



**Asia-Pacific  
Economic Cooperation**

**Advancing** Free Trade  
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# **Advanced Capacity Building for Mycotoxin Prevention and Control in Food and Feed Commodities in Asia-Pacific**

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## Introduction

Food safety is not only a key component in human health issue but also the global problem that needs attention. The 2014 APEC Leaders' Declaration emphasized the importance of food safety and endorsed the Beijing Declaration on APEC Food Security issued at the Third APEC Ministerial on Food Security. The leaders supported the APEC Action Plan for Reducing Food Loss and Waste, the APEC Food Security Business Plan (2014-2020), and the APEC Food Security Roadmap toward 2020 (2014 version) and the Action Plan to enhance Connectivity of APEC Food Standards and Safety Assurance. Beijing Declaration on APEC Food Security indicated that the food security could be achieved at higher level by strengthening the management of food safety through alignment with international acceptable standards, establishment of early warnings, traceability and recall systems, and development of risk based requirements. These initiatives have reflected the goal of APEC in advancing capacity building in food safety.

Mycotoxin contamination has caused huge agricultural yield loss, adverse toxic risk to humans and significantly affected the international trade on food commodities. Establishment of Mycotoxin Forum for Asia and the Pacific to carry out mycotoxin risk assessment on food safety and the issues related to its control will be of great help in advancing the food security in the Asia-Pacific economies especially the developing ones. This project seeks to strengthen the capacity building in mycotoxin prevention and control through technical and information exchange mechanism, hosting a workshop and organizing field visits.



# I. SURVEY ON CURRENT STATUS OF RESOURCES AND CAPACITIES OF FOOD SAFETY

## 1. Development and distribution of questionnaire on current status of mycotoxins issues

A survey of mycotoxin risk assessment and its applications, issues of it related to food trade, minimum tolerable limits for different mycotoxins, and role of various sectors in the control and prevention of mycotoxin among 21 APEC economies were conducted by sending questionnaires.

## 2. Current status of mycotoxin control capacities among APEC Economies

Mycotoxins are the secondary metabolites produced by fungi. It have caused huge agricultural yield loss, adverse toxic risk to humans and significantly affected the international trade on food commodities.

Up to now, there are more than 150 species of fungi known to produce toxins, which can produce more than 300 different mycotoxins. The most relevant groups of mycotoxins found in agricultural products globally are produced by the following five fungal genera: aflatoxins, produced by *Aspergillus* species; ochratoxin A produced by both *Aspergillus* and *Penicillium*; trichothecenes (deoxynivalenol), zearalenone, fumonisins produced mainly by *Fusarium* species; ergot alkaloids produced by *Claviceps*; and altenuene, alternariol, alternariol methyl ether, altertoxin, and tenuazonic acid produced by *Alternaria* species (Barkai-Golan, 2008; Bottalico and Logrieco, 1998). There may be a variety of mycotoxins in cereal or feed. Different fungi need certain environmental conditions to grow and produce mycotoxins. Therefore, mycotoxins contaminations in different regions are different. For example, in subtropical and tropical areas, agricultural products are mainly contaminated by aflatoxin and ochratoxin, and zearalenone, deoxynivalenol, ochratoxin and T-2 toxin have significant advantages in temperate regions. Based on the survey, major mycotoxin contaminants prevalent among APEC Economies are listed in Table 1. Aflatoxins,

ochratoxin A, deoxynivalenol, zearalenone, fumonisins, ergot alkaloids are the most relevant groups of mycotoxins in surveyed APEC Economies.

Mycotoxin contamination could occur during the whole food chain: at pre-harvest, harvest and drying, and storage. Poor agricultural and harvesting practices, improper drying, handling, packaging, storage, and transport conditions promote fungal growth, increasing the risk of mycotoxin production (Marin et al, 2013). To effectively control the harm brought by mycotoxins contamination, regulations and hygiene standards on mycotoxins are issued in different economies or organizations.

Table 1 Regulations of mycotoxins limits in food and feed among APEC Economies

APEC Members	Regulations of mycotoxins limits
Australia	F2015C00052 Food Standard Code, Part 1.4 contaminants and residues standard 1.4.1-contaminants and natural toxicants
Brunei Darussalam	N/A
Canada	Feeds Regulations, 1983 - SOR/83-593 (Section 19) Food and Drugs Act (R.S.C., 1985, c. F-27)
Chile	The Livestock and Agriculture Service (SAG)
People's Republic of China	GB 2761-2017, standard for food safety in China, The limit of mycotoxin in food.
Hong Kong, China	E, R. 2 of 2012. Regulation of harmful substances in food
Indonesia	SNI 7385:2009, Mycotoxin maximum level content on food
Japan	Specifications and standards for foods, food additives, etc. under the food sanitation law.
Republic of Korea	N/A
Malaysia	Food Act 1983, Malaysia Food Regulation 1985
Mexico	N/A

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New Zealand	Food Standard Code, Part 1.4 contaminants and residues standard 1.4.1-contaminants and natural toxicants
Papua New Guinea	N/A
Peru	Legislative Decree N° 1062, Food Safety Law
The Philippines	N/A
Russia	Food safety standards, Russian
Singapore	N/A
Chinese Taipei	Limit standard of mycotoxin in food, Food hygiene management law
Thailand	N/A
The United States	Food and Drug Administration, compliceance policy guides (CPG)-chapter 5-food, colors, and cosmetics
Viet Nam	QCVN 8-1: 2011 BYT technical regulation on fungal toxin contamination on foodstuffs in Viet Nam

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N/A=data not available

Breeding highly resistant crop cultivars could serve as one of the most economical and environmentally friendly means of pre-harvest control of mycotoxins. Among major mycotoxin contaminants prevalent among APEC Economies, deoxynivalenol (DON) is mainly produced by *Fusarium* sp. in the field. To effectively control DON, several resistant cultivars such as Sumai-3, Nyuubai have been obtained. Agricultural ecosystems control also could help reduce the production of mycotoxin. Some success in controlling FHB can be expected by plowing fields to remove or bury crop residues infected with *F. graminearum* after harvest. Application of chemical fungicides and biocontrol agents can be useful in reducing mycotoxins. Carbendazim, Tebuconazole and Phenamacril are effective fungicide for controlling FHB.



After harvest, kernels are stored in a man-made ecosystem. Fungal spoilage and mycotoxins contamination are of major concern. Water content is a critical factor for safe storage. Drying should take place as soon after harvest and as rapidly as feasible. Activities of insect pests can promote fungal proliferation and mycotoxins production. Effective insect pest control method during storage could help reduce the accumulation of mycotoxins (Chulze, 2010). Antifungal agents such as essential oils, antioxidants, fungal extracts have been successfully applied in lab or pilot scale but not commercialized.

Physical, chemical and microbial strategies could be used in reducing these mycotoxins in foods and feeds after harvest. Removing mycotoxin contaminated kernels by sorting machines is an effective means to reduce mycotoxins levels in agro-products. According to the principle of sorting, there are three categories of sorting machines: gravity sorters, color sorters and optical sorters. Gravity sorter is one of the most commonly used equipment in grain and seed cleaning. Seeds with different weight could be separated. Gravity sorter could be used for removing FHB infected grain kernels. Raman spectroscopy, Fourier transform infrared spectroscopy and hyperspectral imaging are the main spectroscopic methods for detecting mycotoxins and toxigenic fungi in food products (Alexandrakis et al., 2012; Lu et al., 2011; Yoshimura et al., 2014, Xing et al., 2017). Many companies in Japan use optical sorters to eliminate mold-growing nuts to reduce aflatoxins in imported peanuts.

Absorbing also serve as a physical approach. For example, Mycofix<sup>®</sup> (Biomin, Herzogenburg, Austria) as the first-ever absorbent authorized by EU could reduce aflatoxin more than 90%. This absorbent is a bentonite-based absorbent. Besides, lots of microbial absorbents have studied in lab. Lactic acid bacteria (LAB) is one of the most well-studied microbes. Due to the reversible absorption mechanism, LAB has not been commercialized.

Chemical approaches include treatment with hydrogen peroxide, ozonation and ammonia (Mishra and Das, 2003). Though promising, these techniques do not comply with safety, cost and productivity requirements for commercialization (Verheecke et al,





2016). Biological detoxification of mycotoxins by fungal and bacterial isolates or their secondary metabolites has been reported. Evidence showed that biotransformation of mycotoxins by microorganisms and their metabolites, especially enzymes, is specific, effective and environmentally sound.

## II. INTERNATIONAL WORKSHOP ON MYCOTOXIN PREVENTION AND CONTROL

For promoting the issues of mycotoxin prevention and control to enhance the food security and safety in Asia-Pacific economies, 1st APEC Conference on Mycotoxin Prevention and Control in Food and Feed Commodities in Asia-Pacific was held in Beijing on October 25-27, 2017.

To discuss the status and challenges of mycotoxin contamination in the Asia Pacific region, five themes were set in this conference: Mycotoxin challenges in the Asia-Pacific Region, Mycotoxin Research in China, Mycotoxin Detection Analytical Methods, Molecular Pathways in Mycotoxin Production, and Reduction of Mycotoxins in Food & Feed. Fused on these themes, there were eighteen plenary lectures in this conference. Besides, half day industrial visit was set.

There were more than 100 attendees at this conference from 12 APEC economies including government officials from Chile, China, Malaysia, Peru, Thailand, and Viet Nam; and experts, scholars, and private sector speakers from Australia, Canada, China, Chile, Indonesia, Japan, Malaysia, Peru, Russia, Thailand, Viet Nam, and the United States.

The workshop helps the international attendees to understand the mycotoxin prevention control system on food and feed in different APEC member economies.

### **Themes 1: Mycotoxin challenges in the Asia-Pacific Region**

#### **Speakers:**

- Wayne Bryden, University of Queensland University of Queensland, Australia
- Jinap Selamat, University Putra Malaysia, Malaysia



- Shohei Sakuda, University of Tokyo, Japan
- Endang Rahayu, Universitas Gadjah Mada, Indonesia
- Yang Liu, Institute of Food Science and Technology, CAAS, China

**Chair: Yang Liu, Institute of Food Science and Technology, CAAS, China**

### **Mycotoxins are highly prevalent in APEC region**

Mycotoxins are toxins produced by certain fungi, and can contaminate numerous commodities. Most frequent toxins are aflatoxin, deoxynivalenol, zearalenone, fumonisins and ochratoxin. Mycotoxin contamination can occur throughout the food/feed supply chain. FAO estimates that potentially toxigenic fungi are present in 25% of global crops. Mycotoxins are acutely and chronically toxic, and carcinogenic. So throughout the supply chain, risks abound that can ultimately impact upon food safety and security.

### **The suggestions for mycotoxin control**

The key point to solve mycotoxins problem is supply chain from farm to table. Mycotoxin contamination increase along with its supply chain. Speakers shared the recommendation on mycotoxin control. Suggestions are as follows:

- 1) Capacity building at national level on mycotoxin control at government, scientist, enterprises as well as farmer associations to improve awareness related to mycotoxin contaminants and health effects, nationally and regionally.
- 2) Research related to mycotoxins control in collaboration between university and government.
- 3) Organizing the international conference and workshop to increase knowledge and technical ability.
- 4) Development of fungal resistant cultivar of crop. Such as “studies on pre-harvest aflatoxin contamination in peanut and its integrated management using host plant resistance” (Reddy et al., 2011).



- 5) Implementation of good practices in the supply chain of agricultural products (from farm to table) assisting by the Government through agricultural specialists  
Improvement of facilities (in collaboration between government and industry).

### **Risk analysis and mitigation**

- 1) Risk analysis consisting of three elements: risk assessment (scientific advice and information analysis), risk management (regulation and control) and risk communication.
- 2) Mycotoxin mitigation mainly for crop survey, supplier quality assurance and factory quality management process, such as develop a specification for incoming raw material from supplier, test aflatoxins, visual inspection (sorting) of damaged and moldy kernel and control temperature and humidity during storage.
- 3) Networking between universities, research institutes, government agencies, farmers, traders, industries have been promoted in implementing strategy for prevention and control of mycotoxin problems.
- 4) Supply chain from farm to table is also a key point to be managed to solve mycotoxins problem.

### **Mycotoxins an ongoing challenge**

- 1) Climate change may cause aflatoxin contamination in domestic crops in near future and alter the profile of mycotoxins produced by different fungal species.
- 2) Fungi are ubiquitous and mycotoxins are natural environmental contaminants.
- 3) New toxigenic fungi emerge as agriculture changes in response to climate change.
- 4) The implication for the nutritional quality of crops as the climate changes and there is increased fungal interactions.

## **Themes 2: Mycotoxin Research in China**

### **Speakers:**



- Zhonghua Ma, Zhejiang University, China
- Yucai Liao, Huazhong Agricultural University, China
- Shihua Wang, Fujian Agriculture and Forestry University, China
- Ligang Zhou, China Agricultural University, China

### **Chair: Jinap Selamat and Yucai Liao**

#### **Chemical control of Fusarium head blight (FHB) and mycotoxin in China**

Professor Ma first introduced the reason of increased epidemics of FHB in China: 1) Climate changes: there are more rainy days during flowering stage of wheat. High humidity is very favorable for epidemics of this disease; 2) Most wheat varieties planted in China are susceptible; 3) The straw returning approach has been used widely in the past a few years. The returned straws on soil surface are very good substrates for Fusarium reproduction, which increases inoculation levels dramatically; 4) The pathogen population has developed resistance to fungicide rapidly, which leads to a significant decline in chemical control of this disease.

Currently, since most wheat cultivars are susceptible, application of fungicides during anthesis is an important strategy for management of FHB of wheat in China. The best time for fungicide application ranges from the full heading to early flowering (30% flowering heads) stage. PMC is a very good fungicide for control of mycotoxin. Since this compound possess a high resistance risk, it must be mixed with other compounds in order to reduce its resistance risk.

#### **Degradation of Fusarium mycotoxins deoxynivalenol by a bacterial reductase**

Mycotoxin-producers in wheat and maize of China are *Fusarium asiaticum* and *F. graminearum*, and the main mycotoxins are deoxynivalenol (DON), nivalenol (NIV), zearalenone (ZEN) and fumonisin (FB). A soil bacterial strain transforming DON into 3-oxo-DON and 3-epi-DON was isolated. A gene coding for an aldo/keto reductase oxidizing DON into 3-oxo-DON has been heterologously expressed. Enzymatic assay showed that: 1) DON is first oxidized to 3-oxo-DON and then converted to 3-epi-DON;



2) AKR18A1 catalyzes the reversible oxidation/reduction of DON to 3-oxo-DON; 3) AKR18A1 catalyzes the reduction of a wide range of ketones and/or aldehyde-containing compounds and the oxidation of alcohols; 4) Strain S3-4 and recombinant AKR18A1 protein could be used as detoxifying agents to control FHB pathogens and to reduce mycotoxin levels in food and feed products.

### **Development of Immunoassay methods for mycotoxins Detection**

Recent research on Immunoassay methods for mycotoxins detection based on monoclonal antibody in Professor Wang's lab was introduced: 1) complete mycotoxins antigens were successfully developed; 2) Hybridoma cell excreting monoclonal antibody against mycotoxins was obtained from the immunized mouse; 3) ELISA Kit and colloidal gold immunoassay for mycotoxins detection based on monoclonal antibody with high affinity were developed for Fumonisin B<sub>1</sub>, Citreoviridin, citrinin; 4) Single Chain Variable Fragment Antibody against mycotoxin were developed against Citreoviridin toxin. This system has the better versatility for creating antibodies to various antigens using GFP as the scaffold.

### **Mycotoxins from the rice false smut pathogen *Villosiclava virens***

Mycotoxins from the Rice False Smut Pathogen *Villosiclava virens* were introduced: 1) One novel ustiloxin was identified from rice false smut balls; 2) 15 novel ustilaginoidins were isolated from fermentation cultures and rice FSBs; 3) Isochaetochromin B<sub>2</sub> was isolated from the pathogen for the first time; 4) 13 novel (including a new skeleton) and 8 known sorbicillinoids were isolated from the pathogen; 5) 10 polar compounds were isolated from the butanol extract, two of them were new alkaloids; 6) Quantitative analysis methods of ustiloxins A and B were achieved by HPLC, LC-MS, ELISA, and LFIA; 7) Bioactivities of the isolated compounds were evaluated; 8) Biosynthesis of ustilaginoidins were preliminarily studied; 9) Distributions of the mycotoxins in rice FSBs at different maturities were analyzed.

### **Themes 3: Mycotoxin Detection Analytical Methods**

#### **Speakers:**



- Zherdev Anatoly, Institute of Biochemistry, Russian Academy of Sciences, Russia
- Zhisong Lu, Southwest University, China
- David Zhang, Romer Labs

### **Chair: Shohei Sakuda and Zhisong Lu**

#### **Rapid tests for mycotoxins detection: Possibilities and new solutions**

Rapid tests for mycotoxins detection, which can be used as simple and rapid screening tests for cost-effective control of food diseases. For rapid immunotests, professor Zherdev suggest:

1) Rapid and efficient extraction procedures (proper sample); 2) Stable receptors for work with complex matrixes and solvents (proper receptor); 3) Designed receptors for individual and group-specific assays (proper receptor); 4) Rapid lateral flow processes without loss of sensitivity (proper interaction); 5) New amplification procedures with stable results (proper interaction), Regulation of assay stages by microfluidic approaches (proper interaction); 6 ) Integration of lateral-flow and through-flow techniques (proper interaction); 7) New physical parameters for sensitive detection of labels (proper response); 8) Multiplex assays (proper response); 9) Separation of immune complexes for analyte identification (proper response); 10) Unified cut-offs in the accordance with MRLs (proper output); 11) Software for automated data processing and transfer (proper output).

#### **Intelligent methods to analyze mycotoxin production for future food safety**

Professor Lu suggested that the challenges of analyze mycotoxin are low cost, fast on-site detection, high throughput, and portable/disposable. Achievement as follows:

1) Novel optical sensing systems based on nanomaterials have been developed for the sensitive detection of mycotoxins; 2) Smart EC sensing systems have been developed to explore the possible mechanisms for antifungal reagent-caused inhibition of aflatoxin



production; 3) Dynamics and intracellular distribution of ROS during the life cycle of *A. flavus* has been revealed at single-hypha level with our single-hypha analysis system.

### Technology of mycotoxin analysis

Mycotoxin Testing Method-Challenge was introduced: 1) not all the Mycotoxins have the standard; 2) High Cost of the testing will eat our profit; 3) Which Mycotoxin should be tested? Which should be monitored? Which should be warning?

Control and Prevention of Mycotoxin is system project plus technical support. Source Monitoring, intermediate Control, finish goods testing along with risk warning and control should be included.

### Themes 4: Molecular Pathways in Mycotoxin Production

#### Speakers:

- Jinrong Xu, Purdue University and Northwest Agriculture and Forestry University
- Shiping Tian, Institute of Botany, CAS, China
- Xianchao Yin, Institute of Food Safety and Nutrition, Jiangsu Academy of Agricultural Sciences

#### Chair: Jinrong Xu and Shiping Tian

#### Regulation of mycotoxin biosynthesis in *Fusarium*

*Fusarium graminearum* causes Scab or head blight, one of the most important wheat and barley diseases. DON, not only inhibits protein synthesis in eukaryotes, but also is an important virulence factor. Biosynthetic pathway and regulation of DON was introduced. Function and interaction of *Tri6* and *Tri10* was introduced. Experimental data showed the cAMP-PKA pathway is important for DON production. Sas3, a histone acetyltransferase, functions downstream of PKA and is important for DON biosynthesis. DON biosynthesis is affected by many environmental factors.

#### Molecular mechanism of patulin biosynthesis in *Penicillium expansum*



*Penicillium expansum* is an important postharvest pathogen. It can cause blue mold rot in various fruits and lead to huge economic losses. Professor Tian's group made a lot of effort to reveal molecular mechanism of patulin biosynthesis in *P. expansum*: 1) The whole genome of *P. expansum* was sequenced. The genome size is 33.12 Mb with 11,770 genes and 55 gene clusters related to secondary metabolism; 2) A patulin cluster with 15 genes, including 9 catalytic enzymes, 3 transporters, 1 transcription factor and 2 unknown function genes was identified; 3) The function of all genes in the cluster directly involved in patulin biosynthesis was identified. Most of them are essential for the pathway, but almost not contributed to growth and virulence of *P. expansum*; 4) PePatL is a transcription factor in patulin cluster of *P. expansum*, and has a crucial role in patulin biosynthesis.

### **Biological management of Fusarium mycotoxins**

To control fusarium mycotoxins, antagonistic control and microbial detoxification were introduced. Antagonistic microbes against FHB were isolated and characterized. Most of them could reduce mycotoxin production by inhibiting the growth of FHB fungus. They might have a potential for field application as FHB biocontrol agents. Several microbes which could degrade DON and ZEN were isolated. Degradation products were analyzed. These microorganisms have potential prospects to develop degradation agents of mycotoxins in cereals.

### **Themes 5: Reduction of Mycotoxins in Food & Feed.**

#### **Speakers:**

- Zhou Ting, Guelph Research and Development Centre, Agriculture and Agri-Food Canada
- Haruo Takahashi, Japan
- Daling Liu, Jinan University, China

#### **Chair: Ting Zhou and Haruo Takahashi**





## **Microbial and enzymatic detoxifications of trichothecene mycotoxins: deoxynivalenol epimerization**

Genetic changes/mutations in *Fusarium graminearum* that affect deoxynivalenol levels in the kernels are taking place. These new populations are spreading with unpredictable long-term consequences. Climate changes may increase deoxynivalenol contamination; warmer summers are increasing the incidence and severity of Fusarium kernel rot and the prevalence of Fusarium head blight associated with *F. avenaceum*. DON contamination can't be avoided in the current agricultural practices. Innovative strategies are needed for controlling DON in food supply chain, to reduce mycotoxin production in the field, storage, processing and to detoxify already contaminated products.

*Devosia mutans* Strain was identified and can transform DON to 3-epi-DON. The reason of reduced toxicity of 3-epi-DON and the mechanism of epimerization by *Devosia mutans* were also introduced. The research of bacterial cells, detoxification enzymes and detoxification genes has potential applications for DON detoxification.

## **Reduction of aflatoxin by near infrared spectrometric sorting in the contaminated peanut lots industrial visit**

Professor Haruo Takahashi group evaluated the sorter (MK, chute type) to reduce aflatoxins level in the highly contaminated lot in China and evaluated a high performance modern Q-sorter (MK-B300, belt type) in US Runner type lots for commercial processing. The study showed the spectrometric sorting is very effective to reduce the aflatoxin-contaminated of peanut. The near infrared spectrometric sorting machine, Q-sorter, is able to reduce level of the aflatoxin efficiently in the contaminated lot, even though the lot is highly contaminated. Especially, modern type of Q-sorter, with high performance and high resolution, can be used in large scale of processing including US Runner type of peanuts. Before the spectrometric sorting, to get information of aflatoxin content in the lot is very useful to set the better running condition of the sorter. Hand picking and/or color-sorting are very also beneficial to



reduce level of the aflatoxin in the contaminated lot of peanuts. The spectrometric sorting can minimize practically the impact or losses of agricultural products infected by aflatoxigenic fungi and also can contribute the efficient utilization of natural resources.

### **The Discovery of aflatoxin oxidase and safe storage**

AFs had been classified as carcinogen of Group A by IARC, could cause human liver cancer, lung cancer and gastric carcinoma etc. Enzymatic detoxifications are considered to be health- and environment- friendship. ADTZ are confirmed of detoxification with 99% destroying aflatoxins. ADTZ is found homology with hydrolase, but it performs an oxidase. The redox reaction involved with one electron transfer. The reaction of AFO is O<sub>2</sub>-dependence. The H<sub>2</sub>O<sub>2</sub> was fast-produced during AFO reacting with ST and AFB<sub>1</sub>. The production of H<sub>2</sub>O<sub>2</sub> may provide an explanation on the detoxification of AFO.

## **III. ESTABLISHMENT OF MYCOTOXIN FORUM**

Mycotoxins forum was built by scholars attending the workshop above from several economics during October 25-27, 2017. Establishment of this mycotoxin forum is to carry out mycotoxin risk assessment on food safety and the issues related to mycotoxin control. The forum will seek to strengthen capacity building in mycotoxin prevention and control through technical and information exchange. The forum will assist in establishment of a long-term information exchange network in mycotoxin risk assessment in food, risk monitoring, and risk communication. The forum will comprise mycotoxin research experts from Asia Pacific economies as the core team members. Websites, emails, telephones, faxes, web-based videos and satellite video conferencing will be used to exchange information on mycotoxin risk and prevention in food and feed. The forum will address areas related to Mycotoxin Prevention and Reduction in various agro-commodities like corn, wheat, peanuts etc. The forum will build collaboration between the laboratories by which students and staff exchange between the economies. The forum will also arrange future workshops and conferences to benefit the Asia Pacific region.



## IV. SUMMARY OF VISITING CHINESE INSTITUTIONS FOR MYCOTOXIN PREVENTION

COFCO Nutrition and Health Research Institute of China (COFCO NHRI) was selected for visiting during the workshop.

COFCO NHRI, as the central research institute of COFCO Group, is a key research platforms at provincial or ministerial level, such as “Beijing Key Laboratory of Nutrition, Health and Food Safety” and “Beijing Livestock Products Quality and Safety Source Control Engineering Technology Research Center”. (<http://www.cofco.com/en/BrandProduct/NutritionHealthResearchInstitute>).

Altogether more than 40 representatives from several APEC economies visited COFCO Nutrition and Health Research Institute of China. NHRI Food Safety and Quality Testing Laboratories were introduced and visited. NHRI Food Safety and Quality Testing Laboratories has been certified by “CNAS (China National Accreditation Service for Conformity Assessment), CMA (China Metrology Accreditation), CMAF (China Metrology Accreditation for Food)” 3 in 1 authentication. More than 400 of detection methods have been built for mycotoxins, pesticide residue, veterinary drug residue, heavy metal and other related substrates. Besides, the center provides technical services such as unknown compound analysis, natural product extraction and so on. Rapid detection kits for mycotoxins were developed and shown.



## APPENDIX

### Photos of visiting Chinese institutions for Mycotoxin prevention









