



**Building Capacity in Metrology:  
Application to Safe Food and Feed**

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# Chinese food

A perfect combination of **color**, **aroma** and **taste**

Food security

Food safety and quality

**Good?**



# 王者以民为天 而民以食为天

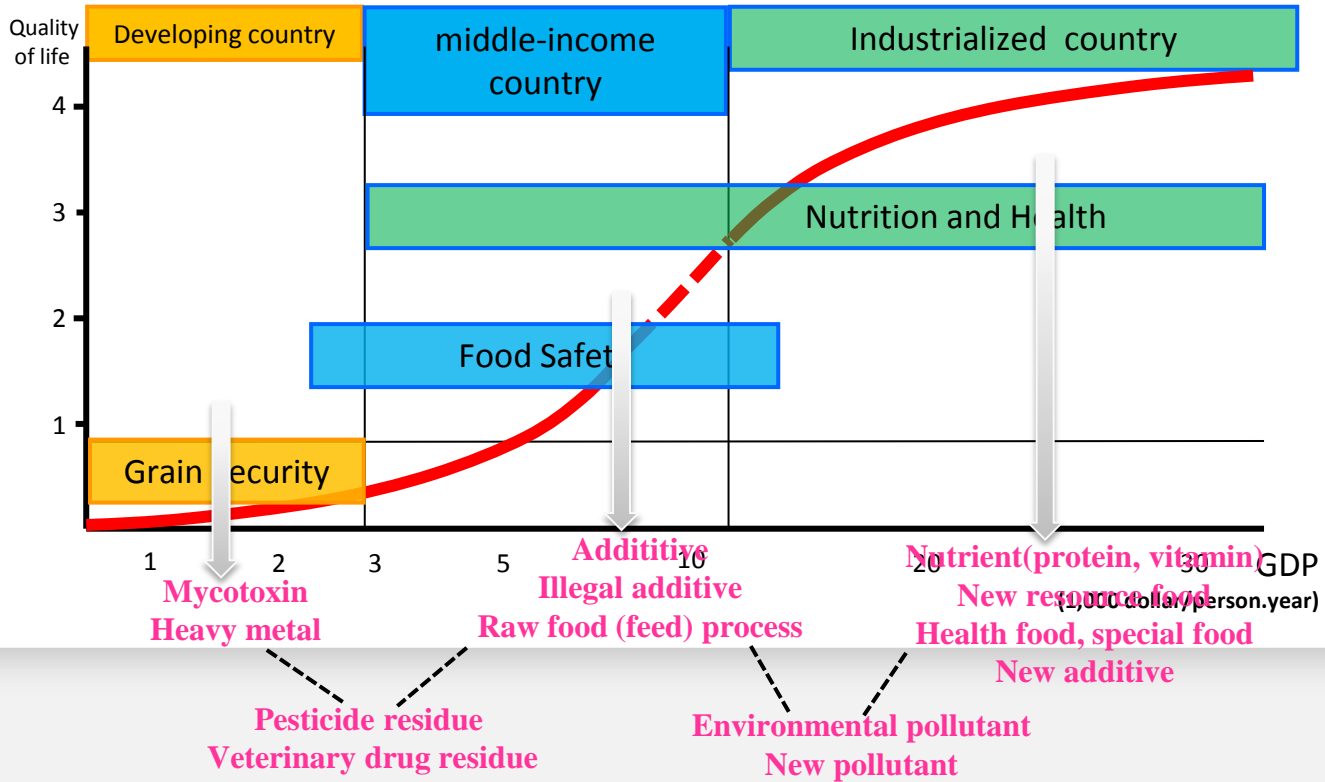
《汉书·酈食其传》

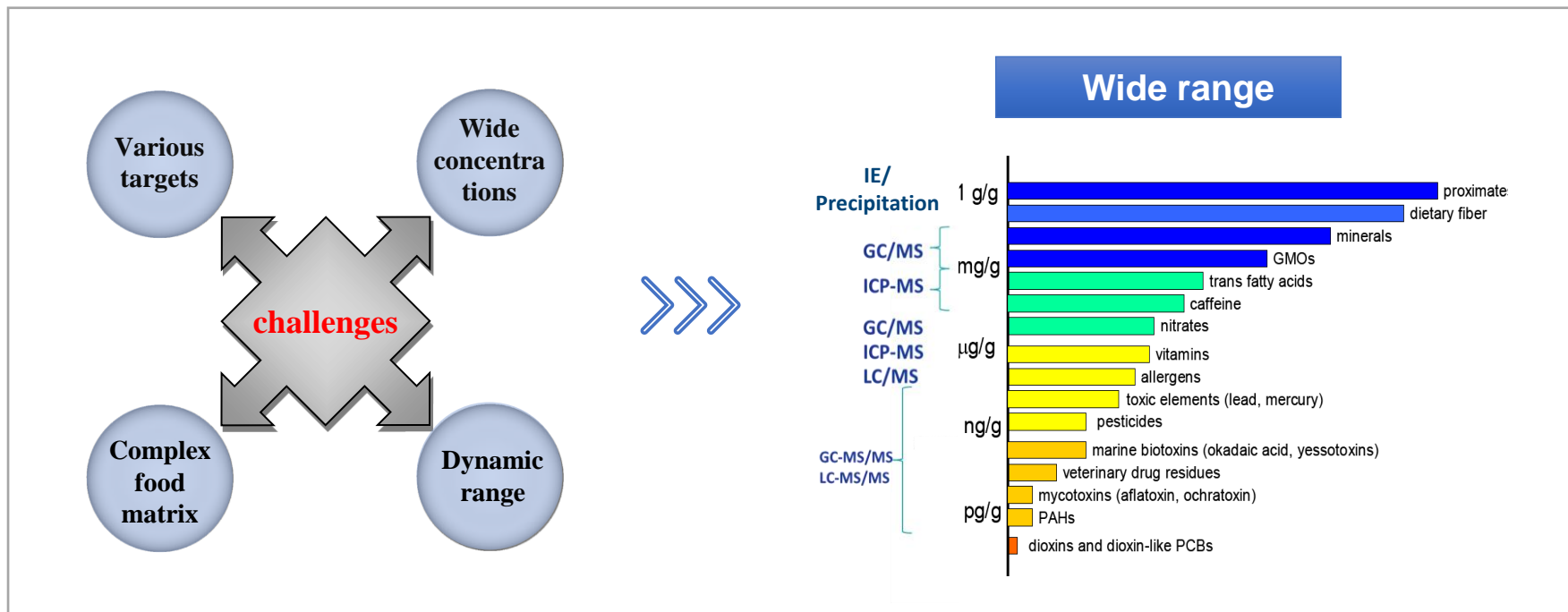
People is the god to the king.

Food is the heaven to the people.

*Li Shiqi, Book of Han*

# GDP and Quality of Life(QOL)





>>> Challenges are

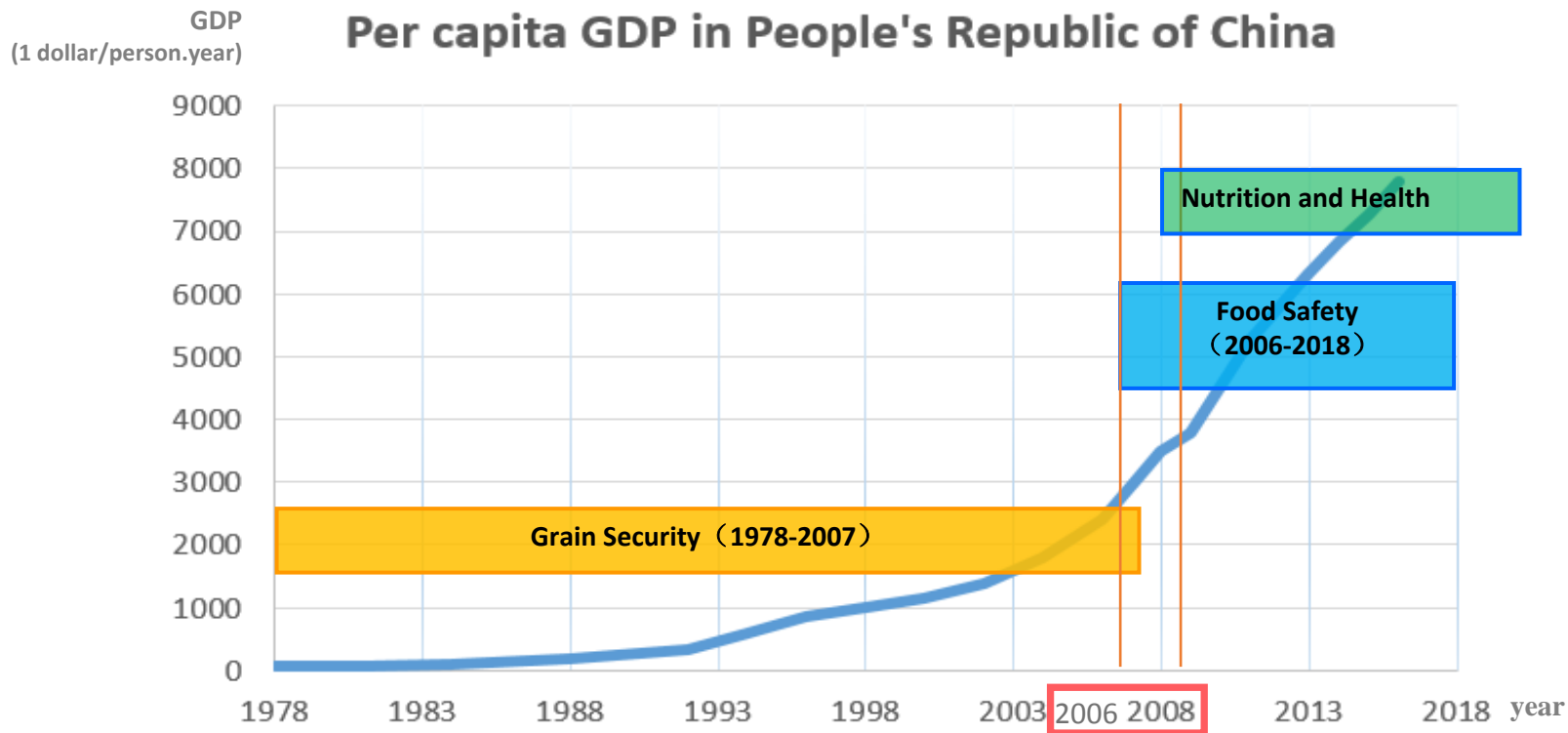
**Complicated matrix**---pretreatment & instrument

**A large number of testing targets**---sensitivity & resolution



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- 1/ **Metrology for food safety in China**
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- 3/ **Conclusion**

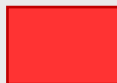


## China's GDP per capita (2016)

—



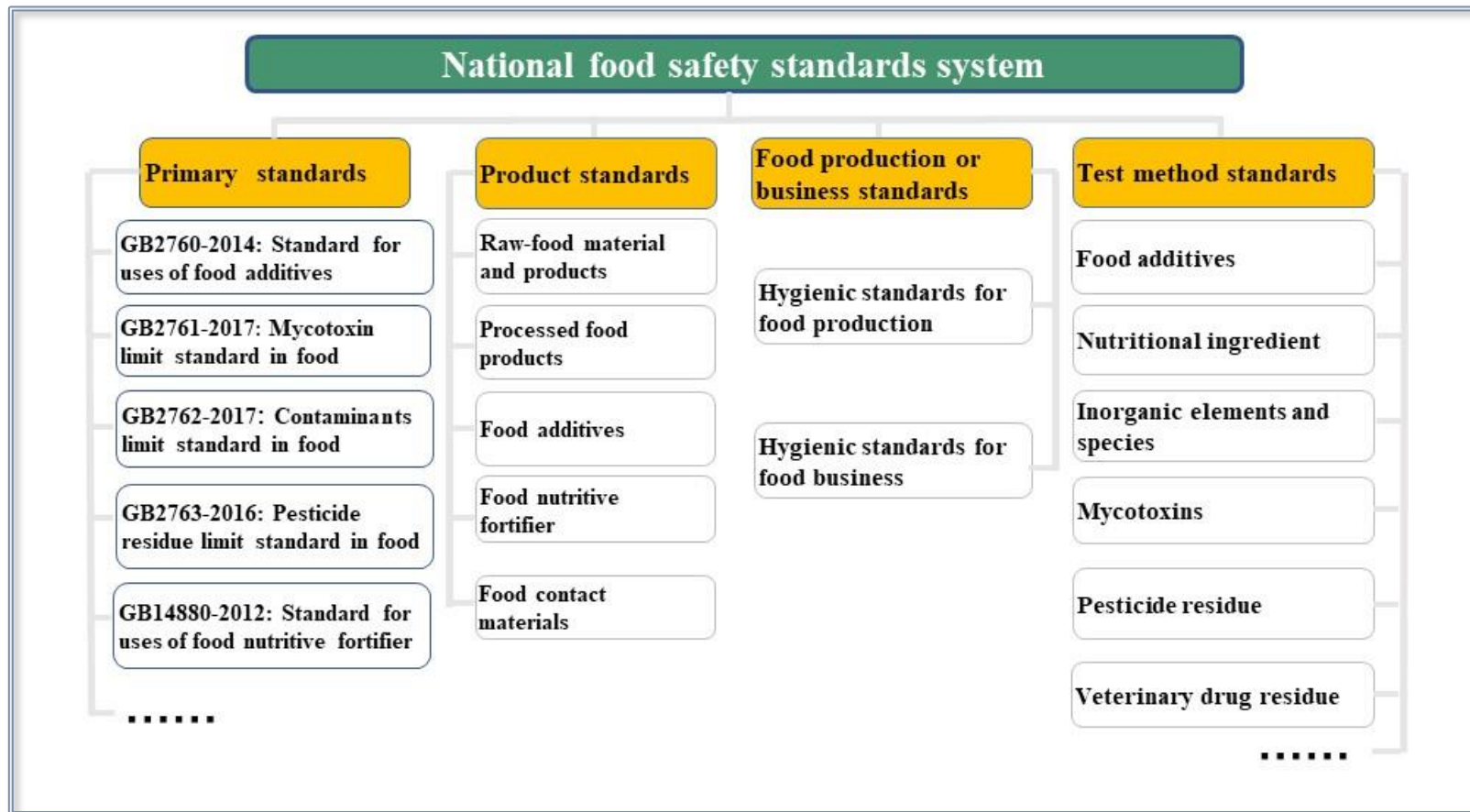
3000-4000  
dollar/person·year



>10000  
dollar/person·year





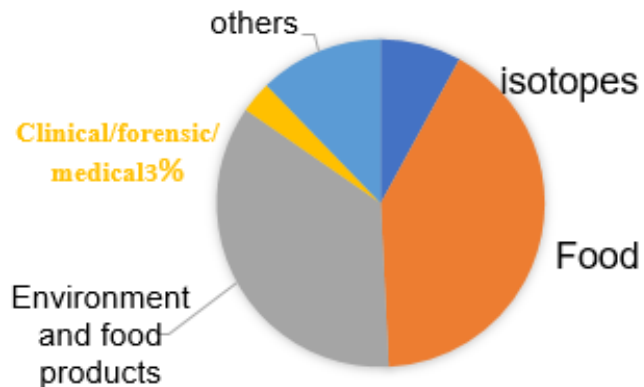
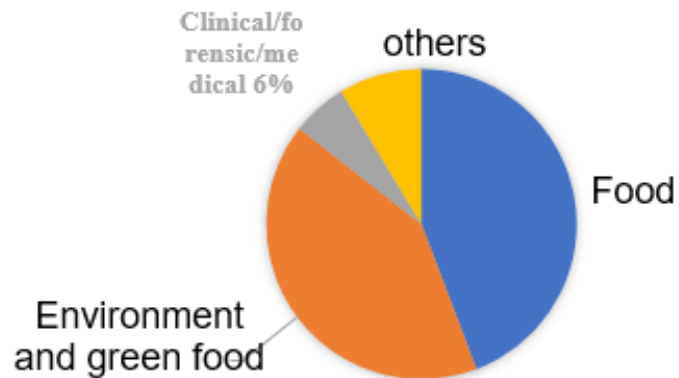
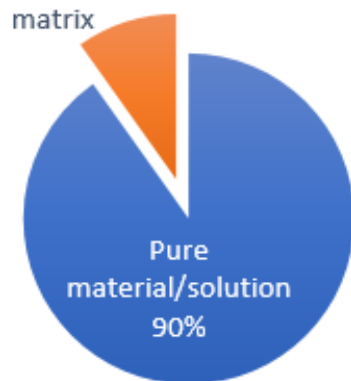


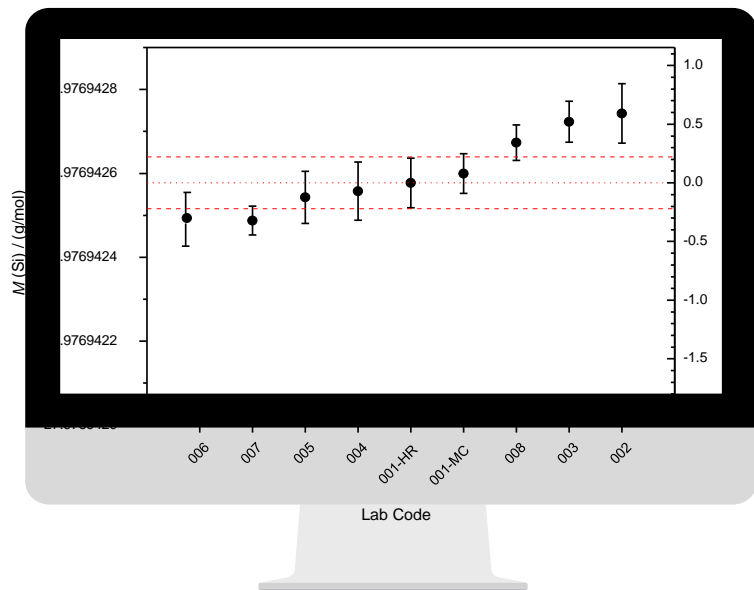


over 1500 kinds of CRMs

NIM developed over 1500 kinds of CRMs, meeting the urgent need of important areas with international advanced level

>400 kinds of food related CRMs





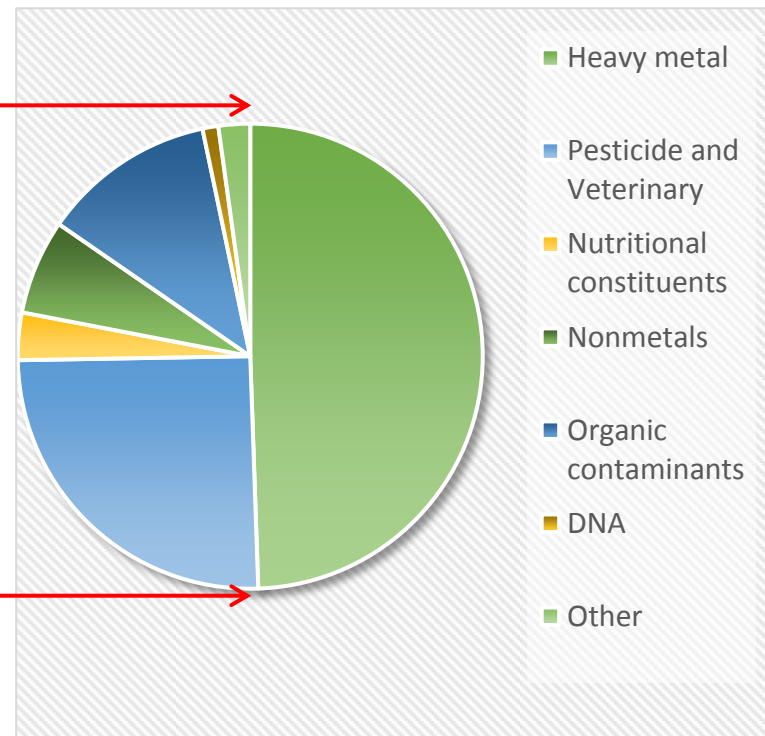
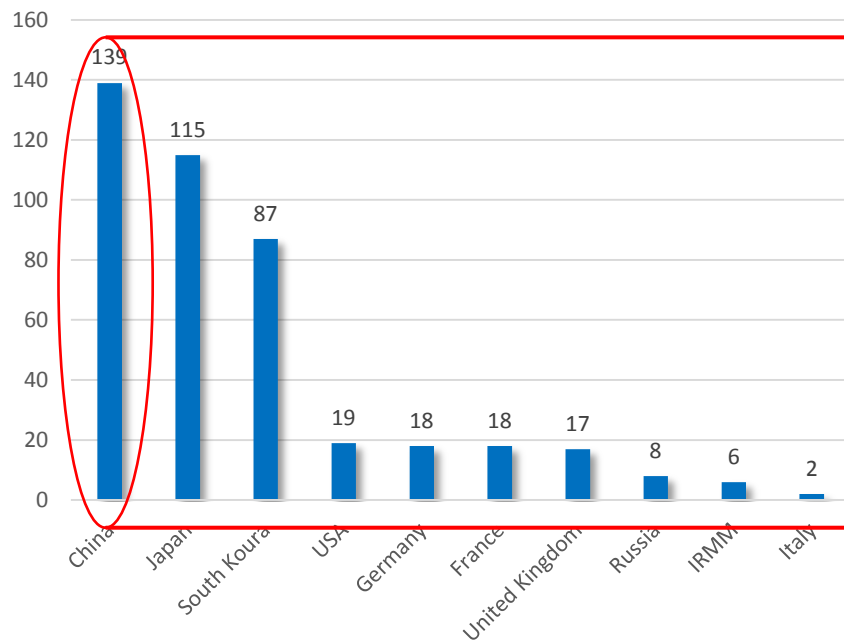
**71.8%**

Among the **32** international comparisons, (CCQM+APMP), NIM participated in **21**.

**4**

Piloted by NIM

## 139 CMCs



# Proficiency Testing (PT) in recent 5 years

17



Proficiency  
Testings

600+



Participants



## What NIM did

- Development of measurement methods and CRMs
- Establishment of national measurement standards
- Participation in international comparisons and PTs



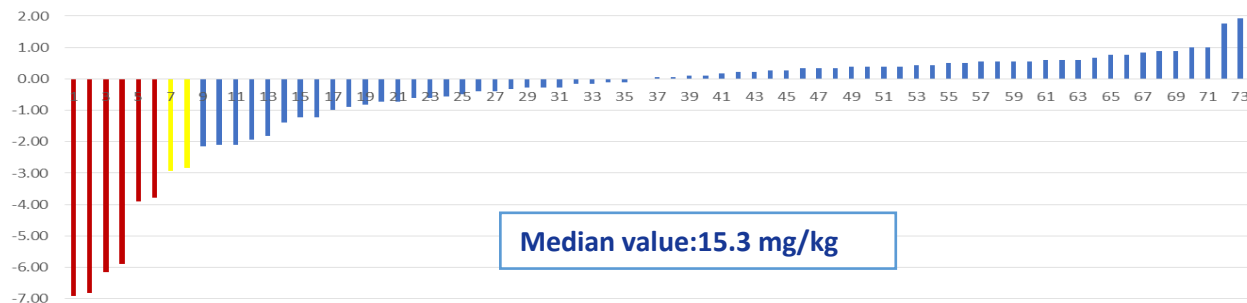
- ✓ 128 kinds of methods applied for determination
- ✓ 36 kinds joined the uniform testing



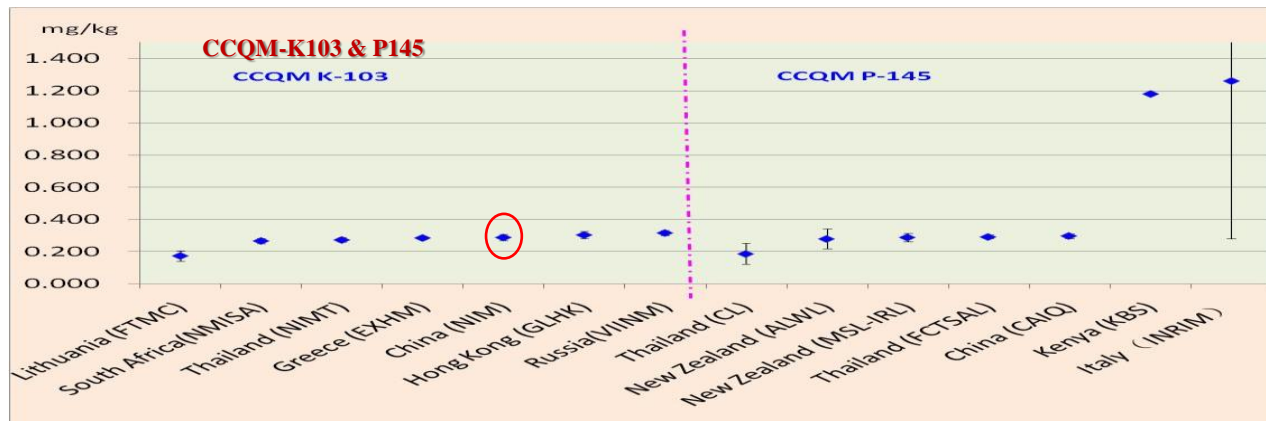
# NIM's efforts in accurate determination of Melamine

## Comparisons of melamine determination

Domestic comparison



International comparison





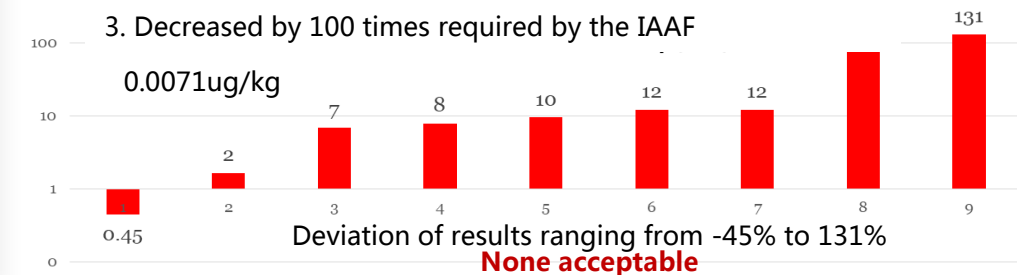
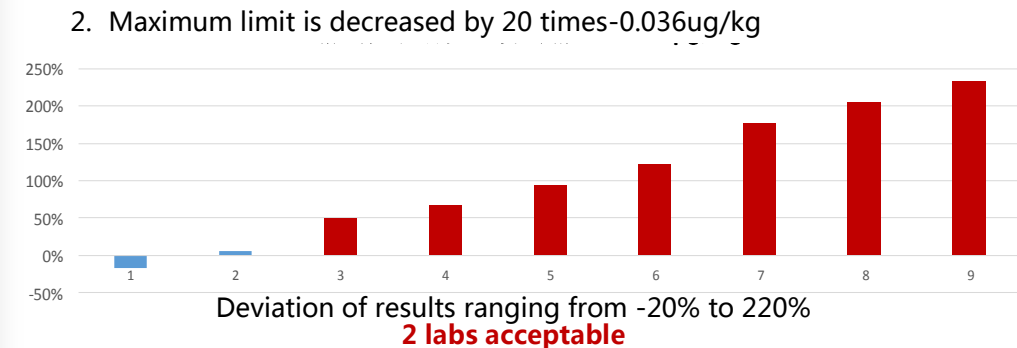
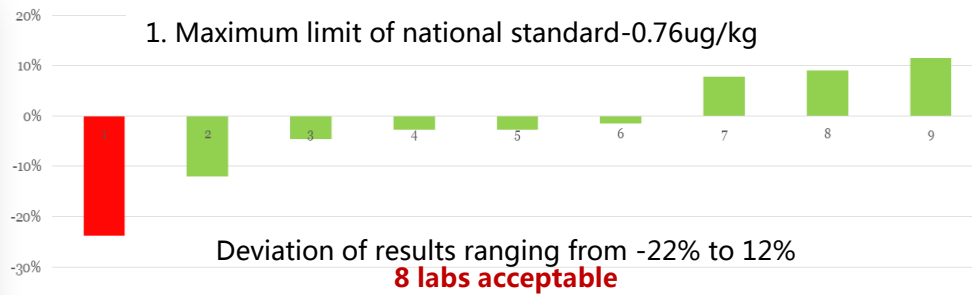
# NIM's efforts in improving clenbuterol determination 2015 IAAF World Championships



National Standard : **50 µg/kg**  
Method detection limit : **1 µg/kg**



Maximum limit in athletic food : **< 1µg/kg**  
Method detection limit : **<0.01 µg/kg**





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# What is mycotoxin?



low-molecular-weight secondary metabolites of fungi

Over 400 kinds

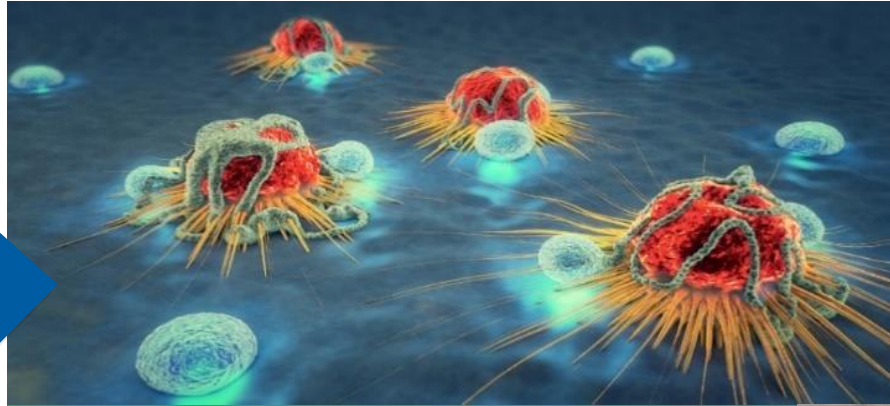


11 kinds in food and feed

aflatoxins (B1,B2,G1,G2,M1),  
fumonisin B, ochratoxin A,  
patulin, deoxynivalenol (DON) and zearalenone (ZEN)

# What is mycotoxin?

25%



Carcinogenic  
Mutagenic  
Teratogenic  
...

Over 25% grain and feed is polluted by mycotoxins, according to World Health Organization (WHO) .

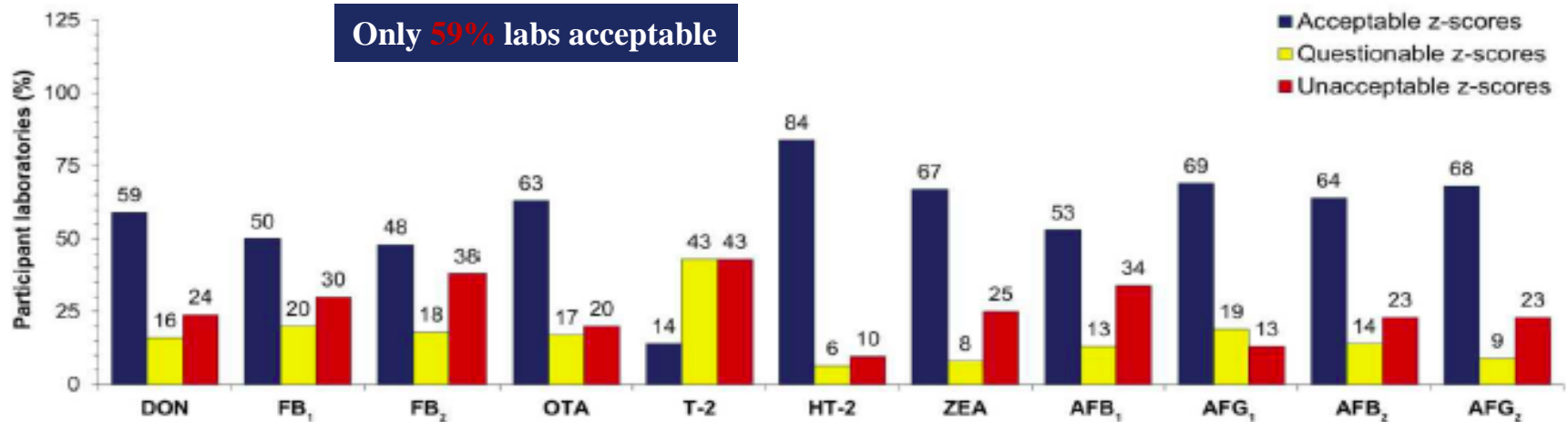
Food and Agriculture Organisation (FAO) estimates in Asia and Africa, 8–18 % of cereals are lost during postharvest handling and storage, mainly because of fungal multiplication and contamination with mycotoxins.



# Challenges for accurate measurement of mycotoxin

Performance evaluation of LC-MS/MS methods for multi-mycotoxin determination in maize and wheat by means of international Proficiency Testing, *Trac Trends in Analytical Chemistry*, 2017 , 86 :222-234

-- Institute of Sciences of Food Production (ISPA), National Research Council



- ◆ Reference solutions and/or calculation errors were the main cause for the severe deviation of results
- ◆ Matrix reference materials are important for the accurate determination of mycotoxin in food



## Prevalence of aflatoxin understated

By Isaac Kalua | Updated Sun, January 22nd 2017 at 10:00 GMT +3

In 2004, 125 Kenyans died because of consuming aflatoxin-infested food. Six years later in 2010, the government issued a public safety alert after finding that aflatoxins in maize in eastern Kenya and the coastal region were above tolerable levels.

## Children under 15 at huge risk of aflatoxicosis in Kenya—study

SATURDAY NOVEMBER 16 2013

Inaccurate measurement of mycotoxin and inadequate capacities have led to huge grain crisis in developing countries.

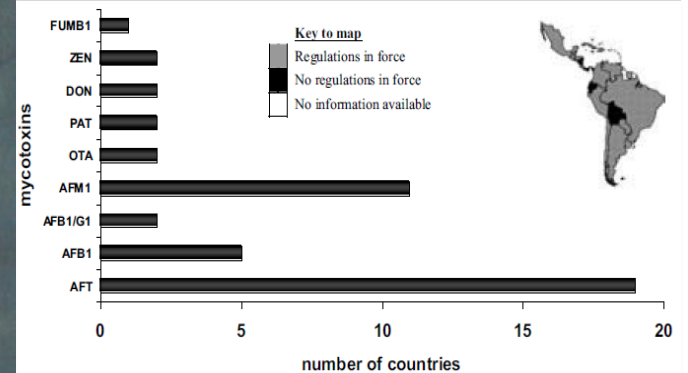
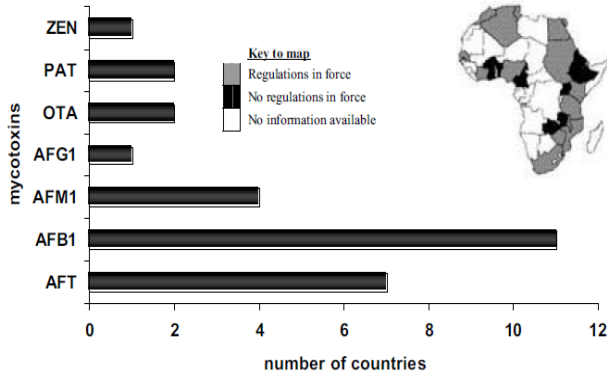
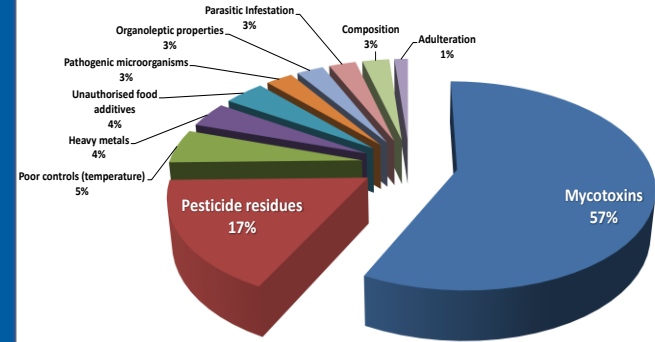
People's health and even lives have been put in great danger.

To protect the public, over 100 countries have implemented regulatory limits for mycotoxin in food and feed.

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AFRIMETS has identified the regional need for CRMs to support the accurate measurement of mycotoxin in food analysis.

South African Alerts/ notifications/border rejections from EU 01/01/2010 - 01/03/2014 received from the European Commission Rapid Alert System for food and feed (RASFF)



# BIPM CBKT Programme “Safe food and Feed” for mycotoxin measurement

Capacity  
Building &  
Knowledge  
Transfer

Calibration  
Standard



Matrix  
Reference  
Material

Sample



Laboratory

Measurement  
Result

Above safe  
level?



a) Calibrant value assignment /  
production

CBKT program at BIPM



b) Analytical methods for  
mycotoxins in food

CBKT program at NMISA



c) Matrix CRM value assignment  
/production

CBKT program at NIM



The project has brought together 15 NMIs and 3 governmental organizations to work together in developing measurement standards and capabilities for Mycotoxin Analysis;

enabling 16 visiting scientists to undertake placements at the BIPM for knowledge transfer relating to producing and characterizing mycotoxin calibrants.



# NIM's contributions to "Safe Food and Feed"



**Date:** 4-8 June 2018  
**Venue:** Pretoria | South Africa  
**Contact:** FoodSafetyWorkshop@nmisa.org

Information on Technical papers and exhibition opportunities to follow



## ➤ **Secondees to the BIPM**

Dr. li Xiuqin, Dr. Li Xiaomin, Mr. Guo Zhen

## ➤ **Training**

5 trainees at BIPM ; 4 trainees at NIM

## ➤ **Workshops**

In Asia, Africa and South America  
Africa Food Safety Workshop, Jun 4-8, 2018

## ➤ **Development of CRMs**

ZEN PURITY, ZEN solution (2), Aflatoxin M1 in infant formula (2)  
T2 purity

## ➤ **International comparisons**

The first inter-laboratory comparison (CCQM-K154.a)

# Research and Application of Measurement Standard and Technical System in Agro-product Safety (2017-2020)

Funded by Ministry of Science and Technology (MOST), China

## Targets :

**A**

To develop RMs of mycotoxins in agro-products;  
To establish a traceability system

**B**

To establish a global mutual recognition framework

**C**

To ensure agro-product food safety for trade facilitation cooperation.



# The APMP Food Safety Focus Group (FSFG)



1

**Founded in 2015**

2

**13 NMIs/Dis:**

HSA (Singapore), KRISS (Korea), NIM (China), NIMT(Thailand ), NIS (Egypt), NMIA (Australia), NMISA (South Africa), etc.

3

**Goals:**

Support the food trade of the Asia-Pacific area

4

**Priorities**

“Mycotoxins and Heavy Metals in Grain Food”  
The APEC Workshop on Capacity Building of Measurement Standards and Technologies in Grain Food Safety , etc....



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## 1 BIPM and APMP

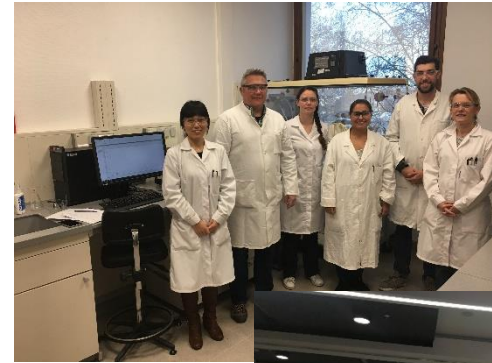
The BIPM acts as an effective international coordinator  
The APMP provides a regional cooperation mechanism

## 2 NMIs

Some other NMIs in developing countries participated actively  
in the CBKT programme in food safety measurement.

## 3 NIM

NIM keeps improving its own measurement  
capabilities, and at the same time, helps many other  
developing countries with capacity building.



## | The challenges facing the food safety metrology

01

How to get more resources, including human resources, funding and technology to support activities among global stakeholders, such as knowledge transfer, capacity building, establishment of relevant guidelines and so on;

02

How to promote more communications and collaborations with the relevant international organizations, such as WHO (the World Health Organization), FAO (the Food and Agriculture Organization), etc;

03

How to make good use of the CBKT project outcomes to develop national measurement standards, establish an entire measurement system, and promote the formulation of laws and regulations from top to bottom.

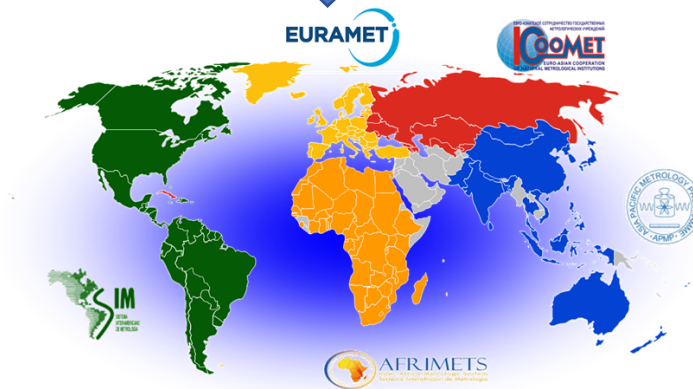
食以安为先

Enjoy  
Safe  
Food

Cooperation with

Comparison

Harmonization







**THANKS**