International Association for Food Protection 참관

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본 학회는 92년의 역사를 가지고 있는 대표적인 식품위생학회로서 특히 microbial hazard인 foodborne pathogen에 대한 다양한 연구가 보고되는 학회이기도 하다. 올해의 symposium은 Food bioterrorism에 대한 내용, Yeast and molds에 대한 집중연구와 새로운 분석기술로 각광을 받고 있는 microarray technology에 대하여 중점적인 발표가 있었다. 내년도 International Association for Food Protection은 Canada의 calgary에서 개최될 예정이며, 식품위생 분야에서 microbial hazard에 대해 상당한 권위를 가지고 있는 학회로 학회지인 Journal of Food Protection도 impact factor가 2.154로 applied microbiology 분야에서 매우 높고, 내년도 학술발표를 위한 초록마감은 내년도 1월초 정도이다.

1. 학회 개요

1) 학회명 : International Association for Food Protection 2005
2) 일 시 : 2005. 8. 14(일) ~ 8. 17(수)
3) 장 소 : Baltimore Marriott Waterfront Hotel, Baltimore, Maryland

2. 학술발표 내용

본 학회에서는 주로 Foodborne pathogen에 대한 detection 및 reduction에 관한 다양한 연구가 보고되고 있다. 다양한 enrichment 방법 간의 비교, detection broth 비교 및 chromogenic substrate를 이용한 새로운 배지의 개발 등이 보고되고 있다. 또한 DNA, RNA probe를 이용한 specific cell determination, microarray technique, immunoassay에 의한 detection 방법이 다수 보고되었다. Intervention

방법으로는 heat와 salt 등의 기본적인 생리조건 하에서의 cell survival 변화양상, multiple hurdle에 의한 cell 변화양상 등이 보고되었다. 올해 학회는 3가지 주제에 대한 symposium이 있었다.

(1) Symposium on Laboratory Response to Food Bioterrorism

식품에 chemical이나 biological agent의 혼입에 의한 테러가능성은 식품유통구조가 대형화되고 있음에 따라 더욱 더 심각한 문제를 야기할 수 있다. 따라서 식품분석에 관계하고 있는 실험기관은 의심되는 수천, 수만 가지의 식품시료와 환경시료를 분석할 필요성이 있다. 따라서 적절한 시료의 샘플링, 효율적인 screening과 conformation method 확립, 관계법규와의 조화, 빠르고 신속한 결과의 공유 등이 필요하다. 따라서 본 심포지엄은 잘 정립된 실험실적 핵심 분석 기술 및 전략을 주제로 하고 있다.

- Food bioterrorism response plan and centers for disease control and prevention(CDC) national laboratory capacities
- State and local public heatlh laboratory capabilities and the role of these laboratories in responding to food bioterrororism
- Federal food regulatory agency laboratory capability
- The food emergency response network (FERN)
- Industry laboratory capabilities and preparedness

(2) Symposium on Yeasts and Molds:

US Department of Agriculture's(USDA's)의 Economic research service에서는 retail, food service와 consumer level 단계에서 매년 27% 정도의 edible food supply 감소가 발생한다고 보고하였다. 이러한 loss는 주로 yeast와 mold에 의한 변질에 기인한다. 소비자들이 더욱 더 유기농식품, 신선한 식품을 요구함에 따라 각종 약품의 사용이 저하되어 이러한 생물에 의한 loss는 더욱 더 커질 수 있다. 아울러 yeast와 mold 자체도 mycotoxin-contaminated food 섭취에 의한 sequelae와 allergic response가 발생할 수 있다. 따라서 본 심포지엄은 yeast와 molds에 의한 가공식품 및 음료의 변질, mycotoxin에 대한 연구, 수확 후의 mycotoxin을 조절하는 기술 및 이러한 생물체의 rapid detection method를 내용으로 하고 있다.

- Overview of the problem
- Case studies on the spoilage of processed foods and beverage by yeast and molds
- Mycotoxins: Current challenges and prospects for the future
- Novel approachs for controlling yeasts and molds in processed foods and beverage
- Preharvest control of yeast and molds in commodities
- Rapid detection methods for yeast and molds

(3) Symposium on Microarray Technology?

Microarray technology는 미생물을 전체의 genome level에서 분석할 수 있는 첨단 분석기술을 제공해 줄 수 있는데, 동시에 유전자의 존재여부 및 expression 여부를 알 수 있다. Microarray-based expression monitoring은 food-associated bacteria의 서로 상이한 environmental condition에서의 발현양상을 파악할 수 있기 때문에 novel bacteria의 control 및 intervention strategy 방법 개발에 적용할 수 있다. 또한 gene 유무를 용이하게 파악함으로서 gene subtyping이 가능하며 특정 gene (virulence genes, antibiotic resistance genes 등)의

존재 여부도 파악할 수 있다. 최종적으로 target 유전자의 multiplex detection이 가능하여 pathogen 이나 spoilage organism의 detection 및 undesirable food component(예를 들면 포장지에 표기되지 않은 축육)의 detection에 효율적으로 사용될 수 있다. 이 심포지엄은 microarray technology에 대한 introduction, 식품산업에서의 다양한 application으로 구성되어 있었다.

- What is the microarray technology and how is it used?
- Use of DNA microarray for subtyping microorganism
- Transcriptional profiling ; Is this gene on
- Microarray as a diagnostic tool

(4) Risk assessment 관련 연구

이번 학회에서도 Risk assessment에 관한 많은 연구 보고가 발표되었으며, 그동안 사용한 기술적인 사항에 있어서 발생되는 문제점들에 대한 논의가 많았다. Risk assessment 기술에 관한 문제는 항상 변하는 환경, 새로운 검출법에 대한 발전 등으로 지속적인 update가 필요한 분야이다.

S02 Microbiological Predictive Models: Development, Use and Misuse

The purpose of the symposium is to present the latest developments in microbiological predictive models, practical and regulatory uses and limits of predictive models, and an international perspective. The audience is industry, regulators and academics who use, develop or validate microbiological predictive models. Three active model developers in the field will present their latest developments. The ARS Pathogen Modeling Program has been continuously improving since its early versions as a spreadsheet. Combining it with the European ComBase has greatly expanded its utility and made ComBase available to many more workers. Modeling microbial responses to continuously changing conditions has been a challenge. Two developers will present their work on a cooling model and a thermal inactivation model. For context, two regulatory microbiologists will add industry and government perspectives on the utility of current predictive models and their limits for practical and regulatory use. Finally, one of the pioneers of microbial predictive modeling will sum up with his insights on optimizing the use of predictive models as well as offering the experience of the Australian meat industry. Thus, this symposium will also give model developers additional insight on improving the utility and application of models that they are developing. The audience will also have a greater knowledge of what current and future models can offer them.

- 미생물 예측 모델을 만들기 위한 세가지 software를 소개하였다.

S13 They Said What? - The Risky World of Risk Communication

TOBY TEN EYCK, Michigan State University, 433B Berkey Hall, East Lansing, MI 48824, USA;

Communicating on food safety issues can be a perplexing and complicated process. Those within the food safety arena have risk analysis

information that must be presented to the public, scientists, regulators, politicians, consumers and the media. How each of these groups hears information, processes that information and then recommunicates to others influences the perception of risk. Whether the hazard is biological, physical or chemical, whether the outcome is acute or chronic, whether the risk is significant or insignificant, and numerous other factors also impacts on the perception of risk by many audiences. The symposium will introduce the social/cultural dynamics of risk and then, through the use of case studies, evaluate the historic success of risk analysis within specific areas of food safety. Using the broad topic areas of agricultural production, agricultural processing, food processing and bio-security, the speakers will identify and analyze the difficulties of staying on message while under fire from the many stakeholders. Utilizing the components of risk assessment, risk management and risk communication, each of the case studies will provide a historic picture of the changing perception of risk and society's reaction to that change. In addition, strategies for reducing message modification will be presented.

- 식품안전에 대한 세계적인 의견교환은 매우 중요하지만 어려운 실정이며, 또한 식품과학자, 정치인 소비자 등과 같이 배경이 다른 집단들의 의견교환 방법도 매우 중요하다.

S15 Managing the Risk of Listeria monocytogenes at Retail and Restaurants

ANN DRAUGHON, University of Tennessee, 2605 River Road, 105 Food Safety and Processing Bldg., Knoxville, TN 37996, USA;

Manufacturers of ready-to-eat foods have made significant improvements in the design and manufacturing processes of sensitive products to prevent contamination and/or growth of Listeria monocytogenes. Control measures include reformulation with antimicrobial agents to inhibit L. monocytogenes growth, installing postlethality treatments to eliminate potential contamination, plant design focused on the isolation of individual producing lines, and increased environmental and finished product testing for Listeria monocytogenes or Listeria spp. Recent studies demonstrated that L. monocytogenes can persist in some retail environments. However, knowledge of the potential transmission of L. monocytogenes to foods, and of effective control measures in retail and restaurants establishments, is limited. This symposium will cover the latest information on the incidence of L. monocytogenes in retail and restaurant environments and the opportunities for additional control measures to prevent product contamination. Presenters will focus on defining the problem of L. monocytogenes in retail and restaurants, identifying current control measures in place, providing insight on additional control measures potentially needed, and providing some of the questions and issues that have arisen about the methodologies to monitor this pathogen in retail and restaurant settings to prevent harboring of L. monocytogenes in their environment. The information covered in this symposium will provide valuable tools to food safety professionals, personnel at regulatory agencies, and retail and restaurant managers and operators.

- 최근 미국에서는 RTE food에서 *Listeria monocytogenes*에 대한 관심과 비중이 매우 높으며, 일반 소매상과 음식점 등에서 취급하는 RTE food에 대한 취급시 *Listeria monocytogenes* 에 대한 위험 잠재력에 대한 대비를 하고 있다.

S16 Risk and Control of Salmonella in Raw Nuts

BILL HOSKINS, Blue Diamond Growers, 1802 C St., Sacramento, CA 95812, USA;

Recent outbreaks of salmonellosis associated with the consumption of raw almonds have caused concerns about the risk and control of Salmonella in raw nut production and consumption. This symposium will discuss a range of topics associated with the risk and control of Salmonella in raw nuts. Speakers from government, industry and academia will provide information on the occurrence of Salmonella in nut production and processing environments, wet vs. dry cleaning, and sanitation practices in postharvest environments. The speakers will provide an overview of the 2004 Salmonella outbreak in almonds and its impact on the industry. The symposium will also address the latest in thermal, non-traditional thermal, and non-thermal processes for the control of Salmonella in raw nuts.

- Nuts류에 대한 Salmonella 오염에 대한 관심과 비중이 매우 높으며, Almond의 주름 부분에 존재하는 미생물에 대한 오염에 대한 처리가 매우 중요하다.
- Nuts류에서 Salmonella에 대한 살균방법을 소개하였다.

T3-10 An Innovative Method for the Recovery of Escherichia coli, Clostridia, and Yersinia DSC enterocolitica from Air Samples

BETH CROZIER-DODSON and Daniel Fung, Kansas State University, Dept. of Animal Sciences and Industry, 1600 Midcampus Drive, Call Hall 202, Manhattan, KS 66506-1600, USA;

Recovering and identifying bacteria from the air can be difficult due to drying stress, nutritional deficiencies, or injuries incurred during air sampling. Previous studies using conventional agars for recovery of bacteria from air samples identified only 2/511 (0.004%) bacterial isolates as Escherichia coli, none as Clostridia, and only 1/511 (0.002%) isolates as Yersinia. As these bacteria may be under-reported, a new method for the recovery of E. coli, Clostridia, and Yersinia enterocolitica from animal confinement air samples was devised. Air samples were collected on Tryptic Soy Agar plates using an impaction air sampler. Depending on the location, 60 to 180 L of air were sampled. The plates were overlaid with 25 ml of either Fluorocult Brilliant Green 2% Bile (BRILA) broth for E. coli, Differential Reinforced Clostridial broth (DRCM) for Clostridia, or an in-house -developed broth for Y. enterocolitica enrichment. The DRCM plates were sealed with Parafilm and all plates were incubated for 24 to 48 h at 35 to 37캜. Following incubation, cultures were identified using appropriate microbiological methods and test kits. Using the new approach, 75% of the BRILA plates recovered 168 - Program and Abstract Book E. coli, 80% of the DRCM plates recovered Clostridia, and 100% of the plates containing the

newly developed broth recovered Y. enterocolitica. This research is significant as we successfully identified a novel, effective, and simple method for the recovery of E. coli, Clostridia, and Y. enterocolitica from air samples. Moreover, a highly selective Y. enterocolitica enrichment medium was developed.

- 공기중 미생물 오염을 평가하기 위하여 사용하기 위하여 필요한 배지를 설명 하고 있음.
- 최근 문제가 되고 있는 공기 오염 미생물을 평가하기 위하여 사용배지가 변하고 있음.

T5-02 Framework for Identification and Collection of Data Useful for Risk Assessments of Microbial Foodborne or Waterborne Hazards

ILSI Risk Science Institute Advisory Group on Data Collection for Microbial Risk Assessment, ILSI Risk Science Institute, One Thomas Circle, Washington, D.C. 2005, USA;

The ILSI Risk Science Institute (RSI) has established an Advisory Committee on Data Collection for Microbial Food Safety Risk Assessment (MRA) in developing countries. The committee includes representatives from FAO, WHO, governments, non-profits and academics from Asia, Europe, Africa and the Americas as well as ILSI branches. There is a need for capacity building in developing countries, both in how to do MRA, and on Program and Abstract Book - 173 the types of data needed to ensure that the risk assessments are meaningful. At present, data for international risk assessments come mainly from North America, Western Europe, Australia, New Zealand and Japan, as few data are available from other regions of the world. Risk assessments will be more relevant and useful if a broader data set is used, particularly when collecting data for exposure assessment or epidemiological food attribution. The Committee is developing a framework for data collection for MRA that could be used by national governments worldwide. The framework includes specific information on how governments can use existing data, and what types of new data may need to be generated in order for an assessment of risk to be made. The document lists both the minimum and the optimum data sets needed for MRA, focusing on data to determine burden of foodborne and waterborne disease, contamination of food/ water and food consumption patterns. Case studies on Vibrio in shellfish in Thailand and Malaysia and on Campylobacter in chickens in Uganda are used to illustrate the framework.

- Risk assessment 연구에 있어서 가장 시급한 문제는 전 세계적으로 관련 자료를 공유하는 체계를 갖추는 것으로 이와 관련하는 프로그램 개발임을 제안하였다.

(5) 발표 논문

P3-01 Prevalence of Listeria in Pork Bulbogi Obtained from Restaurants and Retail Markets in Korea

YUN-JI KIM, Eun-Jeong Seo, Jong-Keun Jang, Sang-Phill Hong, and Nam-Hyouck Lee, Korea Food Research Institute, San 46-1 Baekhyun-dong Bundang-gu, Seongnam-si, Kyunggi-do, 468-420, Korea

The prevalence of Listeria in pork bulgogi was studied in three locations in Kyunggi-do, Korea. Samples were collected from restaurants and retail markets. A total of 78 samples were collected from different sampling site in the cities of Anyang, Seongnam, and Suweon. The percent positive to Listeria for samples collected from Anyang, Sungnam, and Wuweon was 11, 38, and 52%, respectively. Overall, 25 of 35 (69%) samples collected from restaurants were positive to Listeria, whereas only 3 of 42 (7%) samples collected form retail markets were positive to Listeria. To isolate Listeria from pork bulgogi, enrichment of 25 g sample in Listeria enrichment broth, followed by incubating in fraser broth, was achieved. Then loopfuls of growth were streaked onto plates of oxford agar and blood agar. The six most frequent serovars isolated were L. grayi (19.2%), L. ivanovii (12.8%), L. welshimeri (11.5%), L. seeligeri (7.7%), L. monocytogenes (3.8%), and L. innocua (3.8%). The Listeria positive samples were were enumerated by most probable number (MPN). Numbers of Listeria were from below 0.12 MPN/g to 4.6 MPN/g.

- 경기도 일대의 음식점과 소매점에서 판매되고 있는 돈육을 수거하여 총균수, 대장균수, 리스테리아 균수 등에 대한 실험결과로, 대체적으로 리스테리아 수준이 높은 편이며, 본 실험 결과는 Risk assessment 모델링 시 raw data를 사용하고자 한다.

P3-02 Incidence of Listeria in Pork Collected from School Foodservice Programs in Korea

YUN-JI KIM, Eun-Jung Seo, Young-Ho Kim, Nam-Hyouck Lee, and Seok-Chan Jung, Korea Food Research Institute, San 46-1 Baekhyun-dong Bundang-gu, Seongnam-si, Kyunggi-do, 468-420, Korea

School foodservice programs are growing very fast in Korea, and the safety of raw materials of animal origin has become more important. The objective of this study was to observe the incidence and quantity of Listeria in pork from school foodservice programs. A total of 116 samples were collected from schools located in Kyunggi province. Isolation of Listeria from pork was achieved by enrichment of 25 g of sample in Listeria enrichment broth, followed by incubating in fraser broth. Then loopfuls of growth were streaked onto plates of oxford agar and blood agar. Overall, 95 of 116 samples (81.9%) collected were positive for Listeria. Identification of species of Listeria was accomplished using API kit. The five most frequent serovars isolated were L. grayi (49.1%), L. welshimeri (19.8%), L. ivanovii (16.4%), L. seeligeri (16.4%), and L. innocua (12.1%). Listeria positive samples were enumerated by most probable number (MPN). Numbers of Listeria ranged from below 0.12 MPN/g to 1840 MPN/g. From the above results, the incidence of Listeria in pork collected from school foodservice program was very high (81.9%), but L. monocytogenes was not detected.

- 경기도 일대의 학교 급식용 돈육의 위생수준을 평가한 자료이며, 대장균 수준은 양호하였으나 리스테리아 수준이 시중 유통 돈육보다 높은 것으로 나타나, 학교 급식용 돈육 납품업체의 위생관리가 더욱 필요시 되고 있다.