Conclusion]

Based on the above results, it can be concluded that color and texture of vacuum drying are better than that of hot air drying and microstructure was less damaged. But hot air drying can obtain more umami substances.

Keywords: Black carp; drying method; microstructure; quality; taste

Comparison on the flavor substances and protein degradation of black carp (*Mylopharyngodon piceus*) pickled products during steaming

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[Objective]

It's generally accepted that among various cooking methods, steaming is favored by many because it can cause less damage to muscles' nutrient components, retain the inherent food flavor, and reduce the generation of harmful substances. Steaming conditions are closely related to fish flavor, fat, protein oxidation, and digestibility. The objective of this study is to investigate flavor changes of pickled black carps during steaming(4-14 min).

[Method]

In order to investigate the influence of different steaming times on the flavor changes of black carp pickled products, this study mainly used high-performance liquid chromatography (HPLC) and electronic tongue technology to analyze the nucleotides and free amino acids during steaming. The protein degradation was also discussed. The dorsal meat of black carp was put into a transparent pickling jar filled with brine (concentration 9%) so that the water surface of ultrasonic multi-frequency cleaning machine completely cover the liquid level in the pickle jar for 40 min. The water in an induction cooker stainless steel steamer was boiled Timing was started when the water temperature was 100℃. Each piece of fish (100±10 g) was steamed for 4, 6, 8, 10, 12, and 14 min respectively. The steamed fish cool at room temperature for testing.

[Result]

The results showed that the meat steamed within 8 min tasted better, showing high tastiness. The sensory assessment score increased significantly to the maximum value of 82.33 at 6 min. The content of umami and sweet amino acids increased significantly to the maximum value of 168.01 mg/100 g at 6 min. In the meantime, the IMP content was 191.28 mg/100 g, with its TAV reaching 7.65, which proved that IMP affected the taste most.And the total nitrogen content was 3077.23 mg N/100 g, which meant protein degraded a lot. Seeing from EUC and its TAV during steaming, the meat tasted best at 6-8 min. The longer the steaming time, the faster the protein degradation and the more the flavor precursors.

[Conclusion]

Based on the above results, it can be concluded that black carp is suggested to be steamed for 6-8 min.This conclusion provides a theoretical basis for its better taste quality.

Keywords:electronic tongue; free amino acids; nucleotides; protein degradation

Pectin combined with plant essential oils inhibit water migration, myofibril proteins degradation and muscle tissue enzyme activity of vacuum packaged large yellow croaker (*Pseudosciaena crocea*) during ice storage

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[Objective]

The effects of pectin combined with plant essential oils on water migration, myofibrillar proteins (MPs) and muscle tissue enzyme activity of vacuum packaged large yellow croaker (*Pseudosciaena crocea*) during ice storage at 4±1℃ were investigated.

[Method]

Two solutions of 2.5% (w/v) pectin combined with 0.4% (v/v) oregano essential oil (PO) and 0.4% (v/v) ginger essential oil (PG) were used for coating treatments. Water holding capacity (WHC), cooking loss, low-field nuclear magnetic resonance (LF-NMR) and magnetic resonance imaging (MRI) analysis, carbonyl content, total sulfhydryl content, intrinsic fluorescence intensity (FI) of myofibrillar protein and sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) were analyzed. Tissues characteristics, including α-Glucosidase (AG) and β-N-acetyl-glucosaminidase (NAG) activities were measured.

[Result]

The results showed that compared with the control group, LF-NMR and MRI results showed that PO and PG groups delay the transformation of mobilized water to free water and maintain better WHC during storage. PO and PG groups also had a significant protective effect on protein oxidation, such as the inhibition of carbonyl group and FI, prevention of endogenous enzyme activity, and a decrease in the sulfhydryl content.

[Conclusion]

Based on the above results, it can be concluded that PO and PG groups had the most optimal effect and could enhance the shelf life of large yellow croaker for another 7 days at least during ice storage.

Keywords: Large yellow croaker; Oregano essential oil; Ginger essential oil; Pectin; Vacuum packaging; Myofibrillar protein

Effect of different types of collagen peptides derived from shortbill spearfish (*Tetrapturus angustirostris*) on hyaluronidase inhibition activity

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[Objective]

Hyaluronidase (HAase) has been confirmed as an inflammation trigger. Although the HAase inhibition activity of several plants has been reported, the relative research of peptides is quite limited and there is no evidence on the collagen peptides isolated from fish. The objective of this research is to study the effect of collagen peptides obtained from fish skin and muscle on HAase inhibition activity.

[Method]

Type I and V collagen were salting out from crude pepsin-soluble collagen from skin and muscle of shortbill spearfish (*Tetrapturus angustirostris*) and then the collagen types were identified by SDS-PAGE. HAase inhibition peptides were obtained from type I and V collagens by enzyme mixture (collagenase: proteinase at 7:3). After determining of degree of hydrolysate and HAase inhibition rate, the peptides (10.5 mg/ml) were eluted with a linear gradient of acetonitrile (0–60%) containing 0.1% TFA at a flow rate of 1 ml/min by reversed-phase high-performance liquid chromatography (RP-HPLC) on a TSKgel ODS-80TM column.

[Result]

From the results of HAase inhibition rate, it was found that all the type I and V collagens and collagen peptides isolated from the skin and muscle possessed HAase inhibition activity. HAase inhibition rate of collagen peptides from the skin was higher than those from the muscle in both of type I and V. For all tissues, the type I collagen peptides showed higher HAase inhibition rate than type V and in collagen the result was the opposite. The HAase inhibition rate of type I collagen peptides from skin increased by 7.43 times than collagen. In addition, the fraction with the highest HAase inhibition rate were purified from both of type I and V collagen peptides of the skin by RP-HPLC.

[Conclusion]

It was concluded that the type I collagen peptides isolated from the skin of shortbill spearfish possessed higher HAase inhibition activity. On the other hand, since any peptides fractionated from type V collagen of the skin showed higher HAase inhibition rate compared with crude peptide mixture, it seemed that it is necessary to clarify the peptide composition. To investigate the relationship between peptides structure and HAase inhibition activity, analysis of purified peptide by Liquid chromatography-mass spectrometry (LCMS-ESI-MS) is now in progress.

Keywords: hyaluronidase-inhibition, collagen peptides, type I and V, fish skin

Effect of post-catch handling on freshness of farmed Cherry salmon (*Oncorhynchus masou*)

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[Objective]
Sustainable food production by aquaculture is desired in the face of earthquake affects, climate change and decline of fish catch. Salmon are cultivated all over the world, attracting a lot of attention. Local Cherry salmon are cultivated on land at the Sanriku Fisheries Research Center of Iwate University. With proper breeding management, fast growth rate, high safety, and good flavor of cherry salmon can be expected. In order to prolong the shelf life of this cherry salmon for raw consumption and to widen its distribution, freshness preservation technology through supply chain is required. In this study, the effects of post-catch handling on freshness were investigated.

[Method]
The farmed cherry salmon were killed with head impact (Head stunning, H) and destruction of the spinal cord by wire (Ikejime, I) after catch. And then those fish were prepared in fillets (F) and rounds (R), respectively. All the four groups (RH, RI, FH, FI) prepared by different pretreatment were transported to the laboratory in ice-filled styrofoam box (about 4-5 hours). The samples were obtained from the ordinal muscle on the head and back sides and stored at 4 ℃. ATP-related compounds and pH were measured at 0, 4 or 5, 24, 48 and 72 h after killing.

[Result]
The initial ATP content of four groups were 4.49 ± 3.36 μmol/g (RH), 8.44 ± 4.46 μmol/g (RI), 4.56 ± 0.25 μmol/g (FH), and 3.13 ± 0.70 μmol/g (FI) respectively, after killing process immediately. K value was significant difference ($p < 0.05$) between RH group and RI group in 0 hour. Whereafter, the ATP decreased with storage time went on in these four groups. After 4-5 h, the ATP of each group decreased to 0.80 ± 0.77 μmol/g, 0.20 ± 0.07 μmol/g, 0.12 ± 0.04 μmol/g and 0.09 ± 0.04 μmol /g, respectively. Meanwhile, IMP accumulated to 9.89 ± 1.76 μmol/g, 8.23 ± 1.58 μmol/g, 9.25 ± 0.62 μmol/g and 7.25 ± 1.39 μmol/g. After 72 h storage, the K value was 35.3 ±3.7% in RH group, 33.0±5.0% in RI group, 48.6±10.0% in FH group, and 50.3±11.5% in FI group, respectively. Round transport showed lower K value than fillet transport with significant difference ($p< 0.01$). The initial pH was 6.56 ± 0.05and 6.30±0.12 after immediately killing treatment and decreased to 6.48 ± 0.06 and 6.47 ± 0.10 for both round and fillet group on day 3.

[Conclusion]
From these results, it was clarified that the ATP in post-mortem cherry salmon decreased rapidly and IMP accumulated in 4-5 h. The increase of K-value for the round transportation group showed less than that of fillet one. Considering the supply chain from fish catch to consumption, it suggested that the round transportation might be better than fillet one. Moreover, the effect of transportation temperature should be further studied in detail.

Keyword
Cherry salmon, Head stunning, Ikejime, ATP, IMP, K value, pH, Supply chain

Changes in freshness of Ascidian *Halocynthia roretzi* under various storage conditions

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[Objective]

Ascidian (*Halocynthia roretzi*) is one of the major aquaculture species in the Sanriku region of Japan. It emits a distinctive odor and become increasingly bitter when the freshness decreases. Keeping fresh and improving shelf-life will promoting ascidian to be accepted by more people and consumption might increase. However, there is few information about changes in biochemical properties of refrigerated ascidians. Therefore, this research attempts to collect information about their freshness changes and search effective methods to maintain freshness.

[Method]

(1) Comparison of changes in freshness between shelled and peeled ascidians

The live shelled ascidians were stored in the refrigerator at 4°C within 4 hours after landing. The tunic and the pancreas were removed and stored at 4°C in peeled ascidians. The pH and ATP-related compounds were measured within 5 days.

(2)Sensory characteristics and ATP-related compounds of peeled ascidians

Similar to the experiment in (1), three storage conditions (control，packed directly without any treatment, packed with seawater, and with body fluid) were compared. The K value was calculated from the concentration of ATP-related compounds. A sensory evaluation was also conducted to determine the effectiveness of each freshness preservation method in terms of appearance and odor.

[Result]

In experiment 1, the initial pH value of shelled ascidian was approximately 6.7±0.31, then decreased to 5.7 ±0.07 on the 3rd day. The total amount of ATP-related compounds decreased from 3.7 μmol/g to 2.1 μmol/g in the shelled ascidian on day 3. In contrast, the initial pH of peeled ascidians was 6.6±0.08, and decreased to 6.3±0.07 on the 5th day. The total amount of ATP-related compounds was 6.0 μmol/g and remained unchanged. In experiment 2, decreasing in pH of three storage conditions on day 4 were from 6.5 to 6.3 (control), from 6.5 to 6.0 (with body fluid) and from 6.4 to 6.1 with seawater, respectively. The K value of body fluid storage group was 14% on day 5, which was higher than that of control (13%), but lower than that of seawater group (20%). The body fluid storage had the highest score of 15 points due to their less odor and blackening.

[Conclusion]

From the results of pH and ATP-related compounds, peeled ascidians are easier to keep fresh for a long time than shelled ascidians. Moreover, peeled ascidians have the best smell and color of muscles and gills during body fluids storage. However, it is difficult to determine the freshness of ascidians based on K values alone, and it is necessary to evaluate the freshness of ascidians comprehensively.

Keywords: ascidian, freshness, ATP, K value, pH, sensory evaluation