# 2015 MINI-SUMMIT AGENDA

*Food Safety, Policy and Sustainability*

National Taiwan Ocean University, Keelung, Taiwan, R.O.C.  
October 26-27, 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Page</th>
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<tbody>
<tr>
<td>18:30-21:00</td>
<td>Welcome Dinner <em>(TBA)</em></td>
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<tr>
<td>08:15</td>
<td>Meet in hotel lobby to travel to NTOU</td>
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<td>08:30-09:00</td>
<td><strong>REGISTRATION</strong> <em>(Exhibition Hall)</em></td>
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<td>09:00-09:40</td>
<td><strong>WELCOME ADDRESS &amp; OPENING COMMENTS</strong> <em>(2nd Auditorium Hall)</em></td>
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<td>Comments by:</td>
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<td>President Ching-Fong Chang (NTOU)</td>
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<td>Dean Joe Broder (UGA)</td>
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<td>Head Chang-Suo Yang (SAAS)</td>
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<td>Dean Yi-Fen Wang (SHOU)</td>
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<td>09:40-10:00</td>
<td><strong>Group photo</strong></td>
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<td>10:00-10:25</td>
<td><strong>FOOD SAFETY</strong> Chair: Yen-Con Hung (UGA)</td>
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<tr>
<td>10:00-10:25</td>
<td>Effects of Housing System for Laying Hens on Egg Safety and Quality–Chang-Suo Yang (SAAS)</td>
<td>1</td>
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<tr>
<td>10:25-10:50</td>
<td>The status and trends of egg quality and safety in Taiwan – Cheng-Ming Chang (NTOU)</td>
<td>2</td>
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<tr>
<td>10:50-11:10</td>
<td><strong>Break</strong></td>
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<td>11:10-11:35</td>
<td><strong>FOOD SAFETY (Cont’d)</strong> Chair: Chang-Suo Yang (SAAS)</td>
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<tr>
<td>11:10-11:35</td>
<td>Ensuring produce safety through non-thermal treatments – Yen-Con Hung (UGA)</td>
<td>3</td>
</tr>
<tr>
<td>11:35-12:00</td>
<td>Multilevel infrared spectral macro-fingerprints analysis for food quality evaluation and control– Chang-Xua Xu (SHOU)</td>
<td>4</td>
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<tr>
<td>12:00-12:25</td>
<td>Role of building and equipment materials on food safety - Don Conner (AU)</td>
<td>5</td>
</tr>
<tr>
<td>12:25-14:00</td>
<td>Luncheon, poster session (Presentation &amp; Evaluation)</td>
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<td>Time</td>
<td>Session</td>
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<tr>
<td>14:00-14:25</td>
<td>The educational role the US cooperative extension system plays in food safety</td>
<td>Jean Weese (AU)</td>
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<tr>
<td>14:25-14:50</td>
<td>Food safety modernization act and its implications for food product import to USA</td>
<td>Anand Mohan (UGA)</td>
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<tr>
<td>14:50-15:15</td>
<td>Dietary exposure risk estimates for the food preservatives benzoic acid and sorbic acid in the total diet of Taiwan</td>
<td>Min-Pei Ling (NTOU)</td>
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<td>15:15-</td>
<td>Sightseeing at Jiufen, Dinner (Invited only)</td>
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<td>08:30</td>
<td>Meet in hotel lobby to travel to NTOU</td>
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<td>09:00-09:25</td>
<td>Using magnetostrictive particle biosensor for rapid detection of foodborne pathogens</td>
<td>Tung-Shi Huang (AU)</td>
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<td>09:25-09:50</td>
<td>Immunoreactivity and allergenic modifications of shrimp <em>Penaeus vannamei</em> allergen tropomyosin induced by gastrointestinal digestion</td>
<td>Ying Lu (SHOU)</td>
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<td>09:50-10:10</td>
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<td>10:10-10:35</td>
<td>Radiofrequency heating for destruction of <em>Salmonella</em> in packaged powders</td>
<td>Fan-Bin Kong (UGA)</td>
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<tr>
<td>10:35-11:00</td>
<td>Mechanism studies on electrolyzed water for deactivation of microorganisms</td>
<td>Tai-Yuan Chen (NTou)</td>
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<td>11:00-11:20</td>
<td>Break</td>
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*FOOD SAFETY & POLICY*  
Chair: Cheng-Ming Chang (NTOU)

*CONCURRENT SESSION: Poster Committee Meeting*

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*Tuesday, October 27*

*FOOD BIOTECHNOLOGY*  
Chair: Yao-Wen Huang (UGA)

*CONCURRENT SESSION: Strategic Planning for Future Activities*

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<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Participants</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:20-11:45</td>
<td>Factors influencing consumer willingness to consume genetically modified soybean oil and rice in China</td>
<td>T-Ting-Gui Chen (SHOU)</td>
<td>13</td>
</tr>
<tr>
<td>11:45-12:10</td>
<td>Analysis of consumers’ food online purchasing cognitive and willingness to pay through micro platform –</td>
<td>Wei-Jun Liu (SHOU)</td>
<td>14</td>
</tr>
<tr>
<td>12:10-12:35</td>
<td>A conjoint analysis for pork: Consumers’ relative preferences for food safety labeling and traceability for Chinese Sausage in Taiwan</td>
<td>Man-Ser Jan (NTOU)</td>
<td>15</td>
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<td>12:35-14:00</td>
<td>Luncheon</td>
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<td><strong>ENVIRONMENT</strong></td>
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<td>14:00-14:25</td>
<td>A key and necessary technology to improve fertilizer use efficiency and reduce non-point source pollution from the cropland—New type fertilizer</td>
<td>Hai-Tao Zhu (SAAS)</td>
<td>16</td>
</tr>
<tr>
<td>14:25-14:50</td>
<td>Effect of dietary anti-nutrition factors on body health of cultured fish</td>
<td>Xiang-Jun Leng (SHOU)</td>
<td>17</td>
</tr>
<tr>
<td>14:50-15:15</td>
<td>Linking landscape complexity with ecosystem services in agricultural landscapes: opportunities for water and pest management services</td>
<td>Elizabeth Kramer (UGA)</td>
<td>18</td>
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<td>15:15-15:35</td>
<td>Break</td>
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<td><strong>TOXICOLOGY</strong></td>
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<td>15:35-16:00</td>
<td>Influence of <em>Grifola frondosa</em> polysaccharide on preventive effect of avian influenza inactivated vaccine</td>
<td>Chang-Yan Zhou (SAAS)</td>
<td>19</td>
</tr>
<tr>
<td>16:00-16:25</td>
<td>Research on the safety and edible quality of cultured fugu of China</td>
<td>Yuan Liu (SHOU)</td>
<td>20</td>
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<td>Time</td>
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<td>16:25-16:50</td>
<td>In vivo kinetics and metabolic study of Ochratoxin y, China - Zheng Han (SAAS)</td>
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<td>21</td>
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<td>Chair: Cheng-I Wei (UM)</td>
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<td>16:50-17:15</td>
<td>Auburn University Food Systems Institute - Pat Curtis (AU)</td>
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<td>17:15-17:40</td>
<td>Introduction of the Food Science and Technology Program at the University of Maryland College Park Qun Wang, Robert Jackson, Cheng-I Wei (UM)</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>17:40-18:10</td>
<td>Closing Remarks &amp; Poster Awarding Ceremony</td>
<td>Dean Joe Broder (UGA)</td>
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<td>Head Chang-Suo Yang (SAAS)</td>
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<td>Dean Cheng-I Wei (UM)</td>
<td>Dean Henry Fadamiro (AU)</td>
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<td>Vice President Guo-Jane Tsai (NTOU)</td>
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<td>18:10-18:10</td>
<td>Farewell Party</td>
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Effects of Housing System for Laying Hens on Egg Safety and Quality

Chang-Suo Yang

Shanghai Academy of Agricultural Sciences
National Poultry Engineering Technology Center

Salmonella Enteritidis contamination of eggs laid by infected hens is a significant public health problem. The infected laying hens can deposit small number of S. Enteritidis in both the yolk and albumen of developing eggs. Salmonella that reach the yolk (either by deposition or penetration from the albumen) can multiply to very dangerous levels at warm temperature. Alternative production systems are being introduced by the egg industry, but is not yet a clear understanding of the food safety and product quality consequences of these systems to conventional egg production. This research demonstrated that preventing Salmonella infection in laying flocks and prompt egg refrigeration are essential risk reduction practices to prevent egg-borne transmission of illness to consumers.

Keywords: Laying hen; Egg safety; Salmonella Enteritidis; Housing System
The status and trends of egg quality and safety in Taiwan

Cheng-Ming Chang

Department of Food Science, National Taiwan Ocean University, No. 2, Pei-Ning Road, Keelung 202, Taiwan, R. O. C

Updated this June, there were 24.9 million laying hens raised in this 23.5 million populated island, from which more than 18 million eggs per day were produced. Among those near 1500 commercial egg farms, 24% had more than 30,000 hens/farm, while 10% had less than 10,000. For over half century, egg price in Taiwan is set daily by an egg pricing committee composed of representatives both from egg farmer and distributors reflecting a balance among supply and demand. Since feed grains are mostly imported, feed usually accounts for 78-83% of the total cost. Three type of certificates are sponsored by Council of Agriculture (COA) for promoting high quality egg products: CAS (Certificated Agricultural Standard), 26 certified farms account for 4% of total egg production; TGAP (Taiwan Good Agricultural Practice), only 4 farms are certified; and Organic egg, 2 farms are certified. In terms of processing type, majority of the egg (63%) is unwashed and distributed in plastic basket throughout the traditional market in Taiwan. On the other hand, 29% of the egg is washed, graded and packed in egg trays for distribution. Lastly, only 8% is broken in egg breaking facilities and either pasteurized or un-pasteurized, then distributed under refrigerated condition. Egg, as one of the potentially hazardous food providing essential and affordable daily nutrients, is among the top of the list to be announced for mandatory HACCP regulation in Taiwan.

Keywords: Taiwan egg industry, certificate, HACCP
Ensuring Produce Safety Through Non-thermal Treatments

Yen-Con Hung

Department of Food Science and Technology
Food Product Innovation & Commercialization Center
The University of Georgia, Griffin, GA 30223, USA

Fresh fruit and vegetable consumption has been increasing significantly over recent years due to the various nutritional and health benefits that have been demonstrated from their consumption. This trend however has coincided with an increasing number of foodborne illnesses and outbreaks in the United States as well as internationally leading to the need to develop means of tackling this worrying problem which can have detrimental effects on the health of consumers. Electrolyzed (EO) water, a modern antimicrobial treatment used in the fields of agriculture, dentistry, medicine and the food industry can be used as an effective sanitizer for fresh produce. EO water (acidic or near-neutral pH EO water) has been shown to be lethal to many foodborne pathogens including Salmonella and E. coli 0157:H7 found on lettuce, tomatoes, lemons and cabbage leaves as well as other produce items. This presentation will give an overview on EO water and other non-thermal technologies to help ensure the safety of fresh produce. In addition, current research on incorporation of physical treatments in addition of non-thermal washing technologies will be discussed. The optimal goal of this research is to achieve at least 4 log reductions of foodborne pathogens on treated produce.
Multilevel infrared spectral macro-fingerprints analysis for food quality evaluation and control

Xu C. H.¹,², Wang X. C.¹ and Sun S. Q.²

¹ College of Food Science and Technology, Shanghai Ocean University, 201306, PR China
² Tsinghua University, PR China

Analysis on food products with extreme complexity are great challenges to scientists. It usually requires demanding analytical methods and high costs to obtain complete information concerning every component. On the other hand, target compounds cannot be extracted completely when separation methods are inappropriate and impurity substances may exist in mixture samples.

Based on our research in analyzing complicated food samples by infrared spectroscopy (IR) in the past decade, we developed a methodology, ‘multilevel infrared spectral macro-fingerprints analysis’ (Fig.1, summarized as the following ‘3 methods and 9 approaches’), which is applicable to guide the application of infrared spectroscopy in complicated food analysis. This methodology is inherent with a versatile label-free analytical technique—IR— with fingerprint-like features making it not only be suitable to profile the whole food sample but also be able to detect specific components. With the help of computers and chemometrics, both qualitative and quantitative information, can be acquired. Spatial and temporal scales of food samples studied by IR can vary in a wide range. Moreover, diverse sampling techniques ensure infrared spectra of food samples in any forms can be measured simply, quickly and non-destructively. Therefore, food quality evaluation and control could be readily implemented from farm to table by employing the developed methodology.

Keywords: Infrared spectroscopy; Macro-fingerprint; Food; Quality evaluation; Quality control
Role of Building and Equipment Materials on Food Safety

D. E. Conner

Department of Poultry Science, Auburn University, Auburn, Alabama 36849 USA

Bacteria, including foodborne pathogens, can attach to equipment and structural surfaces in the food processing facility; therefore, these surfaces can be sources of bacterial contamination of food products during processing. With increased focus on food safety there is also an increased emphasis on sanitary design of equipment and facilities, particularly in regards to decreasing or preventing bacterial attachment. The phenomenon of bacterial attachment to surfaces is complex and not fully understood. It is known that many factors including physiological state of bacterial cells and the physiochemical properties of the surfaces affect initial attachment. In regards to the influence of surface properties, recent research has focused on the impact of materials commonly used in food processing equipment and facilities on establishment and persistence of foodborne pathogens on and in food contact (equipment) and noncontact (structural) surfaces. Other recent research has explored novel treatments of food contact materials to decrease initial bacterial attachment. A review of these recent data is warranted. Listeriaspp and other bacteria attach to stainless steel and other materials; however, the surface finish and topography of the surface affect the ability of bacteriato initially attach to food-grade materials. Welding of stainless steel surfaces with subsequent polishing to return the surface to its original smoothness does not enhance attachment of L. monocytogenes; however, unpolished welded stainless steel easily corrodes, which promotes attachment of bacteria. In addition to equipment surfaces, noncontact surfaces (walls, floors, ceilings) can serve as sources of chronic bacterial contamination in food processing. Concrete, widely used as in processing environments, may be permeated with bacteriadia to its microporous structure. Newly developed concrete sealants enable control of Listeria spp. and Salmonella spp. when combined with good sanitation procedures. Recent research provides valuable information that food processors, equipment manufacturers and facility designers may use to enhance control of bacterial contaminants.
The Educational Role the US Cooperative Extension System Plays in Food Safety

Jean Weese, Ph.D.

Department of Poultry Science, Auburn University, Auburn, Alabama 36849 USA

Prior to the mid-1800's in the United States, there were no public universities; only private institutions, and tuition was often too expensive for the average family. In 1862 President Abraham Lincoln signed into law the Morrill Act, which gave 10,000 acres of Federal government land to each state to sell and use the proceeds to create a public university to teach agriculture and the mechanic (engineering) arts. With the implementation of the Hatch Act in 1881, each state also was authorized to create an Agricultural Experiment Station with the purpose to do agricultural research. In 1917, the Smith-Lever Act established the Cooperative Extension Service nationally with each state extension service administrated through the state's land grant university. There is also a local county Extension office serving all 4,000 counties in the United States. The purpose of Extension is to "disseminate useful and practical information" to the public. Thus, the land grant system encompasses three major missions: objective or unbiased research (done by the Experiment Stations), non-formal education and information dissemination (carried out by the Extension Services), and classroom or college instruction (taught at each land grant campus).

Through the extension system is state in the US delivers food safety programs following research based information developed by the researchers at all the research institutions in the US. In Alabama we follow this model by taking food safety information to every individual. Whether it is the mother dealing with food safety issues in feeding her family to the food entrepreneur starting a food business. In Alabama we have a food safety and Quality Team that teaches a wide range of food safety classes which include: Good Agricultural Practices (GAP) principles to the farmer, offer a food safety certification class to food service workers, home food preservation classes to those who raise their own foods, HACCP concepts for red meat producers as well as seafood processors, and last but not least we teach food safety concepts to the general public on the importance of food safety principles.
Food Safety Modernization Act and its Implications for Food Product Import to USA

Anand Mohan

Department of Food Science & Technology, University of Georgia, Athens, GA 30602

Food Safety Modernization Act (FSMA) brings significant changes to food safety landscape, especially in the area of imported foods and ingredients. About 48 million people (1 in 6 Americans) get sick, 128,000 are hospitalized, and 3,000 die each year from foodborne diseases, according to recent data from the Centers for Disease Control and Prevention. This is a significant public health burden that is largely preventable. FSMA provides US Food and Drug Administration (FDA) to better protect public health by strengthening the food safety system including certain imported foods to meet the same safety standards as foods produced in the U.S. Building a prevention-based food safety system require food companies to implement preventive controls and develop control systems to control risk using validated systems, and document that those controls are working and maintain the records showing that the controls are working. One of the most anticipated sections of FSMA for all food manufacturers – whether inside or outside the United States – relates to the new requirement that all facilities that manufacture, process, pack, or hold food products have documented preventive control programs in place. The preventive control requirements will go above and beyond a typical Hazard Analysis and Critical Control Point plan, and will include requirements related to recall plans, sanitation, employee hygiene training, environmental monitoring, allergen control program, current good manufacturing practices, supplier approval and verification activities, corrective actions, and records. With implementation of FSMA, the burden of imported food safety is moved onto importers making them accountable for the safety of food products and ingredients they import into the U.S. Importers will now need to assess and perform risk-based foreign supplier verifications to ensure that food entering the U.S. has been produced by employing prevention-based food safety control systems unless the food is already required to be manufactured using HACCP-based preventative controls (seafood, juice, low acid canned products). Under the provisions FSMA, importers of foods and ingredients to the United States will be held responsible for ensuring that the products they handle, manufacture, process, pack or hold are safe. Thus, supply chain visibility will be crucial for compliance.
Dietary Exposure Risk Estimates for the Food Preservatives Benzoic Acid and Sorbic Acid in the Total Diet of Taiwan

Min-Pei Ling

Department of Food Science, National Taiwan Ocean University, No. 2, Pei-Ning Road, Keelung 202, Taiwan, R. O. C.

This is the first study on exposure to food preservatives and its associated health risk in the diet of Taiwan. The purpose was to assess the health risk to general consumers in Taiwan associated with dietary intake of benzoic acid and sorbic acid by conducting a total diet study (TDS). The study dealt with a list of 128 food items, representing 83% of the total daily diet by weight. The hazard index (HI) in %ADI of benzoic acid and of sorbic acid for two exposure groups (high-intake consumers and general population) were calculated. In high-intake consumers, the HI of benzoic acid was 41% ADI for males aged over 3 years old at the 95th percentile, whereas for females, the HI was 48%ADI. The HI of sorbic acid for male and female consumers aged over 3 years old at the 95th percentile were 11%ADI and 9%ADI, respectively. The HI of both benzoic acid and sorbic acid were below the safe upper limit of 100% ADI. These results indicate that the use of benzoic acid and sorbic acid as preservatives at the current level of use in the Taiwanese diet does not constitute a public health and safety concern.
Using Magnetostrictive Particle Biosensor for Rapid Detection of Foodborne Pathogens

Tung-Shi Huang

Department of Poultry Science, Auburn University, Auburn, Alabama 36849 USA

Food safety and security are topics of worldwide public concern because of numerous widespread outbreaks of foodborne disease threatening public health. The contamination of food products by pathogenic bacteria also results in huge product recalls that result in great cost to the food industry. The US Centers for Disease Control and Prevention (CDC) estimated that around 48 million people get sick, 128,000 hospitalized, and 3,000 die from foodborne diseases each year. Scharff(2012) estimated that the total annual economic cost is around 51 billion dollars including medical expenditures and productivity loss in the US. Therefore, technologies and devices that can detect foodborne pathogens in situ or in real-time, would be an important step forward in reducing foodborne illnesses. Biosensors are considered the most promising technology for the rapid or real-time detection of foodborne bacteria. Among various types of biosensors, the acoustic-based sensors are more suitable for the microbial detection. Recently, magnetostrictive strips/particles have been used to develop high-performance biosensors. Magnetostrictive-based biosensors are very inexpensive and wireless, so they are suitable for in-situ detection with high sensitivity and specificity. A magnetoelastic (ME) biosensor has been developed by the Auburn University Detection and Food Safety Center, which has shown promising performance in foodborne pathogen detection. The limit of detection is around 100 CFU/mL for Salmonella in a liquid sample with sensor size of 100 μm x 25μm x 4μm. This sensor has also been tested on the surface of tomatoes for Salmonella detection and the detection limit is 500 CFU/mm². The results of a longevity test show that they are effective for 63 days and 5 days, respectively, by using phage and antibody as the sensing elements at 65°C. The detected bacteria on the biosensor can be confirmed directly by qPCR test.
Immunoreactivity and allergenic modifications of shrimp (*Penaeus vannamei*) allergen tropomyosin induced by gastrointestinal digestion

Ying Lu1, Yongyan Gao1, Yaowen Huang2, Hong Zhang3, Hideki Ushio3

1. College of Food Science and Technology, Shanghai Engineering Research Center of Aquatic-Product Processing & Preservation, Shanghai Ocean University, No. 999, Huchenghuan Road, Shanghai 201306, P. R. China
2. Department of Food Science and Technology, University of Georgia, Athens, GA 30602, USA
3. Department of Aquatic Bioscience, Graduate School of Agricultural and Life Sciences, The University of Tokyo, Bunkyo-ku, Tokyo 1138657, Japan

Shrimp allergy is a common cause of allergic reaction worldwide. Muscle protein tropomyosin (TM) is the major allergen identified in shrimp. Most food allergen sensitization may occur via the gastrointestinal tract. However, the stability and allergenicity variation of TM to simulated gastrointestinal fluid (SGIF) are not well known. Herein, the immunological activity and allergenic modifications of TM in cooked shrimp muscle were investigated. ELISA data showed that braise in soy sauce is more effective to reduce the immunological activity of TM, and makes it easier to be decomposed during SGIF. The loss of immunological activity and allergenicity occurs mainly in the gastric and intestinal digestion phases. Also, digestive tablet might be helpful to decrease the immunological activity of allergen TM. Although gastrointestinal digestion could reduce the reactivity of IgG/IgE-binding of TM, however, its structure-function relationship is not clear. Further study is necessary to explore the molecular mechanism of allergenicity variation.

**Keywords:** Seafood allergen; Immunoassay; Reduction; Allergenicity
Dielectric Properties of Dried Vegetable Powders and their Temperature Profile during Radio Frequency Heating

Fan-Bin Kong, Samet Ozturk

Department of Food Science and Technology, University of Georgia, Athens, GA, USA

Recently, a number of outbreaks of salmonellosis occurred in low moisture foods including dried vegetable powder. As a volumetric heating, Radio Frequency (RF) heating offers the possibility to pasteurize dried foods in short time thus improving quality of final product. The objective of this study was to investigate the dielectric properties of selected vegetables powders, including broccoli, chili and onion powder, tapioca flour, and potato starch, and determine the temperature increase profile during RF heating. Dielectric properties of the samples were determined using a precision LCR meter and liquid test fixture. Different factors including RF frequency (ranging from 1 to 30 MHz), moisture content (6.9-14.9%, w.b.), temperature (from 20 to 80°C), and compaction density (0.14 to 0.88 g/ml) were studied for their influence on dielectric constant ($\varepsilon'$) and loss factor ($\varepsilon''$). To determine the RF heating rate, the samples were placed in a small plastic bottle (height of 4.8 cm × diameter of 2.9 cm), and heated in a 27.12-MHz, 6-kW RF oven until the temperature at the center of the container reached 80°C. The results showed that both $\varepsilon'$ and $\varepsilon''$ of vegetable powders increased with increasing moisture content and temperature, but decreased with increasing frequency. Additionally, dielectric properties of samples increased with compaction density to a peak, then decreased. The relationship between moisture content, temperature and dielectric properties of broccoli powder were described by quadratic models with high correlation coefficients ($R^2 > 0.96$). The RF heating rate for different samples ranged from 0.41 to 2.12 °C s⁻¹, and increased linearly with dielectric loss factor and moisture content. The information provided in this study is useful to develop an effective RF heating protocol to pasteurize dried vegetable powders.
Mechanism studies on electrolyzed water for deactivation of microorganisms

Tai-Yuan Chen

Department of Food Science, National Taiwan Ocean University,
No. 2, Pei-Ning Road, Keelung 202, Taiwan, R. O. C.

Electrolyzed water could be categorized into three species including strong acidic (AEW), slightly acidic (SlAEW), slightly basic (SBEW) electrolyzed water according to their pH, oxidation reduction potential (ORP) and available chlorine concentrations (ACC). The ACC is the predominant contributor to the antimicrobial activity. AEW demonstrates the greatest inhibitory effects on several bacterial species among the three electrolyzed waters. Gram-negative bacteria were more vulnerable to electrolyzed water than Gram-positive species. Regarding to bactericidal mechanism, Gram-positive bacteria seems to encounter higher oxidative stress while Gram-negative bacteria cell membrane are highly susceptible to injury by SBEW. The inhibitory effects of SlAEW and AEW solutions against V. parahaemolyticus may be attributed to the changes in cell membrane permeability, protein synthesis activity, and energy metabolism such as glycolysis and ATP replenishment, by differential proteomic approach.

**Keywords:** Slightly acidic electrolyzed water; acidic electrolyzed water; slightly basic electrolyzed water; bacterial deactivation
Factors Influencing Consumer Willingness to Consume Genetically Modified Soybean Oil and Rice in China

Ting-Gui Chen, Miao-Miao Chen

College of Economics and Management, Shanghai Ocean University, Shanghai, 201306, China

The objective of this paper is to study the factors influencing consumer willingness to consume (hereafter, WTC) the genetically modified (hereafter, GM) foods in the case of the GM soybean oil and the insect-resistant GM rice. The seemingly unrelated regression model was adopted and consumers in Shanghai city were surveyed.

The results show that consumer WTC GM soybean oil and GM rice is influenced by some factors that cannot be observed, however the observable factors make an obvious difference. The positive information has positive impact on consumers’ WTC the GM soybean oil. The negative information predominates when the positive and negative information are simultaneously presented. The consumers’ inherent awareness and safety evaluation of GM soybean oil has a significantly positive impact on the WTC. The impact of the negative publicity and consumers’ attitude to compulsory labeling system is negative. Other factors significantly affect the WTC: gender, kid, professional status, income, reading of label information, evaluation of government regulation and purchasing frequency.

Keywords: Genetically modified soybean oil; Genetically Modified rice; Information; Seemingly unrelated regression; Willingness to consume
Analysis of Consumers’ Food Online Purchasing Cognitive and Willingness to Pay Through Micro Platform

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Weibo, WeChat has become an important platform of acquisition, transmission, and share information. Developing marketing strategy through micro platform has become the focus of the Internet marketing. This paper through the questionnaire survey analysis under the different consumers on micro platform for food shopping cognitive and behavioral tendency. By consumers on the degree of familiar network at the same time, the use of micro platform, online food purchase behavior, etc., under the comprehensive analysis of micro platform consumer willingness to pay (WTP) food online, and the development of network marketing micro platform are proposed.

Keywords: Micro platform; Food online purchasing; Cognitive; Willingness to pay
A Conjoint Analysis for Pork: Consumers’ relative preferences for food safety labeling and traceability for Chinese Sausage in Taiwan

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We use data collected from a consumer survey of face-to-face interview to determine consumer demand for attributes of Chinese pork sausage in Taiwan. Conjoint analysis was employed to elicit consumers’ preferences for various attributes of Chinese pork sausage such as brand name, price and certified label of food safety. The multinomial logit model was then estimated to identify groups of respondents with similar preferences based on the individual implicit weights (part worth, or marginal utility) of the three attributes of sausage obtained from the conjoint analysis.

Results revealed that certified labeling of food safety was the most important attribute in terms of its influence on consumers’ preferences, followed by brand, and then price. Among three levels of certified labeling, there is no significant difference between sausage only with CAS labeling and CAS with traceability, without any certification had the significantly lowest utility value. Results suggest that respondents who are female, married, have higher incomes, higher risk perceptions regarding meat products and has a high frequency to purchase sausage are the potential buyers of safety certified Chinese sausage.

Keywords: food safety labeling, market segments, conjoint analysis, pork
A Key and Necessary Technology to Improve Fertilizer use Efficiency and Reduce Non-point Source Pollution from the Cropland—New Type Fertilizer

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According to the characteristics and technical requirements of low-carbon agriculture. Coated urea was made by solid-liquid reaction technology using the nonmetal minerals as coated film material. The slowed release fertilizer (SRF) was mixed with coated urea, phosphate and potassium fertilizer in accordance to the principle of balance fertilization. The effects of different amount of SRF on rice till dynamic development, yield, N-absorption and greenhouse gas emission were studied. Results showed that the SRF possessed balancing and slow releasing nutrients, the number of productive tillers, grains per panicle and 1000-grain weight improved a lot, and the grain setting rate rose markedly. Comparing with the normal fertilization, T1 (the same amount of nitrogen treatment) rice yield increased 7.06%, T2 (the same input cost of fertilizer treatment) rice yield increased 0.66%. The SRF reduced nitrogen application rates by 20% under the same input cost of fertilizer treatment. The nitrogen use percent of SRF increased by 8.16% compared to the normal fertilization. The CH4 emission of SRF decreased by 40-52%.
Antinutritional factor refers to endogenous substances in feedstuffs that produce negative effects on health and nutrient balance when ingested by animals. Soybean meal (SM), rape seed meal (RSM) and cotton seed meal (CSM) are the important plant protein sources commonly used in fish feed. Antinutritional factors in these feedstuffs include proteinase inhibitors, phytic acid, glucosinolates, and free gossypol (FG), et al. Negative effects from these antinutritinal factors might include disturbance of digestive process and growth, decreased feed efficiency, pancreatic hypertrophy, liver dysfunction and immune suppression. The safe inclusion of feedstuffs and inactivation of antinutritinal factors are commonly concerned in fish feed. In our study, dietary CSM higher than 36% damaged growth performance and hematology of common carp, and high levels of dietary CSM (54% CSM) slightly impaired the liver and decrease the number of sperm cells. High inclusion of rapeseed meal or cottonseed meal in diet would reduce growth performance and increase serum ALT and AST activity of crucian carp, and the proper ratio of RSM to CSM was 3:2 for the growth of crucian carp, when both RSM and CSM were included in feed.

Keywords: Antinutritional factor; Rape seed meal; Cotton seed meal; Fish; Growth
Linking Landscape Complexity with Ecosystem Services in Agricultural Landscapes: Opportunities for Water and Pest Management Services

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Agricultural landscapes are highly dynamic and changes occur at multiple temporal and spatial scales. Very few studies address these dynamics and almost none explore temporal changes with respect to supporting ecosystem functions and ecosystem services. In a recent review paper, Bommarco et al (2007), laid out a case for ecological intensification to parallel agricultural intensification, in order to reduce environmental degradation caused by agricultural practices. This will require a better understanding of the role that agricultural landscapes play in providing ecosystem services. In the area of pest control, an increasing number of studies have recognized that the complexity of these landscapes is important for supporting pest control, yet there often is a lack of conclusive results, which can potentially be attributed to a lack of a consistent measure of landscape complexity which takes into account both the spatial and temporal patterns of these landscapes. In water resource management land managers often focus on the restoration of internal structural measures of biological response rather than responding to these overwhelming landscape-scale human influences. In practice, the identification of restoration sites is often most strongly influenced by the happenstance availability of parcels, and is made absent any framework that considers the potential for restoring ecological function. This presentation will provide examples of integrating larger temporal and spatial scale approaches to achieve better results in providing targeted ecosystem services. One project address siting of wetland restoration activities to improve ecosystem function in watersheds and the second investigates the temporal dimensions of agricultural dynamics in providing connectivity of resources to support pest suppressive landscapes.
Influence of *Grifola frondosa* Polysaccharide on Preventive Effect of Avian Influenza Inactivated Vaccine

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Clean Beijing yellow chickens where divided into groups and raised with the feeds containing different percentages of *Grifola frondosa* polysaccharide; they were inoculated with avian influenza virus H5N1 inactivated vaccine respectively at ages of 10, 25 and 40 days, and their sera’s AIV-H5 Ab levels, macrophages and T cell subpopulations (CD3+/CD4+/CD8+) were determined on the next day after inoculation; and the different groups’ feed consumptions, body weight gains and production performances were analyzed. The results indicated that the *G. frondosa* components could raise the AIV-H5 Ab level, enhance the macrophages activity, increase the T cell subpopulations, improve the production performance, and in short, promote the preventive effect of AIV-H5N1 Inactivated Vaccine.

**Keywords:** *Grifola frondosa* polysaccharide; Beijing yellow chicken; Avian influenza virus; AIV-H5N1; Inactivated vaccine; Preventive effect
Research on the Safety And Edible Quality of Cultured Fugu of China

Yuan Liu, Jian Cong, Ning-Ping Tao, Ying Lu, Xi-Chang Wang

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Cultured Fugu have distinctive aroma and desirable taste, and there have been saids that “Has been eating Fugu, nothing is fresh” and “Desperate to eat Fugu”. There is a long history of eating Fugu in Southeast Asia. In recent years, with the success of artificial breeding technology, Fugu are becoming more and more popular among domestic and foreign consumers mainly due to their non-toxicity, distinctive aroma, desirable taste, abundant collagen and high nutritional value. People have more and more high voices to open up Fugu market in China. The economic value of Fugu is becoming increasingly prominent. To provide the scientific proof that the farmed Fugu is safe and could be controlled, and show its nutritional character. We used ELISA as a preliminary method to detect the content of tetrodotoxin(TTX) in different tissues and ages of farmed Fugu obscurus, which the samples were obtained from Jiangsu Zhong yang Co.Ltd, shanghai Qingpu Nengzheng Fishery Technical Company and Shanghai Wusi Farm. The results indicated that all samples we have detected showing no toxicity, and the contents of TTX all are below 100ng/g. The nutritional composition of muscles from three farmed pufferfish species, Fugu obscurus, Fugu flavidus and Fugu rubripes, was investigated. All three species had high crude protein contents ranging between 17.8 g/100 g and 18.9 g/100 g (with the highest for F. rubripes), and low crude fat contents, 0.73 g/100 g to 0.83 g/100 g for adults, and 0.21 g/100 g to 0.29 g/100 g for juveniles. Significant differences (P < 0.05) in macroelement contents and no significant differences (P > 0.05) in microelement contents were found among the three species. It was found that K was the most abundant macroelement, ranging from 287 mg/100 g to 402 mg/100 g, while Fe was the most abundant microelement, 1.52 mg/100 g to 2.11 mg/100 g. Total amino acid (TAA) contents of three species were between 51.7 g/100 g and 62.9 g/100 g dry weight. The ratios of total essential amino acids to TAA were between 0.43 and 0.50, and F. flavidus had the highest ratio. The ratios of total umami amino acids to TAA were between 0.36 and 0.45, with the highest for F. rubripes. In eight amino acid scores (AAS), six AAS of three adult pufferfish were close to 1.00, but two AAS of valine and sum of phenylalanine and tyrosine of juveniles were close to 1.00. This study shows that the three pufferfish species under investigation have high nutritional qualities and are good protein resources.

Keywords: Cultured Fugu; TTX; Safety; Nutrition
**In vivo Kinetics and Metabolic Study of Ochratoxin A in Rat**

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Ochratoxin A (OTA) is a secondary metabolite produced by several species of fungi, notably *A. ochraceus*, *A. melleus*, *A. alliaceus*, *A. petrakii*, *A. ostianus*, *A. sclerotiorum*, *A. sulphureus*, *A. auricomus* and *A. albertenses*, as well as *Penicillium verrucosum*. It is related to both urothelial urinary tract tumors and Balkan endemic nephropathy and is one of the most frequent metabolites present in contaminated food and feedstuff. IARC has classified OTA in group 2B as a possible carcinogenic compound to humans. In order to reveal the toxicological mechanism, the *in vivo* kinetics in rat including the absorption and distribution were thoroughly investigated. The results of the kinetics study indicated that OTA could reach a maximum value within 5 h due to its fast absorption, and then was slowly eliminated in plasma with a half-life time (t1/2) about 75.6 h. The highest accumulation level was observed in lung, followed by liver, heat and kidney. Since the slow degradation and high accumulation effects were observed, the *in vitro* and *in vivo* metabolic studies of OTA were further performed. Different analytical approaches including UHPLC-MS/MS, UHPLC-Orbitrap-HRMS, HPLC-TOF-MS and LC-ion-trap were applied as combined strategies to investigate the metabolic profile of OTA. The *in vitro* tests on rat liver microsomes indicated that via glucuronidation, three different OTA glucuronide conjugates, which corresponded to OTA amino-glucuronide, OTA phenol-glucuronide and OTA acyl-glucuronide were clearly identified for the first time. The suggested structures were supported by the fragments observed in the mass spectrometers and by hydrolysis with β-glucuronidase. OTA methyl ester, OTα and OTα-glucuronide were formed in the same reaction mixture. The *in vivo* metabolic study was performed by oral administration of OTA solution into rats. Two possible metabolic pathways of OTA in kidney were proposed: firstly, OTA might be dechlorinated to transform to ochratoxin B, and then, a hydrolysis reaction could occur and OTB was conversed to OTβ and phenylalanine. The site of the hydrolysis was tentatively supposed to be N-C9. On the other side, OTA also might be directly metabolized to OTβ and phenylalanine in kidney. The achieved data as direct evidence would substantially promote the interpretation of toxicological findings in animals and humans.
As a land-grant institution, Auburn University has a long history of doing practical research and communicating the results of that research to the public. Auburn’s strengths have long included disciplines that are part of a “food system,” but what is a food system? Briefly, a food system encompasses every aspect of the complicated, interrelated system necessary to feed a population. That includes growing, harvesting, processing, packaging, transporting, marketing, consumption and disposal of food and food-related items. The Auburn University Food System Institute (AUFSI) brings those strengths together in an interdisciplinary, cross-departmental venture to contribute locally, regionally, nationally and globally to the safety and quality of the U.S. food supply and the viability of different parts of the food system. We like to talk about food from “farm to fork” or “pond to plate,” but a food system also includes social, political, economic and environmental contexts that affect the food supply. What do people like to eat? What should they be eating? How should food be delivered and stored? How can “food entrepreneurship” be encouraged? Many of the “bright ideas” that we think characterize AUFSI come out of our “working groups,” which are targeted research and education groups consisting of AUFSI core faculty, other Auburn faculty members who have an interest in the subject and sometimes faculty from other universities as well as representatives from government and industry. AUFSI assists the working groups with grant writing and management and in many cases taking research results into real-world applications. One application for research results is education and training, and now AUFSI is an International Association for Continuing Education and Training (IACET) accredited provider. AUFSI brings together experts from a variety of food-related disciplines to create cutting-edge training experiences. In addition to a number of face-to-face training programs, AUFSI offers a number of online on-demand training courses. Through the development of these courses, AUFSI has been able to create a number of eBooks that serve as excellent reference books. Our e-books are available for both Apple and Android devices.
Introduction of the Food Science and Technology Programs at the University of Maryland College Park

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University of Maryland is a land grant and sea grant university conducting teaching, research and extension functions. The College of Agriculture and Natural Resources has six departments: Agricultural and Resource Economics, Animal and Avian Sciences, Environmental Science and Technology, Nutrition and Food Science, Plant Science and Landscape Architecture, and Veterinary Medicine; an Institute of Applied Agriculture that delivers two-year programs; and a multi-college program of Environmental Science and Policy. The Department of Nutrition and Food Science has 14 professors (7 food science and 7 in nutritional sciences), 300 undergraduate (7 of whom are 2+2 Chinese student) and 65 graduate students. The nutrition faculty represent areas from basic lab-based sciences to population based epidemiology, dietetics, and international nutrition. The food science faculty study: a) design, characterization, and evaluation of biological polymers in food; developing micro- and nano-structures from food biopolymers (proteins, carbohydrates, lipids) for encapsulation and controlled release of bioactive compounds, b) nutraceuticals and functional foods, food chemistry and enzymology, food and nutraceutical analysis, c) food safety risk analysis, quantitative microbial risk assessment, predictive microbiology, food safety engineering, and molecular epidemiology, mycotoxicology, and HACCP/food safety systems, d) foodborne bacterial pathogens, i.e., mechanisms of pathogenicity, diagnostic methods for pathogen detection, and e) development of novel processing technologies and ingredients to enhance food safety and quality.

Dr. Qin Wang is one of the food science faculty. Her research focuses on development of nano delivery systems for nutraceuticals (e.g. curcumin, vitamin D, omega-3, etc.) using native and modified food proteins and polysaccharides aiming to improve nutraceuticals’ processing and storage stability and enhance their bioavailability. Another research direction in Dr. Wang’s group is to improve the safety and quality of fresh and fresh-cut produce through nanotechnology-based approach. Recently, her group has designed a micro-fluidic device that is being used for studying the sanitizer and bacterial interaction to identify proper chlorine concentration and contact time to prevent bacterial growth and cross-contamination in wash water for produce industry.
<table>
<thead>
<tr>
<th>NO.</th>
<th>Author</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA01</td>
<td>Hsiao, H. I., Kuo, S. C.</td>
<td>Implementation of HACCP Management System in Hypermarket with Ready-to-eat Food Manufacturing</td>
<td>27</td>
</tr>
<tr>
<td>PA02</td>
<td>Hsiao, H. I., Chen, Y. X.1., Lu, Y. H.2., Lu, M. C.2., Jyh-Quan Pan3, Tsung-Hsi Wu3, Mei-Chen Lien3</td>
<td>Effective Import Food Management and Border Control in the Grain Produce Chain</td>
<td>28</td>
</tr>
<tr>
<td>PA03</td>
<td>Jie Liu, Jing He</td>
<td>Research on Food Supply Chain Security Credit Risk Identification and Evaluation - A Dairy Enterprise Application Case</td>
<td>29</td>
</tr>
<tr>
<td>PA04</td>
<td>Tai-Yuan Chen†, Shu-Hao Kuo, Shui-Tein Chen and Deng-Fwu Hwang</td>
<td>Differential proteomics to explore the inhibitory effects of acidic, slightly acidic electrolysed water and sodium hypochlorite solution on <em>Vibrio parahaemolyticus</em></td>
<td>30</td>
</tr>
<tr>
<td>PA05</td>
<td>Min-Pei Ling,Keng-Wen Lien and Dennis P. H. Hsieh</td>
<td>Assessing Risk-Based Upper Limits of Melamine Migration from Food Containers</td>
<td>31</td>
</tr>
<tr>
<td>PA06</td>
<td>Min-Pei Ling, Keng-Wen Lien, Shih-Pei Ni and Hui-Ying Huang</td>
<td>Assessing the Risk of Exposure to Organophosphate Pesticide Residues for Food Safety in Taiwan</td>
<td>32</td>
</tr>
<tr>
<td>PA07</td>
<td>Sing-Rong Wu, Tristan Liu</td>
<td>Changes of Nucleotide-Related Compounds and K Value in Lightly Salted and Dried Mackerel Products During Refrigerated Storage at 4°C</td>
<td>33</td>
</tr>
<tr>
<td>PA08</td>
<td>Wen-Chieh Sung, Jing Yi Chen, Jing Yi Chen</td>
<td>Effect of Different Molecular Weight Chitosans on the Mitigation of Acrylamide Formation and the Functional Properties of the Resultant Maillard Reaction Products</td>
<td>34</td>
</tr>
<tr>
<td>PA09</td>
<td>Ting-Heng Tsai, Chun-Ju Chang, Chyuan-Yuan Shiau, Tristan Liu</td>
<td>Quality Effects of the Lightly Salted and Dried <em>Scomber australasicus</em> During Refrigeration at 4°C</td>
<td>35</td>
</tr>
<tr>
<td>PA10</td>
<td>Jie-Ling Dong, You-Ping Jhao, Hui-Chuan Chang, Wei-Chih Cheng and Tai-Yuan Chen†</td>
<td>Implementation of good hygiene practices program in food detergent industry</td>
<td>36</td>
</tr>
<tr>
<td>NO.</td>
<td>Author</td>
<td>Title</td>
<td>Page</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------------------------</td>
<td>-----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>PB01</td>
<td>Juan Du, Ying Lu, Yilong Wang, Yingjie Pan</td>
<td>Effect of Surface Modification of Magnetic Nanoparticles on Detection Sensitivity in Lateral Flow Immunochromatographic Assay</td>
<td>37</td>
</tr>
<tr>
<td>PB02</td>
<td>Yang Lou, Zhaohuan Zhang, Lili Xiao, Yingjie Pan and Yong Zhao</td>
<td>Fundamental Research on Risk Assessment of Antimicrobial Resistant <em>Vibrio</em> spp. in Aquatic Products</td>
<td>38</td>
</tr>
<tr>
<td>PB03</td>
<td>Yichao Ma, Yifen Wang, Li Li</td>
<td>Preparation of Nanocomposite Polymer Films Containing Bioactive Elements and Application to Snakehead (<em>Ophiocephala lus argus</em>) Fillet</td>
<td>39</td>
</tr>
<tr>
<td>PB04</td>
<td>Hsiang-Ping Kuo, Yi-Ling Yan, Hung-I Yeh, Zwe-Ling Kong</td>
<td>Chitosan Enhances the Protective Effects of Curcuminon Heart and Kidney Damages Induced by Type 1 Diabetes</td>
<td>40</td>
</tr>
<tr>
<td>PB05</td>
<td>Bing-Ting Long, Chi-Chih Lee, Zwe-Ling Kong</td>
<td>Effects of <em>Echinacea purpurea</em> Ethanol Extract on Male Reproductive Dysfunction in Streptozotocin-Nicotinamide Induced Diabetes Rats</td>
<td>41</td>
</tr>
<tr>
<td>PB06</td>
<td>Yun-Fong Chung, Wei-Kang Lin, Guo-Jane Tsai</td>
<td>Hypoglycemic and Hypolipidemic Effects of Submerged Culture of <em>Ganoderma lucidum</em> on Type 2 Diabetic Rats</td>
<td>42</td>
</tr>
<tr>
<td>PB07</td>
<td>Mo-Yi Yang, Shu-Hui Yang, Guo-Jane Tsai</td>
<td>Solid-state Degradation of Phytic Acid in Soybean or Soybean Meal by <em>Lactobacillus plantarum</em> FPS 2520</td>
<td>43</td>
</tr>
<tr>
<td>PB08</td>
<td>Sheng-Kai Jhang, Po-Hsuan Chen, Wen-Sing Liang, Ya-Huang Chiu, Chang-Jer Wu, and Chorng-Liang Pan</td>
<td>Study on the Anti-Enterovirus 71 Strain Activity of Carrageenan-Oligosaccharides Produced from γ-Carrageenan Digested by γ-Carrageenase CarIIH1</td>
<td>44</td>
</tr>
<tr>
<td>PB09</td>
<td>Po-Jen Cheng, Tzu-Ling Ting, Zwe-Ling Kong</td>
<td>Effects of <em>Echinacea purpurea</em> Ethanol Extract on Male Reproductive in Dietary Obese Rats</td>
<td>45</td>
</tr>
<tr>
<td>PB10</td>
<td>Jung-Tau Chang, Shu-Wei Yao, Zwe-Ling Kong</td>
<td>Effects of Verbena officinalis L. Extracts on Male Reproductive Function in Streptozotocin-Nicotinamide Induced Type 2 Diabetic Rats</td>
<td>46</td>
</tr>
<tr>
<td>PB11</td>
<td>Hsien-Feng Kung, Chia-Min Lin, Chung-Saint Lin, Yi-Chen Lee, Yu-Ru Huang, and Yung-Hsiang Tsai</td>
<td>A Rapid Polymerase Chain Reaction Method for Detection of Gram-Positive Histamine-Producing Bacteria in Seafood</td>
<td>47</td>
</tr>
<tr>
<td>NO.</td>
<td>Author</td>
<td>Title</td>
<td>Page</td>
</tr>
<tr>
<td>------</td>
<td>------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>PB12</td>
<td>Yung-Hsiang Tsai, Yi-Chen Lee, Tzou-Chi Huang, Yu-Ru Huang, Yi-Cheng Su</td>
<td>Degradation of Histamine by Lactobacillus plantarum D103 Isolated from Miso, a Fermented Soybean Food</td>
<td>48</td>
</tr>
<tr>
<td>PB13</td>
<td>Pang-Hung Hsu, Chien-Han Wei, Wen-Jung Lu, Fen Shen, Chorng-Liang Pan, and Hong-Ting Victor Lin</td>
<td>Extracellular Production of a Novel Endo-β-agaraseAgaA from Pseudomonas vesicularisMA103 That Cleaves Agarose into Neoagarotetraose and Neoagarohexaose</td>
<td>49</td>
</tr>
<tr>
<td>PC01</td>
<td>Ji Siru, Wang Xichang, Qian Ting</td>
<td>Identification of Key Odorants of Gonad Part of Steamed Chinese Mitten Crab (<em>Eriocheir sinensis</em>)</td>
<td>50</td>
</tr>
<tr>
<td>PC02</td>
<td>Jia-Hua Ya, Chiao-Yun Liu, Wen-Hung Hsu and Hui-Huang Chen</td>
<td>Effect of High-pressure Valve Homogenizer on Physicochemical Characterization of Rice Flour</td>
<td>51</td>
</tr>
<tr>
<td>PC03</td>
<td>Wen Chieh Sung, Chang Jer Wu, Chorng Liang Pan, Yu Chin Lin</td>
<td>Effect on the Quality of Baked Potato Chips by Adding Different Algae Lees, and their Antioxidant Activity</td>
<td>52</td>
</tr>
<tr>
<td>PC04</td>
<td>Yu-Ting Jhan, Yi-Hsuan Tsai, Fwu-Long Mi, Min-Lang Tsai</td>
<td>Embedding of Silymarin/Zein Nanoparticles to Bacterial Cellulose for Extending Fish Shelf Life</td>
<td>53</td>
</tr>
<tr>
<td>PC05</td>
<td>Ting-Yi Chen, Yu-Wei Chang, Yun-Hung Chiang, Yuan-Yin Tay, Bo-Bin Huang and Ming-Jeng Chen</td>
<td>Investigation of Plant or Animal Protein Isolates as a Major Substitute for Liquid Egg Products</td>
<td>54</td>
</tr>
<tr>
<td>PC06</td>
<td>Hsin-En Liu, Fu-Shang Zhang and Min-Lang Tsai</td>
<td>Production of Shrimp Chitin Using Explosive Puffing and Microwave Puffing</td>
<td>55</td>
</tr>
<tr>
<td>PC07</td>
<td>Hsien-Feng Kung, Chia-Min Lin, Chung-Saint Lin, Yi-Chen Lee, Yu-Ru Huang, and Yung-Hsiang Tsai</td>
<td>Reduction of Histamine and Biogenic Amines during Salted Fish Fermentation by Bacillus polymyxa as a Starter Culture</td>
<td>56</td>
</tr>
<tr>
<td>PC08</td>
<td>Yung-Hsiang Tsai, Chia-Min Lin, Hsien-Feng Kung, Tzou-Chi Huang, Yi-Chen Lee</td>
<td>Determination of Histamine in Fried Milkfish Stick (<em>Chanos chanos</em>) Implicated in a Foodborne Poisoning</td>
<td>57</td>
</tr>
<tr>
<td>PC09</td>
<td>Po-Hsuan Chen, Szu-Ting Chen, Ya-yun Tsai, Cai-Rong Syu, Chorng-Liang Pan* and Chun-Ju Chang*</td>
<td>“ALternerGAE-Food” for Sustainable Future</td>
<td>58</td>
</tr>
</tbody>
</table>
PA01

Implementation of HACCP Management System in Hypermarket with Ready-to-eat Food Manufacturing

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In Taiwan, hypermarkets have nearly 26% increases in total sale over the past ten years, and ready-to-eat food was one of major contributions. Thus, food safety control and implementation of management system in hypermarkets with ready-to-eat food manufacturing has begun receiving growing attentions in Taiwan. This research aims to investigate the perceived difficulties and advantages for hypermarket ready-to-eat food manufacturers when implementing HACCP management system. In 2015, 25 large hypermarket stores with ready-to-eat foods manufacturing activities were chosen and evaluated by expert groups according the HACCP guidelines and decided its pass/no-pass decision in a simulation trial. The differences between pass/no-pass groups were examined statistically on perceived difficulties of implementing HACCP. The major findings indicate that the pass groups agreed that having GHP protocol in stores was prior factors in success implementation of HACCP management system. Furthermore, the pass groups perceived more positive attitudes than the no-pass groups in particular on benefits like reduces of customers complains and increases of consumers’ confidences if HACCP management systems was implemented.

Keywords: Hypermarket; Ready-to-eat food; HACCP; Food safety
Effective Import Food Management and Border Control in the Grain Produce Chain

Hsiao, H. I.1, Chen, Y. X.1, Lu, Y. H.2, Lu, M. C.2, Jyh-Quan Pan3, Tsung-Hsi Wu3, Mei-Chen Lien3

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Taiwan is limited in natural resources, mostly relying upon importation of raw material such as foods items. Import food management and border control is thus very important to Taiwan. This study aims to investigate an effective import food management and border control for fresh produce chain, from importer’s point of view. In particular, we would like to identify the most effective control steps along the import fresh produce flow. We used grains as an example because grains are one of largest import food items in Taiwan. During March to May 2015, the surveys were mailed to 100 grains importers randomly and received 20 responses, resulting in 20% response rate. Overall results indicate following findings. The import fresh produce flow includes three important key steps: foreign supplier search, control before food arrival, and control after food arrival. In suppliers search step, food quality was generally received as the major criteria for most of grain importers. Regarding control before food arrival, most importers required product inspection records from foreign suppliers to verify product safety. Further, regarding control after food arrival, most importers carried out food safety test regularly through own laboratories or testing institutions. Overall, most of importers agreed that having food quality as major supplier selecting criteria, regular inspections before and after food arrivals were effective control steps when developing self-management concepts.

Key words: Import food, Grains, Food safety management
Research on Food Supply Chain Security Credit Risk Identification and Evaluation - A Dairy Enterprise Application Case

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This article embarks from the perspective of food supply chain, through to the core enterprise of supply chain, the node enterprises and stakeholders food safety credit risk identification, the system analyzes the each link, the consequences of the risk factors and on this basis, the risk matrix analysis to the food supply chain enterprise assessment and classification of safety integrity level of risk factors. Use this table to identify and evaluate famous domestic dairy enterprises in 2008-2014 200 food safety incidents, safety integrity assessment results show that using non-food raw materials in processing link is the most critical risk factors, followed by illegal abuse of additives in the processing link and procurement procedures in the enterprise to reduce cost, purchasing unqualified food or raw materials, etc., and evaluation results can provide the dairy enterprises in our country provides the basis for further safety credit risk control. At the same time, the paper research on the domestic other food companies to effectively take food safety credit risk prevention measures and formulate reasonable credit rewards and punishment mechanism is of great significance.

Keywords: Food supply chain; Security credit risk; Identification and assessment; The risk matrix
Differential proteomics to explore the inhibitory effects of acidic, slightly acidic electrolysed water and sodium hypochlorite solution on Vibrio parahaemolyticus

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Slightly acidic electrolysed water (SIAEW) and acidic electrolysed water (AEW) have been demonstrated to effectively inactivate food-borne pathogens. However, the underlying mechanism of inactivation remains unknown. Therefore, in this study, a differential proteomic platform was used to investigate the bactericidal mechanism of SIAEW, AEW, and sodium hypochlorite (NaOCl) solutions against Vibrio parahaemolyticus. The upregulated proteins after SIAEW, AEW, and NaOCl treatments were identified as outer membrane proteins K and U. The downregulated proteins after the SIAEW, AEW, and NaOCl treatments were identified as adenylate kinase, phosphoglycerate kinase, glyceraldehyde-3-phosphate dehydrogenase (GAPDH), and enolase, all of which are responsible for energy metabolism. Protein synthesis-associated proteins were downregulated and identified as elongation factor Tu and GAPDH. The inhibitory effects of SIAEW and AEW solutions against V. parahaemolyticus may be attributed to the changes in cell membrane permeability, protein synthesis activity, and adenosine triphosphate (ATP) biosynthesis pathways such as glycolysis and ATP replenishment.

Key words: Slightly acidic electrolysed water; acidic electrolysed water; V. parahaemolyticus; proteomic; bactericidal mechanism
Assessing Risk-Based Upper Limits of Melamine Migration from Food Containers

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Melamine contamination of food has become a major food safety issue because of incidents of infant disease caused by exposure to this chemical. This study was aimed at establishing a safety limit in Taiwan for the degree of melamine migration from food containers. Health risk assessment was performed for preschool children 1–6 years old, the population that is likely at highest risk of adverse effects. Selected values of tolerable daily intake (TDI) for melamine were used to calculate the reference migration concentration limit (RMCL) or reference specific migration limit (RSML) of melamine food containers. The only existing values of these limits in international standards today are 1.2 mg/L (0.2 mg/dm²) in China and 30 mg/L (5 mg/dm²) in the European Union. The factors involved in the calculations included the specific surface area of food containers, daily food intake, body weight, TDI, and the percentile of the population protected at a given migration concentration limit (MCL). The results indicated that children are indeed at higher risk of melamine exposure at toxic levels than are other groups, and that the 95th percentile of the MCL for children aged 1–6 years should be the RMCL for protecting the general population.

**Keywords:** Melamine; Health risk assessment; Migration concentration limit
Assessing the Risk of Exposure to Organophosphate Pesticide Residues for Food Safety in Taiwan

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The setting of international food safety standards is primarily based on surveys of uncooked food. Measurements of the risks of food contaminants to human health are also largely based on their residual concentrations in uncooked food. However, the human body is directly affected only by residual contaminants present in cooked food. In view of this fact, it is necessary to analyze residual concentrations of contaminants in ready-to-eat foods that have already been cooked to re-assess their risks to human health. This study analyzed post-cooking residues of 56 organophosphate pesticides (OPPs), and assessed their potential health risks for children, adolescents, and adults. It involved food sampling, preparation, analysis of pesticide residues, estimation of food consumption data, and assessment of food safety risks. Food sampling was conducted between March and August, 2012. Eight portions of each sample food were purchased, resulting in a total of 1596 samples covering twelve major food categories. After the food had been prepared, the samples were recombined into 200 composite samples and analyzed to detect OPP residues. The results showed that organophosphate pesticides were primarily detected in fruit and vegetables. The estimated daily intake (EDI) of these organophosphate pesticides in the Taiwanese population was found to be lower than the acceptable daily intake (ADI). The greatest health risk posed by pesticide residues for the general population (adults) and the susceptible population (children) was attributed to prothiofos. Of the twelve major food categories, vegetables (85%) and fruit (15%) were associated with the greatest food safety risk to the general population from prothiofos. For males over the age of 19 years, the %ADI values of prothiofos at a normal consumption rate and at a high consumption rate were 4.71 and 12.35, respectively. The conclusion of this study is that doses of these 56 OPPs in the diets of the Taiwanese population are within an acceptable level of risk.

Keywords: Health risk assessment; Food safety; Pesticide residue; Organophosphate insecticide
Changes of Nucleotide-Related Compounds and K Value in Lightly Salted and Dried Mackerel Products During Refrigerated Storage at 4°C

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Lightly salted and dried mackerel sample was cured with 8% dry salt and then dried at 23°C in the dryer for two hours. The purpose of this study was to provide inside information of shelf life of lightly salted and dried mackerel, whose relatedly water activity was higher than that of traditional processed salted fish. Changes of nucleotide-related compounds and K value were monitored during 18 days of refrigerated storage at 4°C. Nucleotide-related compounds were first analyzed, following procedure described below. Sampled fish at scheduled time was homogenized with perchloric acid (PCA) and adjusted to pH 6.5. Nucleotide-related compounds of PCA extract were determined by HPLC. K values is one of major freshness indexes for marine products, calculated later by analyzed nucleotides. Results showed that the K value of lightly salted and dried mackerel rose from 34.86% at 0 day to 75.76% at 6 day. Therefore, we suggested that shelf life of lightly salted and dried mackerel may be inappropriate to consume after 6 days due to K value over 60.

Keywords: Mackerel; Salted product; K value; Salted mackerel; Lightly salted and dried mackerel
Effect of Different Molecular Weight Chitosans on the Mitigation of Acrylamide Formation and the Functional Properties of the Resultant Maillard Reaction Products

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The experimental mixtures included: fructose with asparagine; fructose with low, medium or high molecular weight chitosan; and a combination of both fructose and asparagine with low, medium or high molecular weight chitosan. All solutions were heated and then analyzed for acrylamide content, Maillard reaction products (MRPs) absorbance, pH, color, antioxidant power, antibacterial activity and kinematic viscosity. The fructose, asparagine and chitosan mixture had more MRPs than the others. Low molecular weight chitosan, was capable of reducing acrylamide levels. 1,1-diphenyl-2-mericrylhydrazy (DPPH) radical scavenging activities, ferrous ion chelating abilities and reducing power results showed that all solutions containing a combination of two or three reactants had antioxidant powers. Acrylamide content has a positive correlation with absorbance values at OD\textsubscript{294} and OD\textsubscript{420} but a negative correlation with the CIB \textit{L}* value of a solution ($p<0.01$). Results suggest that low molecular weight chitosan could be used to mitigate the formation of acrylamide.

\textbf{Keywords:} Acrylamide; Antioxidant power; Chitosan; Maillard reaction products
Quality Effects of the Lightly Salted and Dried *Scomber australasicus* During Refrigeration at 4°C

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The objective of study was to apply sodium chloride to produce lightly salted and dried *Scomber australasicus*, and to observe its effects of biochemical properties during 12 days at 4°C of refrigerated storage. 8% sodium chloride was applied on sliced *Scomber australasicus* for 1 hour and then dried by cold air drier at 23°C for 2 hours. Samples were observed every 3 days, and analyzed pH value, whiteness and peroxide value. Results showed that the pH value decreased significantly in 12 days. The pH value at day 0 was 6.06, and it is 5.85 at day 12. The lowest pH value 5.4 showed at day 9. The whiteness was significantly decreased at day 3 compared to day 0. The peroxide value (POV) was significantly decreased at day 9. Therefore, we suggested that the shelf life of lightly salted and dried *Scomber australasicus* may be inappropriate to consume after 9 days.

**Keywords:** *Scomber australasicus*; Shelf life; Refrigeration storage; Salt; Peroxide value
Implementation of good hygiene practices program in food detergent industry

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Food detergents are defined as the substances used for cleaning or sanitizing food itself, food contact surfaces including containers and packages according to “Act of Governing Food Safety and Sanitation”. For a better management on food detergents, the Ministry of Health and Welfare, R.O.C. has revised “Sanitation for Food Detergent” this year. It declares certain approved chemical composition and their regulation limit level for food detergents. This project provides food detergent industry guidance and help fulfilling good hygiene practices (GHP) program. The preliminary results indicate that 55% claims protection/not harmful on hand, 32% claims antibacterial function and 9% without warnings when examining label wording. In addition, the major non-conformances were related to improper compartment division among raw materials, semi-manufactured goods and finished products, lack of hand-washing steps and cleaning plan, inappropriate hygiene condition, insufficient pest/pathogen control plan, and inadequate document recording as well as staff training. All above results will initiate a proposal for better management of food detergent manufacturing industry in future.

Key words: Food detergent, risk analysis, good hygiene practices (GHP)
Effect of Surface Modification of Magnetic Nanoparticles on Detection Sensitivity in Lateral Flow Immunochromatographic Assay

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Surface modification of nanoparticle is one factor that contributed to the binding of particles with targets. It has great effect on many properties and functions of nanoparticles. Herein, magnetic nanoparticles (MNPs) were prepared via a solvothermal reaction and coated with silica firstly. Next, the magnetic silica particles were grafted with aminopropyltri(ethoxysilane) (APS) which provided chelate sites (amino groups) on the surface. Subsequently, carboxyl groups were modified on the particles by chelation between amino groups and carboxyl groups. Immuno-magnetic nanoparticles (IMNPs) were prepared by conjugation with specific antibody using EDC and NHS cross-linker. FTIR and Zeta-potential data indicated that carboxyl group density and surface charge on the MNPs was affected by the change of APS amount. Low field nuclear magnetic resonance data showed that $T_2$ relaxation time for IMNPs was more than those of MNPs, implying that the antibody modification might cause the IMNPs being more coagulation than MNPs. In order to discuss the effect of surface modification of MNPs on detection performance, IMNP labeled lateral flow immunochromatographic assay (LFIA) against *Vibrio parahaemolyticus* was established. Detection results showed that the sensitivity for *Vibrio parahaemolyticus* was improved with the increasing of antibody amount modified onto the MNPs. Also, it was found that APS amount could affect the sensitivity. When the quantity of APS was 28.38g, the detection sensitivity was the highest. Based on these results, we speculated that the stability and surface charge of MNPs caused by APS amount may be an important factor in improving the detection sensitivity in LFIA. Further study is necessary to explore the reaction mechanism.

**Keywords:** Magnetic nanoparticles; Surface modification; Immunochromatographic assay; Sensitivity
Fundamental Research on Risk Assessment of Antimicrobial Resistant Vibrio spp. in Aquatic Products

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Antimicrobial resistance of Vibrio spp. in aquatic products is a critical public health issue of increasing importance. Antimicrobial resistance phenotypes (18 antimicrobials; disk diffusion method) and genotypes (38 antimicrobial resistance genes; PCR) of Vibrio parahaemolyticus and Vibrio vulnificus recovered from aquatic products in Shanghai wholesale markets and aquaculture farms were evaluated. Then comparing the variability of growth parameters of different antimicrobial resistant strains. The results illustrated that 85% of the strains were resistant to one or more antimicrobials, and highest resistance was observed to ampicillin (85%) and cephazolin (30%). Eight antimicrobial resistance genes (strB, aadA2, strA, tetA, floR, sulI, sulII, and sulIII) were detected in these strains. And the increase of antimicrobial resistance may lead to shorten the λ, yet has no significant effect on the $\mu_{max}$. This study provided a basis for the quantitative microbiological risk assessment of antimicrobial resistant Vibrio spp.

**Keywords:** Vibrio parahaemolyticus; Vibrio vulnificus; Antimicrobial resistance; Aquatic products; Risk assessment
Preparation of Nanocomposite Polymer Films Containing Bioactive Elements and Application to Snakehead (*Ophiocephalus argus*) Fillet

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Nanocomposite films based on ethylene vinyl alcohol copolymer (EVOH) containing bioactive elements and clay, worked as controlled release agent, were prepared and characterized in this study with the aim to get antimicrobial active packaging materials. A 93% EVOH, 2% clay: either DK-2 or DK-4, and 5% additive: either cinnamaldehyde or anisaldehyde were combined into four formulations of films to compare with two formulations of films consisting of only 95% EVOH, and 5% either cinnamaldehyde or anisaldehyde to determine whether the addition of clay can improve the stability of the films. In these six formulations, ingredients were mixed together before being blown into films by a twin-screw extruder. Meanwhile, four formulations out of these six were blown into films with different procedures to verify the loss of additives. The 100% EVOH film was prepared and characterized as a control. The antioxidant activities of all eleven kinds of films were measured by DPPH method. Then the preservative effects of nanocomposite polymer films on snakehead fillet stored at 4±1°C were investigated by analyzing changes in sensory characteristic, water loss, pH value and total viable bacterial counts. The results indicated that the film containing 93% EVOH, 2%DK-4, and 5% anisaldehyde with the procedure of adding additive directly during film blowing period showed the best preservative effect relatively. The clay DK-4 showed better performance in controlled release but negative impact on antioxidant effect.

**Keywords:** Nanocomposite films; Antimicrobial; Snakehead fillet; Preservative effect
Chitosan Enhances the Protective Effects of Curcumin on Heart and Kidney Damages Induced by Type 1 Diabetes

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High blood sugar in diabetic patients often causes cardiovascular diseases (CVD) that threaten human life. Curcumin (Cur) is known as an antioxidant, possess anti-inflammatory activity and can prevent CVD. However, the low bioavailability has limited its clinic application. In this study, we investigated the protective effects of chitosan encapsulated curcumin (CEC) on CVD using Streptozotocin-induced type I diabetic C57BL/6 mice (DM) model. The results showed that Cur and CEC down regulated blood sugar and enhanced insulin secretion significantly. In echocardiography it showed extending in the cycle length of heartbeat, shortening of left ventricular end-systolic diameters, and increasing of left ventricular fractional shortening. We revealed both Cur and CEC ameliorated cell hypertrophy, nucleus enlargement in left ventricular and reduced fibrosis in kidney, especially in the CEC treatment by histochemistry. This study suggests that chitosan as a biologically functional carbohydrate can effectively modify and enhance the protective effects of curcumin on the CVD induced by DM.

Keywords: Curcumin; Chitosan-encapsulation; Type 1 diabetes; Cardiovascular diseases
Effects of *Echinacea purpurea* Ethanol Extract on Male Reproductive Dysfunction in Streptozotocin-Nicotinamide Induced Diabetes Rats

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As lifestyle changes, the prevalence of diabetes increases every year. Diabetes-induced male reproductive dysfunction is predominantly due to increased oxidative stress, and then result in sperm damage and infertility. *Echinacea purpurea*, the North America herbal medicine, have traditionally been used for immune-modulatory, anti-oxidative, anti-inflammatory, anti-cancer, anti-viral function and prevention from common cold. The toll-like receptor 4 (TLR4) plays a critical role in innate immune responses leading to NF-κB phosphorylation and release of pro-inflammatory cytokines including nitric oxide (NO), interleukin-1 beta (IL-1β) and tumor necrosis factor-alpha (TNF-α). However, relation between *Echinacea purpurea* and TLR4 remains unclear. The aim of this study was to investigate the protective effects on male reproduction of *Echinacea purpurea* ethanol extract (EPE) against diabetic rats, and whether the anti-inflammatory effects were through TLR4 pathway. Diabetic male Sprague-Dawley (SD) rats were induced by nicotinamide (230 mg/kg) and streptozotocin (65 mg/kg). EPE was tested in three dose (93, 279 and 465 mg/kg p.o. daily) for 4 weeks. Besides, metformin administration (100 mg/kg/day) was treated as the positive control. Results indicated that EPE administration about 4 weeks improved hyperglycemia and insulin resistance. In plasma, liver or testis anti-oxidant superoxide dismutase (SOD) and reduced type glutathione (GSH) were increased whereas plasma inflammatory cytokines were decreased. In addition, sperm count, motility, morphology and DNA damage had been improved. Beside, testis protein content of TLR4 and downstream nuclear factor kappa-light-chain-enhancer of activated B cells (NF-κB) were reduced. The EPE might reduce production of pro-inflammatory cytokine via TLR4 pathways and improve diabetes-induced male infertility.

**Keywords:** *Echinacea purpurea*; Diabetes; Male reproduction; Toll-like receptor 4
Hypoglycemic and Hypolipidemic Effects of Submerged Culture of *Ganoderma lucidum* on Type 2 Diabetic Rats

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*Ganoderma lucidum* was submerged cultivated in a modified Gano medium (C/N ratio of 3.48). The contents of mycelium, extracellular polysaccharides and peptide in the culture were 7.1 ± 0.9 g/L, 0.50 ± 0.08 g/L, and 2.0 mg/L, respectively. The aims of this study are to evaluate the hypoglycemic and hypolipidemic effects of this whole culture on type 2 diabetic rats. The whole culture of *G. lucidum* (G) and the separated mycelia were freeze-dried and added to 0.5% high cholesterol diet for the preparation of the experimental diets. Sprague-Dawley rats were induced to type 2 diabetic rats by nitcotamide (230 mg/kg BW) with streptozotocin (65 mg/kg BW), and randomly divided into five groups: (1) diabetes control (D), (2) Diabetes + 1% G (1G), (3) Diabetes + 3% G (3G), (4) Diabetes + 1% M (1M) and (5) Diabetes + 3% M (3M). There was a normal group (NC) that did not be induced to diabetic rat. After 4 weeks of feeding, the blood glucose level at 120 min (194 ± 19.9 mg/dL) in OGTT for 3G group was significantly decreased. The fasting plasma glucose (224 ± 20.3 mg/dL) and homeostasis model assessment equation-insulin resistance (HOMA-IR) (37.2 ± 7.25) values in 3G group were also significantly (*p* < 0.05) decreased, compared to those in DC. The hepatic hexokinase, glucose-6-phosphate dehydrogenase (G6PD) and intestinal sucrase activities (*p* < 0.05) were significantly increased in 3G group. The plasma triglycerides, liver TBARS value and liver acetyl-CoA carboxylase (ACC) activity for all experimental groups (1G, 3G, 1M, 3M) were significantly decreased, and the fecal triglyceride amount was significantly increased. Ingestion of *Ganoderma* mycelia (M) significantly increase the activity of hormone sensitivity lipase (HSL) and decrease lipoprotein lipase (LPL) activity, accordingly, to decrease plasma triglyceride concentrations. In addition, G and M could lower hepatic and renal TBARS concentration and decrease plasma alanine aminotransferase (ALT), creatinine and blood urea nitrogen (BUN) concentrations. In conclusion, the whole culture of *G. lucidum* has hypoglycemic and hypolipidemic effects on type 2 diabetic rats; while *G. lucidum* mycelia have only hypolipidemic effect on type 2 diabetic rats.

**Keyword:** *Ganoderma lucidum*; Submerged culture; Type 2 diabetes; Hypoglycemic effect
Solid-state Degradation of Phytic Acid in Soybean or Soybean Meal by *Lactobacillus plantarum* FPS 2520

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The cost of fish meal rises up greatly due to the increasing of aquaculture harvest. Soybean meal (SBM) may become replacer with its high protein content, cheaper price and steady supply. However, SBM contains many anti-nutritional factors, such as lectin, trypsin inhibitor, saponin, phytic acid, and allergenic proteins, among which phytic acid is the most concerned due to its decreasing the growth rate and blocking the nutrients absorption of the organism. A lactic acid bacterium, identified as *Lactobacillus plantarum* FPS 2520, from fish intestine with phytase activity was chosen. The efficacy for solid-state degradation of phytate in soybean or soybran meal by this strain was evaluated. After fermentation of SBM (19.61 ± 0.26 mg/g phytate) and soybean (18.46 ± 0.42 mg/g phytate) by this strain with an initial inoculum of 5 log CFU/mL at 37°C for 72 h, the phytate degradation efficacy were 49% and 79%, respectively. The optimal temperature and pH for the crude phytase produced by FPS 2520 were 65°C and pH 4.5, respectively. The residual activity for this phytase at 50°C for 12 h was 88%. The phytate degradation efficacy in soybean by this strain was further increased to 83% by using 2 stages of incubation temperatures of 37°C and 50°C.

**Keywords:** Lactic acid bacteria; Soybean meal; Solid state fermentation; Phytic acid; Phytase
Study on the Anti-Enterovirus 71 Strain Activity of Carrageenan-Oligosaccharides Produced from τ-Carrageenan Digested by τ-Carrageenase CarIIH1

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The aim of this study is to investigate anti-enterovirus 71 strain activity of oligosaccharide produced from τ-carrageenan. The car-oligosaccharide was produced by τ-carrageenase CarIIH1, from E. coli Cleancoli BL21-carIIH1, at 50°C and pH 7.2. The mixed car-OSs were treated by a UF system to obtain OS < 3 kDa and designated as COS3k. And DMF method was used to increase sulfate contents of COS3k (24.36%) to obtain higher sulfate content COSDMF (27.20%). In anti-enterovirus 71 strain test, the results of post-infection group showed that higher cell survival viabilities, 2 g/mL and 20 g/mL COS3k (64% and 49%) and 2 g/mL and 20 g/mL COSDMF (57% and 60%), which are higher than the control group that with a 37% host cell survival viability. In the co-treatment group 2 g/mL and 20 g/mL COS3k could obtain 42% and 66% host cell survival viability, respectively. While 2 g/mL and 20 g/mL COSDMF could achieve 60% and 71% host cell survival viability, which are higher than control group did (37%).

Keywords: Anti-enterovirus activity; Carrageenan-oligosaccharides; τ-Carrageenan CarIIH1; Sulfate content
Effects of *Echinacea purpurea* Ethanol Extract on Male Reproductive in Dietary Obese Rats

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*Echinacea purpurea* are among the most widely used herbal medicines. Most uses of *E. purpurea* are based on the reported anti-inflammatory properties. A series of experiments have demonstrated that *E. purpurea* extract do indeed demonstrate significant immunomodulatory activities. The risk of obesity appears to originate from disruption in adipose tissue function leading to a chronic inflammatory state. It comes up with various disorders such as type 2 diabetes, cardiovascular disease, hyperlipidemia, and also infertility. Obesity is rapidly becoming a worldwide epidemic. Some studies have shown a relationship between obesity and infertility, but until now it remains controversial. Thus, the aim of the present study focus on that if *E. purpurea* has potential to prevent high-fat diet-induced hyperlipidemia and reproductive damage. **Methods:** In vivo, Male Sprague-Dawley rats were fed 45% high-fat diet for 5 weeks to induce obesity model. *E. purpurea* ethanol extract was tested in three doses (93, 186, 465 mg/kg per day, p.o. daily) during 5 weeks high-fat diet. After sacrifice, adipose tissues, testis tissues and blood samples were collected for biochemical analysis. **Results:** To determine whether *E. purpurea* reduces high-fat diet induced hyperlipidemia and reproductive dysfunction, we observed the decrease of body weight, fat mass, TG index and increase of HDL level in high dose group rats. Next we found that the level of antioxidant enzymes including catalase, glutathione and the sperm parameters such as counts, mobility were all restored while the lipid peroxidation was reduced. In Western blot, PPARα restored in liver tissue, and StAR, 17β-HSD3 enhance synthetic testosterone in testis. **Conclusion:** *Echinacea purpurea* ethanol extracthas remarkable anti-inflammatory improved hyperlipidemia and reproduction parameters beneficially in dietary obese rats.

**Keywords:** *Echinacea purpurea*; Infertility; Male reproduction; Dietary Obese
Effects of Verbena officinalis L. Extracts on Male Reproductive Function in Streptozotocin-Nicotinamide Induced Type 2 Diabetic Rats

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Diabetes is associated with male infertility. Verbena officinalis L. (VO) extract including water as VOW and n-butanol as VOB. In cell experiment, LC-540 was treated with VOW (50, 100, 200 ng/ml) and VOB (2.5, 5, 10 ng/ml) for 18 and 24 hours in \( \text{H}_2\text{O}_2 \) cell models. Then LC-540 was treated with VOB for 24 hours in AGEs cell models. Male Sprague-Dawley rats were induced into diabetes by NA (230 mg/kg) and STZ (65 mg/kg). VOB was tested in three doses (15, 30, 60 mg/kg per day, p.o. daily) for 28 days. Besides, Metformin (Met) was administrated (100 mg/kg) as the positive control. In vitro, VOB significantly inhibited superoxide production for 24 hours in \( \text{H}_2\text{O}_2 \) or AGEs induced LC-540 cell models, but VOW is inconspicuous. In vivo, indicate that VOB or Met can improve the STZ-NA induced hyperglycemia, but only 15 mg/kg VOB and Met significant increase glucagon-like peptide-1 (GLP-1), sperm count, motility, viability, MMP, LH and testosterone level and reduction in the number of abnormal sperm, DNA damage, ROS and MDA. In antioxidative enzyme assays, 30 mg/kg VOB is good for liver. In western blot, StAR can enhance and synthetic testosterone in testis, but not GPR54 in hypothalamus. VOB also can reduce mitochondrial apoptosis, endoplasmic reticulum stress includes CHOP and GRP78 produced. VOB improved blood glucose as well as sperm quality in diabetic rats while high dosage of VOB could cause harm.

Keywords: Verbena officinalis L.; Diabetes; Infertility; Male reproduction; Oxidative stress
A Rapid Polymerase Chain Reaction Method for Detection of Gram-Positive Histamine-Producing Bacteria in Seafood

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It is important to develop rapid method to detect the presence of gram-positive histamine producers. In this study, the new polymerase chain reaction (PCR) assay yielded a 433 bp DNA amplification fragment from histidine decarboxylase (hdc) of gram-positive bacteria using kp1f/kp3r primer. Nine gram-positive histamine-producing strains isolated from Taiwanese foods successfully produced the PCR amplification products. The minimum levels of detection of Staphylococcus capitis after the PCR amplification using kp1f/kp3r primer were 10^1 CFU/mL in TSB broth, and 10^2 CFU/g in milkfish homogenate, respectively. The hdc amplification using kp1f/kp3r primer was detected 8 h earlier than HPLC detection of histamine in TSBH broth or milkfish homogenate inoculated S. capitis. However, the detection of hdc amplification using previously reported JV16HC/JV17HC primer and that of histamine by HPLC occurred at the same sampling time. Therefore, the rapid PCR method could be easily used to detect potentially gram-positive histamine-producing bacteria in seafood.

Keywords: Histamine; PCR; Histamine-forming bacteria; Histidine decarboxylase gene (hdc)
Degradation of Histamine by *Lactobacillus plantarum* D103 Isolated from Miso, a Fermented Soybean Food

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Histamine is heat stable and the causative agent of scombroid poisoning. Histamine is physiologically degraded through the oxidative deamination process catalyzed by either histamine oxidase or histamine dehydrogenase of certain microorganisms. To isolate histamine-degrading bacteria in fermentation foods, the Miso products and mustard pickle products sold in supermarkets were purchased from southern Taiwan. This research was to isolate histamine-degrading bacteria from Miso and mustard pickle products, and evaluate the influence of environmental condition such as pH, temperature and salt concentration on histamine-degradation activity of histamine-degrading isolate. Four and two histamine-degrading bacteria isolated from Miso and mustard pickle samples were identified as *Lactobacillus plantarum* (4 isolates) and *Lactobacillus brevis* (2 isolates), respectively. Among them, *L. plantarum* D103 degraded histamine up to 100% in MRSH broth. In general, the higher bacterial growth of *L. plantarum* D103 could accompany the higher histamine oxidase activity and histamine-degrading capability. Therefore, the optimal growth, histamine oxidase activity and histamine degrading capability of *L. plantarum* D103 were at 30 °C, pH 5 and 3.0% NaCl for 24 h incubation. The histamine-degrading isolate, *L. plantarum* D103, will be as a starter culture in inhibiting histamine or biogenic amines accumulation during Miso food fermentation.
Extracellular Production of a Novel Endo-β-agarase AgaA from *Pseudomonas vesicularis* MA103 That Cleaves Agarose into Neoagarotetraose and Neoagarohexaose

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The gene *agaA*, of the isolated marine bacterium *Pseudomonas vesicularis* MA103, comprised 2958-bp nucleotides encoding a putative agarase AgaA of 985 amino acids, which was predicted to contain a signal peptide of 29 amino acids in the *N*-terminus, a catalytic domain of glycoside hydrolase 16 (GH16) family, a bacterial immunoglobulin group 2 (Big 2), and three carbohydrate binding modules 6 (CBM 6). The gene *agaA* was cloned and overexpressed in *Escherichia coli*, and the optimum temperatures for AgaA overexpression were 16, 20 and 24°C. The *agaA* was cloned without its signal peptide for cytosolic production overexpression, whereas it was cloned with the heterologous signal peptide PelB and its endogenous signal peptide for periplasmic and extracellular productions, respectively. Extracellular and periplasmic rAgaA showed greater activity than that of cytosolic rAgaA, indicating that membrane translocation of AgaA may encourage proper protein folding. Time-course hydrolysis of agarose by rAgaA was accomplished and the products were analyzed using thin layer chromatography and matrix-assisted laser desorption ionization-time of flight mass spectrometry, indicating that AgaA from *P. vesicularis* was an endo-type β-1,4 agarase that cleaved agarose into neoagarotetraose and neoagarohexaose as the final products.

**Keywords:** Agar; agarase; Neoagar-o-oligosaccharides; *Pseudomonas vesicularis*; Osmotic shock; Extracellular
Identification of Key Odorants of Gonad Part of Steamed Chinese Mitten Crab
(Eriocheir sinensis)

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Gonad part of steamed Chinese mitten crab (Eriocheir sinensis) is popular among Chinese consumers due to its unique pleasant aroma. Volatiles released by 5 g of crab samples from Langcheng Lake were extracted by monolithic material sorptive extraction (MMSE). Volatiles of gonad part were studied by gas chromatography-olfactometry (GC-O) and gas chromatography-mass spectrometry (GC-MS) in order to identify and quantify the compounds responsible for this aroma. From an olfactometric point of view, the key odorant of the gonad part of E. sinensis was trimethylamine (modified frequency value [MF] 96%). In addition, toluene, benzaldehyde, 3-methylbutanal, 1-penten-3-ol and an odorant with a “nutty” descriptor that could not be identified were also found to be important odorants present in the gonad part of steamed E. sinensis due to their higher MF values in GC-O study.

Keywords: Eriocheir sinensis; Key odorants; Gas chromatography-olfactometry; Modified frequency value; Trimethylamine
Effect of High-pressure Valve Homogenizer on Physicochemical Characterization of Rice Flour

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Native starch exhibits many innate weaknesses such as poor solubility and high tendency toward retrogradation, which limits its application in some starch based products. Physical modification techniques can be used to somewhat improve native starch properties. Native rice flour slurry was then treated by high-pressure valve homogenizer (HPH) at pressures of 100MPa and 160MPa for 2 passes in this study. The volume mean diameter of the native rice flour granules, prepared from Japonica rice, was 29.1 μm, and the HPH treated rice decreased flour diameter to 5.61 μm and 5.50 μm under 100MPa and 160MPa, respectively. HPH treatment significantly increased the solubility and swelling power of the fine rice flour. Meanwhile, HPH treatment decreased gelatinization enthalpies ($\Delta H_{gel}$) and retrogradation enthalpies ($\Delta H_{ret}$) of rice flour. It indicated that HPH treatment accelerated gelatinization and inhibited retrogradation of rice starch. These results suggested that the HPH treatment is a suitable candidate for inclusion in starch based products by improving the physical chemical characterization of rice flour.

**Keywords:** Rice flour; High-pressure valve Homogenizer; Physicochemical characterization
Effect on the Quality of Baked Potato Chips by Adding Different Algae Lees, and their Antioxidant Activity

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Algae (Ulva fasciata (green algae), Sargassum crista folium (brown algae) and Kappaphycus contonii (red algae)) lees were added separately to potato chips at a level of 2.5%. The algae lees employed herein were the leftovers of seaweed polysaccharide extract resulting from the use of hot water and enzymes. Antioxidant activities, water activities, color, firmness, overall acceptability and proximate composition of baked potato chips were evaluated. The rehydration rate (49.87%) of red algae Kappaphycus contonii lees is extremely high; the firmness of baked potato chips with red algae lees added was the highest. The water activity (0.23) of potato chips with green algae Ulva fasciata lees addition was lowest among all three groups of baked potato chips. Adding red algae lees significantly increased the ferrous ion chelating activity of the baked potato chips (p<0.05). However, there was only a slight increase (p>0.05) in the DPPH radical scavenging effect. The addition of algae lees increased the protein and ash content of baked potato chips. Sensory scores showed that red algae lees could be added to potato chips at a 2.5% level. Adding green and brown algae lees in baking potato chips should be less than 2.5% due to resultant dark color and strong seaweed flavor.

Keywords: Potato chips; Algae lees; Antioxidant activity; Sensory evaluation
Embedding of Silymarin/Zein Nanoparticles to Bacterial Cellulose for Extending Fish Shelf Life

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Bacterial cellulose (BC) has been studied as biomedical material due to its biocompatibility, nanoscale fiber network, high water holding capacity and crystallinity. The porous three-dimensional network structure of BC can provide controlled release properties for functional ingredients. In this study, The BC film was incorporated with silymarin/zein (Z-S) nanoparticles. Salmons were packed with the BC/Z-S films to improve their shelf life due to the film containing high antioxidant activity Z-S nanoparticles. The results show that the VBN and POV of BC/Z-S group were lower than that of control, however the total viable bacteria was higher than that of control, the color change was insignificantly different with control. Comprehensive evaluation, using the BC/Z-S film as salmon package, the film could improve the shelf life of salmon due to the film could release the active ingredients.

Keywords: Zein; Silymarin; Bacterial cellulose; Nanoparticles
Due to the outbreak of avian flu, egg products have aroused serious issues on food safety. Apart from the beneficial nutrition in the egg, it also contains relatively high cholesterol. Consuming too much cholesterol will increase the risk of cardiovascular disease. The objective of this research was to create an artificial liquid egg product (ALEP) using various protein sources. In particular, ALEP was not only designed to mimic the texture and function of real egg but to create a low cholesterol and calories product. Additionally, this study examined the molecular characteristics of commonly used protein isolates. For instance, Sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) was conducted to compare ALEP protein with real egg. According to the preliminary results, there is one similar band between 37 kDa to 50 kDa in the electrophoretogram of SDS-PAGE. The cooked ALEP contained both soy protein isolate (SPI) and whey protein concentrate (WHC) and glucomannan (1.5%) has the best structure and flavor. The cooked ALEP with curdlan gum (2%) has the highest recovery rate (72%).

Keywords: Liquid egg; Protein isolates; Substitute
Production of Shrimp Chitin Using Explosive Puffing and Microwave Puffing

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The shell of shrimp was generally considered to be aquatic waste. Due to its property which is uneatable and slowly biodegraded, it often causes great amount of wastes during food manufacturing. By recycling and reprocessing those wasted shell, chitin and chitosan can be obtained. Chitin and chitosan have a good biocompatibility and have applied for many fields, such as biomedical and agricultural technology. The aquatic waste is purified into chitin and chitosan by using chemical methods, and is divided into two steps: (1) demineralization (2) deproteination. But both of these purification steps cause a lot of wasted acid, base, water and consume many energies. The explosive puffing and the microwave puffing can expand materials and result in porous structure and broken fragments. These effects could increase surface area, lead to increasing of the chemical rate, and reduce the chemical consumption. Using the explosive puffing (puffing pressure by 14 kg/cm$^2$) which due to strong pressure instantly release, had resulted in expansion structure. To avoid its high-pressure and high-temperature characteristics to cause adverse changes in its appearance and protein denaturation, the processing conditions should be adjusted. After explosive puffed process, the reaction rate constant of demineralization and deproteination were significantly increased comparing with control groups. The microwave puffing (puffing power by 1500 Watt) has its instantaneous and penetrating heating characteristics, which can make sample dry quickly and equally. The appearance of processed shrimp shell was puffed and had some fragment structure. After the treatment, both the demineralization and deproteination reaction rate constant were decreased during the purification steps. As a conclusion, no matter the explosive puffing or the microwave puffing to be the preprocessed step showed the subsequent purification process was faster and could save energy.

Keywords: Shrimp shell; Chitin; Explosive puffing; Microwave puffing
Reduction of Histamine and Biogenic Amines during Salted Fish Fermentation by *Bacillus polymyxa* as a Starter Culture

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*Bacillus polymyxa* D05-1 isolated from salted fish product which possess amine degrading activity was used as a starter culture in salted fish fermentation in this study. Fermentation was held at 35 °C for 120 days. The water activity in control samples (without starter culture) and inoculated samples (inoculated with *B. polymyxa* D05-1) remained constant throughout fermentation, while the pH value raised slightly during fermentation. Salt contents in both samples were constant in the range of 17.5% to 17.8% during the first 60 days of fermentation and thereafter increased slowly. The inoculated samples had considerably lower levels of TVBN (P<0.05) than control samples at each sampling time during 120 days of fermentation. Aerobic bacterial counts in inoculated samples were retarded during the first 60 days of fermentation and thereafter increased slowly, whereas, those of control samples increased rapidly with increased fermentation time. However, the aerobic bacterial counts of control samples were significantly higher (P<0.05) than those of inoculated samples after 40 days of fermentation. In general, overall biogenic amines contents (including histamine, putrescine, cadaverine and tyramine) in the control samples were markedly higher (P<0.05) than those of inoculated samples throughout fermentation. After 120 days of fermentation, the histamine and overall biogenic amines contents in inoculated samples were reduced for 34.0% and 30.0%, respectively, as compared to control samples. These results emphasized that application of starter culture with amines degrading activity in salted fish products was found to be effective in reducing biogenic amines accumulation.

**Keywords:** Biogenic amines; Starter culture; Histamine degradation; Salted fish product; *Bacillus polymyxa*
Determination of Histamine in Fried Milkfish Stick (*Chanos chanos*) Implicated in a Foodborne Poisoning

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Histamine is the causative agent of scombroid poisoning and a foodborne chemical hazard. An incident of foodborne poisoning causing illness in 37 victims due to ingestion of fried fish sticks occurred in September, 2014, in southern Taiwan. To elucidate the causative agent, two suspected fried fish sticks were collected from the suspected kitchen. Additionally, the 16 other raw fish stick samples were purchased from seven retail stores in southern Taiwan and processed for analyses. The leftovers of the victims’ fried fish sticks and the 16 raw fish stick samples were tested to determine the occurrence of histamine, chemical and microbiological quality, and histamine-forming bacteria. Moreover, the fish species of suspected samples were identified as milkfish (*Chanos chanos*) by using PCR direct sequence analysis. The two suspected fried fish sticks contained 86.6 and 235.0 mg/100 g of histamine, levels which greater than the potential hazard action level (50 mg/100 g) in most illness cases. In addition, four of 16 tested raw milkfish stick samples (25%) had histamine levels greater than the FDA guideline of 5.0 mg/100g for scombroid fish and/or product. Ten isolates isolated from raw milkfish stick samples were proven to be prolific histamine-formers with ability to produce 373-1261 ppm of histamine in trypticase soy broth (TSB) supplemented with 1.0% L-histidine (TSBH). Given the allergy-like symptoms of the victims and the high histamine content in the suspected fried milkfish sticks, this food borne poisoning was strongly suspected to be caused by histamine intoxication.
“ALternerGAE-Food” for Sustainable Future

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The growth of macroalgae in the tidal flat yields approximately 21 million tons per year. Humans need algae for carbohydrates, lipids, minerals and essential amino acids etc. Marine organisms produce enzymes to digest algae for nutrients by themselves such as fish, abalone, etc. However, human intestines are unable to digest the algae. The aim of this study is to investigate a new food sources from seaweed which were produced by specific enzymes from *Lc. lactis* NZ3900 and other strains. Hence, this system imitates the digestion of abalone which helps to process the compounds from algae that humans are unable to absorb. This fermentation/transformation process allows the human bodies to acquire nutrients and calories from algae. In addition, nutrients derived from algae, such as polysaccharides, oligosaccharides, and amino acids as well as fatty acids are essential health benefits for human being. Furthermore, this system enhances the content of functional oligosaccharides. These oligosaccharides are rich in bioactive compounds including antioxidation, anti-inflammatory, hypolipidemic, and hepatoprotective compounds. One of the goals of this project is to distribute these predigested algae, named ALternerGAE-Food, in the form of powder which is easy to be transported and conveniently stored. In summary, ALternerGAE-Food can be resource of calories and food supplement for a more sustainable future.

**Key words:** Macroalgae; oligosaccharides; bioactive compounds, calories, ALternerGAE-Food