BOOK OF ABSTRACTS

9th International Symposium on

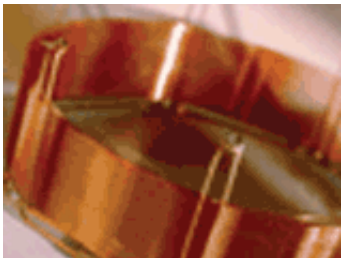
RECENT ADVANCES IN FOOD ANALYSIS

November 5–8, 2019

Prague, Czech Republic

Jana Pulkrabová, Monika Tomaniová, Michel Nielen and Jana Hajšlová
Editors



UNIVERSITY OF CHEMISTRY AND TECHNOLOGY PRAGUE

WAGENINGEN UNIVERSITY & RESEARCH

LECTURES

L44

FOOD SAFETY CONTROL SYSTEM IN CHINA: PAST, PRESENT AND FUTURE

Yongning Wu[1], **Di Wu***[2]

[1] *Food Safety Research Unit of Chinese Academy of Medical Science (2019RU014); NHC Key Laboratory for Food Safety Risk Assessment, China National Center for Food Safety Risk Assessment, China*
[2] *Yangtze Delta Region Institute of Tsinghua Univerisity, Zhejiang, China*
**Corresponding author - E-mail: wudi0913@hotmail.com*

The implementation of the Food Safety Law of the People's Republic of China since 2009 greatly promoted the application of the risk analysis framework in China.This paper is intended to review the evolution in China national food safety control system and nationwide progresses in risk monitoring/surveillance and risk assessment works, in which China National Centre for Food Safety Risk Assessment (CFSA, established in 2011) has played the role of technical support and guidance. The contribution of monitoring/surveillance and risk assessment to the development of risk management in China, including food safety standard system development, is described. However, in comparison with risk management needs and practices in developed countries, China should further strengthen capacity building in food safety monitoring/surveillance and risk assessment. Progress is particularly evident in carrying out food safety risk monitoring/surveillance and risk assessment work. Risk management work has somewhat improved, especially a step-wise approach was followed in reviewing, simplifying and integrating food safety standard based on risk assessment, leading to the integrated National Food Safety Standard (NFSS) framework, which anchored China NFSS in scientific evidence and created the sky for their future evolution.

[1] Wu, Y., and Chen, Y. (2013). Editorial: food safety in China. Journal of Epidemiology & Community Health, 67(6):478-9.
[2] Wu, Y., and Chen J. (2018): *Food Safety Monitoring and Surveillance in China: Past, Present and Future*. Food Control 90., DOI:10.1016/j.foodcont.2018.03.009
[3] Wu, Y., Liu, P., and Chen J. (2018): *Food Safety Risk Assessment in China: Past, Present and Future*. Food Control 90., DOI:10.1016/j.foodcont.2018.03.009
[4] Bai, L., Du, P., Du, Y., Sun, H., Zhang, P., Wang, Y., Lin, Q., Fanning, S., Cui, S., Wu, Y. Detection of plasmid-mediated tigecycline-resistant gene tet(X4) in Escherichia coli from pork, Sichuan and Shandong Provinces, China, February 2019. 2019, Eurosurveillance, 24(25): pii=1900340, doi.org/10.2807/1560-7917. ES.2019.24.25.1900340.
[5] Jen, J., and Chen, J. eds. Food Safety in China: Science and Technology, Management and Regulation. John Wiley & Sons Ltd. Chichester, West Susses, UK.

Keywords: *risk analysis, monitoring, surveillance, risk assessment, food safety in China*

Acknowledgement: *The National Key R&D Program of China under Grant Agreement No 2017YFC1601502 and EU Horizon 2020 Research and Innovation Programme under Grant Agreement No 727864 EU-China-Safe*

LECTURES

L45

H2020 EU-CHINA SAFE PROJECT PROGRESS: DELIVERING AN EFFECTIVE, RESILIENT AND SUSTAINABLE EU-CHINA FOOD SAFETY PARTNERSHIP

Julie Meneely[1], **Christopher Elliott***[1]

[1] *Queen's University Belfast, United Kingdom*
**Corresponding author - E-mail: Chris.Elliott@qub.ac.uk*

EU-China-Safe will mobilise resources in Europe and China to develop a cohesive partnership that will deliver a shared vision for food safety and authenticity and work towards "mutual recognition". Comprising 15 participants from the EU and 18 from China, EU-China-Safe contains key research organisations, Government and industry needed to develop and jointly implement major advances in improving food safety and combating food fraud in the two trading blocks.
EU-China-Safe will build the core components needed for a joint EU-China food safety control system comprising: control management, food legislation, food inspection, food control laboratories, and food safety and quality information, education and communication. The project will develop an EU-China Joint Laboratory Network that will achieve and demonstrate equivalency of results, and will develop a state of the art virtual laboratory, with interchangeable staff from two continents, that will be used as a "showcase" to communicate and demonstrate best practice. Innovative traceability tools will strengthen the most vulnerable supply chains. New or improved detection capabilities for chemical/microbiological hazards and food fraud will be implemented in a harmonised way across the EU-China network. Trade barriers caused by food safety and fraud issues will be analysed and recommendations of how to predict and prevent future events disseminated. The project will focus on the most commonly reported foods linked to chemical and microbiological contamination and fraud (infant formula, processed meat, fruits, vegetables, wine, honey, spices). Substantial knowledge transfers and training actions will build high-level and long-term collaboration, synergies and trust between a wide range of EU and China actors.
These advances, in addition to a wider range of confidence building measures towards food safety, authenticity and transparency, will address consumer expectations and facilitate an expansion of EU- China trade.

Keywords: *EU-China-Safe, food safety, authenticity, transparency, EU-China joint laboratory network*

Acknowledgement: *This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 727864 (EU-China-Safe) and from the Chinese Ministry of Science and Technology (MOST).*

LECTURES

L46

DESIGN AND IMPLEMENTATION OF FOOD COLD CHAIN TRACEABILITY SYSTEM BASED ON BLOCKCHAIN AND RFID

Qinghua Chen*[1]

[1] *Yangtze Delta Region Institute of Tsinghua University, China*
**Corresponding author - E-mail: chenbill@gmail.com*

Food cold chain traceability is a supply chain with strict temperature control. The food cold chain is a combination of multiple industries and departments. The cold chain information comes from food production and processing enterprises, logistics and distribution enterprises, and supermarket retailers. Food needs a unique physical identification at the source, and the information of each enterprise in the food cold chain is written to the physical identification to achieve seamless docking and anti-counterfeiting, to guarantee that the traceability system information is credible and traceable. Based on blockchain and RFID-related technologies, this paper discusses the functions and features of the food cold chain traceability system and proposes technical design and implementation methods.

Keywords: *food safety, blockchain, RFID, cold chain, traceability*

LECTURES

L47

LC-MS TOOLS IN THE CAMPAIGN AGAINST FOOD FRAUD IN INFANT FORMULA

Di Wu[1], **Yongning Wu***[2], **Libiao Wu**[1], **Qiang Cai**[1]

[1)] *Yangtze Delta Region Institute of Tsinghua University, Zhejiang, China*
[2)] *China National Center For Food Safety Risk Assessment, China*
**Corresponding author - E-mail: wuyongning@cfsa.net.cn*

Constantly growing of globalization and expansion of international food supply chains have raised unprecedented challenges in the new millennium. The melamine scandal exploded in 2008, was a catastrophe to Chinese local dairy industry which aroused public awareness toward food integrity. The compound itself is rich in nitrogen, thus became a perfect candidate to cheat existing GB testing standard at the time for protein in infant formula via mono Kjeldahl method. At the meantime, new terms of adulterations were found by replacing whey proteins with cheap bovine milk caseins and plant sourced (Soy proteins as example)/hydrolyzed protein (Not for special clinical use) which might carry potential risks. Although a series of well-developed method specifically targeting melamine was established even at Ultra-trace levels, it's vulnerability against other N-rich and melamine-like compounds have placed every effort in jeopardy once again. Being one of state-of-the-art analytical tools, LC-MS made it possible for scientist to discover chemicals and proteins in food both qualitatively and quantitatively based on non-targeted screening/fingerprinting and targeted proteomic analysis. Our research has combined rapid LC-HRMS N-rich screening database with paralleled tryptic peptide measure by introducing stable isotope labeled signature peptide to minimize matrix effect of AUQA assay during ionization. In 2017, it has become as part of H2020 EU-China-Safe intergovernmental research program in implementation of developing food safety and authenticity network. Within the H2020 framework, we are able to share our experience with partners in E.U. and U.S. and the ultimate goal is to provide a harmonized all in one LC-MS solution for milk fraud discrimination andeventually a mutual recognized global standard to be applied in the whole supply chain.

Keywords: *infant formula, authenticity, LC-MS, targeted protein quantification, stable isotope dilution*

Acknowledgement: *National Key R&D Program of China 2017YFE0110800 and EU H2020 EU-China-Safe 727864*

LECTURES

L48

CREATING A MULTI-PARTNER EU-CHINA VIRTUAL LABORATORY FOR FOOD CONTROL AND INCIDENT RESPONSE

Martin Rose*[(1)], **Sean Panton**[(1)], **Susan MacDonald**[(1)], **Yongning Wu**[(2)], **L. Bing**[(2)], **Jingguang Li**[(2)]

[1)] *Fera Science Ltd, NAFIC, United Kingdom*
[2)] *NHC Key Lab of Food Safety Risk Assessment, China*
**Corresponding author - E-mail: martin.rose@fera.co.uk*

The nature of current food production and distribution means that many food incidents are not confined to local geographical regions, but can become major international or global incidents. This has been the case in particular with dioxins and PCBs where several major incidents have occurred (Hoogenboom et al 2015)[1].
The EU funded EU-China-Safe project has a primary objective of cooperation and harmonization of food control between Europe and China. The development of a virtual laboratory, RL2020 is part of this project. RL2020 is a network of laboratories in Europe and China involved in the testing of food and feed, similar in purpose to the European Union Reference Laboratory network The ambition is to give scientists in both regions real time access to data generated in order to enable shared effort in both method development and validation, and also in analysis for food control via a web-based platform.
Analysis of dioxins using GC-MS/MS was chosen as the first example to assess the feasibility of RL2020. Data files are currently shared and stored using a secure area of the EU-China-Safe project website; http://www.euchinasafe.eu/ .
The next stages of the project will be to expand the number of participants, to develop a similar approach for other food chemicals, and to test the versatility for data generated using different instrumentation and software.
RL2020 has the potential to support global food control. Examples where it may be used include
- technology transfer
- training
- validation
- certification of reference materials etc
- analysis of samples for export, reducing times that products are held in customs
- incident and crisis management
- improvement of trust and mutual recognition

All of these applications have the potential to (1) improve food safety (2) reduce costs, and (3) improve response time.

1. Hoogenboom, R., Traag, W., Fernandes, A and Rose, M.. (2015) European developments following incidents with dioxins and PCBs in the food and feed chain. *Food Control* 50 670-683.
2. Bubbico, A, MacDonald, S, Wu, Y and Rose, M. Economic evaluation of a historic dioxins food incident. *Organohalogen compounds* 2019. - Presentation at Dioxin 2019

Keywords: *EU-China-Safe, virtual laboratory, food control, incidence response*

Acknowledgement: *This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727864 - the EU-China-Safe project and China R&D Key Programme - intergovernmental S&T innovation cooperation project 2017YFE0110800, http://www.euchinasafe.eu/. This work has benefitted from collaboration with Thermo Scientific and Agilent.*

LECTURES

L49

APPLICATION OF NEXT GENERATION SEQUENCING TECHNOLOGY IN FOOD AUTHENTICITY

Ranran Xing[(1)], **Nan Wang**[(1)], **Jiukai Zhang**[(1)], **Jianxun Han**[(1)], **Ying Chen***[(1)]

[1)] *Chinese Academy of Inspection and Quarantine, China*
**Corresponding author - E-mail: chenyingcaiq@163.com*

The assessment of food authenticity is a critical issue that has gained much interest internationally. The reliable identification of the species is of paramount importance for food authenticity. However, most of the existing methods are inappropriate for the identification of multiple species in unknown food products, especially highly processed products. Therefore, it is necessary to develop a high-throughput, high-accuracy and untargeted system for identifying the species of food products. This presentation provides a next generation sequencing (NGS) approach to identify animal species in mixed food products. Next generation sequencing of a short segment of the 16S ribosomal RNA (16S rRNA) mitochondrial gene was performed fo the authenticity of food products containing multiple species. By mixing different kinds of animal species according to different proportions, the mixed samples were prepared and the sequencing library was constructed. The sensitivity, accuracy and quantitative ability of NGS in species identification of mixed samples were evaluated. Although the relative abundance of reads obtained from each species could not make a quantitative assessment of the original species composition, this method still has the potential to the determination of high and low contents of animal species in mixed products. Subsequently, as an initial test, we performed a market survey to identify animal species in commercial food products using the developed NGS approach. Overall results demonstrated that the NGS approach could simultaneously identify all major species and impurity species and has high potential possible for application in routine analysis in the near future.
We are also testing the applicability of NGS to authenticate variously foodstuffs, such as spices, fish products, and mushroom. The latest results on the application of NGS for species identification in various food products will also be presented.

Keywords: *food authenticity, DNA metabarcoding, next generation sequencing (NGS), species identification, food mislabeling*

Acknowledgement: *This work was support by the National R&D Key Program of China (No. 2017YFE0110800) and the EU Horizon 2020 Research and Innovation action (No. 727864-EU-China-Safe).*

LECTURES

L50

INTAKE OF DIOXINS AND DIOXIN-LIKE COMPOUNDS IN CHINA: OCCURRENCE AND TEMPORAL TREND

Jingguang Li*[(1)], **Lei Zhang**[(1)], **Yongning Wu**[(1)]

[1)] *Food Safety Research Unit of Chinese Academy of Medical Science（2019RU014）; NHC Key Lab of Food Safety Risk Assessment, China National Center for Food Safety Risk Assessment, China*
**Corresponding author - E-mail: lijg@cfsa.net.cn*

Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs) and polychlorinated biphenyls (PCBs) are ubiquitous and persistent environmental pollutants. The human exposure to PCDD/Fs and dl-PCBs as well as potential health risk is still a matter of great concern in the world. On 20 November 2018, the European Food Safety Authority (EFSA) published the Authority's first comprehensive review of the risks to human and animal health from dioxins and PCBs in food and feed. The panel set a new tolerable weekly intake (TWI) for dioxins and dioxin-like PCBs in food of 2 pg/kg bw/week, which lead to a large exceedance of TWI in EU.

In China, dietary intakes of PCDD/Fs and dl-PCBs for general population were estimated from 3th, 4th and 5th Chinese total diet studies, in which a decline of the average dietary intake was observed from 2000 to 2011. The latest dietary intake of PCDD/Fs and dl-PCBs is estimated from 6th Chinese TDS conducted from 2017-2019. The national average intake and intakes in most of provinces keep the decline trend. However, a considerable intakes of PCDD/Fs and dl-PCBs from 6th Chinese TDS are still higher than the new TWI from EFSA.

Acknowledgement: *This research was financed by the National Key Research and Development Program of China (grant number 2017YFC1600500) and the National Natural Science Foundation of China (grant numbers 21537001)*

LECTURES

L51

EMERGING OF MONOPHASIC SALMONELLA ENTERICA *SEROTYPE TYPHIMURIUM* IN CHINA

Li Bai*[1]

[1] *China national center for food safety risk assessment, China*
**Corresponding author - E-mail: baili@cfsa.net.cn*

Background: Monophasic *Salmonella enterica* serotype Typhimurium is a worldwide emerging pathogen causing numerous food-borne outbreaks. While there is a good understanding of their genomic landscape in Europe and United States, such investigation has not yet been performed extensively for those originating from China.
Materials/methods: Whole genome sequencing was applied for multiple comparisons of 113 isolates from diarrhea patients in China, 2007 to 2017, and published data of 669 isolates from Japan, United States and European countries, were collected to assess their genetic heterogeneity. Resistance genes and mutations were identified and the carriage of resistance and virulence associated genes were then compared between isolates from different countries. The high quality single nucleotide polymorphisms were obtained and then the emerging time of the Chinese strains were estimated.
Results: Phylogenetic analysis revealed that multiple lineages of *S.* might be transmitted to China from Europe by the imported breeding pigs along with their original *S.* Typhimurium ancestors. The carriage rates of 14 resistance genes in Chinese isolates were extremely high, including *arr-3* (53.10%), *aadA* (53.09%), *aac(6')Ib-cr* (52.21%), bla_{OXA-1} (42.48%), etc, which were much higher than those in isolates from other countries (all less than 10%). The Chinese strains formed two main clades: C1(n=47) and C2 (n=43). C1 was predominantly intercontinental from Europe to China around 1995 (95% CI: 1991-2000) and C2 was around 2009 (95% CI: 2007-2012) . More resistance genes and mutations were accumulated in C1 than C2, most of which were harbored by multiple drug resistant plasmids highly similar with those in resistance bacteria isolated from China originated from the backbone of IncHI2 plasmids. These results indicated dramatically genetic variation for local adaptations of Chinese isolates by horizontal gene transfer.
Conclusions: The ancestor of this set of *S.* isolates occurred around 2007 and currently circulating in China are likely to be part of an emerging multidrug resistant clade first reported in Europe. It is likely that these events were facilitated by animal movement (e.g. breeding pigs). These findings will inform policy on action that is crucial to reduce further spread of *Salmonella* and other (emerging) Salmonella strains globally.

Keywords: *monophasic salmonella enterica serotype typhimurium emergence, emergence, whole genome sequence, antibiotic resistance*

LECTURES

L52

INTERNAL AND DIETARY EXPOSURE ASSESSMENT TO ZEARALENONE IN A TYPICAL AREA OF CHINA

Shuo Zhang[(1)], **Shuang Zhou**[(1)], **Xiaodan Wang**[(1)], **Yun Yun Gong**[(2)], **Yunfeng Zhao**[(1)], **Yongning Wu***[(1)]

[1)] *NHC Key laboratory of Food Safety Risk Assessment, China National Center for Food Safety Risk Assessment, China*
[2)] *School of Food Science and Nutrition, University of Leeds, United Kingdom*
**Corresponding author - E-mail: wuyongning@cfsa.net.cn*

Zearalenone is a widespread mycotoxin with high estrogenic activity, which contaminates grains and also occurs in cereal products. This study aimed to characterize the exposure of ZEN in a Chinese population in Anhui province during harvest season. 199 healthy volunteers with age ranged from 4 to 80 years old participated in this study. Two approaches of exposure assessment were applied. One is the dietary approach based on 24 hour duplicate diet of staple food samples. From the participants staple food samples were collected and subsequently analyzed by high performance liquid chromatography coupled to tandem mass spectrometry (HPLC-MS/MS). With the consumption data obtained by the food frequency questionnaire in this study, measured concentrations of food samples were used to estimate dietary intakes for individuals and for the population. The other approach is the human biomonitoring (HBM) method. As biomarkers of exposure, ZEN and its metabolites in urine samples were analyzed using HPLC-MS/MS before and after enzymatic hydrolysis. Therefore both their concentrations of free and conjugated form were obtained, also the human metabolism pattern of ZEN among populations were investigated. We will discuss the detailed results of exposure assessment to ZEN via these two approaches in this presentation, including the estimated intakes of the cohort comparing to the EFSA's TDI and their age- and gender-related differences. The relationship between the internal and the external exposure will also be discussed.

Acknowledgement: *This work was supported by the CFSA "523" High Level Talents Development Project.*

LECTURES

L53

RESEARCH SCOPE OF HIGHLY SENSITIVE IMMUNE-DETECTION OF AFLATOXIN IN PEANUTS

Shuo Wang*(1), Yaozhong Hu(1), Wei Sheng(2)

1) *Tianjin Key Laboratory of Food Science and Health, School of Medicine, Nankai University, China*
2) *Tianjin University of Science and Technology, China*
**Corresponding author - E-mail: wangshuo@nankai.edu.cn*

Aflatoxin is the most toxic and the most potent carcinogen in humans. Food and feed contamination by aflatoxins are a significant food safety issue in the developing and developed countries because of lack of detection, monitoring and regulating measures to safe guard the food supply. The surveillance system for monitoring of aflatoxins in peanuts would allow better risk assessment of aflatoxin occurrence and better decisions to be taken at earlier stages in the supply chain. But, the establishment of the system must base on the fast and highly sensitive detection of aflatoxins. On the one side, the research group has the rich experience for the development of detection strategies, and has successfully developed fast detection techniques against varied mycotoxins and residue pesticides in the food based on the conventional antibody, which could guarantee the successful development of detection technologies based on conventional monoclonal antibody. On the other side, the group has also performed antigen preparation, immunization and selection of specific Nbs, as well as the characterization of their biochemical properties. The utilization of Nbs for the quantitative detection of Aflatoxin will extend the research scope of the lab for the qualitative and quantitative technologies of the mycotoxin detection in peanuts.

Keywords: *peanut, aflatoxin, immune-detection, monoclonal antibody, nanobody*

Acknowledgement: *This project has received funding from the Chinese Ministry of Science and Technology (MOST) for the National Key R&D Program of China under 2017YFE0110800 and the European Union's Horizon 2020 research and innovation program under grant agreement No. 727864.*

LECTURES

L54

ANALYSIS HAZARDS IN FOOD: FROM ONE-BY-ONE DETERMINATION TO CLASS-BY CLASS SCREENING AND FINALLY TO CHEMOMETRICS-BASED DISCRIMINATION

Feng Zhang*[1], **Yun Ling**[1], **Meiyi Yao**[1]

[1] *Chinese Academy of Inspection and Quarantine, China*
**Corresponding author - E-mail: fengzhang@126.com*

The risky chemical substances in food include pesticide residues, veterinary drug residues, mycotoxins, persistent organic pollutants and illegal additives. At present, there are a lot of reports about the detection methods of the above-mentioned hazards. However, in order to escape the routine detection, the abuse of structural analogues with similar property to risky substances has become a trend, while the discovery and detection of unknown structural analogues is still a huge challenge in food safety science and technology due to the diversity of similar species.
In recent years, we used the mass spectrometry with soft ionization technique to reveal fragmentation mechanism of 12 different structural chemical hazards such as phenylethanolamine. It is found that compounds with the same skeleton structure have the same fragmentation pathway. Inspired from this discovery, exploitation method based on "mass spectrometry fragmentation markers" has been developed, which can solve the problem of difficult detection with new structural derivatives. And thus achieved the detection of harmful substances from one-by-one determination to class-by class screening.
Although the technologies mentioned above solve the problem of screening for new structural derivatives, they cannot screening the potential risks caused by non-standard food processing. In the process of food production, processing, transportation and storage, non-standard operation can cause food safety problems and produce harmful substances. The detection of these trace harmful substances is tantamount to finding a needle in a haystack. In this work, a holographic discrimination technology was developed for screening potential risks in hot-processed milk. By simulating the non-standard processing of raw milk, using multi-dimensional and multi-mode "holographic" analysis techniques such as chromatography, mass spectrometry, spectroscopy, combing with statistical methods such as chemometrics, five high-risk markers of advanced glycation end products were screened out and a safety identification model for hot-processed milk was constructed, which can realize the "holographic" discrimination of risk milk. Thus, a technological breakthrough of food safety can be realized from one-by-one determination to class-by-class screening and finally to chemometrics-based discrimination.

Keywords: *food analysis, determination, screening, discrimination*

Acknowledgement: *This work was financially supported by the National Key Research and Development Program of China (2017YFC1601600)*

LECTURES

L55

MULTI-PLUG FILTRATION CLEAN-UP (M-PFC) METHOD AND AUTOMATED DEVICE FOR ANALYSIS OF PESTICIDE AND VETERINARY DRUG RESIDUES

Canping Pan*[1], **Le Song**[1], **Yangliu Wu**[1]

[1] *China Agricultural University, China*
**Corresponding author - E-mail: canpingp@cau.edu.cn*

A novel design of rapid multi-plug filtration clean-up (m-PFC) method was developed for analysis of pesticide and veterinary drug residues in various matrices of agricultural products. Based on QuEChERS extraction, liquid-liquid partition and salting-out procedure, the supernatant was cleaned up by m-PFC columns packed with various sorbents. Multi-walled carbon nano-tubes (MWCNTs) were used as an alternative material in pesticide residue analysis for its adsorption specificity. It intended to adsorb the interfering substances in the matrix, rather than the analytes. Using m-PFC columns was shown to be a more practical way to perform the d-SPE cleanup. The m-PFC method was very rapid, which took just one minute to perform without any solvent evaporation, vortex or centrifugation. Moreover, m-PFC increased the contact time and surface area between extracts and sorbents, which provided lower RSDs and LOQs than d-SPE. Because of the better cleanup performance, m-PFC could lower the matrix effects. Recently, an automated m-PFC cleanup device was developed. The cleanup process was helpful to reduce the workload in sample preparation. In automated m-PFC cleanup method, the parameters of m-PFC cycles, volume and speed could be optimized separately to obtain the best recovery and cleanup performance. Automated m-PFC methods based on QuEChERS method were widely used in both relatively simple and complex matrices. It was labor-saving and easy to be operated. The automation of the m-PFC method could significantly improve method accuracy and robustness. Applications of this method on various tea samples, vegetables, fruits and animal stuffs will be discussed in the presentation.

Acknowledgement: *This work was supported by National Key R&D Program of China (Project No 2016YFD0200206 and 2018YFC1604401) from the Chinese Ministry of Science and Technology.*

LECTURES

L56

RAPID FOOD ANALYSIS BY AMBIENT MASS SPECTROMETRY

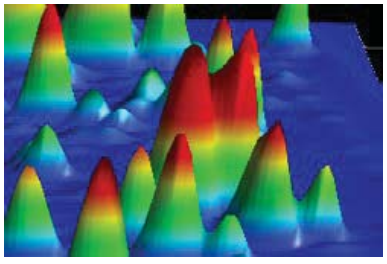
Ke Min[(1)], **Shou Chen**[(1)], **Ruizhi Wen**[(1)], **Jingjing Liu**[(1)], **Bo Chen***[(1)], **Ming Ma**[(1)]

[1)] *Key Laboratory of Phytochemical R&D of Hunan Province, College of Chemistry & Chemical engineering of Hunan Normal University, China*
**Corresponding author - E-mail: dr-chenpo@vip.sina.com*

Ambient mass spectrometry involves the direct sampling and ionization of analytes from samples under ambient conditions and requires minimal or no sample pretreatment. While the ionization process in mass-spectrometric analyses was traditionally performed in vacuo inside the mass spectrometer, the advent of differentially pumped interfaces and atmospheric pressure ionization (API) methods allowed the ionization step to be performed at atmospheric pressure, greatly simplifying sample introduction. Food and related products are complex matrix and its rapid analysis has been challenging. In this talking, we have introduced some applications for food safety analysis, such as by different ionization sources (paper spray, DART or DCBI etc) and different food products (beverage or food packaging material) or chemical containments (food additives).
For example, because thirdhand smoke (THS) components have properties of remaining, remitting and reaction on surfaces, in-situ analysis of the components on different surfaces has been significant and challenging for the THS researches. in-situ DCBI-MS/MS quantitative analysis of typical THS environmental markers on different surfaces such as fruit, clothing, glass, and toy etc. was developed. It was also applied to direct detection of THS on finger without any body damages. In addition, formation of tobacco-specific nitrosamines (TSNAs) such as NNA, NNK, and NNN, was in-situ characterized by DCBI-MS/MS successfully. A PS-MS method was applied for the rapid in situ screening and simultaneous quantitative analysis of bisphenol A and its analogues, i.e., bisphenol S, bisphenol F, and bisphenol AF, in food packaging products. The calibration curves of bisphenols in the range of 1−100 μg/mL were linear. The correlation coefficients were higher than 0.998. The samples were analyzed by PS-MS in situ for rapid screening without a traditional sample pretreatment procedure. The analytical time of the PS-MS method was less than 1 min. In comparison with conventional HPLC-MS/MS, it was demonstrated that PS-MS was a more effective high-throughput screening and quantitative analysis method.
A high temperature desorption (HTD) direct analysis in real time−high-resolution mass spectrometric (DART-HRMS) method was developed for the rapid analysis of four banned cationic dyes. Rhodamine B is used to dye foods, while malachite green, crystal violet, and methylene blue are added to fishponds as antimicrobials. A simple induced phase separation extraction was used to pretreat samples. The DART-HRMS method employed two temperature steps, i.e., 200 °C for drying, purification, and enrichment of sample solution and 500 °C for thermal desorption and ionization of analytes. The calibration curves of dyes in the range of 50−2000 ng/mL were linear using deuterated malachite green as an internal standard. The LODs vary for all analytes between 0.1 and 30 ppb depending on the matrix and experimental conditions.

Keywords: *ambient mass spectrometry, rapid analysis, DART, DCBI, paper spray*

Acknowledgement: *The authors acknowledge support from the National Natural Science Foundation of China (21575040, 21775041, 21775040), .the Aid Program for S&T innovation research team in higher education institutions, the construction program of key disciplines of Hunan Province (2015JC1001), Hunan Province 100 experts project.*




ISBN 978-80-7592-055-3