



JOINT FAO/WHO FOOD STANDARDS PROGRAMME

FAO/WHO COORDINATING COMMITTEE FOR ASIA

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KEYNOTE ADDRESS – FOOD SAFETY ISSUES AND BEST PRACTICES FOR A DIVERSE REGION

Keynote panel discussion – Chemical food safety in ASIA

Managing residues, allergens, and food safety risks through better data and digital innovation

Introduction and background

1. Chemical food safety is gaining unprecedented importance across Asia as agrifood systems grow in scale, complexity, and interconnectedness. Countries are increasingly challenged to ensure that residues of pesticides, veterinary drugs, and other additives and contaminants remain within safe limits, while consumers are becoming more aware and demanding of transparency. This keynote panel will explore both achievements and persistent gaps in chemical food safety management across the region. The session will convene senior officials and technical experts from Japan, China, Thailand, and Malaysia, alongside other regional representatives, to provide scientific, regulatory, and policy insights.
2. Chemical hazards are among the most frequently discussed food safety issues in international food trade, making them not only a public health concern but also an economic and trade issue. For Asian countries that are major exporters of rice, seafood, fruits, and livestock products, the ability to comply with Codex standards and international requirements is essential for maintaining market access and competitiveness. Non-compliance with maximum residue limits (MRLs) can result in rejected consignments, significant economic losses, and reputational damage.
3. The discussion will begin with an overview of current trends in pesticide residues, which continue to attract both regulatory and public attention. While pesticides are indispensable for protecting crops, misuse or overuse can undermine consumer confidence and safety. Monitoring programmes across Asia generally show high levels of compliance with MRLs, but occasional exceedances continue to highlight gaps in farmer training, application practices, and enforcement capacity.
4. Veterinary drug residues present similar challenges, particularly in livestock, poultry, aquaculture sectors. Inadequate adherence to withdrawal periods and inconsistent veterinary oversight can result in residues in meat, eggs, milk, and fish. The rapid growth of aquaculture across the region has further complicated oversight, as the use of antimicrobials and veterinary drugs remains unevenly monitored.
5. Mycotoxins are toxic compounds naturally produced by certain moulds that can grow on a variety of foodstuffs, including cereals, dried fruits, nuts, and spices. They enter the food chain when crops are infected, both before harvest and during storage. Human exposure occurs directly through the consumption of contaminated foods or indirectly through animal products, particularly milk, when livestock are fed contaminated feed. The burden is particularly high in some Asian countries with hot and humid climates, which favour mould growth.
6. Effective risk assessment of chemical hazards depends on reliable and comprehensive data, yet such data remains uneven across Asia. Many countries have limited integrated datasets that capture both domestic consumption patterns and exposure pathways, limiting their ability to prioritize risks. Without strong evidence bases, dietary exposure assessments remain uncertain and decision-making less robust.
7. A major bottleneck lies in data interoperability. Laboratory results are often generated and stored in formats that are not compatible across countries, making regional comparisons difficult. While platforms are emerging to

encourage standardized methodologies, significant work is still needed to align practices with Codex standards. Without such alignment, opportunities for regional risk assessment and cooperation are constrained.

8. In addition, several low- and middle-income countries face persistent gaps in laboratory infrastructure and technical expertise. Limited equipment, variable methods, and shortages of skilled personnel reduce the reliability of results. Strengthening laboratories through targeted investment and capacity development remains critical to building confidence in monitoring data, particularly for emerging contaminants.

9. Regional collaboration has already shown its value in addressing some of these gaps. Joint training programmes, laboratory proficiency testing, and the establishment of centers of excellence have enhanced comparability of results and fostered mutual learning. These cooperative approaches also allow countries to pool resources, share lessons, and reduce the costs of duplicating efforts.

10. As countries develop capacity, digital technologies are opening new opportunities to strengthen chemical food safety systems. Artificial intelligence (AI) and machine learning offer powerful tools for analyzing large datasets, identifying anomalies, and predicting where risks may emerge. For regulators facing resource constraints, such tools can support more strategic prioritization and efficient allocation of efforts. AI can become particularly valuable in anticipating pesticide residues. By integrating agricultural practice data, weather information, and historical monitoring results, predictive models can generate early warnings before risks materialize in the food chain. This predictive potential is especially important in Asia's fast-moving agricultural markets, where decisions must often be made rapidly.

11. In risk assessment, AI has the potential to enhance exposure estimations for different population groups. Linking consumption data with residue monitoring can highlight vulnerabilities among children, the elderly, or other sensitive groups. Several countries have begun piloting AI-assisted approaches, using machine learning to detect patterns that traditional analysis might overlook. Others are investing in digital platforms that integrate laboratory data directly into regulatory systems, creating faster and more coordinated responses.

12. Some countries are advancing toward AI-based risk prioritization, building platforms to guide inspection planning and resource allocation. By focusing on high-risk commodities, regulators can maximize the value of limited resources. Beyond Asia, the European Union and North America have developed similar tools for predicting emerging chemical risks and guiding residue testing. These global experiences offer lessons for adaptation in Asia, highlighting both opportunities and pitfalls.

13. However, barriers remain. Data fragmentation, limited digital infrastructure, and institutional constraints continue to slow adoption. Just as importantly, regulators must ensure that AI outputs remain transparent, interpretable, and subject to human oversight. Building trust in AI requires strong governance frameworks and effective communication with stakeholders, ensuring that technology complements rather than replaces expert judgment.

14. Alongside AI, new practical tools are becoming available to support monitoring. The FAO RVDF (Residues of Veterinary Drugs in Foods) tool is one such example, helping countries organize, analyze, and interpret residue data in line with Codex standards. Designed with usability in mind, it supports both advanced systems and those still developing basic monitoring functions.

15. While Thailand and Singapore underwent the pilot testing of the earlier version of the tool in 2021, Lao PDR has begun applying the RVDF tool and plans a full assessment later in 2025, using it to integrate monitoring into broader laboratory strengthening efforts. Pakistan adopted the tool earlier in 2025 and has already reported benefits, including standardized data structures, improved reporting, and more robust evidence for regulatory action. All cases illustrate how digital tools can help low- and middle-income countries leapfrog traditional barriers and improve coordination between laboratories and regulators.

16. Such experiences demonstrate that structured digital tools can act as equalizers, allowing countries with limited resources to engage more effectively in international food safety systems. They also lay the groundwork for incremental adoption of more advanced AI-enabled approaches in the future.

17. It is also important to note that WHO has recently convened a training workshop on chemical food safety risk analysis in India, while also initiating dialogues on chemical contaminants in foods in China and Singapore. These efforts reflect a growing recognition that digital and capacity development tools must be complemented by strong regional training and policy dialogues. A forthcoming Master Class on Food Safety & Risk Assessment, to be jointly launched by WHO and the Food Safety and Standards Authority of India (FSSAI), is expected to provide an additional structured platform to bring regulators and technical experts together across Asia.

18. Codex texts remain the foundation for chemical food safety, providing globally recognized standards and guidance. For many Asian countries, alignment with Codex is essential not only for consumer protection but also for ensuring continuity in trade. Yet challenges persist, particularly in timely adoption and consistent application of Codex standards.

19. The panel will discuss practical experiences in implementing Codex standards. Some countries have streamlined processes for updating their legislation, while others face institutional or political delays. Ensuring timely and effective adoption remains a critical area for capacity development across the region.

20. Beyond technical standards, the session will reflect on how chemical hazards intersect with broader societal concerns. Issues such as food integrity, sustainability, and consumer trust are increasingly shaping perceptions of food safety. In an environment where misinformation can spread rapidly, building public trust through clear, empathetic communication is as important as building laboratory capacity.

21. A global estimate of the burden of foodborne diseases was first published by WHO in 2015, which highlighted significant data gaps on hazards of chemical origin. To address this, WHO established a second Foodborne Disease Epidemiology Reference Group (FERG II), and the chemicals and toxins working group has prioritized aflatoxin (B1/M1), inorganic arsenic, cadmium, lead, methyl mercury, dioxins, cassava cyanide, and peanut allergen as key chemical hazards for inclusion in the next estimate.

22. Risk communication is particularly challenging given differences in consumer perception across countries. In some markets, even trace residues within MRLs are met with suspicion, while in others awareness of chemical hazards is limited. Regulators must balance scientific accuracy with communication strategies that resonate with local contexts and concerns.

23. Looking ahead, capacity development in Asia must focus not only on laboratories but also on digital readiness and human resources. The region requires more experts able to use advanced tools, interpret complex datasets, and communicate findings effectively to policymakers and the public.

24. Food allergens will also form part of the discussion, as they represent chemically defined hazards requiring strong data, labeling systems, and regulatory oversight. Like pesticides and veterinary drugs, allergens demand robust monitoring, effective communication, and strong regulatory responses. Integrating allergen and chemical safety systems offers opportunities for efficiency and synergy.

25. This keynote panel will also provide an opportunity to report back from the recent regional workshop on food allergens. Three invited experts will share an overview of allergen-related risks, summarize lessons learned from the workshop, and discuss how allergen management can be better integrated into chemical food safety systems. Their perspectives will enrich the discussion and ensure that the panel reflects the full spectrum of chemical food safety challenges in Asia.

Key messages

26. Chemical food safety is both a public health priority and a trade concern in Asia, where non-compliance with MRLs can lead to rejected exports and reputational damage.

27. Pesticide and veterinary drug residues remain core challenges, especially in aquaculture and livestock, where monitoring and compliance with withdrawal periods are uneven.

28. Contamination of food commodities with mycotoxins remains a significant burden, underscoring the need for strengthened scientific guidance and effective technologies to support risk management and control measures.

29. High-quality, interoperable data is essential for effective risk assessment, yet many countries face gaps in integrated datasets, laboratory infrastructure, and technical expertise.

30. Regional cooperation through joint training, proficiency testing, and centers of excellence has already improved comparability of results and reduced duplication of efforts.

31. Artificial intelligence (AI) and digital tools may be able to effectively support predictive risk assessment, early warning, and inspection prioritization, but require strong governance, human oversight, and quality data.

32. The FAO RVDF tool provides practical support for managing veterinary drug residue data; experiences from Thailand, Singapore, Pakistan and Lao PDR show how structured tools can strengthen monitoring and reporting.

33. The WHO report on global estimates of the burden of foodborne diseases highlighted a critical gap in the availability of data on hazards of chemical origin.

34. Codex texts remain the foundation for chemical food safety, yet timely adoption and consistent application remain challenges for many countries in the region.
35. Building public trust is as important as technical compliance, requiring clear, empathetic risk communication that resonates with local contexts.
36. Capacity development must focus on laboratories, digital readiness, and human resources, ensuring that experts can use and interpret advanced tools effectively.
37. Food allergens, as chemically defined hazards, require integration with chemical food safety systems, and the CCASIA23 panel will highlight lessons from a recent regional workshop on allergen management.

Recommendations

38. Codex Members in the CCASIA region are encouraged to share the knowledge gained during this keynote panel with their colleagues upon returning home, for example through internal briefings or technical meetings. Members are also invited to bring the outcomes of the discussion to the attention of their national hierarchy, so that follow-up action points on data quality, monitoring, and digital readiness can be considered in national strategies. Sharing lessons across agencies and with relevant stakeholders will help ensure that CCASIA discussions translate into concrete improvements at national and regional levels. FAO and WHO, together with the Codex Secretariat are ready to support and facilitate such regional cooperation and collaboration for capacity development.