



5th IUMS Outreach Programme Advances in Food Safety and Mycotoxins

Faculty of Agricultural Technology, Universitas Gadjah Mada
Yogyakarta, Indonesia
January 19-20, 2017

Organized by:



Center of Excellence on
Mycotoxin Studies (CEMycoS) of
Faculty of Agricultural Technology
Universitas Gadjah Mada



International Union of
Microbiological Societies (IUMS)

In collaboration with:



Indonesian Society
for Microbiology



Indonesian Association of
Food Technologists

REPORT

Introduction

In support of its mission to enhance the scientific background and professional effectiveness of basic and applied microbiologists, the International Union of Microbiological Societies (IUMS) is embarking on a program of educational outreach to developing countries and their microbiologists. The Union envisions an IUMS series of courses that will be offered to groups of microbiologists that may include graduate students, postdoctoral fellows, and practicing professionals from developing countries within a given geographic region. These will be offered periodically in various regions and on different topics of interest and importance.

The first IUMS Regional Course was offered in Singapore during June 14-16, 2010, and served microbiologists from the surrounding Asian countries. Singapore was chosen as the site, because of its proximity to the countries of Asia. IUMS made a contribution to the subsistence of the successful applicants as far as the finances allow. It is expected that this experience will boost the capability of the attendees in their microbiologic work after they return home, and we shall endeavor to forge a network of the attendees, so they can continue to communicate with each other and the instructors by e-mail.

The second IUMS Regional Course on Food Safety was offered in Bali (Indonesia) 22 - 24 June 2011 and organized in collaboration with the Indonesian Society for Microbiology (PERMI), the International Commission on Food Mycology (ICFM) and the International Committee on Food Microbiology and Hygiene (ICFHM). The third IUMS outreach conference on Antimicrobial Resistance took place in Havana, Cuba on November 14-16, 2013. The fourth course in Yogyakarta focused on food safety and mycotoxins

The Faculty of Agricultural Technology Universitas Gadjah Mada (FTP-UGM) via its Center of Excellence on Mycotoxin Studies (CEMycoS) organized “the International Conference on Mycological Aspects of Food and Feed Safety” (IC-MAFFS) on 27-29 June 2013 at Universitas Gadjah Mada Yogyakarta, Indonesia. In 2014, FTP UGM took the opportunity to be the local organizer for the fourth IUMS outreach program, with the title of the activity “IUMS Outreach Program on Food Safety and International Conference on Mycotoxins”. This program was conducted for two days, 14-15 November 2014, held at the Faculty of Agricultural Technology UGM.

This year, FTP UGM authorized by International Union of Microbiological Societies (IUMS) was success in organizing “5th IUMS Outreach Programme on Advances in Food Safety and Mycotoxins”. This programme was supported by IUMS, **International Commission on Food Mycology (ICFM), and Indonesian Society for Microbiology (PERMI)** and it was attended by more than 250 attendees including scientists and researchers as well as industrialists from around the globe.

Programme of 5th IUMS Outreach Programme Advances in Food Safety and Mycotoxins

Thursday January 19, 2017

Opening

Traditional Dance

08.00am



Preface

Indonesian Society for Microbiology

Dr. Siswa Setyabudi

08.16 am



- Welcoming all the guest speakers and participant.
- “Food safety aspect has a significant role in the food chains. Enhancing the food safety management is strongly needed to prevent diseases and trade disruption. I believe that through this programme people from various background such as from academic institution, government agencies, research center and industrial sector, there will be a strong partnership and commitment to make an improvement on food safety management.”

- Giving applause to the organizer of the programme.
- Giving thanks to all the programme speakers, participants, sponsors and media partners that help this programme.

Preface
Dean of Faculty of Agricultural Technology,
Universitas Gadjah Mada

Prof. Dr. Eni Harmayani, M. Sc.
12.12-12.29 pm



- Welcoming guest speakers and all participants of the programme.
- Prevention of foodborne pathogens and mycotoxins occurrence especially in tropical countries such as Indonesia is very important since it has many strategic implications not only in health but also in economic losses and on international trade. Therefore stronger partnership between researcher, universities, government agencies and industries in national and international level is needed to achieve food safety in Indonesia and globally.
- Congratulating all members of the organizing committee and volunteers on a job well done. Special gratitude goes to guest speakers, participants and all other parties that supported the event.

Preface

International Union of Microbiological Societies (IUMS) and its outreach programs

Prof Dr h.c. Robert A Samson (Secretary general)

08.23-08.29am



- IUMS is one of the 31 Scientific Unions of the International Council of Science (ICSU). It was founded in 1927 as the International Society of Microbiology, and became the International Association of Microbiological Societies affiliated to the International Union of Biological Sciences (IUBS) as a Division in 1967. It acquired independence in 1980 and became a Union Member of ICSU in 1982.
- The major goal of IUMS is to promote research and the open exchange of scientific information for advancement of the health and welfare of humankind and the environment and strongly discourages any uses of knowledge and resources to the contrary.
- The **fifth** IUMS outreach programme on Food Safety and Mycotoxins is now taking place in Yogyakarta, Indonesia **19-20 January 2017**. We are very proud that this meeting is organized in close collaboration with CEMycoS, Faculty of Agricultural Technology, Universitas Gadjah Mada Yogyakarta, Indonesia, the Indonesian Society of Microbiology, the International Commission on Food Mycology (ICFM), the International Committee on Food Microbiology and Hygiene (ICFHM) and ILSI Southeast Asia Region. IUMS is very grateful to these partners to make the IUMS outreach program to be a success.
- IUMS Congresses 2017 are organized by Singapore Society for Microbiology and Biotechnology (SSMB) on 17-21 July 2017 at the Sands Expo & Convention Centre. The IUMS 2017 Congress incorporates three major congresses: the 15th International Congress of Bacteriology and Applied Microbiology, 15th International Congress of Mycology and Eukaryotic Microbiology and 17th International Congress of Virology. The congresses will deal with all aspects of Infectious Diseases and Microbiology and is a platform for the exchange of knowledge and opinions of professionals from academia, industry, government and for fostering international collaborations.

Preface

Prof. Dr. Endang S. Rahayu
Chairperson of 5th IUMS Outreach Programme
08.29-08.38am



- Welcoming all the participants, guests, and colleagues to Yogyakarta, Indonesia.
- Giving Thanks to the International Union of Microbiological Societies (IUMS) via Prof. Robert A. Samson for the opportunity given to the Faculty of Agricultural Technology, Universitas Gadjah Mada to organize the 5th IUMS Outreach Programme: *Advance in Food Safety and Mycotoxins*.
- Introducing all the speakers
- Introducing all the participants
- Giving thanks to IUMS, all guest speakers, oral and poster presenters, participants, as well as sponsors and media partner for their contribution to the success of the outreach programme. The committee have tried their best in order to make this event meaningful and pleasant one.
- Giving Thanks to all of the colleagues and organizing committee (students) for their never ending precious cooperation that made this event possible.

Session 1: Food Safety 1

Moderator: Tyas Utami



Current status of food safety in Indonesia and its policy

Suratmono

08.38-08.42am



Food safety is part of multidimensional aspect. It is not only part of food security but also part of health, economy, and development. Specific policy and strategy on food safety has been developed by World Health Organization (WHO), Food and Agricultural Organization (FAO), as well as Association of Southeast Asian Nations (ASEAN) to provide direction for the Member States in particular and international community in general to improve food safety. Foodborne disease is prominent example of event which may reflect food safety status. WHO estimates more than 200 diseases is spread through food, ranging from acute disease, e.g. diarrhea, to chronic disease e.g. cancers. Nevertheless, a foodborne disease outbreak is very likely to impede socioeconomic condition by straining health care systems, and harming national economies, tourism, and trade at the same time. This talk provide an overview of food safety status in Indonesia by sharing information regarding consumer concerns, foodborne disease outbreak, and food monitoring. Integration of food safety to the national legislation and development policy also be discussed. Some examples of BPOM's priority programs was

explained briefly to give insight on BPOM efforts as food safety leading sector in Indonesia in improving national food safety by empowering stakeholders, including community

An overview of foodborne parasites and the mechanisms for their control

Brent R. Dixon
09.03-09.32am



Foodborne route of parasite transmission should give a more attention, it is due to review from FAO and WHO on foodborne parasites. The foodborne parasites of greatest global concern include those that are found in meats, such as larvae of the tapeworm *Taenia solium*(pork) and the roundworm *Trichinella spiralis* (pork and wildlife) and many others. There are an explanation about factors involved in the contamination of foods and the transmission of parasites, the control measures available for the various parasite-food commodities at the farm level, post-harvest and consumer level, restricted access by livestock and other animals, improved sanitation and hygiene, use of filtered water, chemical and physical disinfectants, thorough cooking or freezing of meats and fish, and washing of fresh produce. Furthermore, these topic will explain more in this article.

Risks for mycosis caused by foodborne fungi

Su-lin L. Leong¹ (delivered by J. Houboken)
09.32-09.52am



Invasive fungal infections (IFI) are a cause of mortality particularly associated with certain patient groups. Infection occurs via the respiratory route or via breach of the skin or mucosa. Benedict et al. (2016, *Foodborne Pathogens and Disease*, 13:343) reviewed 17 cases where ingested fungi (often foodborne), 14 reports were of IFI caused by moulds, with the majority (11 reports) caused by mucormycetes, often *Rhizopus* spp. These indicate the difficulty of confirming the epidemiology of mycoses caused by foodborne moulds. The risk to other vulnerable individuals of eating fungal fermented foods is not known, but a higher incidence of GI mycosis in black South African males in the 1950's was proposed to be associated with a background of high alcohol consumption in this population. Herbal teas and other plant-based supplements have been suggested as a possible source of mucormycetes causing IFI –in Asia then there is a big question that answer yet about widespread use of traditional medicines combined with an increasing number of undiagnosed diabetics represent a risk for increased IFI from foods.

Current Issues on Food Safety in ASEAN Countries

Ratih Dewanti
09.52-10.47am



Most country in South East Asian (SEA) region has interest with food safety. World Health Organization (WHO) inform that the top 5 foodborne pathogens that cause foodborne illnesses in the region are *Campylobacter*, *Shigella*, Enterotoxigenic *Escherichia coli*, non-typhoidal *Salmonella* and Norovirus. While the overall picture in the region as projected by WHO is available, the data in each country may not be exhaustive. Some of the problems in those countries are inadequate or even absence of foodborne disease surveillance and limited foodborne disease outbreak investigation.

Session 2: Foodborne fungi: risks, control and opportunities 1

Moderator: Gayuh Rahayu



New and old names of food borne fungi

R.A Samson, J. Houbraken

10.48-11.19am



The correct identification of foodborne fungi is important to identify characteristics of the species, and can't be denied that in previous years some name of common fungi have changes. Another important change in recent fungal nomenclature is the abandonment of dual nomenclature for pleomorphic fungi. In the latest International Code of Nomenclature for algae, fungi and plants the current nomenclature rules require the use of only one name for a fungal species, whereas previously two or more names could be applied to different morphs of the same fungus.

New insight on safety and quality of salami production related to *Penicillium* species

Giancarlo Perrone

11.20-11.43am



Fermented meat products are unique and often represented as an element of culinary heritage and gastronomic identity. Together with meat enzymes and bacteria, molds are very important in the ripening of some dry fermented meat products. Fungal starter cultures, contribute to the development of the typical sausage's flavor through their lipolytic and proteolytic activities. They also played an important role in preventing lipid oxidations and counteracting undesirable microorganisms. Various genera of fungi could colonize salami but *Penicillium* species are predominant, and above all *P. nalgiovense*, *P. olsonii*, *P. brevicompactum*, *P. chrysogenum* and a new recently described species *P. salamii*. Recently we investigated the technological aspects of a *P. salamii* strain, already well adapted to the ripening conditions. Its interesting attitude to the seasoning process of meat resulted in fast growth, with high lipolytic and proteolytic activities suggesting it as promising candidate to be used in new fungal starter formulations for meat industry. On the other hand, depending on its peculiar on salami surface co-inoculated with *P. nalgiovense* and *P. nordicum* at different rates. In addition, we monitored the expression of a keygene of OTA biosynthesis in *P. nordicum* and toxin accumulation in meat during the seasoning process, observing that expression profile was consistent with OTA accumulation. Results revealed that *P. nordicum* monitoring, since early steps of seasoning, could represent a valid and fast molecular tool for early alert of the possible OTA accumulation. composition, the surface mycobiota could be colonized by undesirable molds, like *P. nordicum* an important and consistent producer of the potent nephrotoxin ochratoxin A (OTA), widely reported as contaminant of dry-cured meat products. In relation to monitoring and addressing the safety of seasoning of salami we developed a sensitive and easy to use LAMP assay for *P. nordicum* detection

Mould spoilage of foods and beverages: assessment and prevention

Emilia Rico

11.44am-12.03pm



Worldwide, spoilage of foods and beverages due to fungi costs the food and beverage industry big economic losses. The fungi groups associated with fungal spoilage are: (1) xerophilic fungi in low and intermediate water activity (aw) foods; (2) heat-resistant fungi in heat-processed products; (3) preservative-resistant fungi in beverages and foods that are preserved; (4) mycotoxigenic fungi and (5) anaerobic fungi or fungi that can grow under very low oxygen concentration.

Each food group has an associated mycobiota that can cause spoilage. Usually, this mycobiota is composed by a few species. The right methodology and media has to be used to isolate the associated mycobiota. It is essential that spoilage fungi be accurately identified. New molecular techniques have helped with identifying the species of spoilage fungi. However, in the case of filamentous fungi, DNA sequencing techniques have to be used in conjunction with morphological techniques.

Shenzhen Bioeasy Biotechnology Co.,Ltd presentation

12.03 – 12.31am



Photo session

12.31-12.36pm



Lunch Break

12.36 – 1.27pm

Session 3: Quantitative microbiology 1

Moderator : I Nengah Sujaya



An introduction to quantitative microbiology

Vasilis Valdramidis

1.27-1.58pm



The development and application of models in food safety and food spoilage falls within the discipline of quantitative microbiology also known as predictive (food) microbiology. Overall, the models developed in predictive microbiology aim at the quantification of the effects of intrinsic, extrinsic and/or processing factors on the resulting microbial growth, inactivation or inhibition in food (model) products. Numerous modelling approaches have been published the past years in the literature. The applicability of these modelling approaches to perform shelf-life assessment, process design optimization, exposure assessment and systems biology studies will also be presented.

Resources to assess and validate the impact of new preservation technologies as control measures in food industry

Sara Bover-Cid

1.58-2.29pm



Food safety management systems based on the hazard analysis and critical control points (HACCP) require the development and implementation of preventive control measures all along the food manufacture and supply chain, from primary production to consumption. These control measures have to be validated, monitored and verified, three different but complementary actions needed to assure food safety. Within the current flexibility of the food safety management systems, and the emergence of new processing and preservation technologies, the validation and re-validation of control measures acquires increased relevance.

For emerging and new preservation technologies, usually a combination of approaches will be needed to provide reliable and robust validation results. Furthermore, the design of the studies to be carried out will depend on the type of technology, the food safety outcome required, as well as the uncertainty and variability associated with the food product, the technology and the validation approach itself. The results of proper validation studies may be useful for the design of verification and monitoring procedures, including final product testing.

From microbial prevalence to virulence – hand in hand data for quantitative food safety evaluation

Andreja Rajkovic

2.29-2.55pm



Despite extensive efforts to develop improved food safety monitoring and evidence-based risk management definitive foodborne illness preventions and interventions remain elusive in large part due to the lack of sufficient information about pathogens diversity. Risk assessment studies are evolving to reflect variability sources such as storage temperatures of food products, seasonality of different food preparation methods, raw materials, home vs. out of doors eating, culinary practice, consumption patterns across a World, and product handling processes across different producers. But, few or none reflect inter-strain variations in behavior and virulence; and these are vast.

The future food safety risk management will probably need to step away from only enumeration of pathogens per unit of food, and include virulence of pathogens as influenced by specific foods/food processing conditions (pH, water activity, temperature, preservation, background flora, packaging conditions etc.) with an eye on especially vulnerable consumers.

Integration of microbial behaviour in predictive models development: the case of *Listeria monocytogenes* in fermented sausages

Luca Cocolin

2.56-3.23pm



Despite the efforts dedicated by food producing companies, official authorities and research institutions to reduce the prevalence and incidence of foodborne pathogens, they still represent relevant health risks for the consumers. Due to the important repercussions which food safety has on the society, not only by the health point of view, but also economically, deeper investigations are necessary to develop tools to combat and reduce the incidence of foodborne pathogens.

In this study we will present the results obtained by applying molecular methods (microarrays and RT-qPCR) to investigate the transcriptomic response of *Listeria monocytogenes* when subjected to several stresses *in vitro* (mainly pH and salt) and *in situ* (during fermentation of sausages). The results obtained underline the heterogeneity of the strains used in the study and they highlight how this intra-species diversity has to be taken into consideration for risk assessment. Moreover, it was underlined the important difference of the outcomes when performed *in vitro* and *in situ*.

The study demonstrate how transcriptomics can be efficiently used to better understand the behavior of *L. monocytogenes* in the food chain.

Modeling the microbial dynamics of food during different processes

Vasilis Valdramidis

3.24-3.51pm



The objective of this lecture will be to discuss the predictive, kinetic modelling approaches dedicated to different processes (e.g., thermal and non-thermal). The application of predictive modelling tools for critically assessing issues in relation to the efficacy and to the impact of processes on the microbial inactivation will be outlined. All of these will be tackled focusing on the development of valid kinetic modelling structures to be exploited for the design and optimization of food processes. Specific examples will be given in which model based design of food processes (e.g., high hydrostatic pressure) ensuring safety and quality of food systems is developed. Future trends in which parameters are estimated from non-static conditions, while studying the kinetics of numerous safety and quality indices will also be presented. These non-static conditions could refer to any realistic industrial process or food storage environment.

Progress of Microbiological Risk Assessment development in Indonesia

Winiati P. Rahayu

3.51-4.23pm



The advancement of microbiological risk assessment (MRA) in Indonesia were reviewed. The first advancement in MRA was the establishment of Indonesian Risk Assessment Center which aims to provide a scientific base for food safety policy in Indonesia. The Center currently is working on MRA about *Salmonella*, which was aimed to discover the level of salmonellosis risk due to fried chicken consumption and to give recommendations to lower the risk. As a maritime country, Indonesia also has performed three MRAs regarding the contamination of *Salmonella* and *Vibrio parahaemolyticus* on fishery products. The results have been communicated to be used by the risk manager as a base for making policy to handle the refusal of exported Indonesian fishery products.

Session 4: Food Security
Moderator: Agustina Asri Rahmianna

Food Safety and Mycotoxin Research in ASEAN Countries
Warapa Mahakarnchanakul
4.47-5.15pm



According to the scholar websites such as ScienceDirect, Scopus, Elsevier and the others, since 2000 less than a hundred research articles related to the mycotoxins in local foods, particularly in ASEAN countries, and conducted by ASEAN scientists and researchers are published. problem of mycotoxins contamination exists in local commodities such as peanuts, spices, corn and feed materials are not the new issue, the adverse incidence is not prominent; the food safety management is not the top priority. Therefore, the sophisticated and costly research of mycotoxins and mycotoxins producing fungi were less supported by the funding agencies. Less sharing analytical data among industry and government is also the barrier to perform effective risk management, the data are kept due to the concerning of marketing. Usually sharing the data from investigation will be very useful to establish the guideline or regulation for their countries or region. Thus, the scientific collaboration and strong commitment among the ASEAN countries with international agencies are needed and it will be the open gate to rectify the problem. Sharing the resources both academia and facilities will solve the limit of resource and funding.

Mycotoxins occurrence in Indonesian commodities and its risk assessment

Endang S. Rahayu

5.17-5.24pm



Five of mycotoxins have been a major concern in Indonesia, i.e., aflatoxins, deoxinivalenol, fumonisins, ochratoxin, and zealarenon. However, occurrences of these mycotoxins in food have been focused only in aflatoxin, fumonisin and ochratoxin. In this presentation, preliminary study of risk assessment of aflatoxins via consumption of corn in the corn producer area (Temanggung) will be discussed. Aflatoxins and ochratoxin A were also found in chili powder, even aflatoxins also was detected in dried salted fish. Since aflatoxins contamination in food is difficult to be removed completely, so prevention of the occurrence of these toxins from the field and in the supply chain must be done. Risk assessment of aflatoxins should be widened through consumption of several food that susceptible to fungal attract

Microbiological Food Safety and Food Security: Application of Next Generation Sequencing Technology

Chai Lay Ching, PhD

5.35-6.15pm



Improving food quality for prolong shelf-life as well as ensuring food safety are important in addressing food security issue. Food waste and lost could occur at various points along the food supply chain: pre- and post-harvest, manufacturing, packaging, distribution and storage. In developing countries, food is typically wasted or lost in the early stages of food supply chain, and can be traced back to financial, managerial and technical constraints in harvesting techniques as well as inappropriate storage and cooling facilities. In this presentation, the application of Next Generation Sequencing (NGS) technologies, particularly metagenomics and whole genome sequencing in pre-harvest and during manufacturing to tract source of contamination, for the purpose of improving yield and product quality and safety will be discussed.

***Listeria monocytogenes*: pathogen of concern to the seafood industry**

Kitiya Vongkamjan

6.15-6.35pm



Contamination of seafood products with a major foodborne pathogen, *Listeria monocytogenes* has been occurred worldwide. *L. monocytogenes* causes a serious infection, listeriosis, in which leads to high mortality rates. *L. monocytogenes* is commonly found in seafood processing facilities. With the increased demand for lightly preserved and/or ready-to-eat (RTE) seafood products, finding of *L. monocytogenes* contamination in some RTE products is a public health concern worldwide. RTE seafood products have been shown with a leading contamination rate of *L. monocytogenes* as compared to other food categories. Understanding of the occurrence and diversity of *L. monocytogenes* in seafood products and processing environments may expand the tools that the seafood industry and regulatory agencies need for improving *Listeria* control measures. This can ultimately lead to minimizing cross-contamination in finished seafood products and ensuring product safety for domestic and international markets.

Dinner

6.35 – 7.00pm

Traditional dance

7.00pm



Friday, January 20, 2017

Technical session

Moderator : Nanik Suhartatik, Titiek F. Djafaar, Tri Marwati



NADES for monascus pigment extraction: A perspective

Ignatius Srianta

08.05 – 08.17am



A perspective on monascus pigment extraction with NADES (natural deep eutectic solvent), a newly unique green solvent. Monascus pigment is a mixture of red, orange and yellow colour pigment compounds. The pigment compounds are produced by *Monascus* sp., a filamentous fungi, through liquid fermentation or solid state fermentation. The pigments have great potential not only for natural colorant but also for functional ingredient in food and beverage application. Because of almost all pigment compounds are insoluble in water, it is usually extracted by using organic solvent especially ethanol. This is a great barrier of the pigments application in food and beverage.

Addition of natural preservation made from the formulation of guava leaves, soulatri leaves, clove leaves and lime powder on coconut sap toward quality of coconut sugar

Karseno

08.18 – 08.28am



Coconut sugar is made from coconut sap (neera). Neera is easily damaged because of microbial activity. The effort to prevent damage of neera is by adding preservatives agent which called laru. The result showed that the best coconut sugar gained by addition of natural laru is the one which consist of guava leaves : clove leaves : soulatri leaves : lime (10:10:10:70) at concentration of 10% which produce coconut sugar with sensory characteristics of brown color (1,63), sweet taste (3,01), coconut sugar aroma (2,6), hard texture (3,5), overall preference was like (3,02) and chemical characteristics were reducing sugar content of 4,57% (db), water content of 10,86% (wb), and ash content of 1,1% (db). The quality characteristics were met with Indonesian National Standard for coconut sugar.

Postharvest quality improvement of nutmeg (*Myristica fragrans*)

Okky Setyawati Dharmaputra

08.29 – 08.43am



Fragrant nutmeg (*Myristica fragrans*) is an important commodity used in food and pharmaceutical industries, hence its quality should be monitored. Based on a research conducted in 2013, postharvest handling method of nutmeg was not appropriately carried out, especially by farmers and collectors in North Sulawesi Province. The kernels can be easily infected by fungi (including *Aspergillus flavus*). This study was conducted to investigate the effect of two methods of nutmeg postharvest handling on moisture content, percentage of damaged kernels, population of each fungal species and aflatoxin content. The results showed that the appropriate postharvest handling method of nutmeg should be as follows: 1. Preventing ripe nutmeg fruits to have direct contact with the ground in the harvesting or collecting stage; 2. Drying the harvested nutmeg immediately after separating the nutmeg seed from the flesh and mace using smoke-drying method; and 3. Storing the nutmeg with its shell intact. This method is considered as a recommended GHP (Good Handling Practice) of nutmeg.

Anti-Mycobacterium tuberculosis strain H37Rv activity against Brazilin compound in vitro

Ratu Safitri

08.43 – 08.57am



Brazilin compound is known to have capability against several pathogenic bacteria, but until now, the ability of brazilin as antituberculosis haven't been investigated yet. Based on some researches, it's known that brazilin is capable to chelate iron. Mtb's growth also strongly influenced by the presence of iron. The purpose of this study was to assess the potential of anti Mtb from brazilin. This research was conducted by examining the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) that were observed for 8 weeks. The capability of brazilin compound to chelate iron in 4 different groups was assessed using Atomic Absorption Spectrophotometer (AAS) method. The test results showed that the MIC of brazilin presented at 128 ppm, while the MBC presented at 256 ppm. The results also showed that brazilin compound at 128 ppm concentration was able to chelate iron up to 32.96% and reduce the growth of Mtb up to 72% in 10⁻³ Mtb dilution and up to 60% in 10⁻⁵ Mtb dilution. The antituberculosis potential of brazilin is suspected because of its ability to chelate iron and the antimicrobial properties of brazilin structure itself.

Natamycin treatment to control *Rhizopus sp.* mold on *Fragaria virginiana*

Vita Meylani

08.58 – 09.06am



Fragaria virginiana (strawberries) fruit has high economic value in food industry which is discovered in Garut, West Java, Indonesia. However, the problem on postharvest disease caused by *Rhizopus sp.* has yet successfully resolved due to unavailable proper treatment methods of natamycin application. The aim of this study is to investigate the effects of natamycin concentration to control *Rhizopus sp.* mold. The natamycin was applied on the *Fragaria virginiana* via dip coating method. Total incidence by *Rhizopus sp.* and weight average of *Fragaria virginiana* observed during the 30 days of storage at 25°C. The results showed that the *Rhizopus sp.* invasion at days 4th were 43, 30, and 35% for control sample, 250, and 500 ppm, respectively. It is concluded that the natamycin treatment by dip coating method preserved effectively at lower concentration.

Quantitative risk assessment of acrylamide in Indonesian deep fried fritters product

Yoga Pratama

09.07 – 09.18am



Acrylamide is a carcinogenic and neurotoxic compound is a public health concern in fried food product. This paper demonstrated the exposure assessment and risk characterization of acrylamide in deep fried fritters in Indonesian population. Acrylamide concentration data was collected from selected monitoring and laboratory simulated researches in Indonesia and neighboring countries, while the consumption data covered 263 adult respondents with age 16-40. Exposure assessment was conducted with probabilistic approach and followed by Margin of Exposure (MOE) calculation. Estimated mean, median (P50) and P95 acrylamide intake were 14.85, 4.10 and 76.06 $\mu\text{g}/\text{kg}\text{-bw}/\text{week}$, respectively. Thus, resulted in estimated 17.4% of population exceed the tolerable intake value (18.2 $\mu\text{g}/\text{kg}\text{-bw}/\text{week}$). MOE derived from average exposure was 75, indicating significant risk and need of risk management action. Possible mitigation of 70% acrylamide level reduction was simulated and population who exceed the tolerable value was reduced to 6.9%.

Quality assurance of *Rhizopus* for tempeh starter

Gayuh Rahayu

09.19 – 09.28



Tempeh making process is shifting from non-hygienic to hygienic process in Indonesia. All the processes involved in hygienic process is intended to minimize the contamination of unnecessary microbes. Beside *Rhizopus microsporus*, yeast and bacteria have been found as a common microbiome in tempeh production. However, some strains of *R. microsporus* has been known to associate with endosymbiotic bacteria. This “mycotoxin” that is produced by *R. microsporus* is actually formed by the bacteria. Yet, the presence of endobacteria in *R. microsporus* starter of tempeh in Indonesia has not been investigated. In this research, twenty two *Rhizopus* spp. from various habitat including tempeh starter were examined for the occurrence of the endobacteria using 16S rDNA 63F and 1387R primers. The result showed that all of the *Rhizopus* tempeh starter is free from the endobacteria, but *Rhizopus* sp. from Waru (*Hibiscus tiliaceous*) leaf collected from Lumajang (East Java), a natural tempeh inoculant harbored endobacteria.

Diversity of *Aspergillus* spp. from groundnuts (*Arachis hypogaea*)

Latiffah Zakaria

09.29 – 09.39am



Groundnuts are often used as ingredients in cooking and consumed as snack. The legume has high nutrient content, thus susceptible to various fungal contaminants, especially species from the genus *Aspergillus* which is a well known storage fungi. *Aspergillus* spp. were isolated from groundnuts obtained from several sundry shops, using direct isolation and surface sterilization methods. Based on molecular identification using ITS, β -tubulin and calmodulin sequences, and phylogenetic analysis, eight species were identified. The most common species isolated was *A. niger* (n = 54) followed by *A. flavus* (n = 20). The results indicated that diverse species of *Aspergillus* occurred on groundnuts. Two well-known toxigenic fungi, *A. niger* and *A. flavus* were recovered from the legume, suggested that there are potential of contamination of mycotoxin.

Pathogenicity activity of *Fusarium oxysporum* and *Fusarium equiseti* from plantation of citrus plants in the Village Tegal Sari, Jember Umbul Wangi, East Java

Dalia Sukmawati

09.40 – 09.46am



Fungus is a ubiquitous decomposer and parasite associated with fruit and dead or dying plant tissues that also may be a pathogen on a wide range of agricultural plants. The objective of this work are isolation, identification and pathogenic assay fungi from citrus fruit plantations, Tegal Wangi, Jember, Jawa Timur. Isolation of fungi using the washing method. Samples were taken in the form of stems and leaves from citrus fruit plantation land in Tegal Wangi, Jember, East Java. Pathogenicity testing (the level of virulence of mold) was obtained using the Koch's postulates method. Based on the pathogenicity test, four representative mold isolates were selected and identified based on the sequence analyses of internal transcribed spacer (ITS) regions of rDNA. The molds were identified as: D5K3A (*Fusarium oxysporum* with 99% homology bootstrap value 64), D6. K3.B (*Fusarium equiseti* with 99% homology bootstrap value of 100%), D7.K2.B (*Fusarium equiseti* with 99% homology bootstrap value 99%) and D3.K2.B (*Fusarium equiseti* with 99% homology bootstrap value of 88%). *Fusarium equiseti* is a main source of trichothecenes, zearalenone and other mycotoxins which can cause serious disease in human and animal.

Quantification of aflatoxin B1 risk in peanut based product in indonesia: challenges and data gaps

Novinar

09.48 – 09.58am



Aflatoxin B1 (AFB1) is one of the mycotoxin which poses threat to human health due to possessing the highest potency to cause liver cancer or Hepatocellular Carcinoma (HCC) among other mycotoxin types. *Aspergillus flavus* and *Aspergillus parvius* are the common AFB-1 producing fungi which often found in peanut. Since peanut is one of the popular foods consumed by Indonesian, therefore it is necessary to quantify AFB1 risk to estimate the likelihood of adverse health effect due to the consumption of peanut and its products. Exposure assessment was conducted using deterministic approach with two scenarios to represent existing condition using all peanut based product samples (scenario 1) and implementation of good practices using the samples below maximum permitted limit (scenario 2). AFB1 concentration data were obtained from institutions who conduct AFB-1 study. The study suggested intervention should be made to increase good practices to reduce the contamination of AFB-1 for peanut based products.

The detoxification of aflatoxin B₁ in maize based product by combination of biological method and chemical binder

Francis M.C.S. Setyabudi

09.58 – 10.13am



A melting pot of activities engaged in the prevention and reduction of fungal infestation and mycotoxin contamination has been initiated by a group study of mycotoxin among university and research institution. This emerging consortium is encouraged to disseminate the research output and community service in overcoming those challenge in food chains. Currently, the role of endogenous filamentous fungi has been studied for reducing and detoxifying aflatoxin B₁ under solid state fermentation, particularly in maize. In the other hands, the combination of lactic acid bacteria, yeast, and methionine have been explored for their binding ability in maize based feed product. Moreover, the limited trial of its detoxified product and mycotoxins binder have also applied in broiler feeding study. This study proposed that the enzyme activity of filamentous fungi may have important role during aflatoxin detoxification in maize. A meanwhile, the mycotoxins binder has reduced potential level of aflatoxin accumulation in broiler digestion.

Break

10.13 – 10.25am

Session 5: Methods and approaches in food safety and quality

Moderator : Widiastuti Setyaningsih



New developments in detection and identification of foodborne molds

J. Houbraken

10.27 – 10.51am



Identification of a species is an important step in food mycology. A correct name is vital for optimal communication, and is often the link between studies of various fields. Ideally, identification should be unequivocal, accurate, simple and immutable. In the last decade, new insights have resulted that certain well-known food related species appear to be species complexes. This might lead (initially) to confusion; however, a correct identification has a function: certain species of these complexes have unique properties such as production of different mycotoxins, higher resistance to certain antifungals and/or have unique enzyme profiles. Nowadays, sequencing of specific genes for species identification is commonly applied. The choice of the target gene and use of reference databases for identification are crucial for correct species

identification. New identification techniques are being developed and are promising tools for rapid species identification.

The study of microbial ecology in foods: Opportunities in the use of NGS approaches

Luca Cocolin

10.52 – 11.12am



In the last five years, the study of microbial ecology in foods has benefited substantially from the development of second generation sequencing techniques, generally referred to as next generation sequencing (NGS). Having the possibility to sequence simultaneously multiple DNA sequences opened up a number of opportunities for scientists involved in the understanding of diversity and interactions in complex microbial ecosystems. It is essential to underline that nowadays the approaches that can be used, based on NGS, are basically two: metagenetics and metagenomics. The information obtained from the application of those methodologies are very different and this aspect must be taken into consideration very carefully in order to avoid misinterpretation of the data obtained. Exploited NGS approaches to study a number of different food ecosystems, both during fermentation and spoilage, in order to define the main bacterial populations involved in the transformation processes. Moreover, metagenomics were used to investigate the changes in the gene content of fermented sausages from the manufacturing to the end of the maturing.

Aptamer-based detection and quantification of mycotoxins in food

Ludwig Niessen

11.15 – 11.36am



Aptamers are DNA or RNA polynucleotides that display a specific affinity against molecules other than nucleic acids. Designing aptamers relies on the SELEX process (Systematic Evolution of Ligands by EXponential Enrichment) in which random sequence oligonucleotides are mixed with nanoparticle-bound target molecules. Washing of particles will leave strongly associated oligonucleotides bound to their target molecule. A PCR using bound oligonucleotides will selectively enrich high affinity nucleic acids. After several repetitions, the SELEX process leads to the selection of aptamers with highly specific binding to their respective target molecule. Aptamers have been developed against bacteria and viruses, proteins and peptides as well as against small organic molecules such as pharmaceuticals and mycotoxins.

Session 6: Food safety 2

Moderator : Rachma Wikandari



Fungi and animal feed: Risks and opportunities for 'one health'

Su-lin L. Leong (presented by Naresh Magan)

11.37 – 11.56am

The concept of 'one health' acknowledges that the health of humans is linked to the health of animals and the environment. The growth of mycotoxigenic moulds in animal feeds can affect human health and nutrition either indirectly or directly. Certain mycotoxins can be produced in commodities that are solely or primarily consumed by animals, the toxins can affect the growth and health of animals, and the associated decrease in productivity is negative for both humans, for whom animal husbandry is a key part of their livelihood, and environmental sustainability, which is favoured by optimal use of available resources. In contrast, other mycotoxins produced in cereals consumed by both animals and humans have direct impacts on animal and human health. For this reason, permissible levels for trichothecenes, fumonisin, zearalenone, ochratoxin and aflatoxins, among others, are legislated in human foods. The presence of these mycotoxins in animal feeds may be managed by guidelines, legislation, or a combination of these. The management of mycotoxin contaminated commodities from a 'one health' perspective raises some interesting questions.

Emerging non-thermal technologies to improve food safety. Case study: High pressure processing and biopreservation of meat products

Sara Bover-Cid

11.57 – 12.21pm



The increasing demand of consumers for healthier, fresh-like and clean labelled food, if possible commercialized as a convenient product (ready-to-eat/use) with an extended shelf-life, have triggered the emergence of non-thermal food processing technologies. In this framework, high pressure processing (HPP) is a non-thermal environmentally friendly technology used to inactivate vegetative pathogenic and spoilage microorganisms, enabling cold-pasteurization of food with limited effects on the organoleptic and nutritional quality. Lethal effects on microorganisms and enzyme inactivation cause irreversible changes in macromolecules, while valuable low molecular components (vitamins, flavors, etc.) remain practically unaffected. Biopreservation consists in the use of non-pathogenic microorganisms and/or their metabolites (e.g. organic acids or bacteriocins) to minimize or avoid the growth of spoilage and/or pathogenic organisms. The combination of HPP with other preservation strategies, such as biopreservation, constitutes an attractive approach to enhance bacterial inactivation and reduce the recovery of sublethally injured cells during product storage.

Development of infrastructure for management of microbial food safety in developing countries: All areas and all things considered – urban or rural

Wei-huan Fang

12.21 – 12.53pm



While foodborne illness remains a major threat to public health in developed countries, it is far more problematic in developing countries: disease burden largely unknown and risk factors unidentified. Dominance of small-scale food operators (SFO), distributors/retailers, wet markets as well as street foods in developing countries have complicated the already difficult-to-tackle food safety problems. Another problem is that food safety network, if ever existent, does not cover the rural areas where the risk of foodborne outbreaks is high. If comprehensive risk assessment along the food chain and GMP/HACCP approaches in SFOs are not feasible for economic reasons in the short term, governmental authorities should prioritize the measures for better food safety management by efficient use of relevant resources. Although the laws and regulations are in place in some developing countries, their effective enforcement is yet a matter of concern. It is expected that strict food safety laws will be implemented and GMP/HACCP will be introduced progressively, though gradual, in the food industry in developing countries for proactive intervention of microbial food safety along the food chain.

Break (12.53 – 13.25)



Session 7: Foodborne fungi: Risks, control and opportunities

Moderator : Agus Wijaya



Fungi and their involvement in food fermentation

J. Houbraken

13.27 – 13.50pm



The growth and metabolic activity of fungi (incl. yeasts) in foods can have different effects. On one hand, undesirable changes such as spoilage and mycotoxin formation can occur; on the other hand, fungal activity has been exploited by man for the purpose of food production. Fermentation is one of the oldest ways of food processing and is of great economic importance. For some food products, the fermentation process is well-documented and starter cultures are used, while other foods are still produced using “traditional” techniques. In temperate regions, *Aspergillus* and *Penicillium* species play a role in the fermentation of cheese and sausages. The genera have a dualistic role in food technology. Some species used in food fermentation processes appear to be closely related to producers of mycotoxins. The presence of these fungi in natural fermentations can therefore be of concern.

Preservatives: their role in preventing food spoilage

Naresh Magan

13.50 – 14.14pm



In the food industry to achieve the necessary shelf-life, whether stored at ambient or cool conditions, this approach to a large extent is achieved by the use of a range of different GRAS (Generally Recognized As Safe) preservative compounds. These are used to control both bacterial and yeast spoilage in liquid-based foods and for the control of filamentous spoilage moulds, especially in intermediate moisture foods, especially bakery products. There are a range of approved preservatives for use in food products and a range of antibiotic-type compounds which are used in dairy product. The concentration required for the control of spoilage bacteria and moulds is determined by the water activity, pH and storage temperature of the food product. This will impact on the efficacy of the preservative/s used and the shelf-life of a specific product. Screening of compounds can be done using traditional methods or with rapid methods. The importance of using an environmental screen to simulate food storage conditions is discussed in context of approaches to identify novel compounds for potential use and control of spoilage microorganisms.

Good Sanitation Practices (GSP) to prevent pathogen contamination and mould spoilage of food and beverages

Emilia Rico

14.15 – 14.38pm



In the United States, ready-to-eat (RTE) foods are recalled daily due to the presence of pathogens. These RTE products and beverages have received a lethality treatment to make them safe to eat or drink. However, when these products are directly exposed to the processing environment, they can become cross-contaminated with pathogens as well as spoilage microorganisms such as moulds. The contamination can come from the environment, the employees, or the equipment. Some RTE products may be reheated by the consumer to enhance palatability, but a reheating process will not necessarily eliminate any pathogens that exist on or in the product. Because many RTE products are consumed right from the package or after minimal reheating, any pathogens that are present will be consumed along with the product. Good sanitation practices (GSP) are essential to prevent pathogen contamination and mould spoilage. However, prevention requires more than GSP. It requires a good design of the processing rooms and equipment and above all, segregation of the areas where the product or beverage is open to the processing environment.

New insights in genetics of mycotoxin biosynthesis by genomic approach: The ochratoxin A story

Giancarlo Perrone

14.38 – 15.03pm



In the nineties fungal secondary metabolites (SMs), such as antibiotics and mycotoxins, started to be genetically characterized. Then, the clustered arrangement of genes involved in the biosynthesis of a single SM was studied. In the pre-genomic era, gene cluster discovery in fungi was complex and time-consuming, involving cumbersome traditional molecular methods. The breakthrough of next-generation sequencing (NGS) technologies and the advent of Bioinformatics have opened a new era in the study of biological systems. NGS technologies contributed significantly to the increasing availability of fungal genomes and bioinformatic analysis lead to the identification of SM clusters of known metabolites and to the prediction of novel cryptic clusters for still unknown microbial metabolites. Presented the example of how the genomic approach has led to the identification of biosynthetic genes and their role in ochratoxin A (OTA) production by *Aspergillus carbonarius*.

Break

15.03 – 15.25pm

Session 8: Method and approaches in food safety and quality 2

Moderator : Endang S. Rahayu



Detection and molecular characterization of parasites on fresh produce

Brent R. Dixon

15.27 – 15.57



Foodborne transmission of protozoan parasites is of growing importance in light of factors such as the global nature of the food trade, international travel, the increased number of immunocompromised and other susceptible individuals, and changes in consumer habits. The parasites *Cyclospora cayetanensis*, *Cryptosporidium* spp. and *Giardia duodenalis* have been linked to numerous foodborne outbreaks of diarrheal illness in North America. The objectives of this study were to determine the prevalence, as well as the genotypes and species, of *Cyclospora*, *Cryptosporidium*, and *Giardia* on domestic and imported packaged leafy greens purchased at retail in Ontario, Canada, in order to determine the potential risk to consumers, and to identify possible sources of PCR-positive samples were then sequenced to determine the parasite species and genotypes present. Testing revealed that *Cyclospora cayetanensis* oocysts were present on 1.7% of the samples. *Cryptosporidium* oocysts were present on 5.9%, with all

isolates belonging to the zoonotic species *C. parvum*. *Giardia duodenalis* cysts were present on 1.8% of samples, with the genotype Assemblage B predominating, suggestive of human contamination. These results suggest that parasite-contaminated leafy greens are not uncommon at retail in Canada and that they may represent a health risk since they are generally consumed raw.

Molecular ecology tools to develop control strategies for mycotoxigenic spoilage moulds

Naresh Magan

15.57 – 16.21



Mycotoxigenic fungi are responsible for significant contamination of a range of staple foods, especially in tropical regions of the world. Recent research has shown that aflatoxins are responsible for causing stunting in infants and children, especially in parts of Africa and other Low Middle Income Countries. This is an important driver to minimise the contamination of staple foods with mycotoxins. Research has shown that the genes involved in mycotoxin biosynthesis are usually clustered together. An understanding the molecular ecology of the key mycotoxigenic species, especially under different environmental conditions, can help identify approaches to inhibit specific key genes to minimise contamination of staple commodities with mycotoxins. q-PCR used for specific genes involved in mycotoxin to better understand the impact of ecological conditions on optimum and marginal conditions for mycotoxin production in commodities. Examination of specific key genes has also been utilised to better understand the efficacy of fungicides on mycotoxin producing fungi.

Development and application of a LAMP-based assay for the group specific detection of aflatoxin producing fungi in *Aspergillus* section Flavi

Ludwig Niessen

16.21 – 16.44pm



Aflatoxins pose a high risk to human and animal health due to their high toxicity and carcinogenic potential. Aflatoxins have been found to be produced by 14 different species within sections Flavi, Ochraceorosei, and Nidulantes of *Aspergillus* in a variety of different substrates and environmental conditions. Early and rapid detection of aflatoxin producing fungi can help to assess the toxicological potential of food and feed commodities and products. Species specific molecular detection assays are currently available but fail to detect species of minor importance. To enable rapid and sensitive detection of several aflatoxigenic species in a single analysis, a *nor1* (*AflD*) specific LAMP assay was developed. Application of the assay to the detection of *A. parasiticus* spores revealed a detection limit of 218 conidia/reaction with minimum sample preparation.

Proteomic and functional signature of a cross-talk between Caco2 cells and foodborne *Bacillus cereus* emetic toxin reveals hidden food safety risks of low dose and long term exposure

Andreja Rajkovic

16.44 – 17.01pm



Bacillus cereus emetic toxin, known as cereulide, is a lipophilic cyclic dodecadepsipeptide produced by certain strains of *B. cereus*. This toxin is known to induce an acute at doses of 8 µg/kg body weight, with even rare fatalities being reported. In contrast with acute doses associated with food poisoning, recent prevalence data demonstrated relatively low concentrations of cereulide in rice and pasta dishes. The effects of repeated exposure to low levels of cereulide through food is largely unknown. Caco-2 cells were used as model of the absorption and properties of the intestinal mucosa. Both MTT and SRB assays showed toxicity on undifferentiated cells at 0.125 ng/mL CER after 3 days of exposure. The three-day treatment with low concentrations of CER on mitochondrial respiration in intact cells showed perturbations in mitochondrial respiration at a concentration of 0.125 ng/ml. Cereulide appear to be more toxic than other cyclodepsipeptide toxins with ionophoretic properties.

Wrap up and Closing:

Robert A. Samson (IUMS)

17.05pm



The guest speakers and committee

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5th IUMS Outreach Programme
Advances in Food Safety and Mycotoxins

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