Asia-Pacific
Economic Cooperation

Asia-Pacific
Legal Metrology Forum

Handbook on Metrology in Food Safety, Agricultural Products and Product Safety

APEC/APLMF Training Courses in Legal Metrology (CTI 25/2007T)

June 4-6, 2008
Hangzhou City, P.R.China

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July 2008

Workshops on Metrology in Food Safety, Agricultural Products and Product Safety
June 4–6, 2008, Hangzhou City, P.R.China

Photos taken at the workshop in Hangzhou City, P.R. China

Contents

Session 3: Measurement for Food Safety and Health

Session 5: Workshop on Metrology in Product Safety Other Than Foods

Foreword

This booklet is one of outcomes of the APEC Seminars and Training Courses (APEC TILF projects, CTI-25/2007T) in Legal Metrology titled 'Workshops on Metrology in Food Safety, Agricultural Products and Product Safety' which was held on June 4-6, 2008 at the Lakeview Hotel in Hangzhou City, P. R. China.

This workshop was a follow-up meeting of the first one held in Thailand in February 2007. It was organized by APLMF and National Metrology Institute of Japan (NMIJ) and supported by General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ), Chinese Society for Measurement (CSM) and National Measurement Institute, Australia (NMIA). Having this result, I would like to extend my sincere gratitude to all the staffs of AQSIQ and CSM who have made efforts for the outstanding preparation and all the speakers from member economies who contributed to this workshop. Also, special thanks should be extended to the APEC Secretariat for their great contributions.

We have conducted the survey among the APEC member economies concerning seminar and training programs in legal metrology to find their needs as well as possible resources available in the region. The survey shows that more and more people have increasing concerns over the quality and safety of foods and agriculture products. Also, there is a strong need for a seminar designed on food safety, agricultural products and products safety, which is one of the most important categories in legal metrology closely connected to our daily life.

Main objective of this workshop was to bring together experts from APEC/APLMF member economies to build on the outputs from the first workshop held in Thailand in February 2007. The speakers have presented the case studies that review existing metrological infrastructure within APEC/APLMF economies with a view to identifying what is working and possible solutions to issues yet to be addressed. The contents of the seminar were classified into four topics: Legal metrology infrastructure for quality measurements of agricultural products, Preparation and use of CRMs (certified reference materials), Measurement for food safety and health, Product safety (other than foods) - legal metrology issue. Presentations on each topic were delivered by the speakers that are experienced in the fields.

In this view, the workshop provided an important opportunity to the experts in the Asia-Pacific region to clarify the present situation on development of legal metrology infrastructure, food safety, agricultural trading and product safety in the member economies, share information on metrological requirements for food safety set in the region, introduce methods for quality evaluation, explain technical procedures for verification of

measuring instruments and discussing the issues that exist in the region. I would like to say that this is certainly a valuable step to promote the establishment and development of robust metrological infrastructure for food safety, agriculture product and product safety in the developing economies.

I am really pleased to have this fruitful outcome from the workshop and again deeply appreciate the APEC Secretariat's generosity in contributing to the development in legal metrology among the APLMF member economies.

July 16, 2008

Mr. Pu Changcheng
APLMF President

Summary Report

In these days, huge amounts of goods including agricultural products are traded across borders within the Asia-Pacific region. Accordingly, more people have become anxious about the quality and safety of such goods and there is an increasing need for the development of reliable systems to determine the quality of product. In addition, such systems are also required to achieve international trade without technical barriers to trade (TBT). A robust metrological infrastructure plays a critical role in the removal of TBT by underpinning the quality and safety of exported products. However, developing economies exporting agricultural products are particularly facing difficulty to construct a reliable technical infrastructure including measurement standards for food quality and food safety.

In order to facilitate these requirements in the region, the first APEC/APLMF Workshop on Metrology of Agricultural Products and Foods was held in February 2007 in Chiang Mai, Thailand. The present workshop is a follow-up workshop of the first one and aims to bring the experts from APEC/APLMF member economies together in order to build upon the outcomes of the first Workshop.

The open workshop titled as "Workshops on Metrology in Food Safety, Agricultural Products and Product Safety" was held from June 4 to 6, 2008 at the Lakeview Hotel in Hangzhou, PR China organized by APLMF and APEC. This workshop was also supported by the organizations: (1) General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ), (2) Chinese Society for Measurement (CSM), (3) National Measurement Institute, Australia (NMIA), and (4) National Metrology Institute of Japan (NMIJ).

A total of 65 participants including the 24 speakers attended the workshop from the following 14 economies: Australia (3), PR China (38), Hong Kong China (3), Indonesia (3), Japan (3), DPR Korea (1), Malaysia (1), Mexico (2), Mongolia (1), Papua New Guinea (1), Philippines (1), Thailand (5) and Vietnam (1), where ( ) indicates the number of participants from the economy. The attendance from PR China also included supporting staff from AQSIQ and invited guests from the China Jiliang University in Hangzhou, which is one of the three universities in the world dedicated to the teaching of metrology. Some of the speakers were supported with travel fund by APEC or APLMF. The host economy and APLMF provided the venue, transportations, tours and meals.

On Wednesday, June 3rd, the workshop started off with the opening ceremony, where Mrs. Kong Xiaokang (Deputy Director General, International Cooperation Department, AQSIQ) delivered an opening address on behalf of the host economy and Mr. Li Jinsi (AQSIQ/APLMF secretary) delivered an address on behalf of APLMF. After the opening ceremony, the topics listed in Table 1 were presented by the speakers and discussed with all participants for three days until Friday.

Table 1 List of Sessions and Presentations in the Workshop held on June 4-6, 2008

Session 1 Legal Metrology Infrastructure for Quality Measurements of Agricultural Products Chair: Dr. Tsuyoshi Matsumoto, Co-chair: Mr. Yang Youtao	
1.1	Measurement Infrastructure for Quality of Agricultural Products / Report on Current OIML Activities (tentative) by Dr. Grahame Harvey (NMIA, Australia)
1.2	National Standard of Rice as a Metrological Infrastructure by Mr. Rusmin Amin (DoM, Indonesia)
1.3	Estimation of Harvest Quantity of Rice by Device by Mr. Hiroshi Yamahira (Kett Electric Lab., Japan)
1.4	Metrological Infrastructure to Support Legal Metrology in Chemical Measurements by Dr. Yoshito Mitani (CENAM, Mexico)
1.5	Agriculture and Metrology in Papua New Guinea by Mr. Victor Vaporoketo Gabi (NISIT, Papua New Guinea)
1.6	Current Topics on Quality Measurement of Foods in the Philippines by Ms. Marilyn Fos (ITDI, Philippines)
1.7	Measurements of Starch Content in Cassava by Mr. Surachai Sungzikaw (Northern Weights and Measures Center, Thailand)
1.8	Measurement Traceability and Transmission for GMC/GMF Nucleic Acids Detection by Dr. Xiaohong Zhou (National Institute of Measurement and Testing & Southern Medical University, PR China)
Session 2 Preparation and use of CRMs (certified reference materials) Chair: Dr. Wang Jing, Co-chair: Mr. Osman Zakaria	
2.1	Need for New CRMs in Food Safety & Agricultural Products by Dr. Wang Jing (NIM, PR China)
2.2	Current Activities of TCQM in APMP / CRMs for Environmental Measurements by Dr. Kenji Kato (NMIJ, Japan)
2.3	Certified Reference Materials: Tools for Achieving National Traceability and International Comparability of Measurement by Dr. Osman Zakaria (SIRIM Bhd., Malaysia)
2.4	Current Situation on CRM for Food Safety in Vietnam by Mr. Nguyen Truong Chinh (VMI, Vietnam)

Session 3 Measurement for Food Safety and Health Chair: Mr. Hiroshi Yamahira, Co-chair: Dr. Yoshito Mitani	
3.1	Metrological Support to the Mexican National Residue Control Plan for Food Safety by Dr. Norma Gonzalez-Rojano (CENAM, Mexico)
3.2	The Role of a National Legal Metrology Authority in Food Safety Control for Public Health in Thailand by Dr. Niphon Popattanachai, Mrs. Jongkolnee Vithaya-rungruangsri and Mrs. Duangdao Wongsommart (Food Safety Operation Center, Thailand)
3.3	Measurement in Food Safety and Inspection in Mongolia by Ms. Khishigmaa Dorjgur (MASM, Mongolia)
3.4	China Jiliang University and Its Development in Bio-metrology by Prof. Yu Xiaoping (China Jiliang University, PR China)
3.5	Assurance of Measurement Result of Chinese Foods and Agricultural Products by Chemical Metrology by Prof. Li Hongmei (National Institute of Metrology, PR China)
3.6	Current Status on Quality Measurement of Foods in DPR Korea by Mrs. Kim Yun Hui (Quality Certification Center of the DPR Korea)
Session 4 Report of the Small Working Group (SWG) Meetings Chair: Mrs. Marian Haire, Co-chair: Dr. Grahame Harvey	
Session 5 Workshop on Metrology in Product Safety Other Than Foods Chair: Mr. Stephen O'Brien, Co-chair: Dr. Chuen-shing Mok	
5.1	Metrology in Chemistry in Relation to Consumer Protection and Product Safety-the Hong Kong Experience by Dr. Chuen-shing Mok (Government Laboratory, Hong Kong China)
5.2	How Product Safety Laws Work in New Zealand by Mr. Stephen O'Brien (Measurement and Product Safety Service, New Zealand)
5.3	Establishment of National Chemical Metrology Traceability System for RoHS Directive by Prof. Ma Liandi (National Institute of Metrology, PR China)
Session 6 Summary Chair: Dr. Tsuyoshi Matsumoto, Co-chair: Mr. Li Jinsi	

At the end of all presentations, a summary session was arranged on Friday 9th chaired by Dr. Matsumoto and Mr. Li Jinsi to summarize all topics and to discuss future planning for the next workshop. In the summary discussion, a lot of valuable suggestions and requests for the future were proposed. The following list provides some examples of the suggestions.

1. need for additional CRMs;

2. need for international or regional databases;

3. need for primary measurement method and measurement standard;

4. support for developing economies to develop appropriate measurement standards for use with agricultural measurements;

5. cooperation with other regional organizations in metrology such as APMP;

6. consider the different measurement requirements for legal metrology, scientific metrology and food safety;

7. need to develop and present appropriate training on agricultural quality measurements.

Moreover, many participants requested follow-up workshops to be conducted in the future. The completed summary of these discussions will be published from the secretariat in due course as a final APEC report of the workshop.

On Friday, the workshop was concluded with a closing ceremony. Firstly Mr. Liu Xinmin (Deputy Director General, Department of Metrology, AQSIQ) delivered a closing address from the host economy. Additional closing remarks from Dr. Tsuyoshi Matsumoto and Mr. Li Jinsi followed his speech.

Besides the workshop, the host economy kindly provided activities to encourage further discussion and to build friendship among the participants. A welcome dinner at the restaurant in the Lake View Hotel was arranged on Wednesday evening. On Friday, the participants visited the National Center for Quality Supervision and Test of Aquatic Products and Food Process in Hangzhou to see an advanced facility to inspect food and agricultural products. They also enjoyed a boat cruise on the West Lake, a well-known lake in PR China referred to as the "heaven on the earth" with picturesque scenes that are commonly seen in traditional Chinese paintings. On departure, the host provided the participants with a CD-ROMs containing copies of the speakers manuscripts and slides and photos taken during the workshop.

In conclusion, as the chair of the WG that coordinated this workshop I would like to sincerely express my deepest gratitude to the hard work and dedicated support provided by the staff of the host economy. I also greatly appreciate all participating APLMF economies as well as all participants, who provided informative presentations and valuable suggestions during the discussions. I particularly appreciate the support of Mrs. Marian Haire of NMIA, Australia in preparing for and organizing this workshop. It is great pleasure for me because this workshop has been finished successfully in thanks to the dedicated cooperation with the member economies. The timing and place of the next workshop will probably be decided at the APLMF forum meeting in October in Sydney.

Dr. Tsuyoshi Matsumoto
Chair, Working Group on Quality Measurements
of Agricultural Products

APEC / APLMF Seminars and Training Courses in Legal Metrology
(CTI 25 / 2007T)

Workshops on Metrology in Food Safety, Agricultural Products and Product Safety

June 4-6, 2008

at the Lakeview Hotel Hangzhou in Hangzhou city, PR China

Program

1. Organizers:

1. Asia-Pacific Economic Cooperation (APEC)
2. Asia-Pacific Legal Metrology Forum (APLMF)

2. Supporting Organizations:

1. General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ)
2. Chinese Society for Measurement (CSM)
3. National Measurement Institute, Australia (NMIA)
4. National Metrology Institute of Japan (NMIJ)

3. Objective:

These days, huge amounts of goods are traded across borders within the Asia-Pacific region. Increasingly, more people have become anxious about the quality and safety of such goods and are interested in developing a reliable system to determine the quality of internationally-traded goods.

According to the requirement to realize international trade without technical barriers to trade (TBT), developing economies producing agricultural products for export are requested to achieve reliable technical infrastructure including measurement standards for both product quality and food safety in order to obtain international competitiveness. A robust metrological infrastructure plays a critical role in the removal of technical barriers to trade by underpinning the quality and safety of export products.

In order to facilitate these objectives, the first APEC / APLMF Workshop on Metrology of Agricultural Products and Foods was held in February 2007 in Thailand. This proposed workshop is a follow-up meeting of the first workshop and aims to bring together experts from APEC / APLMF member economies to build on the outputs from the first Workshop by:

a) drafting guideline documents in legal metrology for APEC / APLMF economies, and

b) presenting case studies that review existing metrological infrastructure within APEC /

APLMF economies with a view to identifying what is working and possible solutions to issues yet to be addressed.

In addition to the Workshop on Agricultural Products and Foods, another Workshop on Product Safety Other Than Foods has been newly added and combined. From the viewpoint maintaining heath and safety in daily life, people also concern about safety of machineries and instruments used at home including toys, tools, electrical appliances / equipments, etc. This short a half-day workshop on the final day intends to provide the experts working on safety and hazard issues of such products to present current international / regional movements and exchange information with experts in metrology.

4. Agenda

4.1. Small Working Group Meetings (SWGs) on June 2-3 (*invitation only*):

Prior to the APEC/APLMF Workshops, parallel **Small Working Group Meetings** (SWGs) organized by the APLMF WG on Metrological Control Systems will be held to draft three APLMF guideline documents for use by the APEC/APLMF economies.

- SWG1: The APLMF Guide to Developing a National Infrastructure for Legal Metrology
- SWG2: The APLMF Guide to Legal Metrology for Stakeholders
- SWG3: The APLMF Guide to the Preparation and Use of CRMs (certified reference materials)

4.2. Open Sessions of the APEC/APLMF Workshop on June 4-6:

Open sessions will be jointly organized by the APLMF Secretariat, WG on Quality Measurements of Agricultural Products, and WG on Training Coordination with the following agenda.

1 Legal metrology infrastructure for quality measurements of agricultural products
  - 1.1 Quality measurement of moisture, protein, fat and saccharimetry, etc.
  - 1.2 Measurements of special products such as starch, cane, coffee, milk, wine, water, etc.
  - 1.3 Measurement standards, calibration and traceability systems
  - 1.4 Legal control of measuring instruments
  - 1.5 Issues re: packaging and labeling
  - 1.6 The role of a national legal metrology authority

2 Preparation and use of CRMs (certified reference materials)
  - 2.1 Legal control of CRMs
  - 2.2 Need for new CRMs
  - 2.3 Measurement standards and traceability for CRMs
  - 2.4 The role of a national legal metrology authority

3 Measurement for food safety and health
  - 3.1 Measurements underpinning food safety and inspection
  - 3.2 Hazard and risk assessments
  - 3.3 International regulations or guidelines for food safety
  - 3.4 The role of a national legal metrology authority

4 Report of the Small Working Group (SWG) Meetings

5 Product safety (other than foods) - legal metrology issues
  - 5.1 Mechanical, chemical and electrical safety of products

5.2 Legal controls for product safety

5.3 International regulations and guidelines for product safety

5.4 The role of a national legal metrology authority

5. Program (Venue: Lakeview Hotel Hangzhou)

<table>
<tr><td rowspan="4">June 2 (Mon) SWGs</td><td colspan="4">Small Working Group (SWG) Meetings to develop APLMF Guideline Documents (participation only by invitation) *1</td></tr>
<tr><td>09:00-10:00</td><td colspan="3">Plenary session
Chair: Dr. Grahame Harvey, Co-chair: Mr. Yang Youtao</td></tr>
<tr><td>10:00-17:00
include lunch & coffee breaks</td><td>SWG1:
The APLMF Guide to Developing a National Infrastructure for Legal Metrology
Chair:
Dr. Grahame Harvey</td><td>SWG2:
The APLMF Guide to Legal Metrology for Stakeholder
Chair:
Mr. Stephen O'Brien</td><td>SWG3:
The APLMF Guide to the Preparation and Use of CRMs (Certified Reference Materials)
Chair:
Dr. Yu Yadong</td></tr>
<tr><td>June 3 (Tue) SWGs</td><td>09:00-16:00
include lunch & coffee breaks</td><td colspan="2"></td></tr>
<tr><td></td><td>16:00-17:00</td><td colspan="3">Summary session</td></tr>
<tr><td rowspan="8">June 4 (Wed)

Open Sessions in the Sapphire Hall</td><td colspan="4">APEC/APLMF Workshop on Metrology in Food Safety, Agricultural Products and Product Safety *2</td></tr>
<tr><td>09:00-09:30</td><td colspan="3">Registration</td></tr>
<tr><td colspan="4">Opening ceremony</td></tr>
<tr><td rowspan="3">09:30-09:50</td><td colspan="3">Welcome Address from the Host by Mrs. Kong Xiaokang
(International Cooperation Department, AQSIQ)</td></tr>
<tr><td colspan="3">Welcome Address from APLMF by Mr. Li Jinsi
(APMF Secretariat)</td></tr>
<tr><td colspan="3">Take a group photo</td></tr>
<tr><td colspan="4">Session 1. Legal Metrology Infrastructure for Quality Measurements of Agricultural Products
Chair: Dr. Tsuyoshi Matsumoto, Co-chair: Mr. Yang Youtao</td></tr>
<tr><td rowspan="2">09:50-10:30</td><td colspan="3">1.1: Measurement Infrastructure for Quality of Agricultural Products / Report on Current OIML Activities (tentative) by Dr. Grahame Harvey (NMIA, Australia)</td></tr>
<tr><td colspan="3">1.2: National Standard of Rice as a Metrological Infrastructure by Mr. Rusmin Amin (DoM, Indonesia)</td></tr>
</table>

June 4 (Wed) **Open Sessions in the Sapphire Hall**	10:30-11:00	*Coffee break*
	11:00-12:15	1.3: Estimation of Harvest Quantity & the Best Time of Rice by Device by Mr. Hiroshi Yamahira (Kett Electric Lab., Japan)
		1.4: Metrological Infrastructure to Support Legal Metrology in Chemical Measurements by Dr. Yoshito Mitani (CENAM, Mexico)
		1.5: Agriculture and Metrology in Papua New Guinea by Mr. Victor Vaporoketo Gabi (NISIT, Papua New Guinea)
	12:15-12:30	Questions & answers session
	12:30-14:00	*Lunch break*
	14:00-15:20	1.6: Current Topics on Quality Measurement of Foods in the Philippines by Ms. Marilyn Fos (ITDI, Philippines)
		1.7: Measurements of Starch Content in Cassava by Mr. Surachai Sungzikaw (Northern Weights and Measures Center, Thailand)
	15:00-15:30	*Coffee break*
	15:30-17:30	1.8: Measurement Traceability and Transmission for GMC/GMF Nucleic Acids Detection by Dr. Xiaohong Zhou (National Institute of Measurement and Testing & Southern Medical University, PR China)
		Session 1: Discussions and Key Points
	19:00-21:00	*Welcome dinner at the Lakeview Hotel*
June 5 (Thu) **Open Sessions in the Sapphire Hall**	**Session 2. Preparation and use of CRMs (certified reference materials)** Chair: Dr. Wang Jing, Co-chair: Mr. Osman Zakaria	
	09:00-10:20	2.1: Need for New CRMs in Food Safety & Agricultural Products by Dr. Wang Jing (NIM, PR China)
		2.2: Current Activities of TCQM in APMP / CRMs for Environmental Measurements by Dr. Kenji Kato (NMIJ, Japan)
		2.3: Certified Reference Materials: Tools for Achieving National Traceability and International Comparability of Measurement by Dr. Osman Zakaria (SIRIM Bhd., Malaysia)
	10:20-10:50	*Coffee break*
	10:50-11:50	2.4: Current Situation on CRM for Food Safety in Vietnam by Mr. Nguyen Truong Chinh (VMI, Vietnam)
		Session 2: Discussions and Key Points

June 5 (Thu) **Open Sessions in the Sapphire Hall**	**Session 3. Measurement for Food Safety and Health** Chair: Mr. Hiroshi Yamahira, Co-chair: Dr. Yoshito Mitani	
	11:50-12:30	3.1: Metrological Support to the Mexican National Residue Control Plan for Food Safety by Dr. Norma Gonzalez-Rojano (CENAM, Mexico)
		3.2: The Role of a National Legal Metrology Authority in Food Safety Control for Public Health in Thailand by Dr. Niphon Popattanachai, Mrs. Jongkolnee Vithayarungruangsri and Mrs. Duangdao Wongsommart (Food Safety Operation Center, Thailand)
	12:30-14:00	*Lunch break*
	14:00-16:00	3.3: Measurement in Food Safety and Inspection in Mongolia by Ms. Khishigmaa Dorjgur (MASM, Mongolia)
		3.4: China Jiliang University and Its Development in Bio-metrology by Prof. Yu Xiaoping (China Jiliang University, PR China)
		3.5: Assurance of Measurement Result of Chinese Foods and Agricultural Products by Chemical Metrology by Prof. Li Hongmei (National Institute of Metrology, PR China)
		3.6: Current Status on Quality Measurement of Foods in DPR Korea by Mrs. Kim Yun Hui (Quality Certification Center of the DPR Korea)
		Session 3: Discussions and Key Points
	16:00-16:30	*Coffee break*
	Session 4. Report of the Small Working Group (SWG) Meetings Chair: Mrs. Marian Haire, Co-chair: Dr. Grahame Harvey	
	16:30-17:30	4.1: Report by Chair of Each SWG Plus Discussion with All Participants
June 6 (Fri) **Open Sessions, Closing in the Sapphire Hall & Tours**	**Session 5. Workshop on Metrology in Product Safety Other Than Foods** Chair: Mr. Stephen O'Brien, Co-chair: Dr. Chuen-shing Mok	
	09:00-10:40	5.1: Metrology in Chemistry in Relation to Consumer Protection and Product Safety - the Hong Kong Experience by Dr. Chuen-shing Mok (Government Laboratory, Hong Kong China)
		5.2: How Product Safety Laws Work in New Zealand by Mr. Stephen O'Brien (Measurement and Product Safety Service, New Zealand)

		5.3: Establishment of National Chemical Metrology Traceability System for RoHS Directive by Prof. Ma Liandi (National Institute of Metrology, PR China)
		Session 5: Discussions and Key Points
	10:40-11:10	*Coffee break*
	Session 6. Summary Chair: Dr. Tsuyoshi Matsumoto, Co-chair: Mr. Li Jinsi	
June 6 (Fri)	11:10-12:00	6.1: Discussions on Summarizing all Topics, Future Planning of the Next Workshop and APLMF Future Activities.
Open Sessions, Closing in the Sapphire Hall & Tours	**Closing ceremony**	
	12:00-12:20	Closing Address from the Host by Mr. Liu Xinmin (Department of Metrology, AQSIQ)
		Closing Address by Dr. Tsuyoshi Matsumoto (WG on Quality Measurements of Agricultural products / NMIJ)
		Closing Address from APLMF by Mr. Li Jinsi (AQSIQ)
	12:30-14:00	*Lunch break*
	Technical tour	
	14:00	*Leave the hotel lobby by bus*
	14:00-16:00	Technical tour to the National Center for Quality Supervision and Test of Aquatic Products and Food Process in Hangzhou
	16:00-17:00	*Lake tour by boat*
	18:00-20:00	*Farewell Dinner at the Louwailou Restanrant*

＊1 Organized by the APLMF WG on Metrological Control Systems.

＊2 Jointly organized by the APLMF secretariat, WG on Quality Measurements of Agricultural products, and WG on Training Coordination.

6. Registration

6.1. Categories of participants

The participants to the present workshop are grouped into the six categorizes below.

1. **Organizers of the workshop** (APEC Experts): Organizers who will cooperatively lead and organize the entire workshop. This category actually includes the APLMF President, Secretariat, Executive Committee members, chairpersons of the three APLMF Working Groups on (1) Metrological Control Systems, (2) Quality Measurements of Agricultural Products, and (3) Training Coordination.
2. **Primary chairpersons of SWGs** (APEC Experts): Primary chairpersons of **three SWGs**. They

will actively lead and organize the discussions in the SWGs. They are required to provide **a summary report** of the discussion to be reported in the open sessions.

3. **Primary chairpersons of open sessions** (APEC Experts): Primary chairpersons of the **five topics** in the **open sessions** (5.2). They will actively lead and organize discussions in the open sessions. They are required to submit **a summary report** of the discussion after the workshop.
4. **Co-chairpersons** (APEC active participants): Co-chairpersons who will support one of the primary chairpersons of the SWGs or open sessions explained in 2. and 3. They will help the primary chairperson to provide a summary report. They must be one of **the speakers** of the open sessions if they request a travel support.
5. **Speakers** (APEC active participants): Mere speakers of the open sessions who will not take a responsibility of any kind of chairpersons. They simply provide a presentation on their knowledge or situation in their economy to support the workshop.
6. **Mere participants**: Audience or support staff who will not take a responsibility of any kinds of chairpersons and will not provide any presentations.

6.2. How to Make a Registration

If you wish to participate in the workshop and/or SWGs, please complete the attached **registration form** by indicating the **category** you wish to participate and send the form to the **APLMF secretariat** to the contact address shown on the form. The **deadlines** of registration are **April 30th** for the categories **1-5** (speakers & chairs) and **May 16th** for the category **6** (mere participants).

If you wish to provide **a presentation** in the open sessions under one of the **categories 1-5**, the registration form must be accompanied with an **abstract** within one page (A4) outlining:

1. How your metrological infrastructure / technique supports the topics you have an interest in the workshop,
2. Issues and problems encountered within national metrological infrastructures in your economies, and
3. Possible solutions that could be implemented within the region.

It is recommended if the abstract also highlight how your presentation builds on the 1st Workshop held in 2007 in Thailand (see "Handbook on Metrology of Agricultural Products and Foods" on the APLMF website).

6.3. Selection of Chairpersons and Speakers

The chairpersons and speakers will be selected by the APLMF secretariat in cooperation with the three APLMF WGs on Metrological Control Systems, Quality Measurements of Agricultural Products, and Training Coordination. The selected chairpersons and speakers will be informed from the secretariat before the workshop.

7. Travel Support:

- **APEC travel support** (**1**), comprising a roundtrip economy-class airfare and per diem including accommodation, is available for the **APEC Experts** in the categories **1, 2 and 3** of the chapter 6.1.

- **APEC travel support** (2), comprising a roundtrip economy-class airfare and per diem including accommodation, is available for the **APEC active participants** in the categories **4 and 5** of the chapter 6. 1. The eligible participants must belong to one of the economies; Chile, Indonesia, Malaysia, Mexico, Papua New Guinea, Philippines, Peru, the Russian Federation, Thailand, and Viet Nam.
- **APLMF / AQSIQ travel support** is available for the participants in the **categories 1-5** from one of the **non-APEC economies** but belong to one of the **APLMF full member economies.**

APEC and APLMF travel support will cover **one** speaker **per economy** unless otherwise permitted by the APLMF secretariat in order to organize the workshop. Participant (s) approved for travel support will be finally decided by the APEC / APLMF Secretariat. We welcome more self-funded speakers will join the workshop.

8. Visa Assistance:

If you need a visa to enter PR China, please complete the bottom section of the Registration Form under "Visa information". This information will be forwarded to the host by the APLMF Secretariat. On receipt, the host will send an official letter of invitation to support visa applications.

9. Venue and Accommodation:

LAKEVIEW Hotel

Add: 2 West Huancheng Road Hangzhou, PR China

Tel: +86 571 87078888 , Fax: +86 571 87071350

http: //www. lakeviewhotelhz. com

If you wish to reserve a room at the venue with a rate of **¥500 RMB** (About USD72. 00) / day (Included tax), please complete the Hotel Reservation Form and send it to the host in PR China by **May 16th 2008.**

10. Access Information:

If you Arrive at the Xiaoshan International Airport (in Hangzhou) you can take a taxi to the Hotel (it takes 40 minutes) ; If you arrive at the Shanghai Pudong International Airport you can take Bus from there to Hangzhou City (you can find the Bus Station just get out from Gate 15 on the Ground Floor, the Tel: +86 21 68345743, Every 2hours has one Bus to Hangzhou, It takes 3. 5 Hours and RMB 85. 00) and then by TAXI to the Hotel.

11. Submission of documents and slides:

If you hope your documents and / or slides would be distributed at the workshop in a hard copy, please be advised to send your documents (soft copy) to the secretariat <APLMF@aqsiq. gov. cn> by **MAY 26.**

12. Contacts for the APEC / APLMF Meetings:

1. APLMF Secretariat (registration and travel support)

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c/o General Administration of Quality Supervision, Inspection and Quarantine of the PR China (AQSIQ), No. 9 Madiandonglu, Haidian District, Beijing, 100088, P. R. China
e-mail: aplmf@aqsiq.gov.cn
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2. Host in PR China (visa assistance, accommodation and venue)

Ms. Xie Hongyan and Ms. Wu Xiaomin
General Administration of Quality Supervision, Inspection and Quarantine of the PR China (AQSIQ), Dept. of International Cooperation
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Participants List
APEC/APLMF Seminars and Training Courses in Legal Metrology (CTI-25/2007T)
Workshop on Metrology in Food Safety, Agricultural Products and Product Safety

No.	Category	Economy	Name	Organization
1	Chair/organizer	Australia	Mrs. Marian Haire	National Measurement Institute, Australia
2	Chair/organizer	China, PR	Mr. Han Jianping	International Cooperation Department, General Administration of Quality Supervision, Inspection and Quarantine
3	Chair/organizer	China, PR	Mr. Yang Youtao	Beijing Institute of Metrology / Chairman of WG on Metrological Control Systems (WG on MCS)
4	Chair/organizer	China, PR	Dr. Yu Yadong	National institute of Metrology P. R. China (NIM)
5	Chair/organizer	Japan	Dr. Tsuyoshi Matsumoto	National Metrology Institute of Japan (NMIJ), AIST
6	Chair & speaker	Australia	Dr. Grahame Harvey	National Measurement Institute, Australia
7	Chair & speaker	China, PR	Dr. Wang Jing	National institute of Metrology P. R. China (NIM)
8	Chair & speaker	Hong Kong China	Dr. Chuen-shing Mok	Government Laboratory
9	Chair & speaker	Japan	Mr. Hiroshi Yamahira	International Marketing, Kett Electric Laboratory
10	Chair & speaker	Malaysia	Dr. Osman Zakaria	National Metrology Laboratory, SIRIM Berhad
11	Chair & speaker	Mexico	Dr. Norma Gonzalez-Rojano	Centro Nacional de Metrología (CENAM)
12	Chair & speaker	New Zealand	Mr. Stephen O'Brien	Measurement and Product Safety Service, Ministry of Consumer Affairs
13	Speaker	China, PR	Prof. Li Hongmei	Executive Director, Division of Chemical Metrology and Analytical Science (NIM)
14	Speaker	China, PR	Prof. Ma Liandi	Deputy Director of Chemical Metrology & Analytical Science Division National Institute of Metrology

15	Speaker	China, PR	Dr. Xiaohong Zhou	GMOs Research Center, Guangzhou, Branch Institute under National Institute of Measurement and Testing & Southern Medical University
16	Speaker	China, PR	Prof. Yu Xiaoping	College of Life Sciences, China Jiliang University
17	Speaker	Indonesia	Mr. Rifan Ardianto	Directorate of Metrology
18	Speaker	Indonesia	Mr. Rusmin Amin	Directorate of Metrology
19	Speaker	Japan	Dr. Kenji Kato	Organic Analytical Chemistry Division, National Metrology Institute of Japan (NMIJ), AIST
20	Speaker	Korea, DPR	Mrs. Sin Yong Ae	Food Safety Division, Quality Certification Center of the DPR Korea (QCC)
21	Speaker	Mexico	Dr. Yoshito Mitani	Materials Metrology Directorate, Centro Nacional de Metrologia (CENAM)
22	Speaker	Mongolia	Ms. Khishigmaa Dorjgur	Mongolian Agency for Standardization and Metrology
23	Speaker	Papua New Guinea	Mr. Victor Vaporoketo Gabi	Acting Assistant Director -Metrology, National Institute of Standards & Industrial Technology
24	Speaker	Philippines	Ms. Marilyn Fos	National Metrology Laboratory- Industrial Technology Development Institute- Department of Science and Technology
25	Speaker	Thailand	Mrs. Duangdao Wongsommart	Department of Medical Sciences, Ministry of Public Health, Thailand
26	Speaker	Thailand	Mrs. Jongkolnee Vithayarungruangsri	Food safety Operation center, Ministry of Public Health
27	Speaker	Thailand	Dr. Niphon Popattanachai	Department of Medical Sciences, Ministory of Public Health
28	Speaker	Thailand	Mr. Surachai Sungzikaw	Northern Weights and Measures Center (Chiang Mai)
29	Speaker	Vietnam	Mr. Nguyen Truong Chinh	Lab of Physico- Chemical Parameters & Reference Materials - Vietnam Metrology Institute
30	Participants	Hong Kong China	Dr. Siu Kay Wong	Government Laboratory

31	Participants	Hong Kong China	Dr. Tong Siu-kuen (Katherine)	Food Research Laboratory, Centre for Food Safety, Food and Environmental Hygiene
32	Participants	Indonesia	Mr. Deden Muhammad Fajar Shiddiq	Metrology Training Center
33	Participants	Korea, DPR	Mrs. Song Myong Hwa	Food Safety Division, Quality Certification Center of the DPR Korea (QCC)
34	Participants	Thailand	Mr. Sakchai Hasamin	Weights and Measures Bureau, Department of Internal Trade, Ministry of Commerce
35	Participants	Thailand	Mr. Veerasak Vissutthatham	Director, Weights and Measures Bureau, Department of Internal Trade, Ministry of Commerce
36	Local Participants	China, PR	Mr. Chen Hao	Hangzhou Entry-Exit Inspection & Quarantine Beureau
37	Local Participants	China, PR	Mr. Chen Wenwei	China Jiliang University
38	Local Participants	China, PR	Mr. Dong Shengzhang	China Jiliang University
39	Local Participants	China, PR	Mr. Ge Jian	China Jiliang University
40	Local Participants	China, PR	Ms. Geng Feifei	Hangzhou Entry-Exit Inspection & Quarantine Beureau
41	Local Participants	China, PR	Mr. Huang Guangrong	China Jiliang University
42	Local Participants	China, PR	Mr. Li Hongliang	China Jiliang University
43	Local Participants	China, PR	Mr. Li Jia	China Jiliang University
44	Local Participants	China, PR	Ms. Li Suhua	China Jiliang University
45	Local Participants	China, PR	Mr. Lin Xinda	China Jiliang University
46	Local Participants	China, PR	Mr. Liu Jun	China Jiliang University
47	Local Participants	China, PR	Ms. Lu Xiulian	China Jiliang University
48	Local Participants	China, PR	Ms. Piao Meihua	China Jiliang University
49	Local Participants	China, PR	Ms. Shang Hanwu	China Jiliang University
50	Local Participants	China, PR	Ms. Shen Tuxuping	China Jiliang University
51	Local Participants	China, PR	Mr. Wu Xingzhi	Hangzhou Entry-Exit Inspection & Quarantine Beureau

52	Local Participants	China, PR	Ms. Ye Zihong	China Jiliang University
53	Local Participants	China, PR	Mr. Zhang Sheng	China Jiliang University
54	Local Participants	China, PR	Ms. Zhang Yongjun	China Jiliang University
55	Local Participants	China, PR	Ms. Zhu Min	China Jiliang University
56	APLMF	China, PR	Mr. Guo Su	AQSIQ / new APLMF Secretary
57	APLMF	China, PR	Mr. Li Jinsi	Beijing Institute of Metrology (c/o Department of Metrology, AQSIQ)
58	APLMF	China, PR	Ms. Zheng Huaxin	Department of Metrology, General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ)
59	Host	China, PR	Mr. Liu Xinmin	Department of Metrology, General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ)
60	Host	China, PR	Ms. Yu Min	Lakeview Hotel

Australian Goverament
National Measurement Institute

Metrological Infrastructure for Agricultural Quality Measurements

by
Dr Grahame Harvey
Head, Legal Metrology &
OIML Vice-President

Introduction

- Metrological infrastructure in general
- Application to Agricultural Quality Measurements
- Recent OIML activity in this area
- Some recent activity in Australia

NATIONAL MEASUREMENT INSTITUTE

1. Metrological infrastructure in general

This may be subdivided into the following broad categories:

- Type approval
- Verification at Installation
- Market surveillance
- Infra-technologies (after Greg Tassey)

NATIONAL MEASUREMENT INSTITUTE

Metrological Infrastructure Type Approval

- International Model Regulations
- National Standards for MI
- Conformity to Standard of the Type

- traditional testing by national authority
- test results accepted under MRA or MAA
- quality systems approach of MID

NATIONAL MEASUREMENT INSTITUTE

Metrological Infrastructure
Verification at Installation

- Realisation of Units of Measurement
- Traceability pathways via
  - reference standards
  - certified reference materials
  - (certified measuring instruments)
- Conformity to Type
- Verification including by Sampling

NATIONAL MEASUREMENT INSTITUTE

Metrological Infrastructure
Market Surveillance

- Verification by government inspectors
- Privatisation of Verification
- Auditing of Private Verifiers
- Random Auditing of Traders
- Database of Verifications & Audits
- Applies to Instruments & Packages

NATIONAL MEASUREMENT INSTITUTE

Metrological Infrastructure
Underpinning Infra-technologies

- ISO/IEC Guide 65 accreditation
- ISO/IEC 17025 accreditation
- Verification Test Procedures
- Quality Systems for verifiers (simple)
- Training & Competence Assessment

NATIONAL MEASUREMENT INSTITUTE

2. Application to Agricultural Quality Measurements

- Quality measurements are "in use for trade" if they determine the value of a transaction. Therefore all of the above can apply to quality measurements of agricultural products
- Because of the nature of the measurands it may be necessary to introduce new approaches to evaluation into the type approval standards
- In general the traceability pathway will make use of CRMs rather than physical standards of measurement

NATIONAL MEASUREMENT INSTITUTE

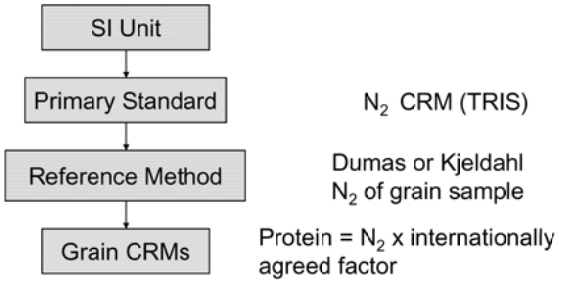
3. Recent OIML activity in this area

- Meetings on grain moisture (TC17/SC1) and protein content (TC17/SC8) were held 20-25 September 2007 at NIST
- Reported in the January OIML Bulletin
- Outcomes:
  - MPEs were reduced for type approval
  - Error shifts specified instead of MPEs for some influence factor tests
  - Two instruments required for type approval to facilitate error shift testing

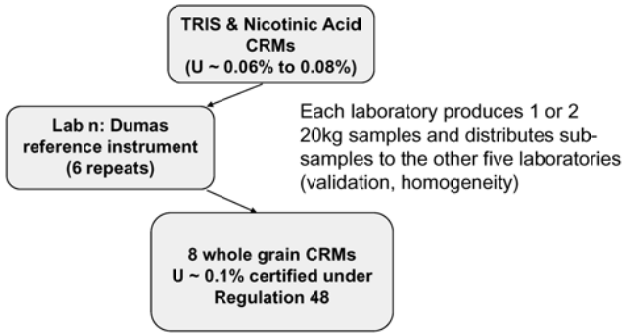
4. Some recent activity in Australia

- At the Chiang Mai workshop, the application of a "measurement campaign" approach to the preparation of whole grain CRMs for grain protein measurements was described
- To recapitulate:

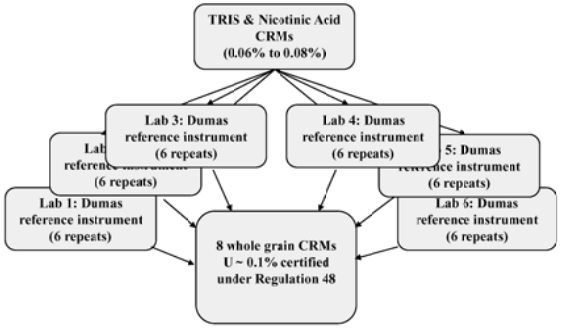
Calibration Infrastructure – Hierarchy of Standards for Grain Protein Measurements



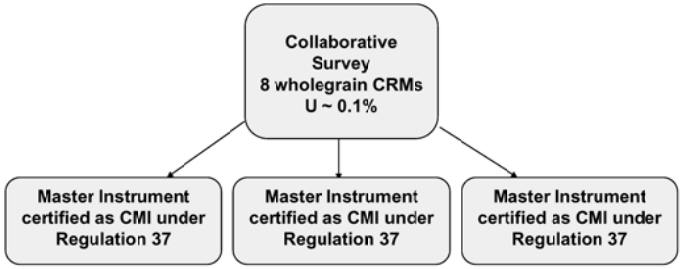
Production of Collaborative Survey CRMs



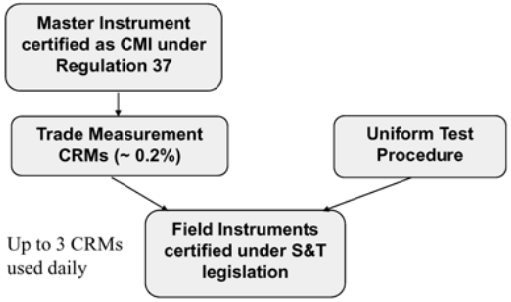
Traceability of Whole Grain Collaborative Survey CRMs



Certification of Master Instruments as Certified Measuring Instruments



Certification of field Instruments



Progress since Chiang Mai

- Originally the value and uncertainty of each CRM was calculated separately from the 36 (or 48) repeat measurements
- This ignores the information contained in the fact that the same reference instruments are used for the measurement of all CRMs
- We have now developed a matrix approach that calculates all CRM values, uncertainties and instrument biases in one calculation

Progress since Chiang Mai

- Each regional laboratory has several NIR master instruments
- The matrix method can be applied to the verification of the master instruments as each instrument is verified with the eight CRMs using six repeats

Conclusions

- OIML TC 17 is well on the way to preparing recommendations (model regulations) for grain moisture measurements (R59) and grain and oil seed protein measurements
- The matrix method of analysis leads to improved results for the preparation of whole grain CRMs

METROLOGICAL INFRASTRUCTURE SUPPORT ROBUSTNESS OF RICE COMMODITIES

Directorate of Metrology
Indonesia

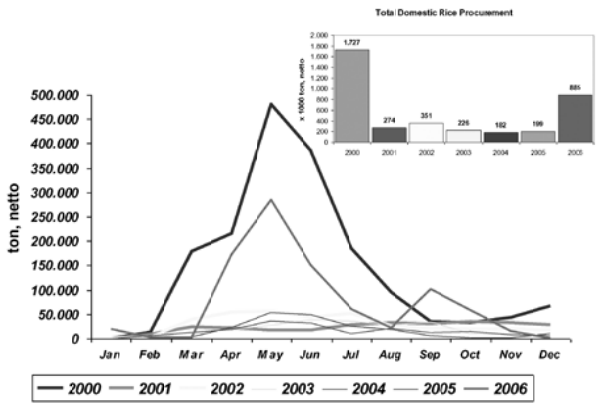
2008

Rusmin Amin, S.Si, M.T
Decen Muhammad, S.T, M.T
Rifan Ardianto, M.Si

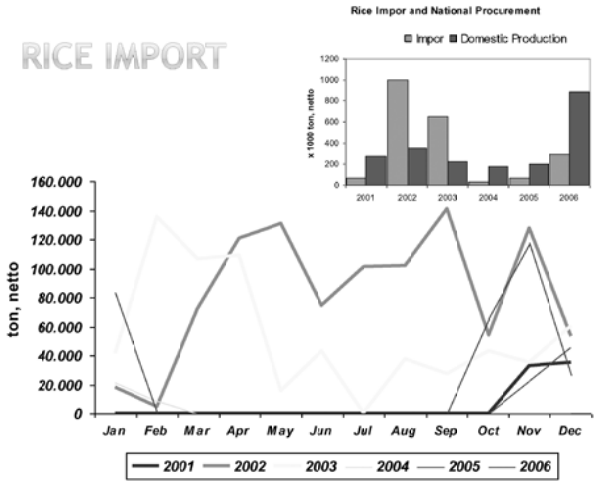
INTRODUCTION

- Indonesian population is around 220 million who need rice as a main food above 2.1 million tons.
- Must national efforts of rice need accomplishment in order to national food robustness.
- Quality and food safety as component of food robustness.
- Infrastructure of metrology, standard, testing and quality-guarantor in supporting food robustness.

DOMESTIC RICE PROCUREMENT



RICE IMPORT



EXISTENCE OF FOOD

- Domestic/local production - this condition becomes priority
- Food Reserve - to anticipate insufficient food, failed harvest, price distortion and/or emergency situation (e.g. disaster)
- Import - conducted if local production and food reserve fall shorts

FOOD ROBUSTNESS

Two main condition for food robustness :

- fulfilled condition availability of a number of food for households
- **quality** and **safety** food

RICE QUALITY

- Raw material Levying
- Production Operation
- Packaging
- Repository and product handling
- Inspection and testing during process and end product
- Security and product responsibility

NATIONAL STANDARD & RICE QUALITY

Rice Quality standard is very needed by existence of rice quality standard referred as good consumer and producer have certainty to desired quality, until rice consumer and also producer will get certifiable rice is matching with the one which produced.

SNI 01-6128-1999

Regulate :

- Rice Classification I II III IV V
- Quality Requirement
- Special Requirement
- General Requirement
- Technique of example intake
- Testing
- Labeling
- Packaging

REQUIREMENT OF RICE QUALITY

General requirement

- Free pest and disease
- Free acid or other
- Free from mixture bekatul
- Free from chemicals that endanger

SPECIAL REQUIREMENT

- Milling Degree Moisture
- Broken
- Color (yellow, red)
- Chalking
- Foreign matter
- Shell of rice Item
- Other variety Mixture

SAMPLING METHODS

- Explain how to take samples in certain Amount
- the need of officer that conduct sampling (e.g. having certificate)

TESTING

- Explain how to conducts testing of rice quality component with method that was established.
- Testing is conducted for general and special requirement of rice quality.

LABELING

Labeling is written with fade-proof safe and clear materials which follows :

- Place name
- Name of Variety, quality class and corporate name
- Nett
- Lot Number
- Labeling Date

PACKAGING

Material of package is

- gunny sack;
- plastic or tidy sack; or
- other strong material.

The material shall :

- protect rice (safe),
- clean,
- sewed/sealed its mouth and
- not contaminate its rice.

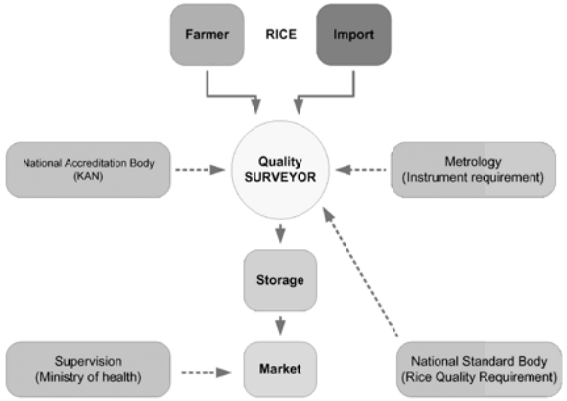
IMPLEMENTATION OF NATIONAL STANDARD

- The National Standard is voluntary, its depends on Ministry of Agriculture's policy as the technical institution.
- Applying of rice quality standard based on President Instruction Number 3 year 2007, on special requirement for rice quality.
- The President Instruction noted the rice quality consist 2 components which are moisture 14 % max and broken 15 % max.

METROLOGY ROLE IN RICE QUALITY

- Maintain quality of food products and commodities is related to one of consumer expectation.
- It also can raise role of metrology, standard, testing and quality-guarantor infrastructure become important matter.

INFRASTRUCTURE MAINTAINS RICE QUALITY



THE CONTROL ON QUALITY MEASUREMENT

Pre – Marketing Control:

- Authorization and food registration
- storage
- label approval
- advertising approval

→ SURVEYOR

Post – Marketing Control:

- monitoring
- sampling
- surveillance
- legal action

→ Ministry of Trade
Ministry of Health

TRACEABILITY SYSTEM

- Documentary traceability (SNI)
- Standard (Physical and Certified Reference Materials) traceability
- Tariff classification (rice, soya bean) – use measuring instrument for testing
- Traceability to origin

TRACEABILITY SYSTEM

- Traceability to SI or if not yet possible to another internationally agreed reference.
- Globally reliable and comparable measurement values traceable to long term stable measurement standards (Trueness).

INDONESIA LEGAL METROLOGY FUTURE CHALLENGE

- Development of economic integration of ASEAN :
  - ASEAN Economic Community Blueprint.
  - ASEAN Economic Community Scorecard.
  - ASEAN Economic Community Communication Plan.
  - ASEAN Charter.
  - ASEAN Trade Facilitation Work Programme.
  - ASEAN Trade in Goods Agreement (ATIGA).
- Mutual Recognition Agrement (MRA) Issues - One stop testing.

FOCUS OF DEVELOPMENT NEEDS

- Accelarate the development of legal metrology infrastructure of services.
- Eliminate technical barriers to services such as type approval procedure, verification schemes, etc.
- Improve supported elemens of legal metrological control.
- Increase cooperation and partnertship with Closer Economics.

Estimation of harvest quantity of rice by device

1. Back ground

Agricultural Accidents Compensation Law 1947

When farmer gets loss by unexpected accident , the loss can be compensated by insurance.

2. Insurance system

Farmer
——Insurance Cooperative
——Provincial Insurance Cooperative
——Government

Agricultural Insurance Fund
\5,600,000,000
Government: \3,800,000,000
Cooperative \1,800,000,000

Covered loss up to 80% against average year.

3. Measurement of harvest Quantity Traditional method:

Harvest quantity is measured per one rice field.

Sampling Paddy→Remove impurity from paddy→
→Weighing of paddy sample→dry paddy to 15%→
→Dehusking→Sieving(1.70mm mesh)→
→Weight of Brown rice→
→Convert to quantity of one rice field

4. Development of speedy & simple device to estimate harvest quantity

Need for Speedy & Simple system

- In the middle of 70s'
  Who uses this system
- Inspector of Insurance Cooperative

5. The system "CROPTRON"

6. Measurement Principle

Correlation between
"VOLUME OF PADDY WITH CONSTANT WEIGHT"
and
"PERCENTAGE OF GOOD QUALITY BROWN RICE OBTAINED FROM THAT PADDY VOLUME".

7. Actual Measurement of Device

1. Harvest paddy from fixed area of Rice field.
2. Remove impurities from paddy.
3. Weigh all of paddy harvested.
4. Take 250gram paddy to the sample cup of device.
5. Make measurement of paddy in sample cup at Constant pressure and get height.

7. Actual Measurement of Device

6. Measure moisture by device.
   (The device incorporates moisture measurement system)
7. Input number of Stumps harvested.
8. Input weight of all paddy harvested.
9. Input the width of Ridge.
10. Distance between Stumps.
11. Display estimated Harvest Quantity of Brown Rice Per 10 are.

8. Application

- Rice
- Wheat
- Soybean

9. Today & Tomorrow

Estimation of Harvest quantity of fruits.

- Take picture of Orange trees and count number of Yellow items by software.

Estimation of harvest quantity of various grain.

- NIR?

Estimation for the best time for rice harvest by device

1. Back ground

In the middle of 1980s',
much demand for good quality Rice because of tough competition among many rice production area.

The report "HARVEST TIME HAS MUCH CLOSE RELATION TO RICE QUALITY".

2. Measurement of Accumulated temperature

Very effective for estimation of best harvest time.
however, the thing is how temperature is measured at Rice Field.

3. Development of device

Easy installation, monitoring wide area and reasonable cost.

4. OT-300

5. Operation

Install the device so that cover faces North.

Turn the switch of device on the day when it ears.

(When 50% of rice field is in ear)

Available for rice fields with four different days of ear around 2km radius.

6. Evaluation

The best harvest time is when accumulated temperature reaches between 920-1100C.

Date after ear	Date	Measurement data [Quantity : 20 ears] (Brown rice)					Accumulated temperature
		Even grain	Immature grain	Dead grain	Cracked grain	Germinated grain	
24	25-Aug	749	421	1	0	0	663
28	29-Aug	1133	245	0	0	1	754
31	1-Sep	1332	149	2	0	0	826
35	5-Sep	1443	118	3	0	2	920
42	12-Sep	1466	54	2	14	18	1079
46	16-Sep	1375	23	4	81	10	1170
49	19-Sep	1197	22	6	227	4	1237
52	22-Sep	1025	8	8	491	34	1304
59	29-Sep	1194	9	13	273	29	1441

7. Today & tomorrow

This device has been used approximately 1000 units.

Currently the study to check color of paddy ear to estimate harvest time and constituent by NIR has been being done.

Asia-Pacific Economic Cooperation

Asia-Pacific

Metrological Infrastructure to support Legal Metrology in Chemical Measurements

Yoshito Mitani, Norma Gonzalez-Rojano, Velina Lara-Manzano, Melina Perez-Urquiza
Directorate of Materials Metrology
Centro Nacional de Metrologia (CENAM)
Km 4, 5 Carretera a Los Cues, El Marques, QRO., MEXICO, C.P. 76241

APEC/APLMF Seminars and Training Courses in Legal Metrology (CTI 25/2007T)
Workshops on Metrology in Food Safety, Agricultural Products and Product Safety
June 4-6, 2008
at the Lakeview Hotel Hangzhou in Hangzhou city, PR China

Results of Monitoring and Guidance Based on the Imported Foods Monitoring and Guidance Plan for FY2006 (July 2007)

Office of Imported Food Safety, Inspection and Safety Division,
Department of Food Safety, Pharmaceutical and Food Safety Bureau, Ministry of Health, Labor and Welfare, Japan

"Scope of monitoring & inspection"
..... in view of the usage of agricultural chemicals overseas, tested substances increased :
from 200 to 450 for agricultural chemicals,
from 60 to 110 for veterinary drugs (Antibiotics), and
Total number of monitoring tests = 79,665

FY2006 (Total Number of Inspections / Number of Import Declarations) = 200,000/1,850,000

CENAM Centro Nacional de Metrología

Major elements for food products monitoring (SUBJECTED TO INSPECTION ORDER)

Categories	Substances
Antibiotics	Oxytetracycline, Chloramphenicol, Chlortetracycline, Streptomycin, Tetracycline, Synthetic antimicrobial agents (Enrofloxacin, Oxolinic acid, Ciprofloxacin, Sulfaquinoxaline, Sulfdimethoxine, Semicarbzide, Malachite green, Nitrofuran (AOZ, AMOZ, AHD)),
Agricultural chemicals	Herbicide (Acetochlor, Diuron, 2,4-D), Insecticide (Indoxacarb, Tebufenozide, **Organophophoroues**: Fenitrothion, Pirimiphos-methyl, Triazophos, Metamidofos, EPN **Pyrethroid**:Fenvalerate, Fenpropatrin, Bifenthrin, Deltamethrin, Cypermethrin, Cyfluthrin, Dichlorvos, Chlorpyrifos, Endosulfan, **Organochlorine**: γ-BHC (lindane)) Bactericide (Flusilazole, Propiconazole, Bromopropylate, Hexaflumuron, Permetrin, Pyrimethanil, Dimethomorph, Difenoconazole, Isoprothiolane) Dioxins (PCDD, PCDF, coplanar PCB), Daminozide,
Additives	Nitrite, Imazalil, Cyclamic acic, TBHQ, Polysorbate, Sorbic acid, Benzoic acid, Sulfur dioxicide, Coloring agents, Antimold agents
Compositional standards	Bacteria count, Colifiorm bacteria, Pathogenic micro organism, Shellfish poisons (diarrhetic or paralytic selfish poison)
Mycotoxin	Aflatoxin, Patulin, deoxynivalenol
GMO	Bacterial genes
Toxic and harmful substances	Heavy metals, Cyanide compounds, such as cyanogenic glycoside

Asia-Pacific Economic Cooperation

4 main activities in Legal metrology :

- Setting up legal requirements;
- Control/conformity assessment of regulated products and regulated activities;
- Supervision of regulated products and of regulated activities; and
- Providing the necessary infrastructure for the traceability of regulated measurements and measuring instruments.

OIML D1:2004

CENAM Centro Nacional de Metrología

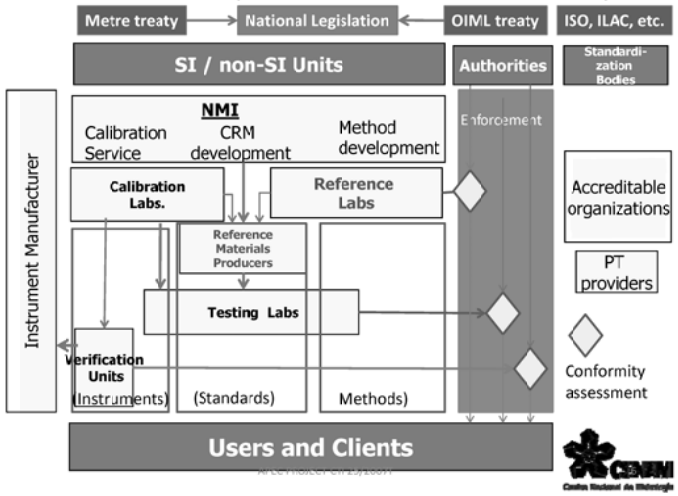
National Metrology Infrastructure should comprise:

- A legal corpus, including the laws and regulations that have provisions related to metrology;
- An authority in the Government, in charge of the National metrology policy, and of coordinating the action of other Departments related to metrological issues;
- One or several institutes in charge of tasks assigned at national level for the metrology policy;
- System of national measurement standards and dissemination of legal units;
- A (voluntary) system for accrediting calibration laboratories and, if required, testing laboratories, inspection bodies and certification bodies;
- Structures for disseminating knowledge and competencies in metrology (e.g. training, education, consultants, etc.); and
- Services to industry and to the economy in the field of metrology (e.g. calibration, maintenance, training, consultancy, type testing, verification, etc.).

OIML D1:2004

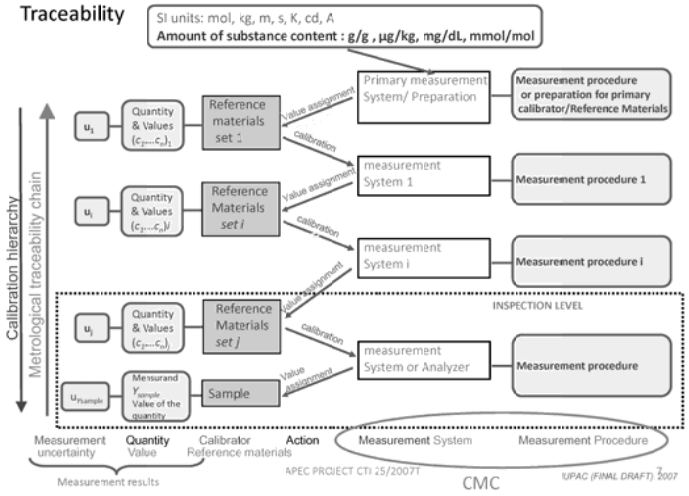
APEC PROJECT CTI 25/2007T

Traceable measurement system and Measurement control in a economy



Metrological Traceability

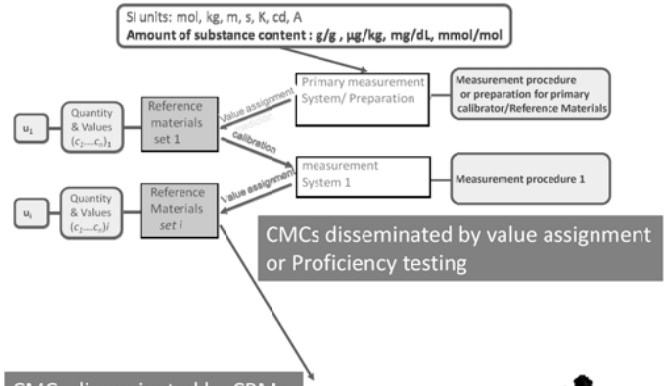
Chemical metrology infrastructure in a economy



APEC PROJECT CTI 25/2007T

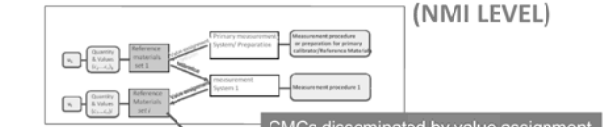
IUPAC (FINAL DRAFT) 2007

Are CMCs necessary at NMI LEVEL ?



APEC PROJECT CTI 25/2007T

Traceable measurements to the SI (NMI LEVEL)



CMCs disseminated by value assignment or Proficiency testing

calibration

CMCs disseminated by CRMs

measurement System i

Measurement procedure i

Value assignment

CMCs disseminated by value assignment or Proficiency Testing

u_j Quantity & Values $(c_j,...c_n)_j$ Reference Materials *set j*

REFERENCE LABORATOPRY LEVEL

CMCs disseminated by CRMs

INSPECTION LEVEL

What should be controled?

- Measurement system/Analyzers
- CRMs
- Measurement procedures

u_j Quantity & Values $(c_j,...c_n)_j$ Reference Materials *set j*

calibration

Measurement System or Analyzer

Measurement procedure

Value assignment

$U_{Ysample}$ Mensurand Y_{sample} Value of the quantity

Sample

IUPAC (FINAL DRAFT), 2007

How to guarantee measurements at inspection level?

- Metrological control **at the inspection level**
  - Instrumental control
  - CRMs for legal use
  - Standardized Method
  - Standardized sampling
- Competence building at the inspection level
  - Accreditation based on ISO 17025
  - Proficiency testing
- Organization to establish metrological traceability with NMI or alternative mechanism.

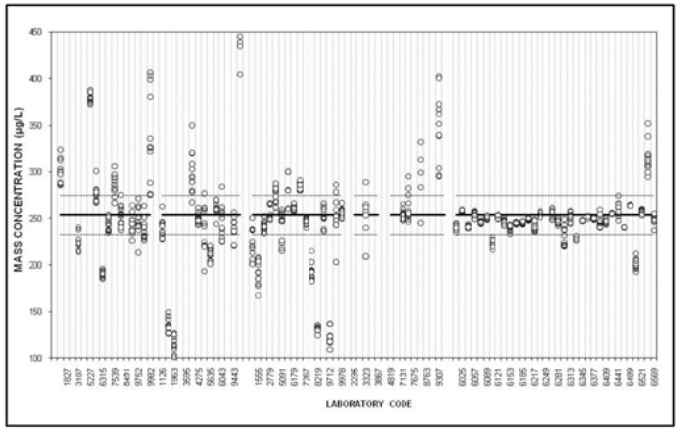


Figure 1 Proficiency test results for As in residual water. Results of six groups are presented with respect to the certified value 253.3 µg/L in solid line and uncertainty range ±4.2 µg/L by dotted lines

PT scheme with CRM helps make measurements comparable!

Calibration and Measurement Capability (CMC)

National Metrology Institutes should provide the highest order of measurements to establish traceability of measurements in their economy, which should be comparable to the others. Under CIPM-MRA, BIPM-KCDB provides CMCs of NMIs which are recognized their equivalence.

9 out of 21 member economies of APEC have registered CMCs (as for March 2008)

Existing Measurement Capabilities according to the CMCs published in BIPM/KCDB

	Service Category in Chemistry	China	Russia	Mexico	US	Korea	Japan	Canada	Australia	Chinese Taipei
QM01	**High purity substances**	**25**	**3**	**53**	**0**	**0**	**14**	**0**	**25**	**0**
	1.1 Inorganic compounds	10	1	0			1		0	
	1.2 Organic compounds	14	2	53			13		25	
	1.3 Metals	0	0	0					0	
	1.4 Isotopics	1	0	0					0	
	1.5 Other	0	0	0					0	
QM02	**Inorganic solutions**	**37**	**13**	**37**	**73**	**21**	**20**	**0**	**0**	**0**
	2.1 Elemental	37	13	32	67	21	20	0	0	
	2.2 Anionic	0	0	3	6	0	0			
	2.3 Other	0	0	2	0	0	0			
QM03	**Organic solutions**	**19**	**21**	**48**	**145**	**34**	**9**	**0**	**0**	**0**
	3.1 PAHs	0	5	16	43	10	0			
	3.2 PCBs	0	1	5	27	4	6			
	3.3 Pesticides	8	13	18	23	5	3			
	3.4 Other	11	2	9	52	15	0		1	
QM04	**Gases**	**27**	**272**	**14**	**135**	**127**	**45**	**0**	**0**	**3**
	4.1 High purity	0	7	0	0	5	2			0
	4.2 Environmental	16	119	8	123	57	25			3
	4.3 Fuel	11	5	6	10	6	3			0
	4.4 Forensic	0	2	0	2	1	2			0
	4.5 Medical	0	0	0	0	3	0			0
	4.6 Other	0	48	0	0	55	13			0

Existing Measurement Capabilities according to the CMCs published in BIPM/KCDB

	Service Category in Chemistry	China	Russia	Mexico	US	Korea	Japan	Canada	Australia	Chinese Taipei
QM05	**Water**	**0**	**1**	**9**	**21**	**0**	**21**	**30**	**4**	**0**
	5.1 Fresh water		1	7	21		21	18	3	
	5.2 Contaminated water		0	2	0		0	0	0	
	5.3 Sea water		0	0	0		0	12	0	
	5.4 Other		0	0	0		0	0	1	
QM06	**pH**	**4**	**6**	**7**	**10**	**5**	**6**	**0**	**0**	**0**
QM07	**Electrolytic conductivity**	**0**	**2**	**2**	**3**	**0**	**0**	**0**	**0**	**0**
QM08	**Metals and Alloys**	**0**	**9**	**8**	**0**	**0**	**0**	**0**	**0**	**0**
	8.1 Ferrous metals	0	4	3						
	8.2 Non-ferrous metals	0	5	5						
	8.3 Precious metals	0	0	0						
	8.4 Other	0	0	0						
QM09	**Advanced Materials**	**0**	**0**	**0**	**9**	**0**	**4**	**0**	**0**	**0**
	9.1 Semiconductors				7		0			
	9.2 Superconductors				0		0			
	9.3 Polymers and plastics				0		4			
	9.4 Ceramics				0		0			
	9.5 Other				2		0			
QM10	**Biological Fluids and Materials**	**9**	**0**	**4**	**190**	**2**	**3**	**20**	**2**	**0**
	10.1 Blood serum	1		4	56	2	3	0	2	
	10.2 Renal fluids	1		0	15	0	0	0	2	
	10.3 Hair	0		0	0	0	0	0	0	
	10.4 Tissues	0		0	82	0	0	20	0	
	10.5 Bone	0		0	8	0	0	0	0	
	10.6 Botanical materials	7		0	29	0	0	0	0	
	10.7 Other	0		0	0	0	2	0	0	

Existing Measurement Capabilities according to the CMCs published in BIPM/KCDB

	Service Category in Chemistry	China	Russia	Mexico	US	Korea	Japan	Canada	Australia	Chinese Taipei
QM11	**Foods**	**18**	**5**	**6**	**117**	**23**	**3**	**0**	**8**	**0**
	11.1 Nutritional constituents	0	0	2	42	8	0		0	
	11.2 Contaminants	5	5	4	75	15	3		7	
	11.3 GMOs	0	0	0	0	0	0		0	
	11.4 Other	13	0	0	0	0	0		1	
QM12	**Fuels**	**8**	**0**	**0**	**35**	**0**	**0**	**0**	**0**	**0**
	12.1 Coal and coke	0		0	25					
	12.2 Petroleum products	8		0	10					
	12.3 Bio-mass	0		0	0					
	12.4 Other	0		0	0					
QM13	**Sediments, Soils, Minerals, Particulates**	**0**	**4**	**23**	**205**	**0**	**38**	**32**	**6**	**0**
	13.1 Sediments	0	4	4	81		38	32	6	
	13.2 Soils	0	0	0	27		0	0	0	
	13.3 Ores	0	0	4	0		0	0	0	
	13.4 Particulates	0	0	0	97		0	0	0	
	13.5 Other	0	0	15	0		0	0	0	
QM14	**Other materials**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	14.1 Cements				12					
	14.2 Paints				0					
	14.3 Textiles				0					
	14.4 Glasses				0					
	14.5 Thin films				0					
	14.6 Coatings				0					
	14.7 Insulating materials				0					
	14.8 Rubber				0					
	14.9 Adhesives				0					
	14.10 Other				0					
Total No. of CMC s in chemistry		147	336	211	943	212	163	82	45	3

Some considerations
NMI level

- Not all economies have demonstrated CMCs
- CMCs for environmental measurements are predominant
  - Water, gas, soils, sediments
  - PAH, PCB, pesticides
- TBT and SPS related measurement capabilities are few

Reference Laboratory Level

- Not well defined
- Not harmonized in the region
- Not necessarily included in accreditation process
  - CRM provider
  - PT provider
- Traceability via NMIs of CIPM-MRA

Analytical Laboratory level

- Accreditation helps
- Method harmonization is a good step to harmonize measurement capabilities
- Measurement system/analyzer control is not easily applicable
- CRMs are not always available
- Traceability via NMIs of CIPM-MRA or Reference Laboraotries is possisble

Recommendations

Asia-Pacific

Review and update legal corpus, including the laws and regulations that have provisions related to metrology;

Efficient actions of the authority in the Government, in charge of the National metrology policy, and of coordinating the action of other Departments related to metrological issues; ⇨ Strengthen coodination function

Establish or function one or several institutes in charge of tasks assigned at national level for the metrology policy; ⇨ CMCs by NMI & Designated Institutes

Enhance or complement the System of national measurement standards and dissemination of legal units; ⇨ SI units and other units harmonized with International Organizations

Establish or enhance the (voluntary) system for accrediting calibration laboratories and, if required, testing laboratories, inspection bodies and certification bodies;

Establish and promote structures for disseminating knowledge and competencies in metrology (e.g. training, education, consultants, etc.); and

Establish and promote services to industry and to the economy in the field of metrology (e.g. calibration, maintenance, training, consultancy, type testing, verification, etc.). ⇨ Training by PT with CRM

Acknowledgements to:

Your kind attention

The organizer for his kind invitation

The APEC for the support

This effort continues,
thanks to the support of APEC
APEC PROJECT: CTI29/2008T
Strengthening Chemical Metrology Infrastructure
Workshop in Cusco,
Peru in August 2008

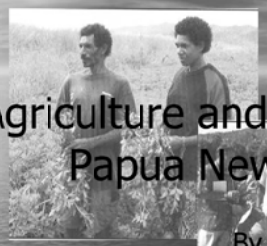
Asia-Pacific Economic Cooperation

Asia-Pacific Legal Metrology Forum

APEC/APLMF

Workshops on Metrology in Agriculture Products and Food Safety

June 4 - 6, 2008



Agriculture and Metrology in Papua New Guinea

By
Victor Gabi
Assistant Director – Metrology Division
NISIT

Papua New Guinea in brief

PNG is located on the east half of New Guinea and is 160 kilometres north of Australia. The western half of the Island is Irian Jaya, a province of Indonesia.

- PNG comprises the mainland and some 600 offshore Islands
It has a total land area of 462 800 square kilometres and is about the same size as Thailand.
- PNG is relatively young and its geography is diverse which is characterised by high mountain ranges, deep valleys and swift rivers in the interior and open plains, tropical forest and swampy inlets in the coastal region.

Climate

- Located just south of the equator Papua New Guinea experiences a moderate tropical climate with high levels of seasonal rainfall.

In the Highlands temperatures can range from a low of 4 degrees Celsius to a high of 32 degrees Celsius.

The low land, coastal and island areas have an average daily temperature of 27 degrees Celsius.

Population

- Papua New Guinea has a population of over 6 million people.
- The majority live in the highland valley, many in isolated villages.
- Apart from the National Capital District, population density is relatively low.
- Around 15 % of the population live in the major urban areas. Namely Port Moresby, Lae, Madang, Wewak and Goroka.

Trade (at a glance)

Exports (yr 2000)	% Export	K, millions
Mineral Exports incl crude oil	77.3	4494.6
Agriculture incl processed food	9.4	544.7
Manufactured exports	7.5	436.1
Logs exports	4.9	283.5
marine exports	0.6	33.7
Total	99.7	5792.6

Looking at agriculture exports. This amounted for 9.4% for PNG's total exports in year 2000.

Major Trading Partners

Country	% Export	K,millions	%Import	K,millions
Australia	52	3000.0	56.2	1600.0
Japan	10.6	614.2	4.3	118.5
Korea	5.2	303.8	0.5	14.8
China	5.1	296.6	1.1	31.0
United States	4.3	251.8	15.1	419.8

Other Major Trading Partners in 2000 include Singapore, Germany, United Kingdom, New Zealand & Hong Kong China.

Agriculture in PNG

Agriculture remains the mainstay of Papua New Guinea's economy, but its potential is far from being exploited. Today the sector accounts for 14% foreign exchange earnings and 25% of Gross Domestic Product, but with major investment could further improve the sector.

The government believes that agriculture could become the cornerstone of the country's export drive, and has called for a "green revolution". The aim is to encourage greater private sector participation and expand commercial and small holder production.

In the longer term, PNG needs to develop its agriculture resources to prepare for the time when it can no longer depend on its mineral resources as a major source of earnirgs.

Cont'd

- On the current governments initiative, a package of tax breaks has been introduced to attract investment into the sector.

  This include;

  -150% deduction for suppliers of primary production extension services

  -a 150% tax deduction for research and development expenses

  -and a special tax rate of 20% for primary agriculture projects started within the next three years

- Current Major export commodities –

  Oil palm, Coffee, Cocoa, Copra Coconut Oil.

PNG also produces tea, rubber, vanilla, sweet potatoes, fruits, vegetable and livestock.

National Agriculture Development Plan (2007 – 2016)

NADP 8 point improvement Plan

The Measurement Standards Laboratory Services come into play in addressing Point (7) REGULATORY AND TECHNICAL SERVICES

The regulatory and technical services include agriculture quarantine, land use planning and development and Codex and Food Safety.

Codex and food safety is mandatory in PNG covering all food in general.

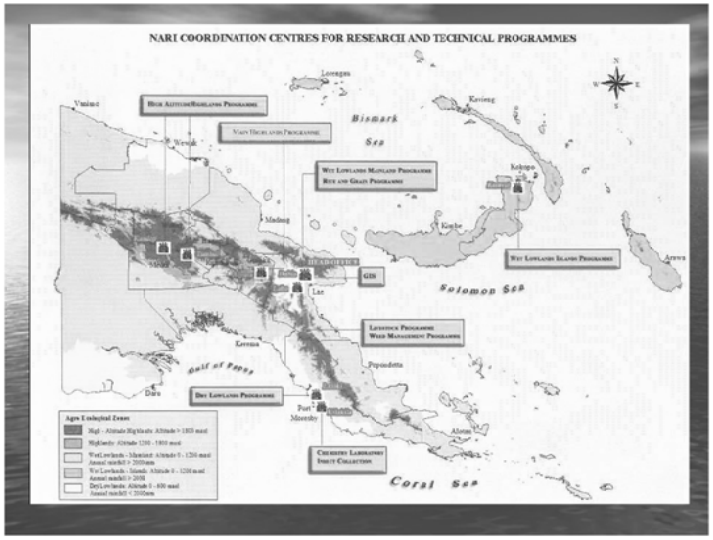
Agriculture Sector

Policy - Department of Agriculture & Livestock

Research & Technology Transfer, Product testing - National Agriculture Research Institute, Coffee Industries Corporation, Cocoa Industries Corporation, Coconas Industries Corporation

Production – Private Sector, Informal Sector or small holder production units

Transactions – Major export Commodity Boards, Local Markets



NARI CHEMISTRY LABORATORY

- NARI Chemistry Lab is a government own laboratory that provides Chemical Testing Services to the agriculture Sector. It also provides technical support to the various programs NARI is running in PNG.
- Apart from the Laboratories existing for the Major Commodities NARI also provides an independent opinion when conflicts arise.
- NARI was once a PNGLAS accredited Laboratory until the lab was gutted by fire.
- Periodically MSL – NISIT provides calibration on balances, masses, thermometers moister meter, force gauges etc..
- It obtains CRM's from reputable CRM providers in Australia and New Zealand and it also participates in Intercomparison programs to provide in-house CRM's.

Vanilla Quality Testing

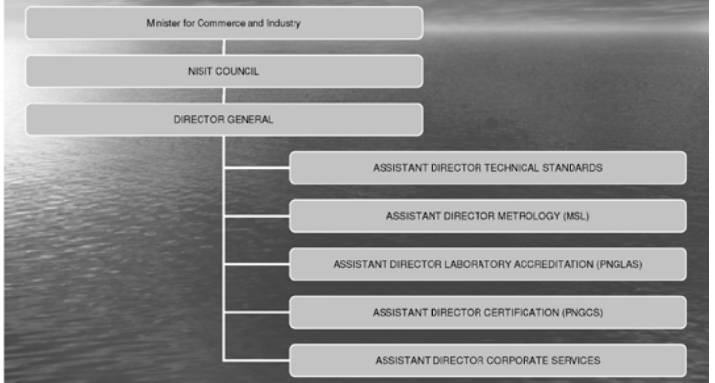
Tissue culture propagation

Other Established Bodies

National Agricultural Quarantine and Inspection Authority (NAQIA)

PNG Customs (under the Internal Revenue Commission)

Standards and Conformance Infrastructure (National Institute of Standards & Industrial Technology)



Enactment

National Institute of Standards & Industrial Technology Act 1993, established under what was called the beyond the Mineral Boom

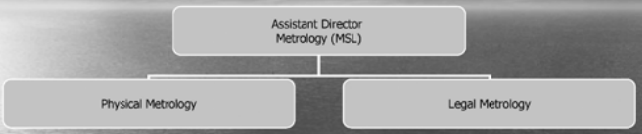
It is in this act that Metrology is called upon to Administer, Establish and maintain the Measurement Infrastructure of Papua New Guinea

- Other stand alone Acts are Trade Measurement Act, Bread Act, Packaging Act. This are maintained by the Commerce and Industry Department

NISIT SERVICES

- Technical Standards - Standards development, and dissemination of ISO, ISO/IEC, AS, AS/NZ, BSI, API/ASTM, PNGS, Codex Alimentarius Commission (CAC Food Code)
- Metrology (MSL) – both Physical and Legal Metrology, maintenance of traceable national measurement standards. Provides calibration and verification services in all sectors of the economy
- PNGLAS – ISO/IEC 17025 Accreditation, currently has 15 labs accredited in the fields of Chemical Test & Construction Materials Testing
- PNGCES – Provides Certification for QMS, EMS, HACCP,OHSE and in the near future will be going into product certification

Current Metrology Structure



Other Functions outside of NISIT

Trade Measurement Section (Consumer Protection Branch) currently under the Independent Consumer and Competition Commission

Metrology and its Contribution to the Agriculture Sector.

Measurement Standards Laboratory	→	AGRICULTURE RESEARCH
Measurement Standards Laboratory	→	PRODUCTION
Measurement Standards Laboratory & Trade Measurement Branch, ICCC	→	TRANSACTION

Cont'd

Mass
- Industrial & Laboratory Masses
- Industrial & Laboratory Balances
- NAWI's
- Bulk Weighing Devices
- Moister Analyzers
- Checkweighers
- Weight Actuators
- Weigh Hoppers

Volume & Capacity
- Calibration of volume measuring devices, cylinder etc..
- Provers
- Bulk Meters
- Tanks
- Fuel Dispensers
- Dispenser other then for fuel

Cont'd

Temperature
- Platinum Resistance Thermometers
- Gauging tapes
- Digital Thermometers
- Clinical Thermometers
- LIGTs /MIGTs
- Thermocouples
- Baths/Ovens/Incubators/Furnaces
- Radiation Thermometers

Pressure
- Pressure Gauges
- Pressure Systems
- Aneroid Barometer
- Digital Barometers
- Safety relief valves

Cont'd

Torque
- Torque wrenches
- Torque screw driver
- Torque multipliers

Force
- Compression & Tension Machines
- Load Cells

Density
- Hydrometers
- Density Meters

Length
- Rulers
- Survey Tapes
- Dial Gauges
- Vernier Calipers

Other Information

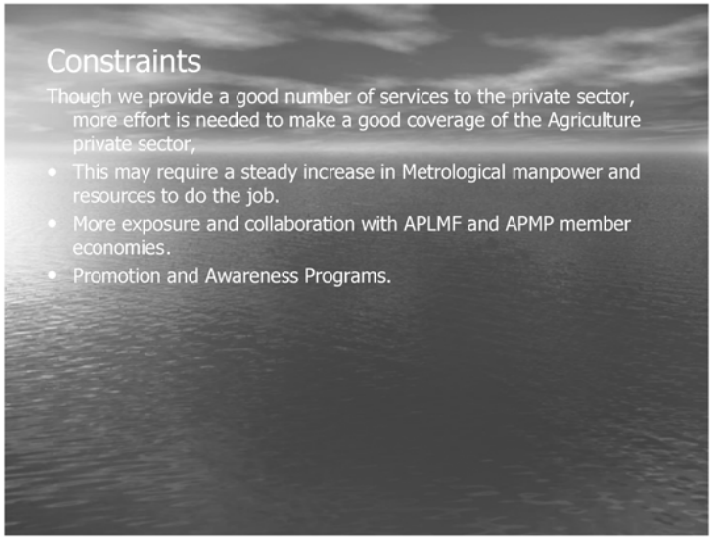
- MSL competence – The Laboratory is ISO/IEC 17025 accredited by NATA, Australia in the area's of Physical and Dimension.

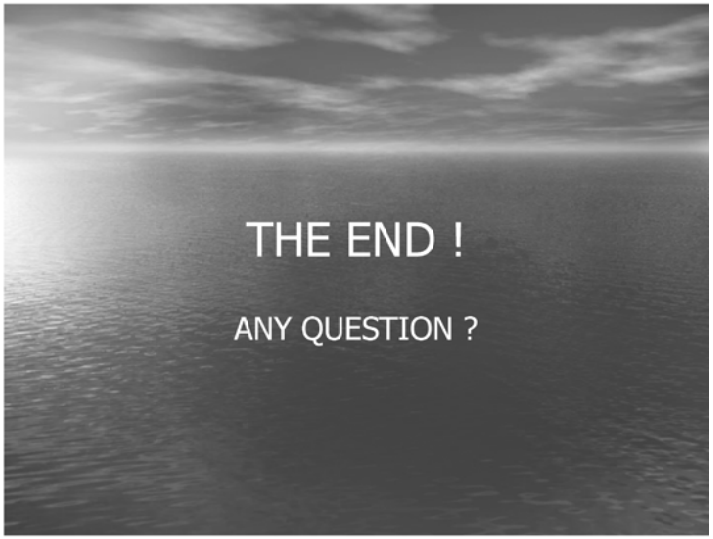
New Areas

- Electrical Metrology (end 2008)
- Time and Frequency(2009)
- Chemical Metrology(2009)

New Areas

Electrical Metrology (end 2008)
Time and Frequency(2009)
Chemical Metrology(2009)


Constraints
Though we provide a good number of services to the private sector, more effort is needed to make a good coverage of the Agriculture private sector,
• This may require a steady increase in Metrological manpower and resources to do the job.
• More exposure and collaboration with APLMF and APMP member economies.
• Promotion and Awareness Programs.


THE END !
ANY QUESTION ?

CURRENT TOPICS ON QUALITY MEASUREMENTS OF FOODS IN THE PHILIPPINES

(Particularly Rice)

MARILYN C. FOS

NATIONAL METROLOGY LABORATORY

INDUSTRIAL TECHNOLOGY DEVELOPMENT INSTITUTE

DEPARTMENT OF SCIENCE AND TECHNOLOGY

PHILIPPINES

The National Metrology Laboratory - Philippines

Provides accurate international traceability for different end-user's measurements undertaken in the country.

It is the organization responsible for establishing and maintaining national reference standards for basic and derived quantities such as mass, length, temperature, luminous intensity, time interval, voltage and resistance and the units derived from them.

Dissemination of Standard values are disseminated to different end- users at the best uncertainty levels attainable through the calibration and measurement services offered by the Laboratory.

The National Metrology Laboratory - Philippines

The NML, ITDI provides traceability to grains moisture meters and other moisture meters used in industry and trade and other applications by performing periodic verification on working standards of end users . The ITDI applies appropriate International Standards like ISO 712, ISO 7700 and OIML R59. The ITDI also conducts trainings/seminar- workshops upon request for end users on the verification of moisture meters.

Departments and Agencies that concerns Rice

Department of Agriculture (DA)

The principal government department responsible for the promotion of agricultural development and growth. It provides the policy framework, helps direct public investments, and in partnership with local government units (LGUs) provides the support services necessary to make agriculture and agri-based enterprises profitable and to help spread the benefits of Agricultural development to the poor and needy, particularly those in rural areas.

National Food Authority (NFA)

NFA is an agency under the Department of Agriculture which ensures food security which include grain and cereals in times and places of calamity or emergency, both natural and man-made. Staple food requirements during crises and in calamity/emergency-stricken areas shall be made available within 48 hours response time.

Philippine Rice Research Institute (PhilRice)

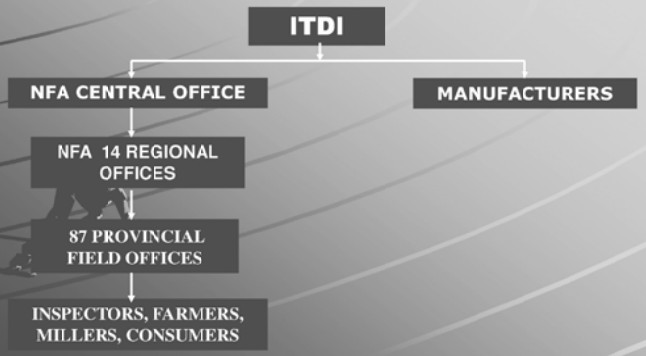
PhilRice is also an agency under the DA which is responsible to sustain rice self-sufficiency and to build a competitive rice economy through research, technology promotion, and policy advocacy.

International Rice Research Institute (IRRI)

An International Organization supported by different international organizations and many foreign governments to generate and disseminate rice-related knowledge and technology of short- and long-term environmental, social, and economic benefit and to help enhance national rice research and extension systems. With the assistance from many foreign researchers, it conducts research and development on different varieties of rice under different environmental conditions at different locations for different soil conditions.

Rice Moisture Meters

Rice Moisture Meter Traceability System of the Philippines



Philippines' Source of Rice

As of first week of May, 2008, a total of 3, 589,538 metric tons of imported rice from Vietnam, Thailand, Pakistan, China and USA are already in the country for Food Security purposes in times of calamity and emergency and for stabilization purposes in deficit areas and during lean periods.

It is important to dry food grains quickly and effectively after harvest and before storage.

To keep grains dry are to be kept its quality for long time. In grain dyer, control of drying condition is the most important to keep the grain quality such as less cracks of grain, high germination, good taste and flavor.

There are about 598 leased/owned warehouses in the country with a total capacity of 1.9 metric tons of milled rice.

Issues and problems encountered with in national metrological infrastructures in the Philippines:

Harmonization of International Standards used in verification of moisture meters. Different countries produce different grains (rice) quality and use different standards on verifying moisture meters. This is a problem between importer and exporter of the product.

Local scene

Local regulatory bodies, suppliers and traders do not have the capabilities in terms of knowledge and laboratory standards and facilities regarding verification of moisture meters. Because of which, The ITDI is loaded with requests for verification of moisture meters.

Possible solutions that could be implemented with in the region:

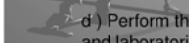
a) Farmers need to be provided accurate and reliable moisture meters.

b) Drying systems should be improved. Use of Solar, or other dryers using non- conventional energy and storage systems for palay and other grain products which will assure control of quality especially during rainy season should be explored and encouraged and they should be made available to farmers..

c) Equip the necessary instruments and technical knowledge to calibration/ verification laboratories of moisture meters in local regulatory offices.

d) Perform the intercomparison between verification laboratory of ITDI and laboratories of testing offices or inspection bodies.

e) To implement a National Grains Standards through-out the country through continuing advocacy campaigns particularly among farmers, millers, rice grains businessmen and consumers on grains quality, labeling, weighing and packaging.



Maraming Salamat po!

Thank you very much!

Xie xie!

Measurements of Starch Content in Cassava

Presented: by Surachai Sungzikaw

Workshop on Metrology in Food Safety, Agricultural Products and Product Safety, Hangzhou, PR China, June 2-6, 2008

Overview

1. About Cassava
2. The Determination of Starch Content in Cassavas for Trade in Thailand
3. A Comparison of Starch Content Values Measured by Reimann Balance and Electronic Balance
4. A Comparison of Different Methods for Estimating Starch Content of Cassava Tubers
   - Underwater Method
   - Determination of Dry Matter by Oven Method

What is Cassava?

- Cultivated in most equatorial regions

What is Cassava? (continuous)

- Cassava tubers are long and tapered

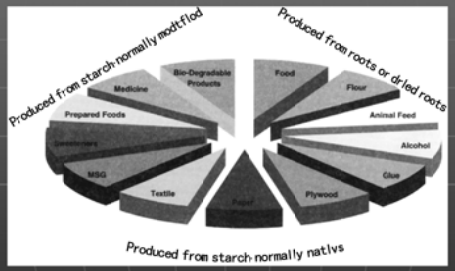
What is Cassava? (continuous)

- Cassava tubers are very rich in starch

Cassava Names	
Indonesia	Ubi kettella Kaspe
South America	Manioca Yucca Mandioca Aipim
Africa	Manioc Cassava
India	Tapioca
Thailand	Cassava

Source: International Starch Institute, Science Park Aarhus, Denmark

Products Derived from Different Forms of Cassava



Source: *The world cassava economy* , FAO

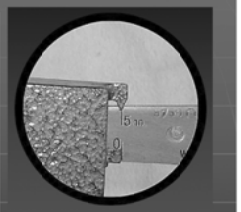
Determination of Starch Content in Cassava Tubers for Trade in Thailand

- Officially for trade, by Reimann Balances verified by Weights and Measures Bureau

- by the electronic scale in combination with computer-based calculations (under pattern testing)

1. Determination of Starch Content by Reimann Balance

Weigh 5000 g clean tubers into upper basket in air



1. Determination of Starch Content by Reimann Balance

Weigh 5000 g clean tubers into upper basket in air

Move the tubers into the lower basket under water

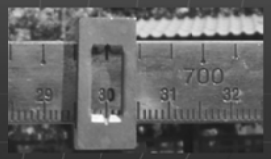
1. Determination of Starch Content by Reimann Balance

Weigh 5000 g clean tubers into upper basket in air

Move the tubers into the lower basket under water

Weigh the tubers again in water

Determination of the Starch Content



2. Determination of Starch Content by the electronic scale in combination with computer-based calculations

Source: Genius Design & Engineering Co.,Ltd.

The Construction of the scale

1. Indicating Device
2. Load Cell
3. Basket (load-receiving element)
4. Water Bucket
5. Hydraulic Lift

Source: Genius Design & Engineering Co. Ltd.

Measuring Procedure for Determination of Starch Content

With clean water, lift bucket to empty basket until the basket is completely immersed in water.

Weigh the empty basket immersed in water and record the weight of basket by the indicating device.

Move the bucket back to the lower position.

Measuring Procedure for Determination of Starch Content

Weigh 3-6 kg clean cassava tubers into the basket in air.

Lift the bucket to the basket containing cassava tubers until the basket is completely immersed in water and weigh again.

Starch content of the sampling is calculated by a microprocessor in the indicating device.

Comparison of Starch Content Values Measured by Reimann Balance and Electronic Balance

1

Measuring by Reimann Balance

Comparison of Starch Content Values Measured by Reimann Balance and Electronic Balance

2
Measuring by
the electronic balance

Samples

Sample No.	Varieties	Places
1	KU50	North-East
2	Kan Deang	North-East
3	KU50	North-East
4	Kan Deang	North-East
5	Rayong 90	North-East
6	KU50	East
7	KU50	East
8	Rayong 90	East
9	Rayong 90	East

The procedure

1. Calibrated the Reimann Balance and electronic balance with class M_1 standard mass
2. Programmed in the Computer of electronic balance to calculate starch content by the equation:

Starch Content = (SG – 1.00906)/0.004845 %

$$SG = W_0/(W_0-(W_U + BC))$$

Wo = weight of the cassava sample in air
Wu = weight of the sample under water
SG = specific gravity
BC = basket compensated weight (BC = weight in air – weight under water)

- First determined starch content of 5 kg, 3 kg, and 1 kg wet clean tubers by Reimann Balance
- Second determined starch content of the same samples by the electronic Balance

Results

Sample No.	Sample Sizes	Starch Content Values	
		Reimann	Electronic
1	5 kg	21.2	21.11
	3 kg	21.1	21.04
	1 kg	21.1	21.12
2	5 kg	26.7	26.59
	3 kg	26.3	26.54
	1 kg	26.3	26.06

Discussion

- Basket's weight compensation for Electronic Balance is significance for measurement of specific gravity by Under Water Weight
- Specification of the basket comprised with the Electronic Balance have to be considered

- With the determination of cassava tubers by the Electronic Balance, there is no significant difference on the starch content values of by decreasing each sampling weight to 1000 g from 5000 g

A Comparison of Different Methods for Estimating Starch Content in Cassava Tubers

Objective

- To revise the correlation equation between specific gravity and starch content of cassava tubers

  Starch Content = (SG – 1.00906)/0.004845 %

- To obtain the information for developing the Electronic Balances

Methods of Determination of Starch Content

- Under Water Weight Method
- Determination of Dry Matter by Oven at 130 °C

The Experiment

- The experiments were carried out to determine starch contents in the same samples by Under Water Weight method and by Oven method at 130 °C

Apparatus

- For Under Water Weight method
  - Analytical balance weighing to the nearest 0.01 g
  - Vessel with clean water
  - Stainless steel wire for hanging the sample weighed in water

Apparatus (continue)

- For the Determination of Dry Matter by Oven Method
  - Analytical balance weighing to the nearest 0.1 mg
  - Dishes of aluminum with tight-fitting lids
  - Electrically heated oven
  - Desiccator containing an effective desiccant

The Procedure

- Determined of specific gravity of cassava tubers by Under Water Weight method
- Calculated starch content values with the equation:

Starch Content = (SG – 1.00906)/0.004845 %

- Determined of dry matter of cassava tubers by Oven at 130 °C
- Calculated starch content values with the empirical equation published by FAO:

Percent Starch Content = Percent Total Dry Matter – 7.3 %

Source: 1. ISI 01-1e Determination of Dry Matter in Starch by Oven Drying at 130°C, International Starch Institute, Science Park Aarhus, Denmark
2. Cassava processing, FAO

Comparison

Under Water Weight		Oven at 130 °C		Δ
SG	%Starch	Dry Matter	%Starch	%Starch
1.092	17.1	30.7	23.4	6.3
1.097	18.2	34.1	26.8	8.6
1.103	19.3	35.5	28.2	8.9
1.106	20.1	35.5	28.2	8.1
1.111	21.1	37.6	30.3	9.2
1.118	22.5	35.7	28.4	5.9
1.125	23.9	36.8	29.5	5.6
1.128	24.6	38.1	30.8	6.2
1.136	26.3	39.0	31.7	5.4
1.145	28.0	40.5	33.2	5.2
1.152	29.5	43.2	35.9	6.4
1.152	29.5	43.2	35.9	6.4

Discussion

- The starch content values estimated by UWW method are significant different from by Oven method
- To confirm this, other reliable methods are required to make more comparison such as Krochmal and Kilbride or Near Infrared Reflectance (NIR)
- The correlation equation between specific gravity and starch content of cassava tubers should be revised

A cassava field in Chonburi, Thailand

Measurement Traceability or Transferability for GMC/GMF Nucleic Acids Detection

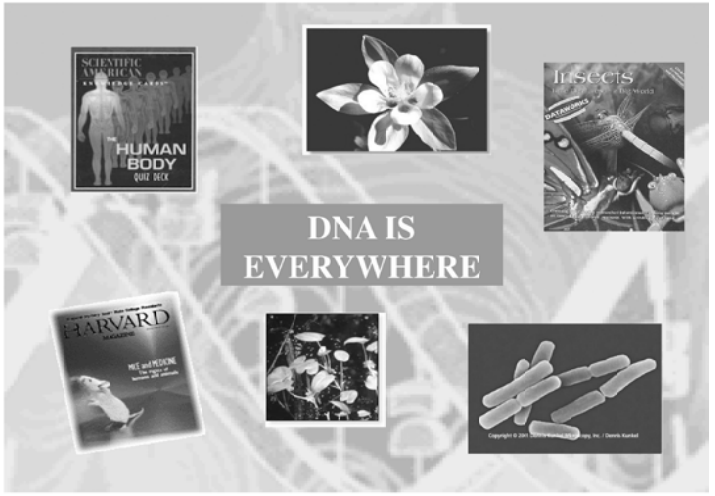
Xiaohong Zhou, Lunbin Zhou, Xiaoguang Chen, Liangyong Hu

GMOs Research Center
Guangzhou Institute of Measurement and Testing
& Southern Medical University

1. GMC/GMF introduction
2. GMC/GMF Biosafety
3. Technology advance of GMC/GMF nucleic acid detection
4. Measurement traceability or transferability
5. Our Lab's work
6. Establishing the Joint Calibration Labs and Network Labs for GMOs detection is necessary to APLMF

1. Genetically Modified Crop/Food Introduction

1. Genetic Engineering/ Transgenic Techniques
2. Genetically Modified Crop/Food, GMC/GMF
3. How are GMOs produced?
4. What do the GMO's can be used for ?
5. Current GMOs
6. GM world view



Genetic Engineering/ transgenic techniques?

- It has become possible to introduce changes to the DNA of living organisms in a precise and controlled manner in the laboratory, using recombinant DNA (rDNA) technology. This is often referred to as modern biotechnology, genetic modification, or genetic engineering, or transgenic techniques.
- In brief, the DNA encoding a specific property is isolated from one organism, purified, and introduced to the same, or a second, organism.

What Is GMO / GMF?

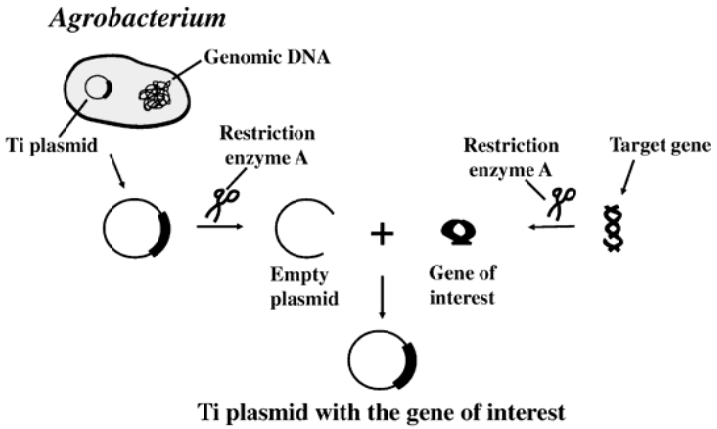
- *Genetically Modified Food: food and food additive from genetic engineering.*
  - Genetically Modified Organism (GMO)
    - **Microorganism**
    - **Animal**
    - **Plant**
  - Genetically Modified Food (GMF)
    - **Food and food additive from genetic engineering**
    - **Mainly from Genetically Modified Crop (GMC)**

How are GMOs Produced?

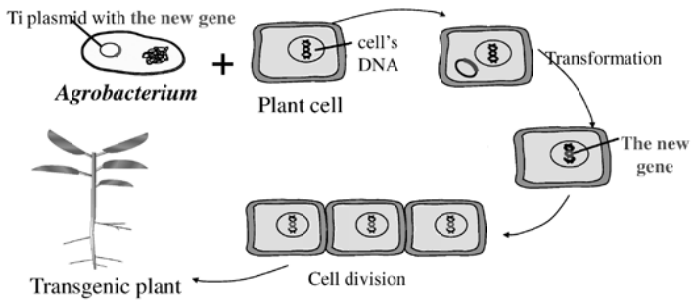
Commonly Used Methods of Transgenic Plants

- ***Agrobacterium tumefaciens mediated tranformation***
- **Gene Gun**

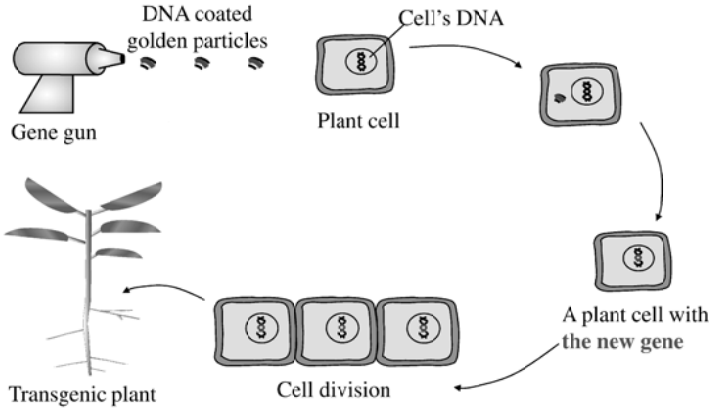
Agrobacterium tumefaciens mediated transformation



Agrobacterium tumefaciens mediated transformation



"Gene Gun" Technique



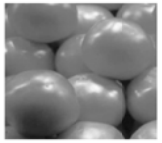
What do the GMOs can be used for ?

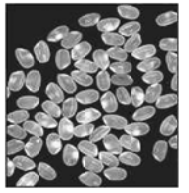
to produce needed products; to carry out useful processes; to give an organism desired characteristics

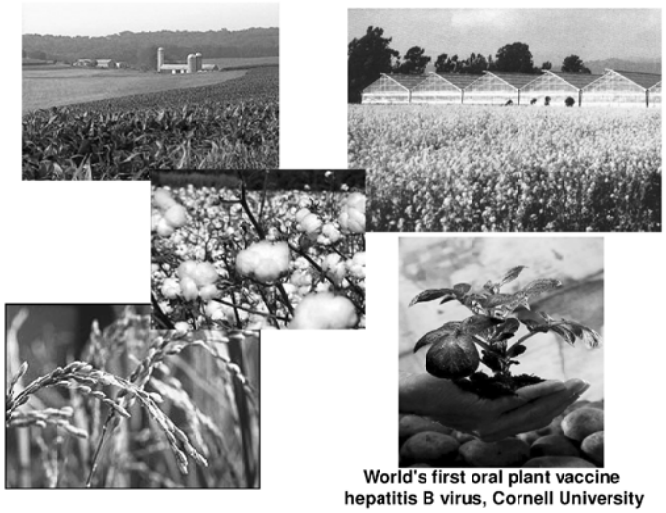
- **By genetically modifying organisms we can:**
  - Reduce pesticide use
  - Conserve fuel and water
  - Preserve non-pest insect populations
  - Increase food production per hectare of farmland
  - Enable crops to grow in sub-optimal conditions
  - Increase the nutritional value of food
  - Produce edible vaccine or other pharmaceutic protein
  - others

Current Products

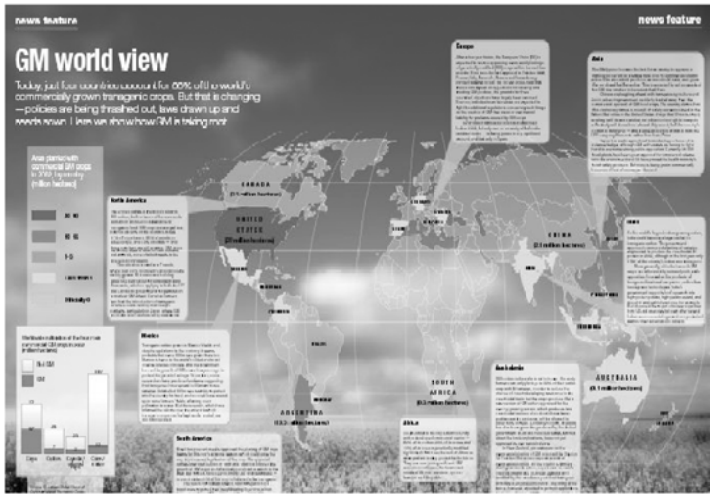
- Transgenic Soybean







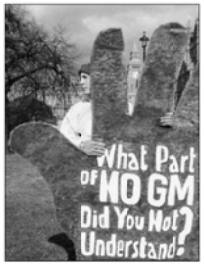
World's first oral plant vaccine
hepatitis B virus, Cornell University



2. GMC/GMF Biosafety

1. **Focus on GMOs' Biosafety**
2. **GMOs' Eco-environment Biosafety**
3. **GMOs' Healthy Safety**
4. **Governments pay attention to GMOs' Biosafety**
5. **Establishing the measurement traceability or transferability system for GMOs monitoring is needed**

Focus on GMOs biosafety



Focus on GMOs biosafety

Approval **opposition**

No evidence verified it's not safe. ⟷ No evidence verified it's not danger.

Nature Web Focus: GM crops: Time to choose.

Nature Genetics :2003 GMO special volume;

FDA, Royal Society of U.K., WHO, WTO and many governments attached important to this debate all around the world about GMC/GMF's safety. The controversial essential was not only scientific problem, but also the complex problem about politics, economic and trade It was a hot topic and a trade bulwark of present international trade.

GMOs' Eco-environment Safety

1. **Genetic stability: recombinant virus or other pathogenic organism?**
2. **Survival Competitivenness: weediness, invasion, pest?**
3. **Gene loss: transferring to interspecies including cultivar, wild species or microorganism?**
4. **Effects on target organisms: enhance the pest's resistance and speed up evolution?**
5. **Effects on non-target organism and biodiversity**

GMOs' Healthy Safety

1.Toxicity

2. Allergy

3. Marker gene and antibiotics' resistance

4. Nutritious elements and anti-nutritious factors

5. Non-expected effects

The governments of many countries pay attention to the management of Biosafety of GMOs

China ,As a big agricultural country, is a land of biodiversity. Chinese government pays close attention to the management of biosafety while developing biotechnology. In recent years, the Chinese government has laid down and promulgated regulations on the management of biosafety, established administrative bodies, the supervision and managerial system as well as the safety evaluation system. At present, the government is making efforts to promote the development of monitoring and testing systems for biosafety of agricultural genetically-modified organism (GMO).

Establishing the measurement traceability or transferability system for GMOs monitoring is needed

It is obvious that GM technology will become a ubiquitous part of global agricultural production whether for food, textiles or fuel. And Human Being will benefit from it for sufficient foodstuff supply.

As to GMOs, safety or not? Science couldn't answer this question because it is no "absolute truth" except "ultimate truth" . Truth has the difference in Time and Space. So, Science couldn't guarantee GMOs absolute safety.

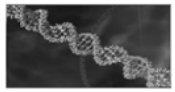
For this reason, we needn't answer if GMOs are safe to human being and environment, but we must answer how to solve the problem caused by GMOs biosafety and keep them safe to human being and environment.

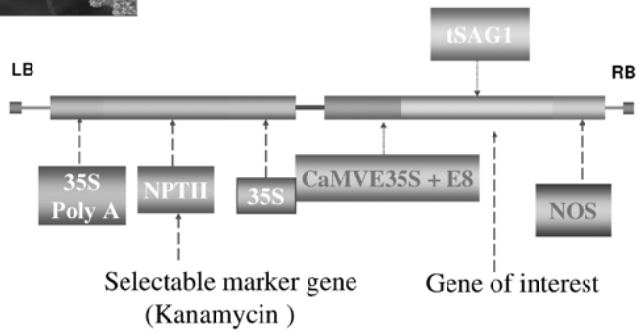
Establishing the measurement traceability or transferability system for GMOs monitoring is needed

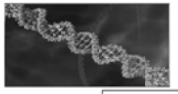
Therefore, it is very important to enhance international cooperation and calibration to establish the measurement traceability or transferability system for GMOs detection. That depends on Science and Technology. This is the key project related with global livelihood.

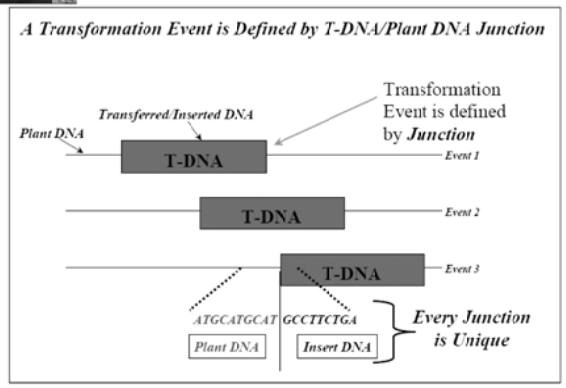
3. Technology advance of GMC/GMF nucleic acid detection

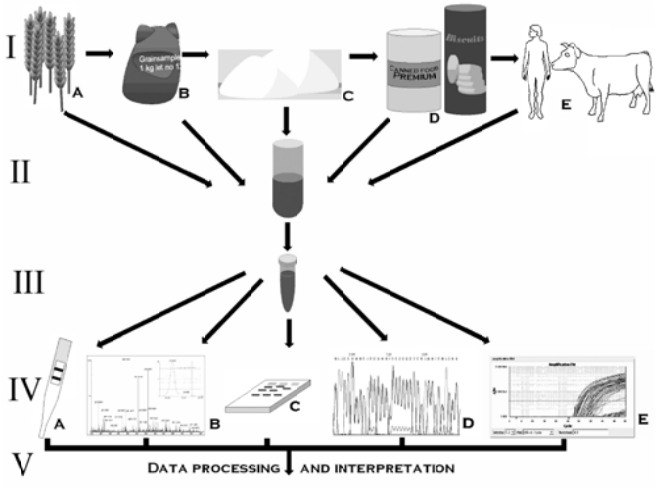
1. **introduction**
2. **Real time PCR**
3. **microarray**
4. **xMAP**











Anal Bioanal Chem (2005) 381: 72–74

Stefanie Trapmann , Hendrik Emons
Reliable GMO analysis

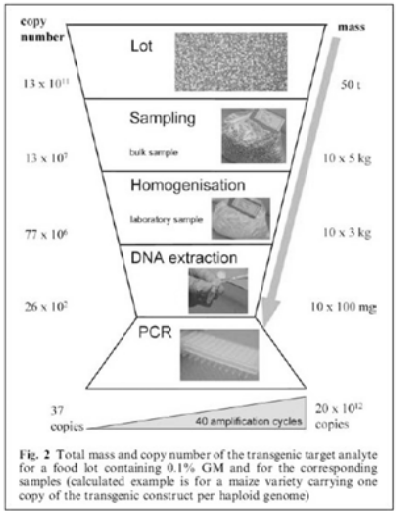
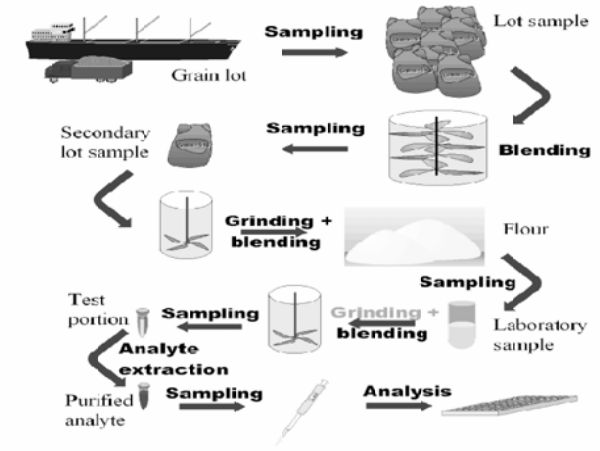


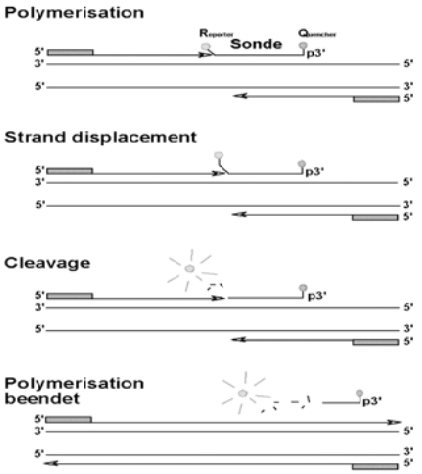
Fig. 2 Total mass and copy number of the transgenic target analyte for a food lot containing 0.1% GM and for the corresponding samples (calculated example is for a maize variety carrying one copy of the transgenic construct per haploid genome)

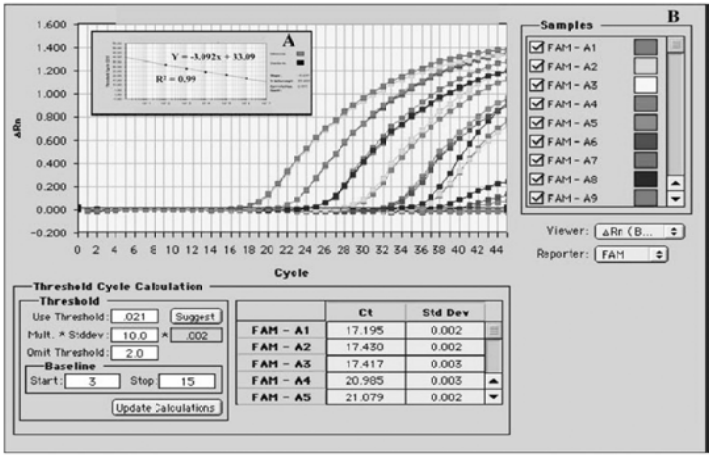


PCR-ELISA、

QC-PCR

Real time PCR





Real time PCR

- **Certificate Reference Materials system**
- **Measurement Traceability or Transferability: accuracy?**
- **Comparability : consistency?**

It is important to develop multiplex detection methods, which means detecting more than one GMO with just one test. Right now, GMO tests usually look for one GMO at a time. With the number of GMOs being grown today, this is becoming less and less feasible. We need to get a much better understanding of the commonalities between GMOs to make it easier for us to detect many GMOs at once.

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Biosensors and Bioelectronics 22 (2006) 71–77
BIOSENSORS & BIOELECTRONICS
www.elsevier.com/locate/bios

Screening genetically modified organisms using multiplex-PCR coupled with oligonucleotide microarray

Jia Xu[a,1], Haizhen Miao[c,1], Houfei Wu[a], Wensheng Huang[b], Rong Tang[a], Minyan Qiu[c], Jianguo Wen[a], Shuifang Zhu[b,*], Yao Li[a,*]

[a] State Key Laboratory of Genetic Engineering, Institute of Genetics, School of Life Science, Fudan University, Shanghai 200433, PR China
[b] Institute of Animal and Plant Quarantine, CAIQ, Peking 100029, PR China
[c] Shanghai BioStar Genechip Institute, Shanghai 200092, PR China

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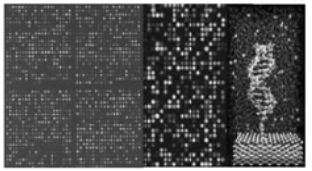
Available online 8 February 2006

DNA Microarray



Total: 46 genes

31 inserted genes

e.g. EPSPS

7 reference genes

e.g. lectin

8 event-specific genes

e.g. Roundup Ready Soybean

Genes involved in microarray research

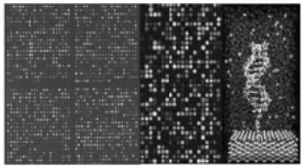
DNA Microarray

Expensive

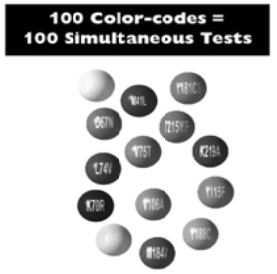
Sensitive and Specificity

Repeatability

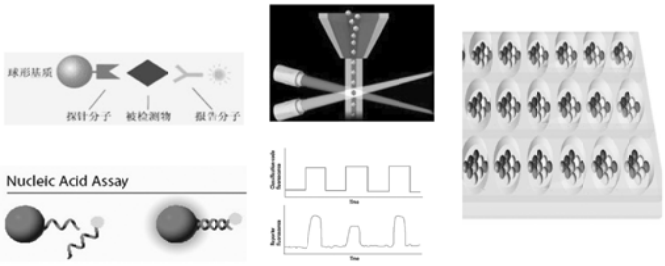
Evaluation of uncertainty



xMAP （flexible Multi-Analyte Profiling）



xMAP （flexible Multi-Analyte Profiling）



Food Anal. Methods
DOI 10.1007/s12161-007-9005-0

Innovative Application of Fluorescent Microsphere Based Assay for Multiple GMO Detection

Anna Fantozzi · Monica Ermolli · Massimiliano Marini · Branko Balla · Maddalena Querci · Guy Van den Eede

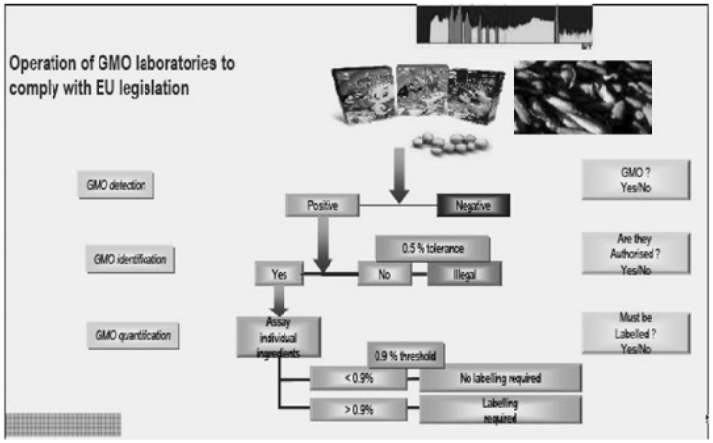
Received: 28 September 2007 / Accepted: 16 November 2007

4. Measurement traceability and transmission for GMC/GMF Nucleic Acids detection

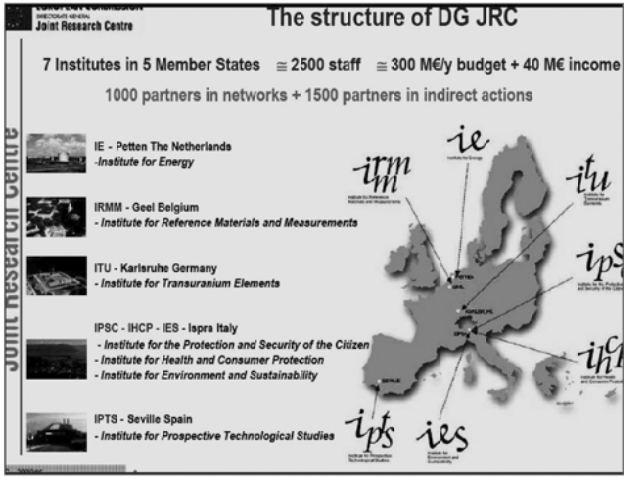
1. **European Union: Joint Research Center**
2. **Some National Standards of China**
3. **Bottlenecks**

According to European Regulations 1829/2003 and 19830/2003, products which are, consist of or contain GMOs should be labelled and traceable in each stage of production, processing and distribution. And the threshold of the food and feed products containing ingredients from GMOs is below 0.9%.

In order to implement European regulatory requirements for labeling, a huge effort was underway in the labs of EC, to elaborate, assess and validate the necessary sampling strategies and molecular analytical procedures.

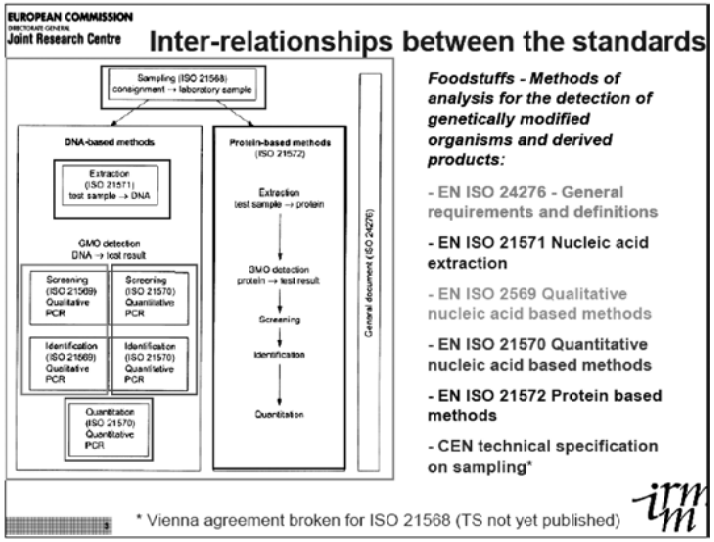


The Joint Research Centre: a networked organisation of EU



European Network of GMO Laboratories

- Start date: 14/07/2000
- Co-ordination of the European Network of GMO laboratories (38 enforcement laboratories)
- European Community Reference laboratory for the GMO food and feed regulation
- Production of reference materials
- Protocols for validation studies, proficiency testing
- Information collection/dissemination (molecular register, on line access to databases etc.)
- Training



EUROPEAN COMMISSION
Joint Research Centre

Standards

EN ISO 24276 - General requirements and definitions
- Definitions related to DNA extraction, purification, amplification, PCR, reference material
- Guidance concerning the inter-relationship of the standards
- Laboratory organisation, general expression of results

EN ISO 21571 Nucleic acid extraction
- Extraction, purification, purity control of DNA
- Quantification of DNA
- Annexed methods (10)

EN ISO 2569 Qualitative nucleic acid based methods
- Focus on PCR, controls, procedure and performance criteria
- .PCR design, expression of results
- Annexed methods (14)

EN ISO 21570 Quantitative nucleic acid based methods
- Focus on PCR, principals, calibration, expression of results
- Annexed methods (13)

EN ISO 21572 Protein based methods
- Definitions
- Principle, apparatus and sampling
- Annexed methods (1)

Not covered to the extend originally intended by the general document

EUROPEAN COMMISSION
Joint Research Centre

Flexibility via annexed methods

-EN ISO 21571 Nucleic acid extraction

(A) Methods for DNA extraction:
(1) Phenol/cholorform-based
(2) Polyvinyl-pyrrolidone (PVP) based
(3) CTAB based
(4) Silica based
(5) Guanidinium-chloroform based
(B) Methods for quantitation of DNA:
(1) Ultraviolet
(2) Gel elctrophoresis and Ethbr staining
(3) Real-time PCR

-EN ISO 2569 Qualitative nucleic acid based methods

(A) Target-taxon-specific methods
(B) Screening methods
(C) Construct-specific methods
(D) Event-specific-methods

-EN ISO 21570 Quantitative nucleic acid based methods

(A) Target-taxon-specific methods
(B) Screening methods
(C) Construct-specific methods
(D) Event-specific-methods

- EN ISO 21572 Protein based methods

(A) Detection of genetically modified soybeans (RUR tolerant)

irmm

CRMs of genetically modified roundup ready TM soya beans (IRMM-410)

SB - 0:	0 % GMO (1 g units)
SB - 0.1:	0.1 % GMO (1 g units)
SB - 0.5:	0.5 % GMO (1 g units)
SB - 1:	1 % GMO (1 g units)
SB - 2:	2 % GMO (1 g units)
SB - 5:	5 % GMO (1 g units)

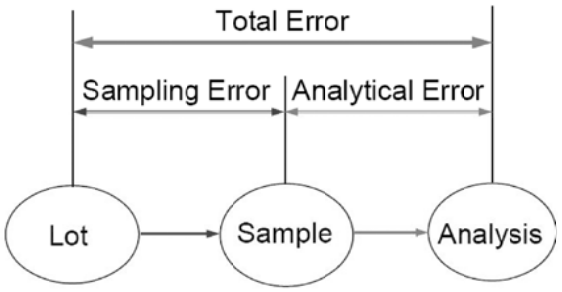
CRMs of genetically modified Bt-176 maize (IRMM-411)

MZ - 0:	0 % GMO (2 g units)
MZ - 0.1:	0.1 % GMO (1 g units)
MZ - 0.5:	0.5 % GMO (1 g units)
MZ - 2:	2 % GMO (1 g units)

MZ – 1:	1 % GMO (1 g units)
MZ – 5:	5 % GMO (1 g units)

GMO analysis: sources of uncertainty

Joint Research Centre



ifcp Institute for Health and Consumer Protection

EUROPEAN COMMISSION
Joint Research Centre

序号	标准性质	行业标准名称	标准号
1	SN	基因检验实验室技术要求	SN/T1193-2003
2	SN	植物及其产品中转基因成分检测 抽样和制样方法	SN/T1194-2003
3	SN	大豆中转基因成分的定性PCR检测方法	SN/T1195-2003
4	SN	玉米中转基因成分定性PCR检测方法	SN/T1196-2003
5	SN	油菜籽中转基因成分定性PCR检测方法	SN/T1197-2003
6	SN	马铃薯中转基因成分定性PCR检测方法	SN/T1198-2003
7	SN	棉花中转基因成分定性PCR检测方法	SN/T1199-2003
8	SN	烟草中转基因成分定性PCR检测方法	SN/T1200-2003
9	SN	植物性饲料中转基因植物成分定性PCR检测方法	SN/T1201-2003
10	SN	食品中转基因植物成分定性PCR检测方法	SN/T1202-2003
11	SN	食用油脂中转基因植物成分定性PCR检测方法	SN/T1203-2003
12	SN	植物及其加工产品中转基因成分实时荧光PCR定性检测方法	SN/T1204-2003
序号	标准性质	国家标准名称	标准号
1	GB	转基因产品检测 导则	即将发布
2	GB	转基因产品检测 实验室技术要求	即将发布
3	GB	转基因产品检测 取样制样方法	即将发布
4	GB	转基因产品检测 核酸提取纯化方法	即将发布
5	GB	转基因产品检测 核酸定性检测方法	即将发布
6	GB	转基因产品检测 核酸定量检测方法	即将发布
7	GB	转基因产品检测 基因芯片检测方法	即将发布
8	GB	转基因产品检测 蛋白质检测方法	即将发布

and other bio-ontologies. We also strongly support the creation by the US National Institutes of Health of the National Center for Biomedical Ontology. Musen *et al.* do, however, misunderstand our proposal for dealing with the problems of ontology use in biology.

Figure 2 in our article clearly shows that our proposal is to create an intermediate ontology of experiments, which will abstract out the key concepts in scientific experiments. This ontology will link down to subject specific experimental ontologies, such as those in the omics, and up to SUMO. Building ontologies as an extension of an upper ontology enhances formalization and axiomatization for logical inference, data mining and knowledge discovery.

European GMO labeling thresholds impractical and unscientific

To the editor:

In the next few months, the European Union (EU) will witness a burst of novel authorizations for genetically modified (GM) plants. In this context, a huge effort is underway in the laboratories of the European Commission (EC), of the Member States, of third countries and of private companies, to elaborate, assess and validate the necessary sampling strategies and molecular analytical procedures required to implement European regulatory requirements[1] for labeling food and feed products containing ingredients from GM organisms (GMOs). It is now more than five years since the legislation was first introduced, yet enormous technical and scientific challenges remain in reducing regulations to practice.

The EC first introduced labeling thresholds for the accidental unavoidable presence of GM ingredients because of the technical and practical impossibility of ensuring their

The first question facing a scientist attempting to develop an assay to implement the GMO regulations is: what does "0.9% of the food ingredients" mean in terms of genes? Or, put another way, how to translate the gross generic definition of "ingredient" into something making sense at the molecular level?

JOINT RESEARCH CENTRE EUROPEAN COMMISSION

Real Time PCR based GMO quantification: limits and accuracy

Cristina Barbaú, Florian Weighardt, Simon Kay, Claudia Pooletti, Maddalena Querci and Guy Van Den Eede

IHCP-FPU-GMO Joint Research Centre - European Commission - Ispra (VA) Italy

Few reports exist which have analysed the performance of GMO quantification by means of Real-Time PCR (RT-PCR). The data presented here are part of a study which main goals are to set-up and validate a method for the quantification of the synthetic *pat gene* and to determine the measurement accuracy around a concentration of 1% GMO.

The study is being executed in an international context supervised by the JRC/European Network of GMO laboratories.

Eur Food Res Technol (2008) 226:1513–1524
DOI 10.1007/s00217-007-0683-z

ORIGINAL PAPER

Modelling the limit of detection in real-time quantitative PCR

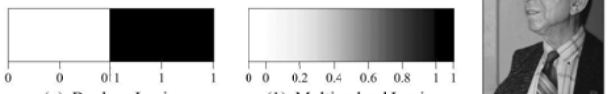
M. Burns · H. Valdivia

What does "percentage of GMOs" actually mean?

Guy Van den Eede is head of the GMOs and Biotechnology Unit of the Institute for Health and Consumer Protection.

What the percentages actually stand for hasn't always been clear. In the past, we've interpreted it as a weight/weight ratio, so for a one percent reference we would mix one gram of GM grain with 99 grams of conventional grain. But you could also view it as the percentage of individual kernels that are GM. In that case you would just take one individual GM kernel and mix it with 99 conventional kernels, regardless of the weight. Fortunately, there's now a general consensus about how to define what the percentages mean. Rather than the weight, we've found the best way to do it is to go straight to the DNA. We mix one gene from a GMO together with 100 copies of a gene for that crop. This is important because instead of needing to painstakingly mix reference material and extract DNA, we just take DNA we make in the lab and mix it just how we need it. It takes much less effort and is actually much more precise.

Uncertainty and Fuzzy Logic



(*a*) Boolean Logic. (*b*) Multi-valued Logic.

Lotfi Zadeh

Boolean Logic：{True，False}；{0，1}

Fuzzy Logic：**Partial true (partial false)**

Food Anal. Methods (2008) 1:126–135
DOI 10.1007/s12161-008-9021-8

Expanding Horizons in the Validation of GMO Analytical Methods: Fuzzy-based Expert Systems

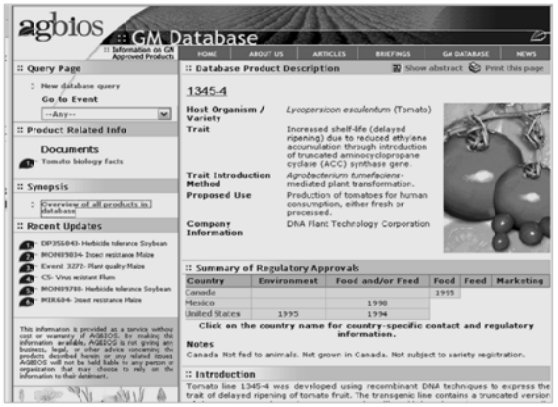
Gianni Bellocchi · Marco Acutis · Claudia Paoletti · Roberto Confalonieri · Patrizia Trevisiol · Emanuele Grazioli · Chrystele Delobel · Cristian Savini · Marco Mazzara · Guy Van den Eede

Abstract Validation is the process establishing the suitability of an analytical method for a particular purpose. Various guidelines defining statistical procedures for validation of chemical, bio-chemical, pharmaceutical, and molecular methods have been developed, and ad hoc validation metrics (indices and test statistics) are available and routinely used, for in-house and interlaboratory testing and decision making. However, there is no universally accepted practice for assay validation, and often, subjectivity plays an important role in the interpretation of validation studies' results. Instead, the key to rational validation studies relies upon the formalization and harmonization of procedures for their design and interpretation of results. Fuzzy-based techniques can be helpful in such respect. Fuzzy logic allows summarizing the information obtained by classic independent validation statistics into one synthetic index of overall method performance. The possibility of having a comprehensive indicator of method performance has the advantage of permitting direct method comparison, facilitating the evaluation of many individual, possibly contradictory metrics. The objectives of this paper are to illustrate the advantages that a fuzzy-based aggregation method could bring into the validation of analytical methods and to propose its application for the evaluation of methods' performance. Validation metrics are compared for practical examples of assessment of method performance in collaborative studies. Fuzzy logic-based rules are shown to be applicable to improve insights into method quality and interpretation of results.

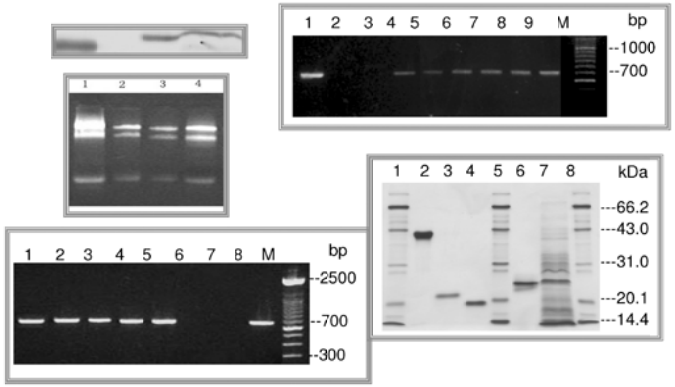
5. Our Lab's work

1. study on transgenic plant vaccines for several years
2. Southern GMOs online
3. Constitution of the Reference and Calibrate Materials system for GMC/GMF Nucleic Acids detection based on Reverse Diagnostics
4. Real time PCR and xMAP
5. Join international cooperation and calibration
6. Application and evaluation of this technology system

Why tomato?



Molecular Identification of Transgenic Tomato



Homepage of *Southern GMOs*

Southern GMOs

Fig1. Gene Bank

Fig2.News

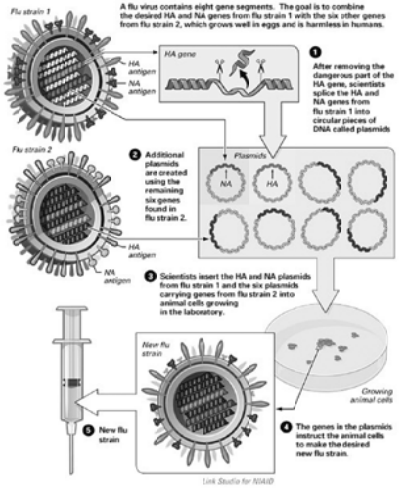
Fig3.Online consultation

Fig4.Internal communication

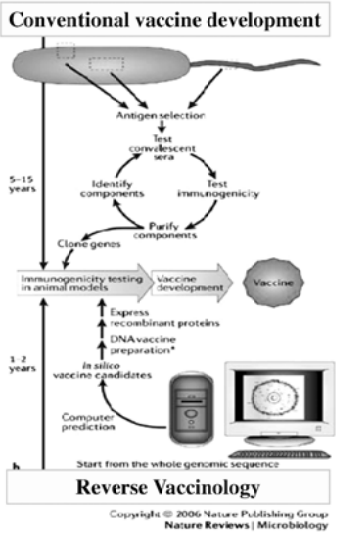
Fig5.GMOs class online

Fig6.Enterprises introduction

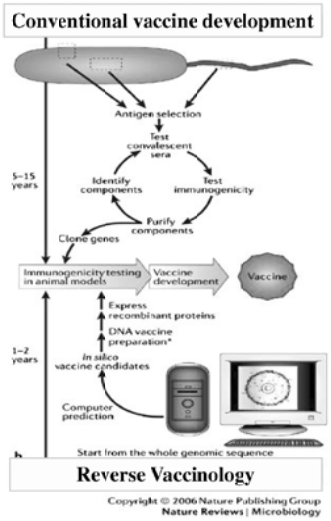
Reverse Genetics



Reverse Vaccinology

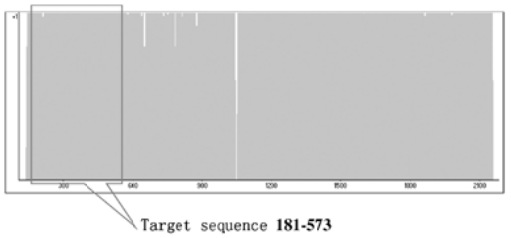


Why not Reverse Diagnostics?

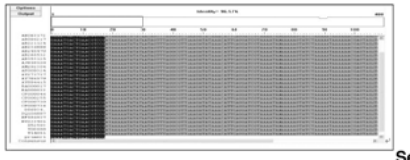


Reverse Diagnostics: Bioinformatics with Molecular Biological Technology

The rapidly growing knowledge about organisms genomes, gene expression and metabolism of both model and crop plants provides a rich source of information for biotechnological applications.



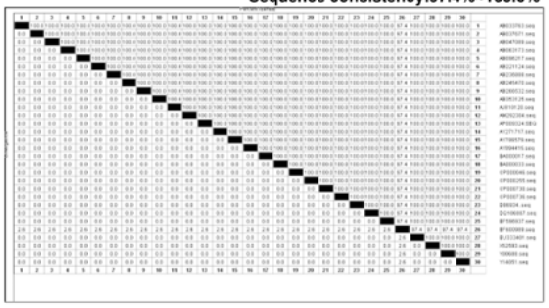
Vector NTI Suite Advanced 9.01 (Invitrogen.co，USA)

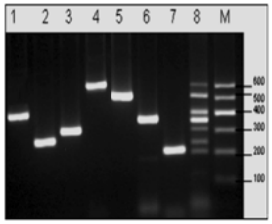


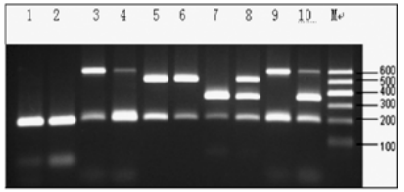
DNAMAN

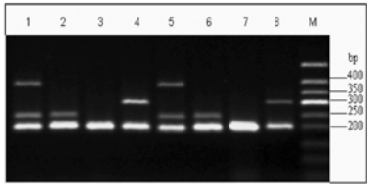
MegAlign(GeneStar™ Lasergene 7.1，GeneStar,USA)

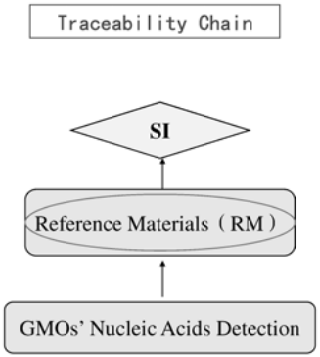
Sequence consistency:97.4%~100.0%











Reverse Diagnostics: Bioinformatics with Molecular Biological Technology

Reference Materials

- **common screening: P35S, T-nos, selective genes**
- **identifying: insert genes , EPSPS, tSAG1**
- **event-specific: junction region**
- **Species-specific: endogenous genes of target crops**

Agrobacterium virus

Anal Bioanal Chem (2004) 378 : 1198–1207
DOI 10.1007/s00216-003-2372-5

SPECIAL ISSUE PAPER

Isabel Taverniers · Erik Van Bockstaele · Marc De Loose

Cloned plasmid DNA fragments as calibrators for controlling GMOs: different real-time duplex quantitative PCR methods

This paper demonstrates that plasmid DNA molecules containing either one or multiple target sequences form perfect alternative calibrators for GMO quantification and are especially suitable for duplex PCR reactions.

Eur Food Res Technol (2006) 224:249–258
DOI 10.1007/s00217-006-0376-z

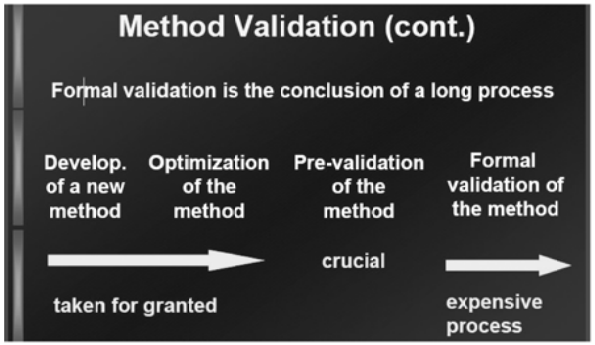
ORIGINAL PAPER

Comparison of plasmid and genomic DNA calibrants for the quantification of genetically modified ingredients

Malcolm Burns · Philippe Corbisier · Gordon Wiseman · Hernan Valdivia · Paul McDonald · Peter Bowler · Katrina Ohara · Heinz Schimmel · Diana Charels · Andrew Damant · Neil Harris

A recent EU Commission recommendation (2004/787/EC) advocates expressing the GM percentages measured as the percentage of the number of GM target DNA sequence per target taxon specific sequence calculated in terms of haploid genomes. Plasmid calibrants certified on the basis of copy number may therefore be needed to fulfill this new definition of GM percentage. The demonstration of the applicability of using pDNA as opposed to extracted gDNA for quantitative PCR calibration is therefore of particular importance.

Development of Real time PCR and xMAP standard detection system



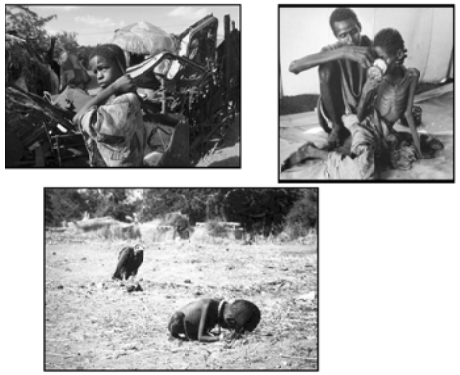
Join international cooperation and comparison and calibration
Application and evaluation of this technology system

- **New Transgenic Plant Evaluation**
- **GMC/GMF Trade**
- **Monitoring Environment Biosafety of GMC/GMF**
- **Evaluating the Healthy Biosafety of GMC/GMF**

6. Establishing the Joint Calibration Labs and Network Labs for GMOs detection is necessary to APLMF

- **Decrease International Trade Disputes，for Energy Saving and Environmental Protection**
- **Global Disasters： Food Crisis**

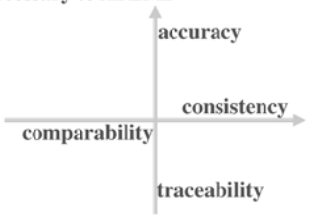
- **Global Disasters： Food Crisis**



More than 800 million People world-wide suffer from hunger and malnutrition

➢Establishing the Joint Calibration Labs and Network Labs for GMOs detection is necessary to APLMF

- CRMs development and production
- Methods development
- Measurement standardization
- Training



Summary

- GMOs Biosafety?
- Traceability and transferability of GMOs Nucleic Acid Detection
- Real time PCR, xMAP
- CRM, Reverse Diagnostics
- Ring trial , International cooperation

中国计量科学研究院
National Institute of Metrology P.R.China

Need and development of new Biotech-CRMs in Food Safety & Agricultural Products

Dr. WANG JING
National institute of Metrology (NIM)
China
2008. 6. 5

Outline

- ✓ New challenges
- ✓ Food safety analysts
- ✓ Biotechnology CRMs
- ✓ International activity
- ✓ Conclusion

1. New challenges

Concerns:

- Health protection
- Safety (Food safety)
- Trade

Concern food safety trade problem

- Genetically modified organisms (GMOs)*
- Microbiology
- Allergen
- Biological toxins
- Canned mushrooms enterotoxin
- Bovine Spongiform Encephalopathy ("mad cow" disease)
- Avian Influenza (“Bird Flu”)

Agricultural GMO products current status :

ISAAA annual report in 2007
- more than 100 species commercialized
- 114 million hectares in the world soybean, maize, rape……

Food Safety

International and domestic mandatory labeling :

- Fulfill regulatory requirements in more than 40 countries that require labeling
- Mandatory labeling （EU 0.9%，Korea 3%，Japan 5%.....）

中国计量科学研究院 National Institute of Metrology

2. Food safety analysts

Important bio-measurement

Health protection

biological toxins | GMO | pathogenic microorganisms

Virus | allergen | Infection pathogen

(qualitative and quantitative)*

reference materials | **Standard methods** | method validation

中国计量科学研究院 National Institute of Metrology

Biotechnology-derived grains test

Quantifying the amount of biotechnology component contained within a sample of grain.

1. **molecular biology** methods (e.g. PCR)
2. **Chromatography** with mass spectrometric detection (e.g. LC/MS/MS)
3. **Immunology methods** (e.g. ELISA)

GM rice events(2006): different lab give different results

中国计量科学研究院 National Institute of Metrology

GMO Products standard method system

International standard	National standard	Industry standard
Qualitative nucleic acid based methods	GB/T19495.1-2004	SN/T1193-2003
Quantitative nucleic acid based methods	GB/T 19495.2-2004	SN/T1194-2003
Nucleic acid extraction	GB/T19495.3-2004	SN/T1816-2006
Protein based methods	GB/T19495.4-2004	SN/T1195-2003
General requirements and definitions	GB/T19495.5-2004	SN/T1196-2003
	GB/T19495.6-2004	SN/T1197-2003
	GB/T19495.7-2004	SN/T1198-2003
	GB/T19495.8-2004	SN/T1199-2003
		SN/T1200-2003
		SN/T1201-2003
		SN/T1202-2003
		SN/T1203-2003
		SN/T1204-2003

Current Status on Standard:
5 International standards, 8 national standards, more than 20 industry standards

中国计量科学研究院 National Institute of Metrology

- **Now the biotechnology testing cannot control, and shows the data is not comparable all over the world.**
- For official food safety control, methods should be **validated**.

- **Facing analysts challenge**

1. It is understood that internationally recognized reference materials for biotechnology-derived grains do not exist.
2. And does have a limited number of reference materials.
3. Analysis can produce varying results due to many factors including non- reference materials.
4. Scientists have the challenge of detecting and quantifying the amount of biotech component to fulfill regulatory requirements in countries that require labeling.
5. It must be stressed that method validation goes hand in hand with suitable test materials and method performance can be improved when reference materials are used for calibration of the analysis/test system.

- **Developing Biotechnology RMs/CRMs**

Food safety analysts

3. **Biotechnology RMs/CRMs**

Prior to:
DNA/RNA
PROTEIN

Biological toxins | **GMO** | **Microbiology**

allergen | **Virus**

Achieve

(Qualitative and quantitative highest quality results)*

Biotech CRMs in China

Biotech Foods

- **GMO CRMs**

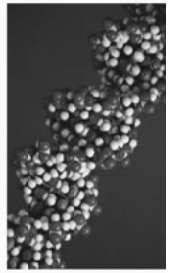
First step —— GMO soybean powder

- **Nucleotide CRMs**

5 nucleotides CRM：ATP，GTP，CTP，UTP，TTP

- **Microbiology CRMs**

Bacteria total numbers CRM



In the past three years

Microbiological Reference Materials in EU

Organism	Unit	Certified value	Matrix	Application
Enterococcus faecium (BCR-506)	CFU	76*, 72*, 109*	cells in milk powder	cell count
Enterobacter cloacae (BCR-527)	CFU	34	cells in milk powder	cell count
Bacillus cereus (BCR528)	CFU	53.4 – 55.8*	cells in milk powder	cell count
Escherichia coli WR1 (BCR-594)	CFU	36*,40*,49*, 56*	cells in milk powder	cell count
Listeria monocytogenes (BCR-595)	CFU	7.2	cells in milk powder	cell count
Salmonella typhimurium (BCR-507R)	CFU	5.0	cells in milk powder	cell count
E. coli O157 (IRMM-449)		identity	Genomic DNA	diagnostic PCR
L. monocytogenes (IRMM-447)		identity	Genomic DNA	diagnostic PCR

中国计量科学研究院 National Institute of Metrology

4. International Activity

- CCQM pilot study
  - **P44 (on quantitative PCR)** 2004，2005，2007
  - **P53 (evaluating the stability of AFLP as a DNA profiling technique)** 2004
  - **P54 (based on developing primary MS based methods for quantification of DNA and the development of a traceable DNA quantification standard.)** 2005，2006，2007
  - **P60 (on developing a reference method for DNA extraction – using GM as a model system)**
  - **P55 (develop appropriate RMs and reference methods for complex peptide and protein/proteome measurements to meet industrial requirements)** 2006，2007
  - **P58 (focusing on fluorescence MU in ELISA assays)** 2005，2006
  - **P59 (based on Circular Dichroism Spectroscopy)** 2005，2006

Development

中国计量科学研究院 National Institute of Metrology

5. Conclusion

- Challenges need develop new biotech-CRMs
- First need GMO and Microbiology CRMs
- Biotech-CRMs are used for calibration of the analysts system ensure the method validation
- Biotech-CRMs are used to achieve the highest quality results of food safety
- New need and challenges bring biotech-CRMs development

中国计量科学研究院 National Institute of Metrology

谢谢！
Thank you!

中国计量科学研究院 National Institute of Metrology

AIST NMIJ National Metrology Institute of Japan

Current activities of APMP-TCQM and NMIJ CRMs for the Determination of Contaminants in Food

APEC/APLMF Workshop on Metrology in Food Safety, Agricultural Products and Product Safety

Lakeview Hotel Hangzhou in Hangzhou city, PR China

4-6 June 2008

Takashi Yarita and Kenji Kato

National Metrology Institute of Japan (NMIJ), AIST

AIST NMIJ National Metrology Institute of Japan

Contents

AIST NMIJ National Metrology Institute of Japan

I. Current activities of TCQM in APMP

AIST NMIJ National Metrology Institute of Japan

I-1. Member of APMP

1. Full member

32 Organizations from 21 economies

Australia (NMIA, ARPANSA, ANSTO), Bangladesh (BSTI), China (NIM), Chinese Taipei (CMS/ITRI, INER, Chunghwa Telecom Co., Ltd.), DPR of Korea (CIQM), Fiji (Fiji National Measurement Laboratory), Hong Kong China (HKSCL, GL), India (NPL, BARC), Indonesia (KIM-LIPI), Japan (NMIJ/AIST, NICT, CERI), (the Republic of) Korea (KRISS), Malaysia (SIRIM-Berhad, MINT), Mongolia (MASM), Nepal (NBSM), New Zealand (MSL-IR), Pakistan (NPSL), Philippines (ITDI), Singapore (SPRING Singapore), Sri Lanka (MUSSD), Thailand (NIMT, DSS, TISTR), Vietnam (VMI)

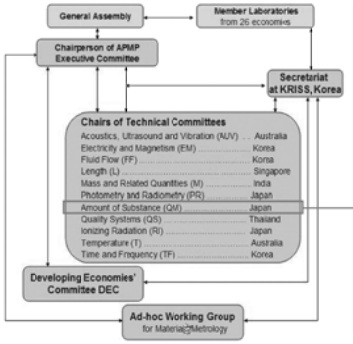
2. Associate Member

5 NMIs

Egypt (NIS), Jordan (JNMI), Russia (VNIIM), South Africa (NMISA), Syria (NSCL)

http://www.apmpweb.or

I-2. Structure of APMP



TCQM Chair : Dr. K. Kato NMIJ Japan

- **Organic Analysis WG**
  - Dr. Lindsey Mackay of NMIA
- **Inorganic Analysis WG**
  - Mr. Liandi Ma of NIM
- **Gas Analysis WG**
  - Dr. Kenji Kato of NMIJ
- **Electrochemical Analysis WG**
  - Dr. Euijin Hwang of KRISS
- **Surface Analysis WG**
  - Isao Kojima (NMIJ)
- **Bio Analysis WG**
  - Dr. Kerry Emslie of NMIA
- **Key Comparison WG**
  - Dr. Lindsey Mackay of NMIA

I-3. Objective of APMP

1. Information exchange on measurement standards and capabilities
2. International credibility for measurement traceability and competence as a basis for global Mutual Recognition Arrangement (MRA) for metrology standards and calibration certificates issued by National/Territorial Metrology Institutes
3. Training of personnel to upgrade measurement capability within the region
4. Traceability of measurement through calibration and comparison of national/territorial standards
5. Extend collaboration with BIPM and also with other counterpart regional bodies, e.g., EUROMET, SADCMET, SIM(NORAMET, SURAMET etc.), COOMET, MENAMET
6. Support APEC objectives

I-4. Activities of APMP

1. Global Mutual Recognition Arrangement (MRA)… review and submission of CMCs from APMP
2. International comparisons: to arrange participants of BIPM comparisons and to organize APMP-key and supplementary comparisons and pilot studies
3. Conduct of training, workshops, conferences: including APEC fund to share information, knowledge, and improve skills and know-how in metrology
4. Collaboration with other Asia-Pacific SRBs and other regional metrology organizations and BIPM

II. CMCs from APMP

CMC claims for QM recorded in Appendix-c on KCDB. (24, October 2007) are:

Australia:	64 (8)*
China:	141 (18)*
Chinese Taipei:	3 (0)*
Japan:	170 (3)*
Korea:	301 (24)*
Total CMC claims:	676 (53)*

* Category 11: Food and contains subcategories, (May 2008)
11.1: Nutritional Constituents, 11.2: Contaminants, 11.3: GMOs, and 11.4: Other.

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CMCs submitted in the Cycle IX at 6 March 2008

Economy	Category													Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	
AR		5	6		2								9	22
AU				10										10
CN	16	8					1		1			1		27
HK China											2		5	7
JP			1	15							15			31
KR	2	10	16	59						26	17		9	139
Total New Claims	18	23	23	84	2	0	1	0	1	26	34	1	23	236

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III–1. CCQM and APMP TCQM Key Comparisons and Pilot Studies

Name	Subject of comparison	FY '99	'00	'01	'02	'03	'04	'05	'06	'07	'08	Pilot Lab	Paticipants
CCQM-P04	pp'-DDE in corn oil	●										LGC	NRC, BAM, PTB, KRISS, VNIM, LGC, NIST
CCQM-K05	pp'-DDE in fish oil	●										LGC	NIST, BAM, KRISS, NARL, NRC, NRCCRM, PTB, VNIIM
CCQM-P10	DDT, Hexachlorocyclohexane in fish oil	●										LGC	NARL, NRC, NRCCRM, BAM, KRISS, SMU, VNIM, NIST
CCQM-K21	pp'-DDT in fish oil		●									LGC	NARL, NRC, NRCCRM, BAM, VNIM, NIST, KRISS
CCQM-P10.2	Hexachlorocyclohexane in fish oil		●									LGC	NARL, NRC, BAM, KRISS, VNIM, NIST
CCQM-P12	Pb in wine		●									IRMM	NMIJ, BAM, CENAM, CSIR-NML, EMPA, KRISS, LGC, LNE, NARL, NRCCRM, PTB, VNIIM
CCQM-P11	As in Shellfish			●								NIST	NMIJ, CCHEN, CENMA, CENA/USP, Dalhousie, IRMM, KRISS, LGC, NRC, TU Delft
CCQM-P13	Metals in synthetic food digest			●								LGC	IRMM, KRISS, NARL, NIST, VNIIM etc.
CCQM-P29	Cd and Zn in Rice			●								IRMM/NMIJ	[illegible]
CCQM-K24	Cd in rice			●								IRMM/NMIJ	[illegible]
APMP.QM-P01	pp'-DDE in fish oil			●								NARL	HKGL, 3KT-LIPI, Malaysia, The Philippines, PSB, ITI, CSIR-NML
APMP.QM-P02	Cd in rice			●								NARL	NMIJ, KRISS, NRCCRM, CSIR-NML, GL, CFTRI, NPL-I, RCC-LIPI, NPSL, ITDI, PSB, ITI
CCQM-K27b	Ethanol in wine				●							LGC	NARL, NRCCRM, LNE, BAM, KRISS, VNIIM, NIST
CCQM-K31	As in Shellfish				●							NIST	NMIJ, KRISS, NRC, CENA, IMGC, IAEA
APMP.QM-P03	N, Ca, Cu, Pb in milk powder				●							NIM	
CCQM-P39	As, Hg, Pb, Se, Methylmercury in tuna fish					●						IRMM	[illegible]
CCQM-P57	PCB Congeners in Tissue Extract						●					NIST	BAM, CENEM, IRMM, KRISS, NRCCRM, etc.
CCQM-P67	PCB Congeners in Tissue						●					NIST	BAM, CENEM, IRMM, KRISS, NRCCRM, etc.
CCQM-K43/P39.1	As, Hg, Pb, Se, Methylmercury in Salmon						●					IRMM	NMIJ, BAM, IAEA, IMGC, INMETRO, KRISS, LGC, LNE, NIST, NMIA, NRC
CCQM-P64	Cu, Zn, Fe and Ca in nonfat soybean powder							●				NIM	NMIJ, IAEA, NIST, PTB, UME, CENAM, CSIR-NML, KRISS, ALLNL, GL, IMGC, INTI, NMIA, etc.
CCQM-K45	Toxic Metals in Food (Sn in Tomato Paste)							●				LGC	KRISS, LNE, PTB, UME
APMP.QM-P04	p,p'-DDE in fish oil							●				NARL	
CCQM-P78	Nutrients in Infant/Adult Formula: Vitamins								●			NIST	NMIJ, KRISS, NIM, etc
CCQM-P12.1	Pb, Fe, Cu, Cd in wine								●			LGC	CMQ, INM, INMETRO, INTI, NMIA etc
CCQM-P72	Toxic Metals in Food (Sn, Pb and Cd in Tomato Paste)								●			LGC	BAM, IMGC, IRMM, KRISS, LNE, PTB, UME etc
CCQM-P86	Total Se and Se methionine in pharmaceutical supplements								●			LGC/NRC	NMIA, NRCCRM, NIST, INRIM, LNE, INTI etc
CCQM-K30	Pb in wine								●			LGC	NMIJ, KRISS, INMETRO, LNE, PTB etc
CCQM-K49/P85	Toxic and essential elements in bovine liver								●			NIST	[illegible]
APMP.QM-P05	Cd in oyster tissue								●			KRISS	
APMP.QM-P07	Trace elements in soybean powder								●			NIM	Parallel to CCQM-P64
CCQM-P88	Malachite green in fish									●		LGC	NMIA, GL(Hong Kong), NIM, KRISS, NIMT, BVL
CCQM-P90	Chloramphenicol in milk									●		BVL	PTB, GL(Hong Kong), CENAM, NIMT, NMISA, etc
CCQM-K62	Nutrients in infant/adult formula: vitamins									●		NIST	NMIJ, KRISS, NIM
CCQM-P109	Determination of acrylamide in potato chips									●		KRISS	NIM, BAM, NIMT, NFRI, etc
CCQM-P96	As and arsenobetaine in marine fish (swordfish)									●		NMIJ/NIM	KRISS, UME, BAM, NIST, NPLI
CCQM-P97	Cd and Pb in Herb									●		GL-HK	IAEA, NIST, NPLI, KRISS, INTI, LNE, NIM etc.
CCQM-K43.1	As, Hg, Se and Methylmercury in marine fish (swordfish)									●		NMIJ	NIM, NIST, KRISS, UME etc.
CCQM-K56/P64.1	Ca, Fe, Zn and Cu in whole fat soybean powder									●		NIM	NMIJ, NIST, PTB, UME, KRISS, IAEA, NIMT, CENAM, VNIIM etc.
APMP.QM-P10	Cd and Pb in Herb									●		GL-HK	NIM, HKGL, CFTRI, ITRC, NPLI, LIPI, KRISS, NBSM, NPSL, DMS, NIMT, TISTR
APMP.QM-P11	As and arsenobetaine in marine fish (swordfish)									●		NMIJ/NIM	KRISS, NPLI, DMSc (Thailand)
CCQM-K60/P86.1	Total Se and Se speciation of Se-rich wheat flour										○	LGC/NRC	NMIJ, NRC etc.
APMP.QM-K24	Cd in rice powder										○	KRISS	NMIJ, NIM, etc
CCQM-P91	Pyresroides in apple juice											NIM	NMIJ, etc (Planning)

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III–2. APMP TCQM Key Comparisons and Pilot Studies

Comparison	Subject of comparison	Period	Pilot Lab	Participants	Preceding or parallel Comparisons
APMP.QM-P01	pp'-DDE in fish oil	2001	NARL	NARL, HKGL, 3KT-LIPI, Malaysia, The Philippines, PSB, ITI, CSIR-NML	CCQM-K05 LGC (1999)
APMP-QM-P02	Cd in rice	2001	NARL	NMIJ, NARL, KRISS, NRCCRM, CSIR-NML, GL, CFTRI, NPL-I, RCC-LIPI, NPSL, ITDI, PSB, ITI	CCQM-K24 IRMM/NMIJ (parallel)
APMP-QM-P03	N, Ca, Cu, Pb in milk powder	2002	NRCCRM		
APMP-QM-P04	p,p'-DDE in fish oil	2005	NARL		APMP-QM-P01 (2001)
APMP-QM-P05	Cd in oyster tissue	2006	KRISS		
APMP-QM-P07	Trace elements in soybean powder	2006	NRCCRM	NMIJ, NIM, IAEA, NIST, PTB, UME, CENAM, CSIR-NML, KRISS, ALLNL, GL, IMGC, INTI, NMIA, etc.	CCQM-P64 (parallel)
APMP.QM-P10	Cd and Pb in Herb	2007	Govt Lab HK china	NIM, HKGL, CFTRI, ITRC, NPLI, LIPI, KRISS, NBSM, NPSL, DMS, NIMT, TISTR	CCQM-P97 GL-HK China (parallel)
APMP.QM-P11	As and arsenobetaine content in marine fish (swordfish)	2007	NMIJ/NIM	NMIJ, NIM, KRISS, NPLI, DMSc (Thailand)	CCQM-P96 NMIJ (parallel)
APMP.QM-K24	Cd content in rice powder	2008	KRISS	NMIJ, NIM, KRISS, etc.	CCQM-K24 IRMM/NMIJ (2001)

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Summary of APMP TCQM activity

1. **APMP's primary object is MRA and submission of CMCs to BIPM, conducting international comparisons and arranging many meetings.**
2. **The interest level for CRMs related to international trade is increasing in APMP (Food, RoHS).**
3. **Number of CMCs in category 11 (Food) is about 8 % of total number of CMCs and is increasing.**
4. **Many International comparisons relating food were conducted and many APMP economies are involved in these comparisons.**
5. **Results of these comparisons show reliable CRMs are required for trace level analysis of food contaminants.**

http://www.apmpweb.or

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NMIJ CRMs for the Determination of Contaminants in Food

Major Food CRM Producers in Japan

- **NIES: National Institute for Environmental Studies**
- CRM No.10, Rice Flour Unpolished (3 Cd levels): **13 elements.**
- CRM No.11, Fish Tissue: **Total tin and tributhyltin.**
- CRM No.27, Typical Japanese Diet: **14 elements.**
  (Certified values is provided from interlaboratory studies.)
- **JSAC: Japan Society for Analytical Chemistry**
- PT 0711, Powdered Milk RM: **Protein, lipid, ash, Ca, Fe, Na and P.**
- PT 0721, Fish Sausage RM: **Protein, lipid, ash, Ca, Fe, Na and P.**
  (Certified values is provided from interlaboratory studies.)
- **NFRI: National Food Research Institute**
- GMO Corn and Soybean CRMs (in progress) : **GM concentrations.**
- **- intended for the validation of GMO analysis.**
  (Certified values is provided from interlaboratory studies.)
- **NMIJ: National Metrology Institute of Japan**
- NMIJ CRM 7402-a: **13 elements and organo metal (As and Hg)**
- NMIJ CRM 7501-a: **White Rice Flour (17 elements, Cd level Ⅰ: 0.05 mg/kg)**
- NMIJ CRM 7502-a: **White Rice Flour (17 elements, Cd level Ⅱ: 0.50 mg/kg)**
- NMIJ CRM XXXX-a: **Japanese seabass, Organochlorine Pollutants (PCBc)**
- NMIJ CRM XXXX-a: **Pesticides in Unpolished Rice,** (Fenitrothion, Isoprothiolane, Ethofenprox, Fthalide)

I. Feature of NMIJ CRMs

NMIJ's Activities in Matrix CRMs Production

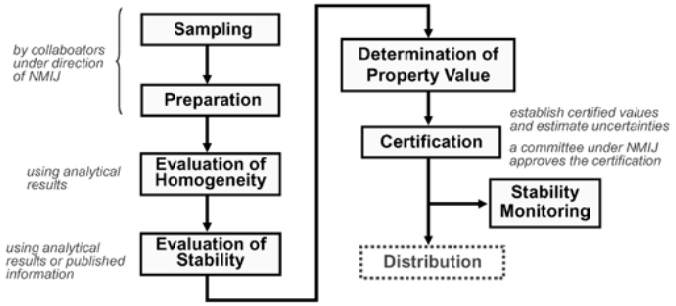
- **Since 2001, NMIJ has been developing matrix CRMs for environmental monitoring.**
  - 6 sediment CRMs for elements,PCBs, organochlorine pesticides and organotins analysis
  - 2 river water CRMs for elements analysis
  - 4 mineral oil CRMs for PCBs analysis
- **NMIJ is working on the development of matrix CRMs for food analysis now.**

Policy on Analytical Methods for Certification

- **NMIJ's results should be included. (Usually only NMIJ's data was used.)**
- **Isotope-dilution mass spectrometry (IDMS) is principally applied.**
  - ***...to establish the traceability to SI***
  - ⇒ *IDMS has potential to be operated as a primary method of measurement*
- **Two or more analytical methods are applied.**
  - ***... because analytical values may be biased***

Flow Diagram of CRMs Development

Both environmental and food CRMs are developed by this process



Our management system based on ISO Guide 34 is accredited by a third body (National institute of Technology and Evaluation)

II. Examples of Completed CRMs

II-1. Trace Elements, Arsenobetaine and Methylmercury in Cod Fish Tissue

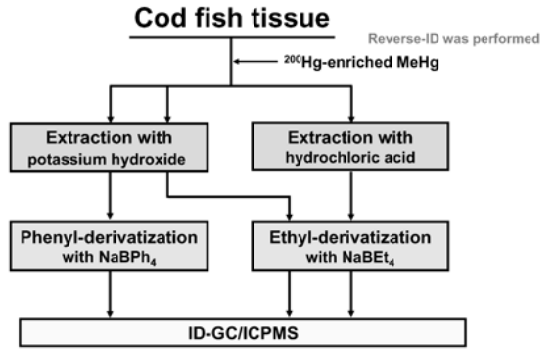
NMIJ CRM 7402-a **(issued last year)**

	Certified value ± *U* (*k* =2)	
Cr	0.72 ± 0.09	mg/kg
Mn	0.41 ± 0.03	mg/kg
Fe	11.2 ± 0.9	mg/kg
Ni	0.38 ± 0.05	mg/kg
Cu	1.25 ± 0.07	mg/kg
Zn	21.3 ± 1.5	mg/kg
As	36.7 ± 1.8	mg/kg
Se	1.8 ± 0.2	mg/kg
Hg	0.61 ± 0.02	mg/kg
Na	3.6 ± 0.2	g/kg
Mg	1.34 ± 0.03	g/kg
K	22.3 ± 1.0	g/kg
Ca	0.52 ± 0.05	g/kg

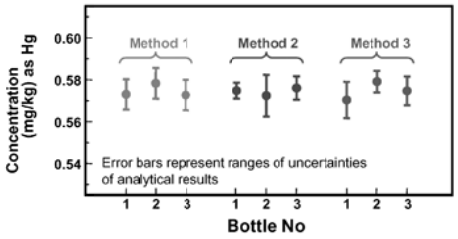
	Certified value ± *U* (*k* =2)	
Arsenobetaine (as As)	0.72 ± 0.09	mg/kg
Methylmerculy (as Hg)	0.41 ± 0.03	mg/kg

The raw cod fishes were collected from the northern part of the Sea of Japan.

Analytical Methods for the Certification of Methylmercury (MeHg)

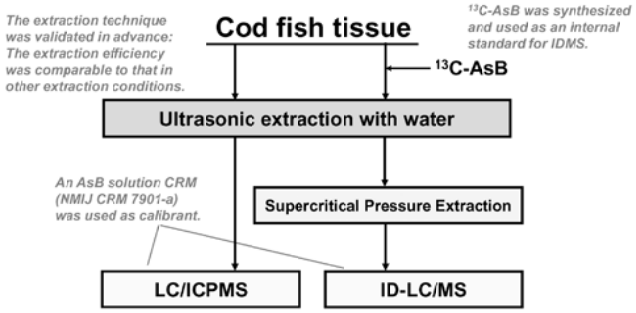


Comparison of Analytical Results of CRM 7402-a



Analytical method:
1. Extraction with KOH and phenyl-derivertization
2. Extraction with KOH and ethyl-derivatization
3. Extraction with HCl and ethyl-derivatizationation

Analytical Methods for the Certification of Arsenobetaine (AsB)



White Rice Flour

for trace elements analysis

NMIJ CRM 7501-a: Cd level Ⅰ: 0.05 mg/kg

NMIJ CRM 7502-a: Cd level Ⅱ: 0.50 mg/kg ··· *almost the same as the international standard proposed by CAC*

These CRMs was issued in March 2008.

Analytical Methods for the Certification of CRM 7502-a

Eleven elements are certified using analytical methods based on IDMS

Analytical technique	Element																
	P	Cr	Mn	Fe	Ni	Cu	Zn	As	Sr	Mo	Cd	Ba	Pb	Na	K	Mg	Ca
ID-ICPQMS			●	●	●	●	●		●	●	●	●					
ID-ICPHRMS		●											●				
ICPQMS	●	●	●	●	●	●	●	●		●	●	●	●				
ICPHRMS	●	●			●			●	●				●				
ICPAES	●		●	●			●		●					●	●	●	●
GFAAS		●	●	●		●	●	●			●						
FAAS														●	●	●	●
Flame-phctometry														●	●	●	●

More than two analytical methods are applied for the certification

Summary

- **CRMs intended to validate residue/contaminant analyses in food are required.**
- **NMIJ is working on the development of matrix CRMs for these analyses.**
- **By applying highly accurate analytical methods, NMIJ CRMs provide reliable certified values.**

Thank you for your attention !!

SIRIM

Certified Reference Materials: Tools for Achieving National Traceability and International Comparability of Measurement

Dr. Osman Zakaria
National Metrology Laboratory,
SIRIM Berhad,
Malaysia

APLMF WORKSHOP 2008
HANGZHOU, CHINA, JUNE 2~6, 2008

Outline

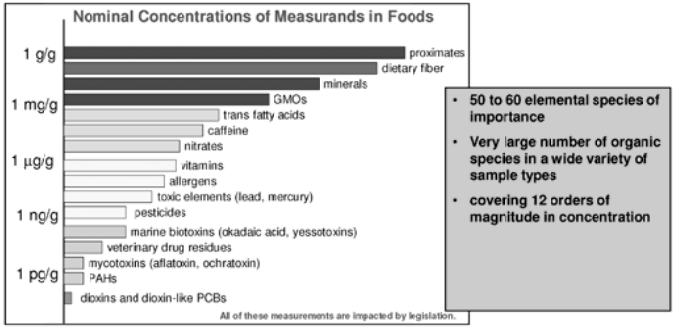
- Chemical Measurements
- Global issues
- Worldwide Comparability through Traceability
- The needs of Reference Materials
- Chemical Metrology Infrastructure
- Conclusion

The Importance and Complexity of Chemical Measurements

- According to a study released by the Council for Chemical Research, **chemistry is core or important to virtually all industrial sectors and technology areas**
  - *"Measuring Up: Chemical R&D Counts for Everyone", CCR, 2006*
- **For metrology in chemistry** the task is to determine the quantity of a **specific chemical entity** and not merely "amount of substance"
- **Chemical measurements are multidimensional**
  - a large number of chemical entities (>10^5)
  - in a broad range of matrices (10^2)
  - and mass fractions ranging from <10^{-12} to 1

... an example of this complexity

Regulated Classes of Chemicals in Foods

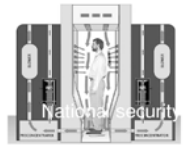


Global Issues

- National and International Trade
- Environmental Decision-making
- Assessing Food Quality
- Healthcare Decision-making

Cont'd

- Realibility of National Safety Related Measurements and Data
- Realibility and Acceptable of Forensic-Related Measurements and Data
- Innovation and Industrial Competiveness



Internationally – Accepted Chemical Measurements Facilitate

- Trade specifications
- Compliance with regulations (a.o. in-vitro diagnostics, food safety, pollution control)
- Labeling (vitamins, amino and sorbic acids, fat, GMO's, caffeine, additives, pigments)
- Tariff classification/customs (butter fat, sugars, caffeine, fat in milk, protein in meat)
- EU REACH legislation
- Accreditation and certification
- Avoidance of market distortions in a single market

Cont'd

- Internationally trade agreements (WTO)
- Technical Barriers to Trade (WTO TBT)
- Sanitary and Phyto-Sanitary measures (SPS)
- Trade agreements (e.g. EU – other nations)
- Regulations (EU Directives, US legislation, national regulations)
- JCTLM, WHO, Codex Alimentarius, Pharmacopeia, ISO, sector specific standardization bodies
- Accreditation (ILAC Arrangements, e.g. based on ISO 17025, 15189, 15195, WADA, etc.)
- WMO Global Atmospheric Watch, climate change
- Addressing traceability and measurement uncertainty

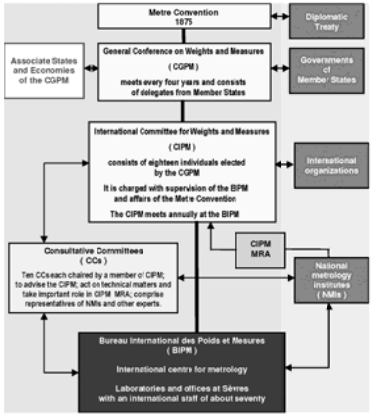
Establishing worldwide comparability through traceability

- Inter-Governmental Treaty of the "Metre Convention", established in 1875
- Member States (51) and Associate countries and economies (30) (December 2005)
- 10 Consultative Committees
- International Bureau of Weight and Measures (BIPM) in Sèvres,France
- Coordinating and representing the National Metrology Institutes (NMI's) globally

The Meter Convention

Provides the framework within which the international measurement system is maintained and made available to the whole world for:

- National and international trade
- Manufacturing
- Human health and safety
- The protection of the environment, and
- All aspects of science and engineering



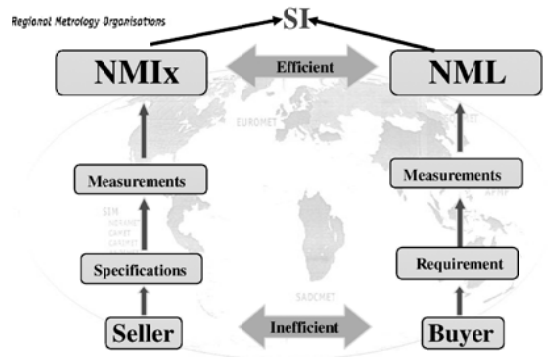
Traceability and Comparability

- Need for accredited CRM producers and accredited (sector specific) reference/calibration laboratories linking the NMIs to the field laboratories
- Need for Proficiency Testing schemes with traceable assigned reference values

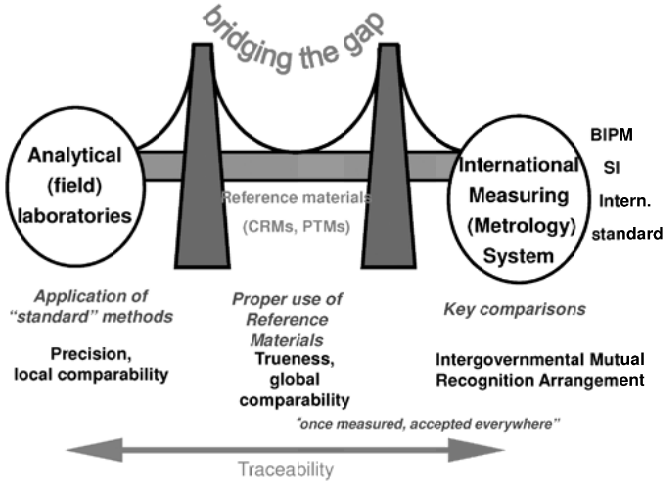
CIPM MRA basis for global comparability through internationally recognised traceability

Measurement Traceability to stated references.

And global confidence in this realization are the basis for mutual recognition and confidence in data use to facilitate and underpine international trade and decisions regarding health, safety, commerce, and/or scientific studies

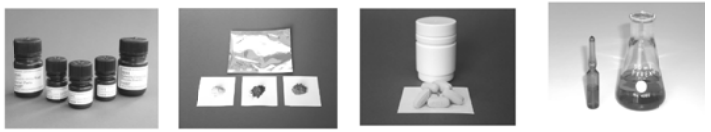


Traceability of analytical results



The needs of Reference Materials

- Method validation
- Calibration
- Estimation of measurement uncertainty
- Training
- Internal quality control
- External quality assurance (proficiency testing)



Types of RM

- Pure substances characterised for chemical purity and/or trace impurities.
- Standard solutions and gas mixtures often prepared gravimetrically from pure substances and used for calibration purposes.
- Matrix reference materials characterised for composition of specified major, minor or trace chemical constituents. Such materials may be prepared from matrices containing the components of interest, or by preparing synthetic mixtures.

Cont'd

- Reference objects or artefacts characterised for functional properties such as taste, odour, octane number, flash point and hardness. This type also includes microscopy specimens characterised for properties ranging from fibre type to microbiological specimens.
- Physico-chemical reference materials characterised for properties such as melting point, viscosity, and optical density.

Classification of RM

- Certified reference materials CRMs
- Reference materials RMs

- Primary reference material
- Secondary reference materials
- In-house or working reference material

Certified Reference Materials (CRMs):

Reference material, accompanied by a certificate, one or more of whose property values are certified by procedure which establishes traceability to an accurate realisation of the unit which the property values are expressed, and for which each certified value is accompanied by an uncertainty at a stated level of confidence.

Reference Material (RM):

Material or substance one or more of whose property values are sufficiently homogeneous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.

Types of RM

Measurement method	Traceability
• Primary method	• SI
• Method of known bias	• SI/International standard
• Independent method(s)	• Results of specified methods
• Interlaboratory comparison	• Results of specified methods

Method Validation and Measurement Uncertainty

- Estimation of bias (the difference between the measured value and the true value) is difficult in method validation, but appropriate RMs can provide valuable information.
- Clearly the RMs must be within the scope of the method in terms of matrix type, analyte concentration etc.
- The uncertainty associate with an RM should be no greater than one third of that of the sample measurement.

Verification of the Correct Use of a Method

- The successful application of a valid method depends on its correct use, both with regard to operator skill and suitability of equipment, reagents and standards.
- RMs can be used for training, for checking infrequently used methods and for trouble shooting when unexpected results are obtained.

Calibration

- Normally a pure substance RM is used for calibration of the measurement stage of a method.
- The uncertainty associated with RM purity will contribute to the total uncertainty of the measurement.
- Some other methods, such as XRF analysis, use matrix RMs for calibration of the complete analytical process.

Quality Control and Quality Assurance (QC & QA)

- RMs should be characterised with respect to homogeneity, stability, and the certified property value (s).
- For in-house QC adequate homogeneity and stability are assential. Similar requirements apply to samples used to establish how well or badly measurements made in different laboratories agree.

Assessment of the suitability of Reference Materials

- Analytical specification
  - ⇒ Measurand including analyte
  - ⇒ Measurement range (concentration)
  - ⇒ Matrix match and potential interferences
  - ⇒ Sample size
  - ⇒ Homogeneity and stability
  - ⇒ Measurement uncertainty
  - ⇒ Value assignment procedures (measurement and statistical)

Cont'd

- In the case of proficiency testing, homogeneity is essential and sample stability within the time-scale of the exercise must be assessed and controlled.
- The cost of certifying the property values of proficiency testing samples often prohibits this being done and consensus mean values are often used instead.
- Value, 'the majority' is not necessarily correct and as a consequence the values carry some undisclosed element of uncertainty.

Chemical Metrology Infrastructure at NML-SIRIM

- **NML is the national authority on physical and chemical measurement standards and the Malaysia's premier laboratory for measurement science and technology.**
- **NML-SIRIM has been appointed as National Measurement Standards Laboratory (NMSL) under the National Measurement Act 2007(15 February 2008).**
- **It is the one stop centre where all the national physical and chemical standards for the SI units of mass, length, time, temperature, luminous intensity, resistance, voltage and mole were established and maintained.**

Mission…
- To fulfill the nation's current and future needs for measurement standards to support national measurement system
- To enhance our clients international competitiveness by providing excellent metrological related services

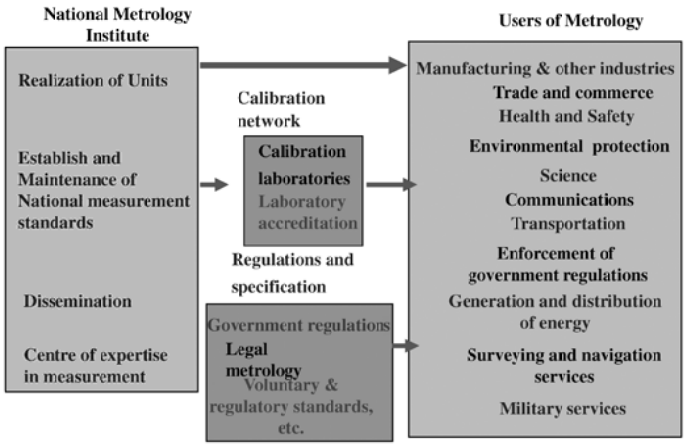
Functions of NMSL

- To realize, establish and maintain or caused to be maintained, the National Measurement Standards (plus CRMs).
- To disseminate Units of Measurement that are traceable to the National Measurement Standards.
- To maintain or caused to be maintained the Coordinated Universal Time (UTC).
- To carry out research and to develop measurement technology and measurement standards.

Cont'd

- To approve the patterns of measuring instruments.
- To coordinate and promote the national measurement system.
- To assist the Council in matter relating to measurement technology and measurement standards.
- To publish and disseminate technical information on measurement technology and measurement standards.

National Measurement System Act 2007



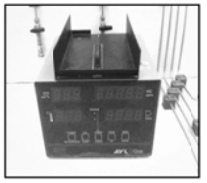
Demonstrate the measurements capability

- To establish our own independent chemical measurement capability in the country.
- To provide reliable services for government, public institutions and industry.
- To defend the interests of the country in the case of international dispute (trade, health, environment).
- Industrilised market economies - a multitude of chemical measurement service providers which ones can be considered competent (e.g. by an inspector, by a governmental official etc.,

Legal Measurements

- Calibration of Evidential Breath Analyzer (EBA). NML-SIRIM was appointed competent authority since 1 July 1995 for the calibration of EBA under the Road Transport Act 1987.

- Calibration of vehicle emission devices and most types of gas analyzers. NML-SIRIM was appointed as competent authority under the Environmental Quality Act 1996 for CO-HC Analyzer.



New Method developments

- New program for rice moisture measurement has been started since 2003 through the actively participated in the APLMF programmes.
- Glass electrode has been developed for the purpose of pH measurement.
- Pesticide residue in tea leaves using IDMS method still in the development process at our laboratory.

New Building For Chemistry Section

The new building is proposed for Chemistry Section with cost about USD 5 millions under the nine Malaysia plan. Equipped with gas laboratory, organic laboratory and clean room are ready, gas analysis, electrochemistry, surface analysis, trace metals, biotechnology, characterization of pure organic substance and CRM's production. The new building for Chemistry Section expected ready by January 2009.

- First phase will be focused on the production of gas productions.
- Second phase will be focused on the characterization of pure substance such as drugs, natural products, DNA profiling, pharmaceutical products, bio-metrology etc.
- Third phase will be focused on the trace metal analysis, electrochemistry, nanotechnology, biotechnology, surface analysis etc.

Conclusions

- Development of measurement capabilities for new compounds in new matrices
  - Need for higher order methods for foods
    - Current microbiological methods used for water-soluble vitamins are "outdated"
    - Current LC-UV and LC/FL methods for vitamins moving to ID LC/MS and ID LC/MS/MS methods
  - Methods for dietary supplements limited at present
- Development of CRMs to support measurements in food and dietary supplements to underpin legislation
  - CRMs are limited or lacking in most food measurement areas
  - CRMs unavailable for most dietary supplement measurements

CURRENT SITUATION ON RMs/CRMs FOR FOOD SAFETY, AGRICULTURAL PRODUCTS AND PRODUCT SAFETY IN VIETNAM

Nguyen Truong Chinh
Vietnam Metrology Institute

June 4-6, 2008

Background

- Food and agriculture is a clear demand of Certified Reference Materials (for calibration and methods validation). This mainly concerns residual pesticides (insecticides, fungicides and herbicides), heavy metals (Cu, Pb, Zn, Sn, Hg, Cd, As, Sb) and toxins (ochratoxine, aflatoxines and patuline) in two major products are of great importance for Vietnamese exportation: rice and coffee. Quality of contaminants analysis has to be focused on these food and agriculture commodities.

Background (Cont.)

- Aquaculture is also demand of specific and related to analysis of green malachite, histamine, residual antibiotics (fluoroquinolones), protein and lipid contents and heavy metals (mainly Hg and As). In that case too, the demands are focused on matrix certified reference materials.

Need for CRMs

- Toxin (aflatoxin, ochratoxin) in microorganism
- Pesticides with chlo radical: Lindane, HCB, Heptachlor, Aldrin, Dieldrin, Endrin, Chlordance
- Antibiotics (chloramphenicol, nitrofuran, tetracycline, sulfonamide, fluoroquinolone, etc.,)

Need for CRMs (Cont.)

- Hormones growth inhibited (celenbuterol, salbutamol, …)
- Malachite green, leucomalachite green
- Germicide, parasite (Triclofon, dipterex)
- Heavy metal (Cu, Pb, Zn, Hg, Cd, As, …)

Use of RMs/CRMs

- For metal analysis in food and agriculture product, need for highly accurate and low uncertainty in order to obtain more reliable assigned values, along with the use of SRM from NIST and chemical standard from Merck (pure compounds) to prepare calibrant solution.

Use of RMs/CRMs (Cont.)

- Regarding analysing pesticides, hormones, antibiotics, etc., in meat and meat products (including milk, eggs, honey) and in aquaculture product use RMs/CRMs import from international and mainly from PT provider. Now, we still lack of CRMs for method validation and analyse (mainly use pure compounds).

Stretagy for Medium and long term

Future missions of my laboratory have been confirmed:

- Research and Production of RMs/CRMs and provide RMs/CRMs to end-users
- Transfer to end-users the guide to the preparation and use of RMs/CRMs by international documentations (Translate/adapt guides for end-users, distribute guides on a permanent way)

Stretagy for Medium and long term

- Organization of Training courses for end-users to preparation and use of RMs/CRMs
- Help to accreditation body
- Organization of PTS

Conclusion

We hope that after some tasks relating to CRMs (Certified Reference Materials) to be discussed in this Workshop, we will find out a master plan for development of CRMs on food safety and agriculture product in my country.

Thank you
for your attention

Metrological support to the National Residue Control Plan for Food Safety in Mexico

APEC/APLMF 2nd Workshop,
Hangzhou, PR China
June 4-6, 2008

Norma Gonzalez, Yoshito Mitani, Organic and Inorganic Materials Divisions
CENAM, Mexico

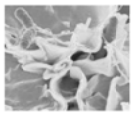
- Food Safety
- Mexican products
- National system for food safety
- Situation
- Inter-institutional collaboration

Food Safety

- A suitable product which when consumed orally either by a human or an animal does not cause health risk to consumer

Food Safety Hazards

- Biological (Bacteria, Viruses, Protozoa, etc.)
- Physical
- Chemical (Agricultural Chemicals/Animal Drugs and Environmental Contaminants)
- New technologies (genetic engineering, irradiation of food, ohmic heating and modified atmosphere packaging)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Agricultural Products of Mexico

Agricultural exportation Income: USD 605 million, 2007

1º Avocado, mango, Papaya, watermelon, melon
2º Onion, chickpea, cucumber, lemon...
3º Eggplant, tomato, spinach...

Tuna, lobster, shrimp sardine, clams...

Meat (pork, bovine)
Others

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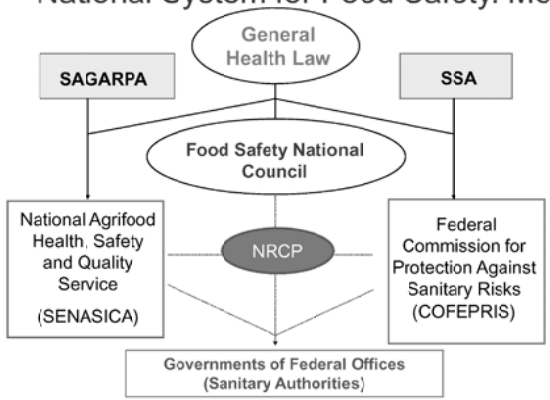
National System for Food Safety. Mexico



SAGARPA – Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food
SSA – Ministry of Health
NRCP – National Residue Control Plan

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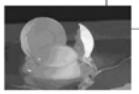
Field on Food

- Vegetables/Fruits
  - Primary production
  - Slicing
  - Refrigerated
  - Frozen
- Meat: poultry, beef, pork, game, equidae, goat, sheep
  - Primary production
  - Processing
  - Industrialization
    - Sausage
    - Processed food
    - Dehydrated
- Fishing and aquaculture products
  - Before processing
- Eggs
  - Primary production
  - Processing involving a physical transformation
- Milk
  - Before processing
  - Cow shed
- Honey
  - Primary production
  - Bottling







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Action Field

Products and commercial purchasers

- Livestock, agricultural and fishing products
- Production and health supplies

Inspection

Verification

Certification

- Production units
- Processing plants
- Packing plants
- Slaughterhouse
- C. distribution, marketing and storage

Notifications of Exportation Products

- 2003 – 2004 residues findings in consignments were reported under the RASFF
  - 5 notifications concerned streptomycin and sulphonamides in honey
  - 1 nitrofuran metabolite (AOZ) in spray-dried egg albumin
- 2005 – Evaluation of the National Residue Control Plan (NRCP)
  - Ensure that consignments of meat and meat products to export are no derived from animals treated with hormonal growth promoters or beta-agonists
  - Ensure that residues of VMPs banned are not present in exported commodities and to verify the absence of residues by developing an appropriate analytical testing capability
  - Ensure a legal basis for the residue control (including MRLs) of all commodities to be exported
  - Address identified shortcomings in the structure and implementation of the NRCP in order to ensure that it will offer guarantees on the resicues status of exported food commodities
  - Ensure the development and validation of analytical methods capable of meeting ccuntries requirements and covering as broad a scope of analytes as possible

Role of Metrology

- To protect own society against dangerous unsafe and toxic products
- Globalization of trade and industry:

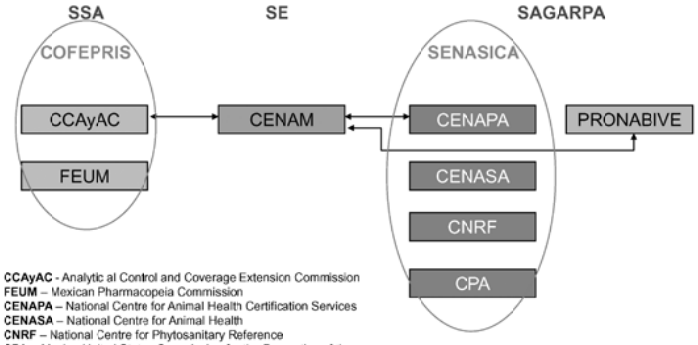
wrong measurement results ➡ large losses of money

- Removal of technical barrier to trade: once measured/tested, everywhere accepted
- Support to import and export

CENAM Activities

- To Develop and Maintain National Standards
  - **Primary Methods**
  - **CRM**
- To Contribute to the Development of National Measurement System
  - **Proficiency test (PT)**
  - **MRTC program**
  - **Reference Laboratories**
- To Provide Metrological Services

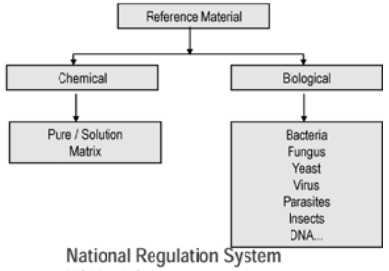
Inter-institutional Collaboration



CCAyAC - Analytic al Control and Coverage Extension Commission
FEUM – Mexican Pharmacopeia Commission
CENAPA – National Centre for Animal Health Certification Services
CENASA – National Centre for Animal Health
CNRF – National Centre for Phytosanitary Reference
CPA – Mexico-United States Commission for the Prevention of the Aftosa Fever
PRONABIVE – National Producer of Biological Veterinaries

Metrological Needs

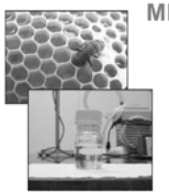
- Availability of CRM
- Ensure the development and validation of analytical methods for low levels of residues
- Ensure the development and validation of bioanalysis methods
- Proficiency testing schemes
- Ensure a legal basis for the residue control (including MRLs) of all commodities to be exported and imported
- Reference Laboratories



National Regulation System
NOM = 178
Food 28
Beverages 9
NMX = 789
Agriculture 138
Food 141

Inter-institutional Activities

MRCs



Honey - Pesticides/antibiotics

Meat - Clenbuterol

Validation of methods

Chloramphenicol in milk
OP and pyrethroids in honey
by LC-MS/MS

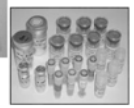
PTs (INFAL)

Laboratory Networks

Conformity assessment

Table salt

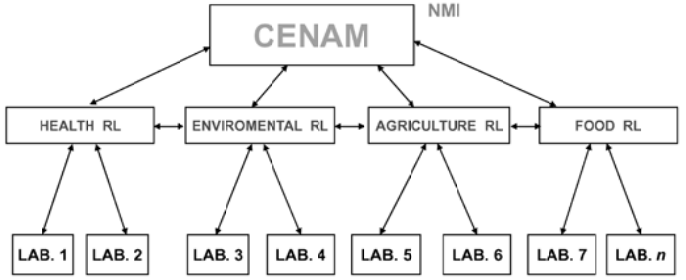
RefSubst - Albendazol



Vaccine - Rabies

INFAL – Interamerican network of food analysis laboratories

Reference Laboratories



Analytical Laboratories, Research Institutes, Universities, Government, etc.

Metrological Activities of Reference Laboratory

- ✓ Maintain traceability to SI units, by MRTC program or CRM developed under collaboration
- ✓ Disseminate accuracy to the National Standards toward the testing laboratories by means of:
  - Preparation capabilities of RM candidates
  - Measurement capabilities
  - Collaborative studies
- ✓ Guarantee: harmonization and reliable chemical measurements, which will be carried out in the country

Conclusions

- Availability of CRM in the agriculture, livestock, aquaculture and health fields are very limited
- It is urgent to develop suitable and sufficient CRMs for domestic use, by inter-institutional collaborations or using CENAM's MRTC program, working with Mexican producers, or by accreditation of competent RM producers in order to:
  - **reduce the cost and time in obtaining CRM**
  - **Increase the availability of CRM**
  - **establish traceability and comparability**
- To support the Mexican NRCP to ensure residue contaminants measurements of exportation and importation products
- To support the National Measurement System for quality and food safety

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Thank you for your attention!

E-mail: materiales@cenam.mx
Website: http://www.cenam.mx

The Role of a National Metrology Authority in Food Safety Control in Public Health in Thailand

Niphon Popattanachai (M.D.)

SCOPE

I. Introduction
II. What is the correlation of metrology and food safety
III. Metrology and chemical metrology in Thailand
IV. Traceability chain
V. Metrology in practice for food safety

I. INTRODUCTION

The importance of food safety on health aspect :

- Pre-marketing
- Post-marketing
- Contribution to the economics
- Consumer protection
- Contribution to the international market

WHAT DO WE NEED FOR THE RELIABLE TEST ?

- Testing from reliable laboratories (ISO/IEC 17025 Accreditation)
- Certification such as HACCP, GMP, GAP
- Regional and international acceptability

II. METROLOGY AND FOOD SAFETY

- **Food safety**
  - Registration
  - Monitoring and surveillance
  - Production improvement
  - Raw material quality control
  - Education and indicator tool for Consumers

10-1-30343-1-0005

III. METROLOGY AND CHEMICAL METROLOGY IN THAILAND

- International body for metrology - BIPM
- Regional Body - APMP
- National Institute of Metrology Thailand (NIMT)
- Chemical Metrology
- Designated in specific area
- Department of Medical Sciences

BIPM= Bureau International des Poids Mesures
APMP=The Asia Pacific Metrology Programme
NIMT = National Institute of Metrology (Thailand)

the Department of Medical Sciences(DMSc)

- National reference laboratories for
  - Health products analysis for consumer protection : foods, drugs, narcotics and cosmetics
  - Quality control of biological products e.g. vaccines
  - Analysis of medicinal plants
  - Clinical diagnosis of infectious and non-infectious diseases
  - Investigation of safety & quality of medical and radiological devices
- Research and development
- Accreditation body for health products and medical testing laboratory
- Identification of human health hazards e.g.Virus, bacteria, yeasts-molds and parasites, in order for reduce risks or severity of illnesses

WHAT WOULD WE DO IF WE WANT TO BE INTERNATIONAL ACCEPTED IN CHEMICAL METROLOGY ?

The laboratories have to

- participate in pilot study
- participate in key comparison
- be accredited by internationally accepted body complying with the international standards, ISO/IEC 17025
- use higher order method

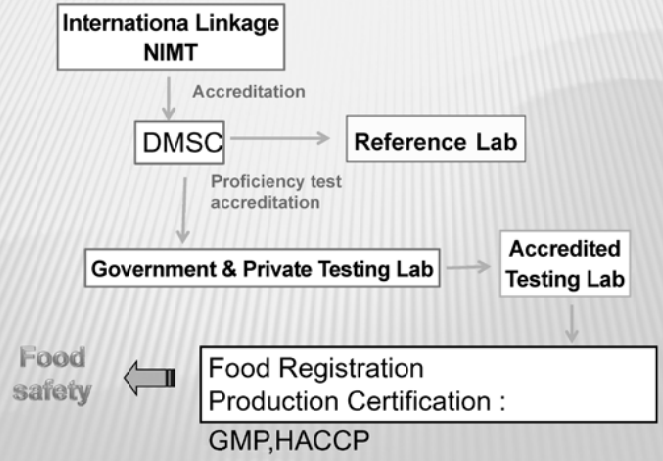
Metrology on Food Safety DMSc, Thailand

- ISO/IEC 17025 Accreditation
- Pilot Study
  - -APMP.QM-pilot study P4 pp'-DDE in fish oil
  - -CCQM.P90-Chloramphenicol in milk
- Key Comparison
  - -CCQM.Q-K61-P44-Quantitative Real-Time PCR
- Higher order method (Isotope dilution technique)
  - - Organochlorine insecticides in edible oil

EXPECTED RESULTS

- Production of reference materials
- Increasingly ability to provide assigned value
- Facilitate acceptable proficiency testing programs to other laboratories

IV . Metrology Traceability Chain



V. METROLOGY IN PRACTICE FOR FOOD SAFETY

The high end and sophisticate technique
Vs
The low end and user friendly technique

The technique for someone & somewhere
Vs
The technique for everyone & everywhere

The complexity
Vs
The simplicity

FOOD ANALYSIS

Reference laboratory

- Perform as higher end of chemical metrology
- Perform food analysis by using standard methods in the laboratory

Food Test Kits

- For screening test
- Need validation

FOOD ANALYSIS

Implement of Food Test Kits

- For food safety monitoring
  - In fresh market, food stalls in the village overall the country
  - In school, supermarket, etc.
- For consumers self-care

Disadvantages

- Need confirmation by standard method
- Qualitative results (most of Test Kits)

FOOD ANALYSIS

Standard method	Test kits

• Complicate
• Time-consuming
• High investment
• Need skilful or well-trained personnel
• Unsuitable for urgent needs and problem solving
	• Simple
	• Rapid
	• low cost
	• No need skilful personnel
	• Implementation
	  ◦ Monitoring of food safety in wide areas
	  ◦ Suitable for urgent needs and problem solving

CRITERIA FOR TEST KIT DEVELOPMENT

- Frequency of occurrence:- high frequency
- Virulence of agents:-cause high fatality rate
- Severity of illnesses:-cause acute symptoms
- Technical support available

PRIMARY SCREENING FOR FOOD CONTAMINANTS

Chemical Contaminants	Food Items
1. Borax	Meat and meat products
2. Formalin	Sea food and fishery products
3. Salicylic acid (Antifugal agent)	Pickled fruits and vegetables
4. Sodium hyrodsulfite (Bleaching agent)	Animal organs & vegetables
5. Pesticide residue	Fruits and vegetables
6. Aflatoxin	Grain and cereals

PRIMARY SCREENING FOR FOOD CONTAMINANTS

Target Places:

Fresh markets, Supermarkets, Marketplaces, etc.

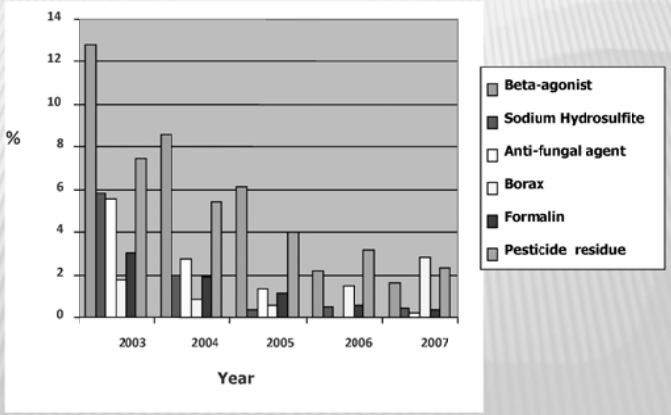
Testing Method:

DMSc Food Test Kits

Situation of Food Safety in Thailand

Chemical contaminants	Amount of samples and % violence by year									
	2003		2004		2005		2006		2007	
	Sample	%	Sample	%	Sample	%	Sample	%	Sample	%
Beta-agonist	7,569	12.78	8,515	8.59	6,219	6.11	2,997	2.17	2,875	1.63
Sodium Hydrosulfite	36,809	5.81	46,785	2.00	100,483	0.37	31,287	0.51	80,327	0.21
Anti-fungal agent	31,743	5.56	45,614	2.76	99,695	1.35	14,338	0.01	74,733	0.21
Borax	55,133	1.77	64,138	0.84	134,022	0.54	13,743	1.50	80,042	2.82
Formalin	24,185	3.02	38,342	1.92	86,969	1.11	15,378	0.57	63,286	0.38

Percentage of 6 chemical contaminants (2003~2007)



Conclusion

METROLOGY

High End
- Reference laboratory
  - Accreditation (ISO/IEC 17025)
  - Pilot study
  - Key comparison
  - Higher Order Method
- Reference material Assigned value
- Proficiency Testing

Medium End
- Testing laboratory (private&government)
  - Accreditation
  - Participate in proficiency Testing

validate

Low End
- Quality assessment using Test kit (Validated by comparing with Standard method)

Metrolog

Simple Systems

谢谢你 สวัสดี

спасибо 謝謝你

おはようございます

شكرا ,.لك شك ا Gracias 고맙습니다

Terima kasih Cám ơn **Salamat**

Thank you

For more information please visit:
http://www.dmsc.moph.go.th
E-mail : niphon_p@dmsc.moph.go.th

Measurement in food safety in Mongolia

Presented by
Khishigmaa Dorjgur
Mongolian Agency for Standardization and Metrology

Geography

- **Location: Northern Asia, between China and Russia.**
- **Area: 1 566 500 sq. km. (604 103 sq. mi.);**
- **Landscape: plunge down from snow capped mountains, sweep across the steppe grasslands, and cover much of the Gobi desert in south. Almost 90% of land area is pasture or desert, of varying usefulness; 1% arable; 9% forested.**
- **Population: 2.75 million**

- **Natural resources: Oil, coal, copper, molybdenum, tungsten, phosphates, tin, nickel, zinc, fluorspar, gold, silver, iron.**
- **Industries: Construction and construction materials, mining, oil, food and beverages, processing of animal products, cashmere and natural fiber manufacturing.**

Agriculture

- **In 2000 agriculture accounted for only 16.2 percent of national income and 31.7 percent of the labor force. Nevertheless, agriculture remained economically important because much of Mongolia's industry processed agricultural. In 2002 agriculture supplied nearly 40 percent of Mongolia's exports.**

Animal husbandry

- Animal husbandry is most important component of the national economy, supplying foodstuffs and raw materials for domestic consumption, for processing by industry, and for export.
- In 2006 there were 34.8 million head of livestock, of which 42.7% were sheep, 44.4% goats, 6.2% cattle, 6.0% horses, and 0.7% camels.
- In addition, pigs, poultry, and bees were raised. In 2006 there were 56.1 thousand pigs and 271.3 thousand head of poultry.

- Livestock products included meat and fat from camels, cattle, chickens, horses, goats, pigs and sheep; eggs; honey; milk; wool from camels, cattle, goats, and sheep; and hides and skins from camels, cattle, goats, horses, and sheep.
- In 2006 exports of livestock products included 15.5 thousand tons of wool, 121 thousand large hides, 1.256 million small hides, and 44.1 thousand tons of meat and meat products.

Number of Livestock

thous.heads

	2000	2001	2002	2003	2004	2005	2006
Total	30227.5	26075.3	23897.6	25427.7	28027.9	31471.7	34802.9
Camel	322.9	285.2	253.6	256.7	256.6	254.5	253.5
Horse	2660.7	2191.8	1988.9	1968.9	2005.3	2108.3	2114.8
Cattle	3097.6	2069.6	1884.3	1792.8	1841.6	2071.5	2167.9
Sheep	13876.4	11937.3	10636.6	10756.4	11686.4	12985.6	14815.1
Goat	10269.8	9591.3	9134.8	10652.9	12238.0	14051.8	15451.7

Crop farming

- Crop farming as an independent branch of agriculture began to develop in Mongolia in the latter half of the 50s when a start was made on the reclamation of virgin lands. The country now has large mechanized state farms producing grain and vegetables.
- Mongolia's staple crops are wheat, barley, oats, potatoes, carrot, cabbage, radish, tomato, cucumber and onion. In 2006 total cultivated area exceeds 150.000 hectares, cereals covered 86 percent of sown areas, vegetables 12 percent and fodder crops 3 percent.

- Mongolia also produced small quantities of oil-yielding crops, such as sunflower and rape, and fruits and vegetables, such as sea buckthorn, apples, black currants, watermelons, and garlic.
- Small amounts of soybean, millet, and peas also were grown to provide protein fodder.

Total crops

tons

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Wheat	215282.1	237700.4	191836.4	166651.2	138722.4	138717.4	123064.2	160362.1	135622.2	73418.9	127756.5
Potato	46021.7	54199.7	65152.4	63764.6	58853.1	58033.8	51887.9	78673.0	80192.1	82749.1	109069.9
Other vegetables	23818.2	34024.1	45456.3	38990.2	43965.4	44509.8	39721.0	59610.3	49171.0	64027.0	70440.5

Food safety

Food safety is an emerging issue in Mongolia as its international food trades are increasing and is presently trading with more than 60 countries with imports and exports.

Availability of main food staples /wheat, meat, milk and vegetables/ is adequate reflecting the recovery of the agricultural sector in the past three years.

Domestic production is now trying to revive and technological improvement are made especially packaging and labeling technology. However, domestic food industries need to done much to introduce HACCP.

Mongolia: Per capita annual food consumption by main food groups (kg)

	2001	2002	2003	2004	2005	Average
Meat and meat products (in terms of meat)	97.2	97.2	98.4	94.8	99.6	97.4
Milk and milk products (in terms of milk)	100.8	100.8	130.8	138.0	140.4	122.2
Flour and bakery products (in terms of flour)	110.4	110.4	114.0	105.6	118.8	111.8
Rice	15.6	15.6	18.0	18.0	26.4	18.7
Potatoes	26.4	26.4	31.2	33.6	43.2	32.2
Vegetables (in terms of fresh vegetable)	16.8	16.8	18.0	16.8	25.2	18.7
Fruit	3.6	3.6	4.8	6.0	12.0	6.0
Vegetable oil	6.0	6.0	8.4	8.4	12.0	8.2
Fish and fish products	2.4	2.4	0.0	1.2	2.4	1.7
Sugar and sugar products (in terms of sugar)	12.0	12.0	12.0	12.0	16.8	13.0

LEGISLATIVE ENVIRONMENT

Between 1995-1999, the Government has developed several legislative acts and regulations related to nutrition and food safety such as approval of Food Law by the Parliament in 1999.
In 2000, the President of Mongolia issued a decree consisting from three parts concerning organization of consolidated structure of administrative management of the food safety and security, establishment of national Reference laboratory on food safety and networking, and introduction of HACCP in food industry. Within the framework of the decree the Government of Mongolia has developed and approved a National Plan of Action (NPAN) on Food Security, Safety and Nutrition with the full support WHO in 2001. Enforcement of the President's decree to restructure current organization of the agencies dealing with the Food safety is urging.

- **The agency for standardization and metrology has 6 departments.**
  One of the departments is the legal metrology department which is responsible for establishing and maintaining national reference materials for basic and derived quantitie mass, length, temperature, time, voltage and the units derived from them.

MASM has been carrying out a 2008-2015 year program for developing testing and metrological laboratories by regions in Mongolia.

The purpose of this program are:

- To enhance the cooperative system of national testing and metrological laboratory and control the quality and safety of exported and imported products
- To improve the technical capacity of metrological laboratories
- To develop the food testing standard methods based on instruments which are of advancement technology
- To set up of physico-chemical measurement standard to meet accuracy level and international trade requirement etc.

Physico-chemical laboratory in MASM

Main activities of the laboratory are:

- Calibration of chemical measuring instrument /PH meter, saccharimeter, spectrophotometer, and refractometer, etc., of food and chemical laboratory /
- Improvement of national measurement standard
- Development of international measurement standard
- Development of certified reference materials

In order to meet wide requirement for the reliability and objectivity of calibration, reference materials of high accuracy are therefore required.
We import the some certified reference materials for the calibration of measuring instrument of food lab.

CONCLUSION

Laboratory need to be provided certified reference materials and accurate measuring instruments.

•Need to develop CRMs for calibrating the physicochemical instruments to support measurement in food sector
•Need to strengthen of lab capacity and improve technical assistance the metrology system

Thank you

College of Life Sciences,
China Jiliang University

China Jiliang University and its development in bio-metrology

June 2008

中國計量學院
CHINA JILIANG UNIVERSITY

College emblem

Our Mission

- Metrology to invigorate the university
- Standard to foster talents
- Quality to build cause

生命科学学院

General information

1. General Introduction

Establishment:

- College of Life Science was established in Sep. 2001
- Undergraduate education majoring in biotechnology started to recruit students in 2002

Academics and research:

- 4 Departments: Biotechnology, Bioengineering, Food Science, Pharmacy
- 1 university institute: Institute of Bio-safety and Food Science

Faculty members:

Faculty and staff	58
Professor and associated professor	17
Supervisor of master students	27
Supervisor of doctoral students	2
Doctoral degree	39
Zhejiang "151" talent program	12
Leading Staff in Science and Technology among the Young and Middle-age Group	2

生命科学学院

General information

1. General Introduction

- **Students:** Undergraduate student 800

  Master students 20+22=42

- **Diciplinary construction**

  1 provincial key discipline, M.S. program: biochemistry and molecular biology

  2 university key discipline: ecology, and food science

生命科学学院

General information

1. General Introduction

- **Labs (6 groups)**

  Province-grade Experimental Teaching Demonstration Center: Bioassay center
  Lab of genetic engineering and detection; Lab of bio-product safety detection
  Lab of food quality and detection; Lab of exit&entry animal and plant inspection and quarantine; Lab of phytochemistry

- **Research**

  Projects: About 70 projects, including projects from National High-Tech Research and Development Plan (863), National Natural Science Foundation; Zhejiang Natural Science Foundation, Key projects of Zhejiang Province, etc., Total funding reached 14 million RMB.

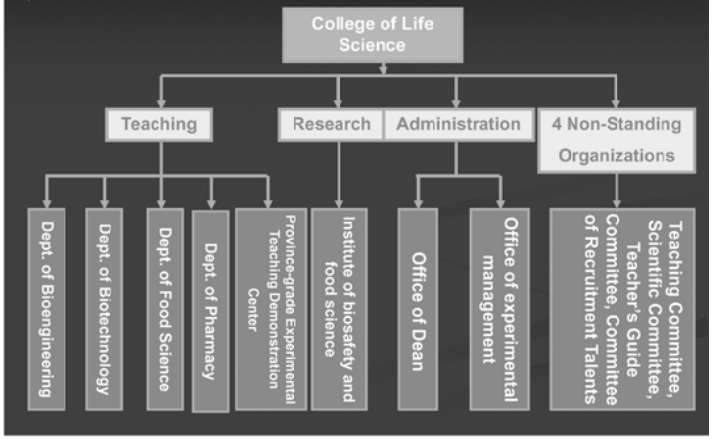
- **Papers and achievements**

  137 papers were published within 3 years, 52 papers were collected in SCI, Published 5 books, 3 projects were rewarded by government, 20 invention patent applications, 2 were granted

生命科学学院

General information

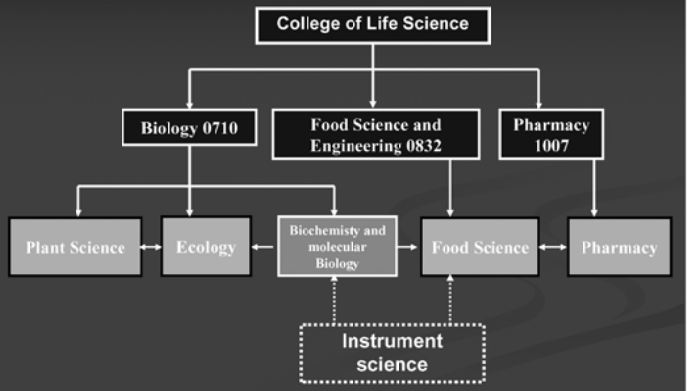
2. Administration Offices



生命科学学院

General information

3. Disciplinary Construction



生命科学学院

General information

4. Laboratory Construction

- **General introduction**

  Three levels of Laboratories: Basic teaching Laboratories, Specialized Laboratories and Research Laboratories

  Total Laboratory areas: 3000m^2,

  Total facility value: 15 million ￥ RMB, 15 million more was expected within 4 years

  Greenhouse and net houses, 1800m^2 are ready to be used

  New Laboratories 3000m^2 are under construction

- Laboratory teams

  7 regular lab technicians,
  2 Senior Experimentalist,
  6 with Master Degree

生命科学学院

General information

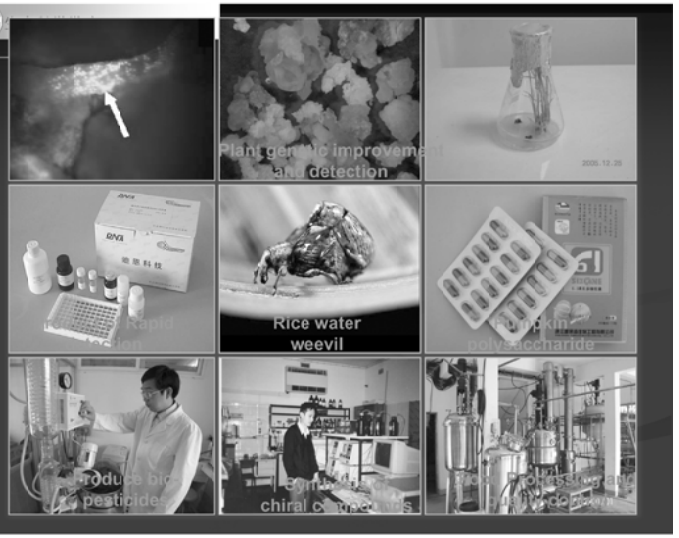
Greenhouse and nursery garden

Greenhouses 600m², Net houses 1200m²

生命科学学院

5. Research

Aquatic plants genetic improvement and detection	Dr. Ye, associated professor
Biosafety and Rapid residual Molecular Detection	Dr. Zhang, associated professor
Invasive alien species and its detection	Dr. Shang, professor
Spread of invasive species and suitability analysis	Dr. Zhu, associated professor
Detection of toxic residual material and instrument science	Dr. Chen, associated professor
Safety and standard for food quality	Dr. Zhang, associated professor
Agro-product processing and quality control	Dr. Jiang, professor
Biopharmaceutical research and detection technology	Dr. Yu, professor
Synthesis and characterizations of chiral compounds	Dr. Lou, professor
The active components and its action mechanism of Chinese herbal medicine in the treatment of hepatitis B	Dr. Wu, associated professor



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Cares from governmental officers

Mr. Z.K. Ji

General Administration of Quality Supervision, Inspection and Quarantine

Mr. X.L. Si

Provincial Head of Party Organizational Department

生命科学学院

Bio-metrology

Physics

Chemistry

Biology

生命科学学院

New Challenge

Global economic integration
Global environmental security
Global trade and trade barriers

Agricultural products
Invasive alien species
Genetic modified organism
Biopharmaceutical product

Fierce competition of measurement technology

Development of New & High technology

The economy development

Development and competition of international and national standards

International Mutual Recognition about bio-Metrology

生命科学学院

Role of biological measurement

- Better measurement can improve communication between the science base, small companies, large companies and official regulators
  - Facilitating the transfer of technology
  - Increasing regulator and investor confidence
  - Reducing time-to-market
  - Making for safer and more sustainable biotech
  - Driving international measurement harmonization and comparability
- Promote the principles, practice and benefits of valid bio-measurement to improve the accuracy, reliability and comparability of measurements important for bio-industry

生命科学学院

Role of biological measurement

- High priority technical themes identified where there are rapid developments in measurement technology critical to their robust application and commercial exploitation

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Context of biological measurement- biopharmaceutical case

- Gene measurement theme
  - Measurement comparability in genomic analysis and molecular diagnostics
- Protein measurement theme
  - Complex protein measurement in support of clinical medicine and biological structure determinations
- Cell based testing theme, tissue?
  - Cell model validation and mechanism based risk assessment (toxicogenomics) as alternatives to animal testing for drug safety and efficacy
- Product characterization theme
  - Usually protein characterization in support of biopharmaceutical production

生命科学学院

Understanding of bio-metrology

- Bio-metrology – the science of bio-measurement, develops sound measurement practices for the bioscience sectors
  - support the comparability, validity and traceability of bio-measuring
  - make the accurate measurement trace to the SI or the traceability according to the bio-characteristics

生命科学学院

Understanding of bio-metrology

- Function of bio-metrology:
  - help to figure out the quality assurance, traceability, uncertainty, validity, calibration and standard (reference) substance of bio-measuring
- Main scheme of bio-metrology:
  - Quantification of DNA, protein, cell, tissue etc.
  - Lab comparison
  - Quality standard of bio-molecule
  - Standard (reference) substance
  - …

生命科学学院

Bioanalysis Scope

- Bio-analysis covers large macromolecules – where the target measurand is of biological origin (including, but not limited to, genes, proteins, cells) in a biological measurement context
- Bio-measurement includes, but is not limited to, the identification and quantification of the active macromolecule in complex matrices and mixtures immediately relevant to biological function
- Biological measurand, the quantity subjected to measurement, may not easily be defined
- Direct and indirect measurement (s) and inferences are included

生命科学学院

Development of bio-metrology

- Consultative Committee of Amount of Substance (1993) – CCQM – Metrology in Chemistry (mole)
- 21th General conference of Weights and Measures (CGPM) (1999)– Metrology in biology

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Development of bio-metrology

- Bio-Analysis Working Group (BAWG) established in 2001, to develop an international bio-metrology infrastructure underpinning bio-measurements
  - Reference methods
  - Reference standards/calibrations
  - Traceability
  - Measurement uncertainty (ISO 17025)
  - Internationally comparable bio-measurements

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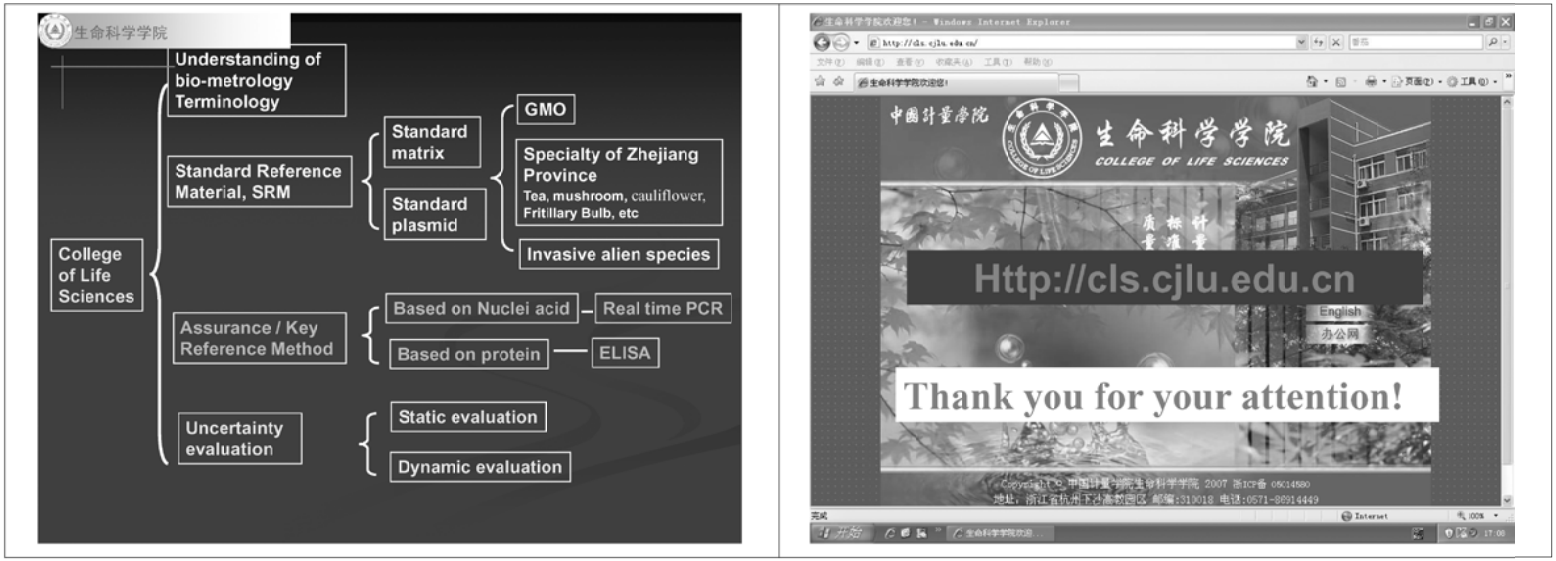
Development of bio-metrology

- Grown rapidly, reflecting strong international support for developing bio-measurement comparability and standardization
- National Measurement Institutes (NMI's) and expert laboratories from >20 different countries now participate in its studies, including US, UK, Japan, China, Korea, S.Africa, Australia, Germany, Russia, Thailand, Italy, and Sweden.


生命科学学院
College of Life Sciences
Understanding of bio-metrology Terminology
Standard Reference Material, SRM
Standard matrix
Standard plasmid
GMO
Specialty of Zhejiang Province
Tea, mushroom, cauliflower, Fritillary Bulb, etc
Invasive alien species
Assurance / Key Reference Method
Based on Nuclei acid
Real time PCR
Based on protein
ELISA
Uncertainty evaluation
Static evaluation
Dynamic evaluation
中國計量學院
生命科学学院
COLLEGE OF LIFE SCIENCES
Http://cls.cjlu.edu.cn
English
办公网
Thank you for your attention!

Assurance of Measurement Results of Chinese Foods and Agricultural Products by Chemical Metrology

Prof. Hongmei Li

National Institute of Metrology

中国计量科学研究院 National Institute of Metrology P.R.China

Content

1. Roles and status of chemical Metrology
2. Current Standard of Chemical Metrology Foods and Agricultural Products in China
3. Achievement of Chemical Metrology for Foods and Agricultural Products in China
4. Requirement of Chemical Metrology for Foods and Agricultural Products
5. Future Work Plan

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1. Status of Chemical Metrology

1.1 Chemical Metrology System

1.2 Status of Chemical Metrology in Measurement Results

1.3 International Mutual Recognition System

1.4 Key Role of Certified Reference Materials

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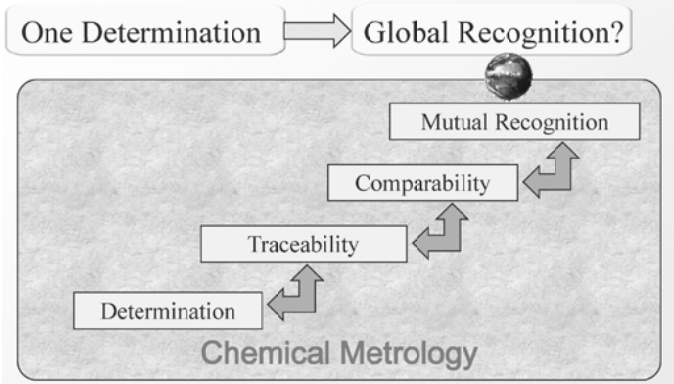
Question:



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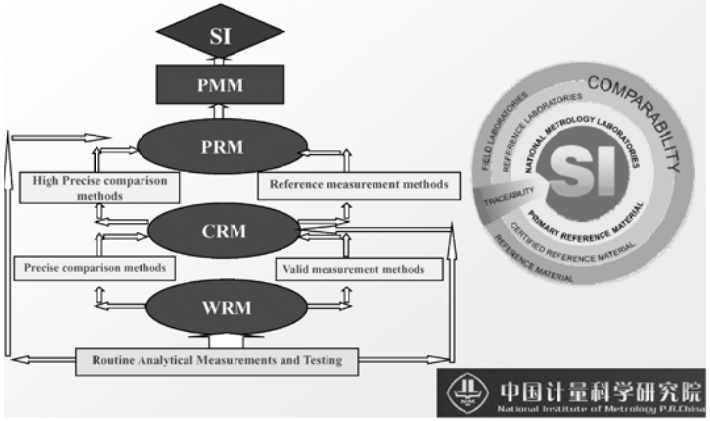
1.1 Chemical Metrology System



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1.1 Chemical Metrology System

Characteristics of Chemical Metrology

- Objects and Analytes: many varieties and vast components

- Task: complicate
  - Sample preparation, Instrumental Analysis …

- Traceability: mainly by Certified Reference Materials

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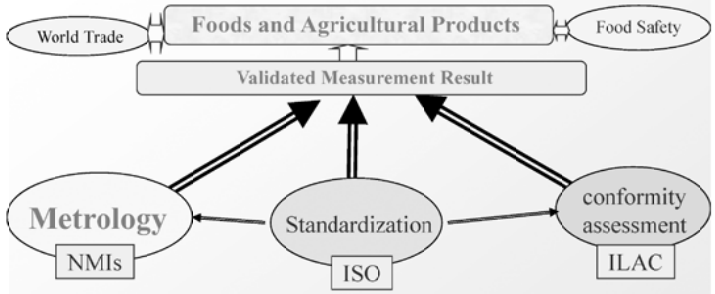
1.2 Status of Chemical Metrology in Measurement Results



- Metrology, standardization and conformity assessment **are three pillars to support the sustainable development and to establish harmonious, equal and honest international trade relationship in the future. They are** *national technical infrastructures*.
- Metrology and substance standards **provide the basis for accurate measurements, the accepted performance of which can then be written in** international standards, **which can, in turn, be used as the basis for** conformity assessment.

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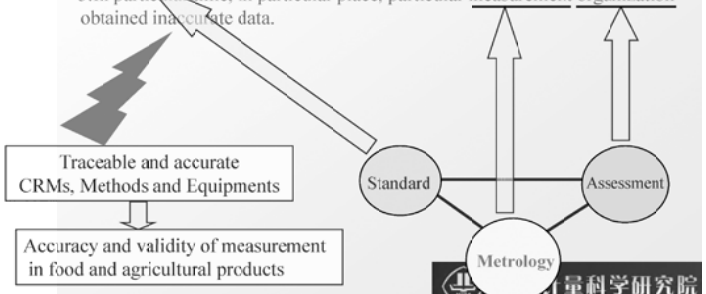
Effect of Chemical Metrology on Food Safety

Reasons that some of China's products were recalled these years:
(Changjiang Li, Minister of AQSIQ)

1. Some products have problems in quality.
2. Standards in two countries are different.
3. In particular time, in particular place, particular measurement organization obtained inaccurate data.



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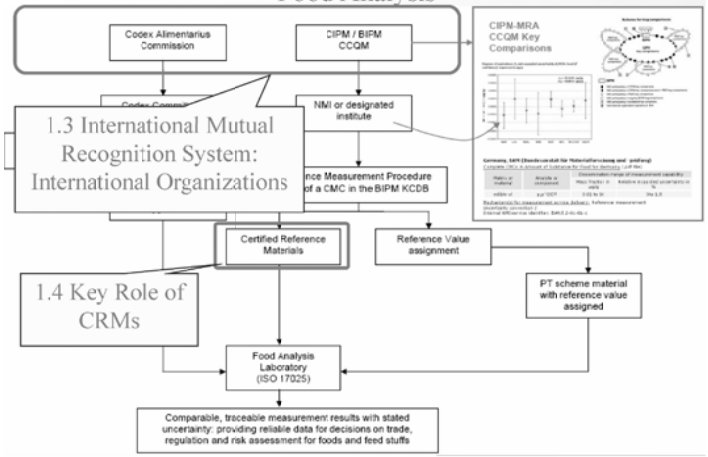
Harmonisation of Reference Measurement Systems for Food Analysis



1.3 International Mutual Recognition System

BUREAU INTERNATIONAL DES POIDS ET MESURES

ORGANISATION INTERNATIONALE DE METROLOGIE LEGALE

INTERNATIONAL LABORATORY ACCREDITATION COOPERATION

CIPM 2005-18

2005-09-06

COMMON STATEMENT AND DECLARATION BY BIPM, OIML AND ILAC ON THE RELEVANCE OF VARIOUS INTERNATIONAL AGREEMENTS ON METROLOGY TO TRADE, LEGISLATION AND STANDARDISATION.

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1.4 Key Role of Certified Reference Materials

The use of Reference materials is very important for traceability of many measurement activities:

中国计量科学研究院 National Institute of Metrology P.R.China

2 Current Standard of Chemical Metrology, Foods and Agricultural Products in China

2.1 Chemical Metrology

The National Law of Metrology of the P.R.C.

Regulation for the administration of CRMs

Primary RM	• Using primary methods or more than two accurate or reliable methods according to different principles. • Having the highest accuracy in China.
Secondary RM	• Using methods by compared with PRM or same methods for the certification of PRM. Lower accuracy than PRM, but meet the needs of routine analysis.

中国计量科学研究院 National Institute of Metrology P.R.China

2 Current Standard of Chemical Metrology, Foods and Agricultural Products in China

2.2 Foods and Agricultural Products

(Standards and Regulations of Limited Components)

Catagory	Number	Title	Components
Pesticides	GB 2763-2005	Maximum residue limits for pesticides in food of pesticides)	136 kinds
Veterinary drugs	Ministry of Agriculture Announcement 193-2002	Banned Veterinay drugs	37 kinds
	Ministry of Agriculture Announcement 235-2002	Maximum residue limits for veterinary in animal food(136)	132 kinds
Food Additives	GB2760-2007	Hygienic standards for uses of food additives	294 kinds
Food Nutrients	GB14880 (revised 2007)	Hygienic standard for the use of nutritional fortification substances in foods	117 kinds
	GB13432-2004	General standard for the labeling of prepackaged foods for special dietary uses	13 kinds of labeling
Packaging materials	GB9685-2008	Hygienic standard for adjuvants and processing aids in food containers and packaging materials	350
…	…	…	…

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3. Achievement of Chemical Metrology for Foods and Agricultural Products in China

3.1 International intercomparisons and mutual recognition

3.2 Certified reference materials

3.3 Primary / authoritative methods

3.4 Support establishment of national measurement standards

3.5 Improve national measurement capability

3.6 Emergency database for food analysis

3.7 Current research projects

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3.1 International intercomparisons and mutual recognition

NIM participated activitites of CIPM MRA, including

intercomparisons of CCQM, APMP:

In Chemitstry: 45 key intercomparisons

50+ pilot study intercomparisons

41 key intercomparisons related to food safety and environment

4 intercomparisons coordinated by NIM

NIM play important role in CCQM, APMP

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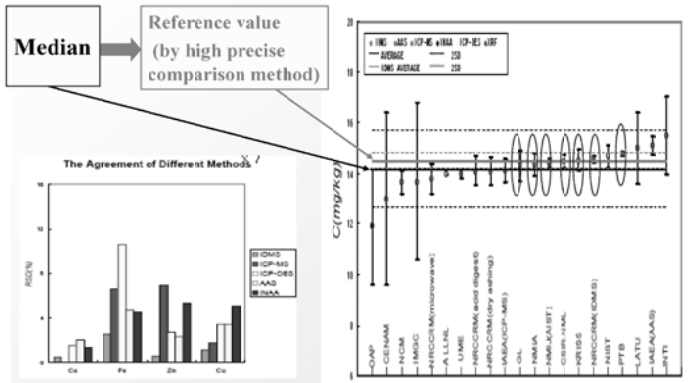
3.1 International intercomparisons and mutual recognition

- **NIM advise:**
  median replaced by reference value



Mutual recognition:
CMC (Calibration Measurement Capabilities)

NIM has established primary reference measurement methods in food safety and environment, and gained CMCs.

BIPM website : NIM CHINA
Food：18
Environment：12
Related：High Purity Materials：2
Inorganic Solutions：37
Organic Solutions：19

Support International Mutual Recognition in Food Safety.

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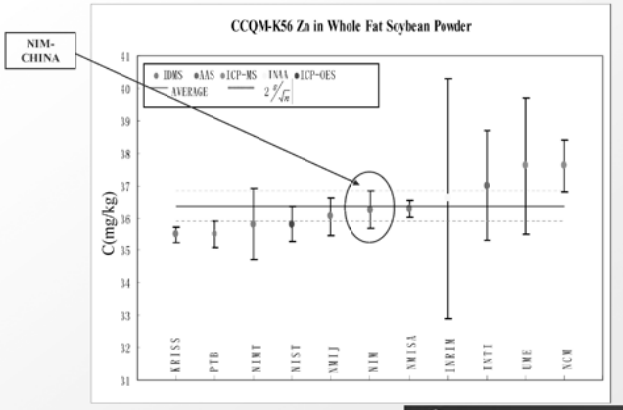
National Institute of Metrology P.R.China

CCQM-K64 Trace Elements in Soybean Powder



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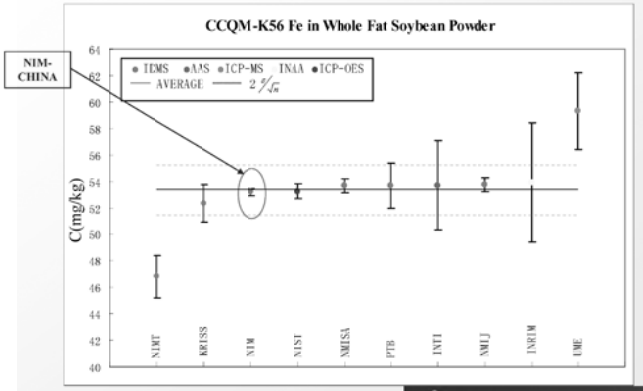
CCQM-K56 Fe in whole Fat Soybean Powder



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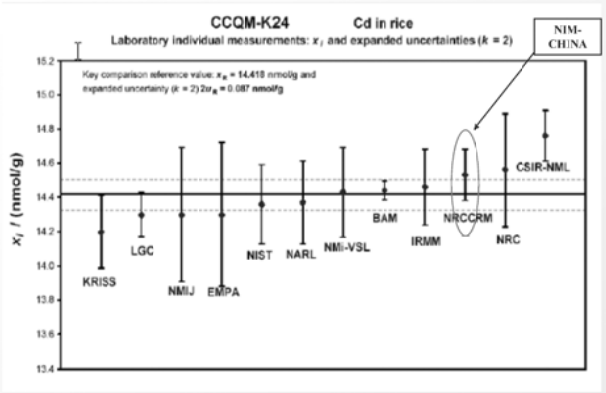

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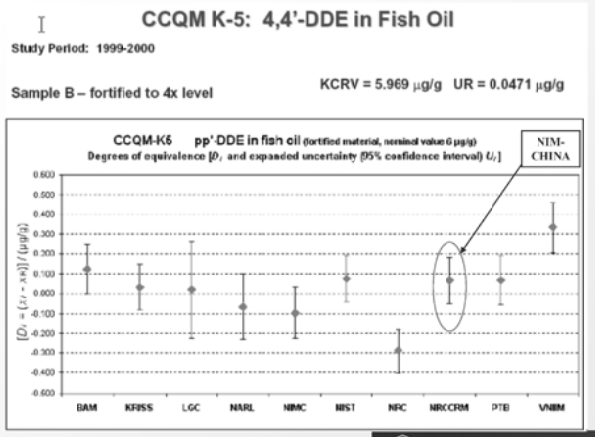

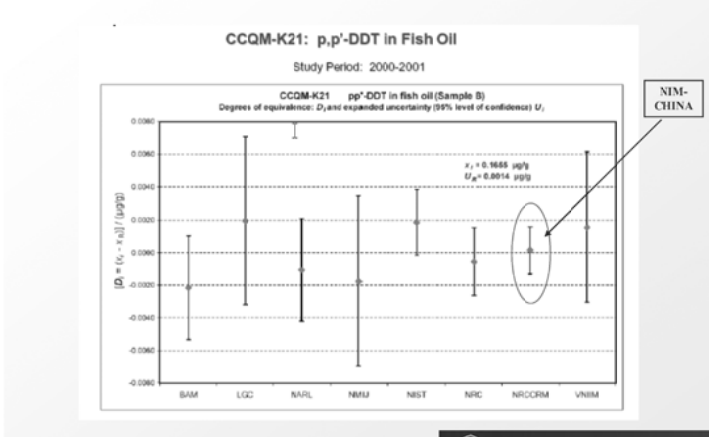

3.2 Certified reference materials

- Base on CMCs and KCDB
- According to ISO Guides
  - ISO Guide 30,31,34,35,80 and ISO 17025
- Amount of RMs in food and agricultural products
  - NIM 194
  - LGC 192 (including sales for other countries)
  - IRMM 105
  - NIST 50

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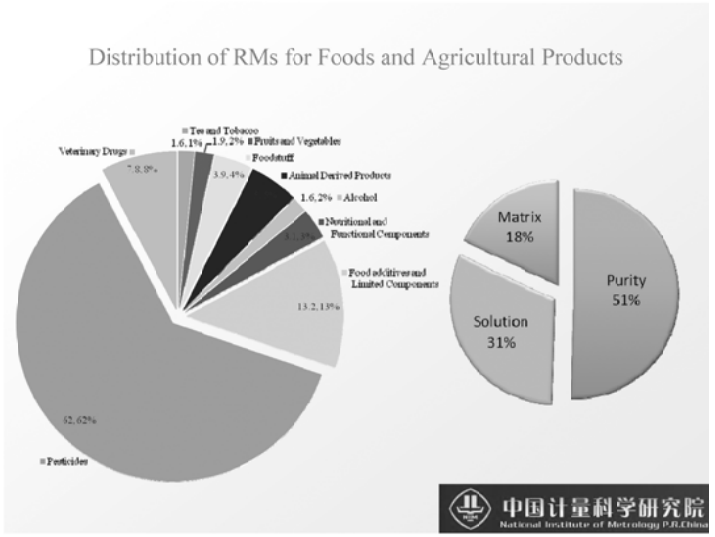

List of certified reference materials

Category	No.	Name
Tea and Tobacoo	GBW07605	Tea
	GBW08516	Fluoride composition in tea
	GBW08514	Tobacco
	GBW08515	Tobacco
Fruits and Vegetables	GBW08517	Laminaria japonica aresch
	GBW10014	Cabbage
	GBW10015	Spinach
	GBW10016	Tea
	GBW10019	Apple
Foodstuff	GBW08510	Cadmium in rice
	GBW08511	Cadmium in rice
	GBW08512	Cadmium in rice
	GBW10010	Rice flour
	GBW10011	Wheat flour
	GBW10012	Corn flour
	GBW10013	Soybean flour
	GBW(E)080684	Rice flour
	GBW(E)100009	Nutritious compositions in rice flour
	GBW(E)100010	Nutritious compositions in wheat flour

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List of certified reference materials

Category	No.	Name
Animal Derived Products	GBW08552	Pork muscle
	GBW08573	Pseudosciaena crocea
	GBW10018	Chicken muscle
	GBW10017	Milk powder
	GBW08509a	Nonfat milk powder
	BW3709	13 organochlorinated pesticides in salmon tissue
	BW3713	7 PCBs in salmon tissue
	BW3710	18 organochlorinated pesticides in tuna tissue
	BW3711	14 organochlorinated pesticides in tuna tissue
	BW3716	7 PCBs in tuna tissue
	BW3717	7 PCBs in tuna tissue (Arochlor fortified)
	BW3708	16 organochlorinated pesticides in salmon oil
	BW3712	7 PCBs in salmon oil
Alcohol	GBW(E)100012-100013	Reference materials for the chromotographic analysis of alcohol
	GBW(E)080647	Methanol in alcohol/water(50%/50%)
	GBW(E)080648	Isobutanol and isopentanol in alcohol/water(50%/50%)
	GBW(E)080649	Methanol、isobutanol and isopentanol in alcohol/water(50%/50%)

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3.3 Primary / Authoritative Methods

Methodology study: Most potential primary measurement methods in chemistry are studied in NIM, such as:

- **IDMS**
- **Gravimetric method**
- **Freeing Point Degression**
- **Coulometry**
- **Titrimetric method**
- **Others**

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3.3 Primary / Authoritative Methods

National Measurement Standards:

Maintains 6 national primary standards and 42 national standards

- National Primary Standard for Combustion Heat
- National Primary Standard for Viscosity
- National Primary Standard for Gravimetric Hygrometer/ Two-pressure Standard Humidity Generator

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3.3 Primary / Authoritative Methods

- National Primary Standard for pH
- National Primary Standard for Electrolytic Conductivity
- National Primary Standard for chemical purity determination
- IDMS (Isotope Dilution Mass Spectrometry) Primary Measurement Method




3.4 Support establishment of national measurement standards

- Support establishment of eight national standards
  Four of them was issued:
  - GB/T18979—2003
  - GB/T18980—2003
  - GB/T19339—2003
  - GB/T5009-199—2003
- Standards for food irradiation processing
  - Co-60 γ-ray standard irratidation field
  - ESR technology to determine irradiation processing method for food of bone, meat and fish
  - Thermoluminescence method to determine irradiation processing method for spice and dehydrated vegetables

3.5 Improve national measurement capability

- PT of food
  - 800 labs
- Activities
  - PT meeting and workshop

•Nutrients in soybean,
•Fusel oil in methanol,
•Synthetic food colorants in beverage
•Acesulfame potassium in beverage
•Pyrethroids in fruit juice
•Trace pollutant in fish
•Solution of organochlorine pesticides
•Heavy metals in plastic

•Improve measurement capability of labs
•Solve problems such as inaccurate measurement

Improve national measurement capability

- CNAL Methanol-Fusel oil
- CNAL T0087 -2003 organochlorine pesticides solution
- CNAL 0250 -2004 Pigments in beverage
- CNAL T0183-2005 Nutrients in soybean powder
- CNAS 0330 -2006 Acesulfame potassium in beverage
- CNAL-2007 Pyrethroid in apple juice

3.6 Emergency database for food analysis

- Collection and integration of resources
  - Technical organizations
  - Experts
  - Methods
  - Cases

•Provide database for society
•Construct emergency system of food safety
•Strengthen emergency processing capability of food safety
•Underpin health of people and economic development

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3.7 Current research projects

- Aim at:
  - "2006-2020 National Plan for Medium to Long-term Scientific and Technological Development"
  - International metrology science and technology
- Content:
  - Research on measurement technology and standardization of toxic and harmful components in food, food additives, packaging materials, etc.
  - Strengthen CRM research and chemical metrology system in food safety
  - Research on CRMs and measurement methods for limited components and urgent needed components in food safety monitoring:
    - Pesticides, Veterinary drugs, Food Additives, Heavy Metal Elements, Food Nutrients, Food Packaging materials, Cosmetics.
    - Including CRMs of purity, solution and matrix
  - Assure reliable, traceable, comparable measurement results for food and agricultural products
  - Establish multi-organization share network system to provide technical and material support
  - Build human resources expert at CRM research and measurement methods for food safety

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3.7 Current research projects

- Period 1 (Completed)
  - 32 urgent needed CRMs of pesticides, etc.
  - Measurement method research
  - Popularization of CRMs and ISO guides
- Period 2 and 3
  - Mainly on new regulations of China on limited components in food
  - Mainly on "Positive List System" of Japan
  - According to key work on food safety, make future research plans

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3.7 Current research projects

	CRMs
Period 1	•Methyl Paraben, Propyl Paraben, Butyl Paraben, Isopropyl Paraben, Propionate Sodium, Calcium Propionate, Purity •Solution of methyl mercury and ethyl mercury •As,Pb and Cd in laver •Organochlorinated pesticides in fish, PCBs in fish, PAH in fish
Period 2	•Nicotinamide,purity •Sodium Glutamic Acid, Sucrose Trichloride, Biphenyl, Salicylic Acid, Purity •Azocyclotin，Bensulfuron-methyl，Carbendazim，Cyhalothrin，Fenbutatin oxide，Fenpropathrin，Fenpyroximate，Mancozeb，Metalaxyl，Phosmet，Estradiol，Diethylstilbestrol，Purity •Certified Reference materials for Se speciation •Enriched isotope dilutio certified reference metarials of Pb,Ce and Hg •Solutions of Phthalate Acid Esters, Concentration •Certified Reference materials of Pb,Fe and Mn in wine •Pb and Ce reference materials in rice powder and corn powder •Nicotinamide in Milk Powder,Concentration •Organochlorinated pesticides in fish, PCBs in fish, PAH in fish

3.7 Current research projects

	CRMs
Period 3	•Nicotinic acid, purity •Emodin,purity •Erythrosine, Fancy Red, Potassium Sorbate, Phenylethanol, Isobutyl p-Hydroxybenzoate, Thiabendazole,Purity •Prochloraz，Thiodicarb，Trizaophos，Purity •Acesulfame Potassium in Methanol, Caffeine in Methanol, Saccharin Sodium in Methanol, Benzoic Acid in Methanol, Potassium Sorbate in Methanol, Saccharin Sodium, Benzoic Acid,Potassium Sorbate in Methanol, Concentration •Antiseptics in Cosmetics,Concentration
Period 4	*Planning*

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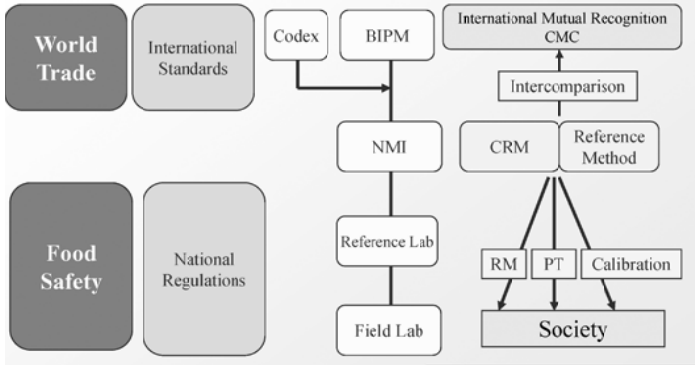
4. Requirement of Chemical Metrology for Foods and Agricultural Products



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4. Requirement of Chemical Metrology for Foods and Agricultural Products

Developing trends and needs of CRMs

◆Most needs concentrate on pesticides, verterinary drugs, food additives:

pestides and veterinary drugs	43.8%
foods additives (preservatives and dyes)	11.5%
amino-acid, vitamins, fatty acids, organic acids sugars and functional components	7.0%
VOCs	6.0%
heavy metals and organic metals	3.0%
occupation hygiene, clinic and pharmacy	1.9%
plasticizers	1.5%
PCBs and PAHs	1.4%
biotoxin	1.2%
Others (chemical products, etc.)	22.7%

Customer needs collected by NIM, 2006

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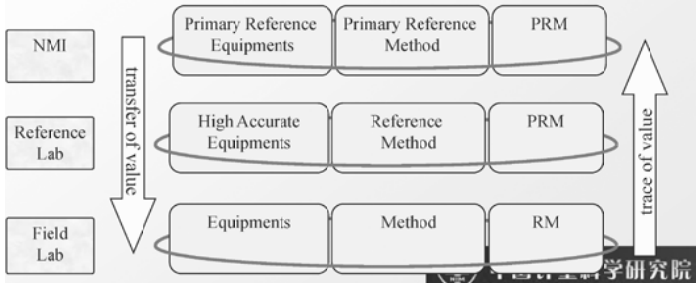
5. Future Work Idea

Traditionally — Chemical Metrology: mainly by CRMs

Future — Metrological System of Chemistry: by **combination of three elements**: (Equipment, Method, Reference Material)



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Conclusion

- NMI order of magnitude breakthrough uncertainty reduction should be able to lead directly to lower uncertainties down through the measurement system
- Chemical metrology system has taken an important role in the application fields

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Thank you for your attention !

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Current Status on Quality Measurement of Food in Democratic People's Republic of Korea

QUALITY CERTIFICATION CENTER(QCC)

Introduce

- 1947. 6 Outdated measurement system
- 1949. 8 Central Agency for product Inspection of the Cabinet

...

- 1986. 6 Central Institute for Quality and Metrology
- 2001. 11 Quality Certification Center(QCC)

Role of QCC

Super assessment organization

- Conducting quality test works of products manufactured in the main factories and companies
- Quality judgment of the main exported or imported commodities
- Highest certification center

(QMS, EMS, HACCP, GMP)

Work of Food testing division in QCC

Analysis of various kinds of food and agricultural products

- Grains and their processed products

- Meat and fish and their processed products
- milk, oil, liquid and soft drinks, sweets and cakes

- Additives including season powders
- Sweet materials, antiseptics and coloring matters and vitamins, etc.,


Problems
What is the toxin judgement method and criteria?
How can we use microorganism for the examination of poisonous ingredients?
What is the observation index on the safety of the storage process of grain?
What is the definition of criteria of hygienic and safety of food?
How can we combine with quality and hygienic and safety criteria of food?
Is there a traceability on quality and criteria of safety of food?
How can we determine the residue of agricultural chemicals and their tolerance limit?
On the analysis of mold poison and their reference materials?
Thank you for your attention!

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Metrology in Chemistry in relation to Consumer Protection and Product Safety – the Hong Kong Experience

by

Dr C S MOK

Government Laboratory
Hong Kong SAR, China

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Overview

1. Scientific Measurements- the social and regulatory function
2. Consumer Protection-related Ordinances in Hong Kong China
3. Metrological and regulatory needs for chemical measurements
4. Chemical Measurement- the need and the constraint
5. The Government Laboratory of Hong Kong China
6. Conclusion

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Scientific Measurements-social and regulatory functions

Provide information to

- Meet the needs of trade
  - Consistency in measurement - removal of technical trade barriers
- Protection of
  - public health and safety
  - consumers' interests
  - government revenue
  - environment
- Enforcement of regulations and ordinances

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Consumer Protection

Related Ordinances in Hong Kong China

a) Weights and Measures Ordinance
b) Smoking (Public Health) Ordinance
c) Trade Descriptions Ordinance
d) Toys and Children's Products Safety Ordinance
e) Consumer Goods Safety Ordinance

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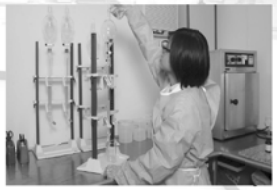
Scientific measurements:

Physical, chemical, physico-chemical and DNA based measurement are needed *to substantiate conclusion on regulatory compliance /non-compliance*



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Metrological and regulatory needs for chemical measurements

- Un-ambiguous confirmation for the presence / absence of the compound of interest
- Accountability, trust and confidence in measurement results
- Traceability of measurements
- Stated uncertainty for quantitative measurements
- Comparability of measurement results
- Quality of measurement

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Weights and Measures Ordinance

For the determination of short-weight goods. Balances are calibrated by standard mass traceable to the international prototype of the kilogram.

For example:

Crabs are normally sold with the weeds/strings. There were complaints about the net weight of crab.

In our measurement, both the net weight of the crab and the weight of the strings will be reported.

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Smoking (Public Health) Ordinance

Under the Smoking (Public Health) Ordinance, the tar content of cigarette shall not exceed 17 mg per cigarette. Tests are carried out in accordance the International Standard Methods ISO 3308:2000, ISO 4387:2000, ISO10362-1:1999, ISO 8243:2003, and ISO 10315:2000. International comparison is in place to ensure comparability of test .

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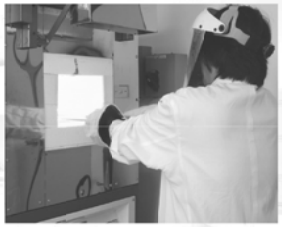
Trade Descriptions Ordinance

- **Gold Assay**
- ISO11426:1997
  - Scrap sample
  - Mix sample with silver and copper, then wrap in lead foil
  - Press the lead foil into ball-shape and place sample in cupel
  - Fire Assay (Cupellation) 1100°C



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Trade Descriptions Ordinance

Example:
Analysis of Bird's Nest

- Reference to literature
- Reference materials available
- National/International standard methods not available.

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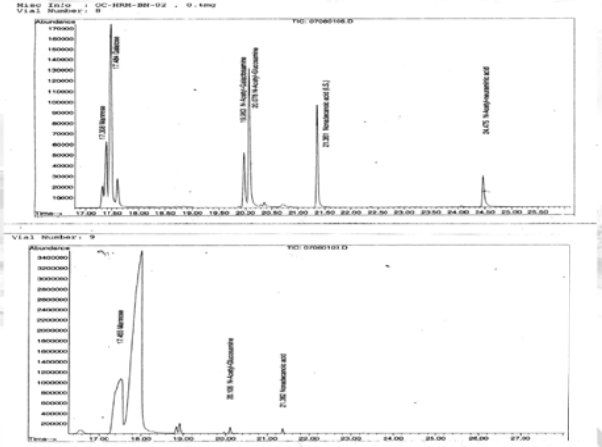

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Toys and Children's Products Safety in Hong Kong China

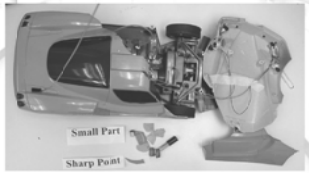
Toys Safety

Three sets of safety standards are adopted

a)International Voluntary Toy Safety Standard

b)European Standard EN71

c)ASTM F963



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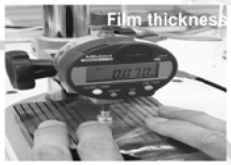
Chemical measurements for toys and children's products

- Trend:
- More safety requirements for chemicals

e.g.

a) EN71-7 2002, Safety of Toys-Finger paints-lists the requirements for colourants, preservatives and azo dyes. (first introduced in 2002)



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Children's Products Safety

Appropriate international/national standards are adopted

ISO-International Organization for Standardization
ASTM International
BS-British Standards
EN-European Standard
AS-Standards Australia
NZ-Standards New Zealand

Different standards for the same product may not be identical

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Bisphenol-A

- In 2007, the Environment California Research and Policy Centre reported leaching of the chemical Bisphenol A from baby feeding bottles made of polycarbonate.

- An extraction method according to the BS EN 14350 : 2004 (Child use and care articles –Drinking equipment) is used for extraction of the compound, measurement was done by LC/MS/MS. Different extraction conditions may give different results. The test is traceable to the BS EN standards.

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Consumer Goods Safety

Examples

- In April 2007, the Consumer Council issued a warning on the use of PAAG (hydrophilic polyacrylamide gel, a jellylike transparent implant used in breast augmentation). Polyacrylamide is a permissible ingredient in cosmetics and is not considered toxic. However, un-polymerized acrylamide monomer, which may be present in the end product, is a neurotoxin and is a probable carcinogen as classified by the International Agency for Research on Cancer. An analytical method using liquid chromatography-tandem mass spectrometry (LC/MS/MS) with isotopic labelled acrylamide as an internal standard is applied for determination.

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Consumer Goods Safety

Examples

b) There were media reports that excessive levels of methanol was found in nail polish. According to GB 7916-87 Hygienic Standards for Cosmetics of the People's Republic of China, the content of methanol in cosmetics shall not exceed 0.2 %. An analytical method using gas chromatography- mass spectrometry (GC/MS) is applied for determination.

c) Benzene in nail polish was determined by GC-MS using d6-benzene as an internal standard. Benzene at a level of 10 mg/L can be measured. Benzene is listed as a substance that must not form part of the composition of cosmetic products under Annex II of Council Directive of 76/768/EEC, and in GB 7916-87 Hygienic Standards for Cosmetics of the People's Republic of China.

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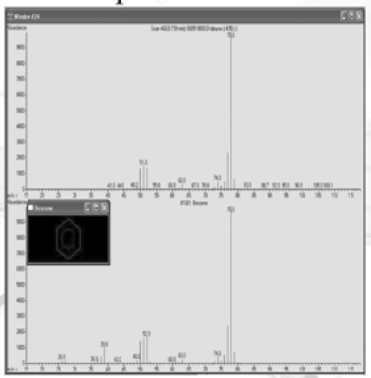
Benzene in nail polish

- Sample MS spectrum
- Library MS spectrum



GC/MS for benzene in nail polish

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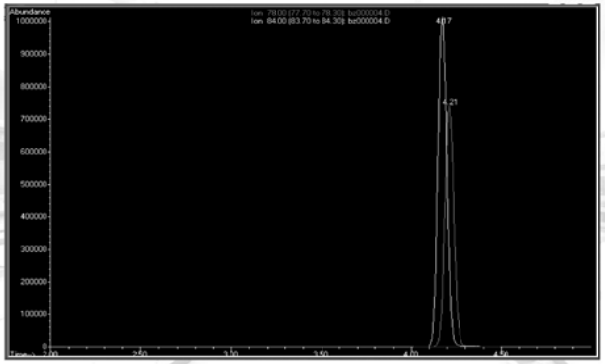
Measurement of benzene with d-6 substituted benzene as an internal standard



—— Benzene —— d-6 Benzene

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Consumer Goods Safety

Examples

d) Presence of trace amount of chromium and neodymium in cosmetic products has recently attracts public attention. The two elements and their salts are prohibited under Council Directive 76/768/EEC, and in the Hygienic Standard for Cosmetics of the PRC, to be present in cosmetic products.

- But Council Directive 76/768/EEC also specify " presence of traces of the substance ..... Shall be allowed provided that such presence is unavoidable in good manufacturing practice and that it conforms with Article 2. Article 2 states that "*A cosmetic product ..... must not cause damage to human health when applied under normal or reasonably foreseeable conditions of use…*".
- The measurements were done by ICP-MS and ICP-AES. Health experts were consulted on the levels of the metals found in test samples on possible health impact.

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Consumer Goods Safety

Examples

e) Presence of 1,4-butanediol (BD) in toys reported in the media in November 2007. According to the literature, the compound will be converted in human body to gamma-hydroxybutyric acid (GBL), which is a central nervous system depressant. Serious illnesses and deaths have been reported as a result of using products that contain BD, GBL and gamma butyrolactone.

- Measurements and confirmation of BD were carried out using GC-MS analysis.

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Requirements of Analytical Protocol

- Need to fulfill metrological requirements
- Validated method offers both selectivity and sensitivity
- Establish detection limit
- Estimate of measurement uncertainty
- Establish traceability through use of reference materials/appropriate comparisons, or to stated reference
- Participation in proficiency testing programmes

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Chemical measurements-the trend

a) To ensure public safety in the use of consumer products, the requirements on chemical safety have been on the increase.

- e.g. **In EN71-9 2005, Safety of Toys-Organic Compounds-requirements-** the limits of flame retardants, colourants, primary aromatic amines, monomers, solvent migrations, solvent inhalation, wood preservatives, preservatives, plasticisers have been introduced. Relevant test methodologies have been given in EN 71 parts 10 and 11.

e.g. **In European Council Directive 76/768/EEC**
Annex II Lists substances which must not form part of the composition of cosmetic products, there are about 1200 entries

Annex III Lists substances which cosmetic products must not contain except subject to the restrictions and conditions laid down, there are about 100 entries and related substances, and about 60 entries which are provisionally allowed subject to the limitations and requirements stipulated therein.

Annex VI lists about 80 preservatives and UV filters which cosmetic products may contain up to the maximum authorized concentration.

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Chemical measurements-the constraint

Because of the very extensive scope of chemical measurements in connection with product testing

- CRMs, both the pure substances and matrix materials, would facilitate traceability in measurement, but CRMs for most of the listed substances are not available in the market.
- Standard test protocols are often not available.
- Interlaboratory comparison programmes to ensure comparability of test results are often not available.

More work has to be done to ensure validity of measurements and comparability of test results.

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The Government Laboratory of Hong Kong China

- provides chemical measurements to support the enforcement of the regulations in connection with product safety and consumer protection
- demonstrates international equivalence of measurement through active participation in CCQM and APMP study and comparisons
- implement a quality system to ISO/IEC 17025 in its operations
- accredited to be a proficiency test provider
- promotes comparability of chemical measurements through organizing international inter-laboratory comparisons, including comparisons for metals in paint in 1999 (APLAC T013) and 2006 (APLAC T039) in connection with product testing

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Conclusion

- ***Chemical measurements are indispensable to ensure for consumer protection, and for policy decision making.***
- ***The measurements should observe relevant metrology principles to ensure traceability and consistency of measurement results.***
- ***Requirements for chemical safety are on the increase. Methods of assessment should produce reliable and consistent test results.***
- ***Reference materials are needed for test method validation and maintain traceability of measurement.***

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Ozone chamber

Test for burning behaviour

Testing of flexible rubber tubing

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Special facilities

- **Cleanroom for trace organic analysis**

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Cleanroom for trace elemental analysis

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- You are welcome to visit our website at:

http://www.info.gov.hk/govlab/

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Thank you !

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How product safety laws work in New Zealand

Overview

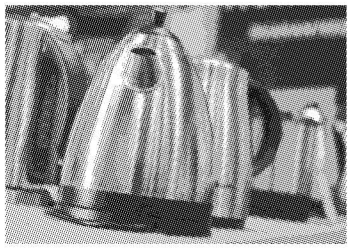
New Zealand has two key laws which deal with product safety, the Consumer Guarantees Act and the Fair Trading Act. The Consumer Guarantees Act is a general consumer protection law which gives minimum standards of quality for goods and services. The Fair Trading Act is designed (among other things) to promote product safety and to prevent injuries.

The Ministry of Consumer Affairs administers both these Acts. The Ministry is expected to liaise and consult with other government agencies that may have an interest or be affected by any proposed government intervention.

The Commerce Commission enforces product safety standards and product bans made under the Fair Trading Act. The New Zealand Customs Service can also enforce the safety provisions, they generally do this under the Customs Act.

Consumer laws

The Consumer Guarantees Act



The Consumer Guarantees Act gives consumers certain guarantees when they purchase goods and services. The Act puts responsibilities on retailers and manufacturers/importers and sets out rights and remedies consumers can claim if these guarantees aren't met.

The guarantees apply to goods (new and second-hand) and services which are purchased for household use. Excluded from the Act are goods and services that are supplied for business use and goods supplied by auction.

Relevant to product safety are the guarantees contained within the Act that goods sold are of 'acceptable quality'. This means that the goods have to be free from minor defects, safe, and durable. It also means they have to be 'fit for the purpose for which they were supplied' and acceptable in appearance and finish.

Goods that are unsafe are said to be of 'substantial failure' and the consumer has the right to reject the goods. To remedy the situation the consumer may choose a repair, replacement, or a full refund.

Action taken under this law is directed towards putting the problem right, including compensation for consequential loss. If a consumer can't sort out the problem with the supplier, the issue can be taken to the Disputes Tribunal.

Product Safety Policy Statement

The government has recently decided to take a more proactive approach to product safety by

issuing government product safety policy statements. The first statement clarifies acceptable levels of formaldehyde in clothing.

A government product safety policy statement is designed to complement the Consumer Guarantees Act by making it clear to manufacturers and importers what is considered 'acceptable quality' and 'fit for purpose' under the Act. Other government policy statements may be developed in future for other areas of product safety.

The Fair Trading Act

In relation to product safety, the Fair Trading Act allows the Minister of Consumer Affairs to:

- Recommend the introduction of product safety standards;
- Declare goods to be unsafe (a product ban);
- Order a compulsory recall.

Product safety standards

The Minister of Consumer Affairs may recommend that a product safety standard is made for the purpose of 'preventing or reducing the risk of injury'. The Minister is obliged to consult with parties who will be affected by a product safety standard, to give them the chance to comment. A product safety standard may cover:

- the nature of the product and its performance-e. g. composition, contents, manufacture, processing, design, construction, finish or packaging;
- tests the product should go through during or after manufacture;
- the form and content of any markings, warnings or instructions on the product.

There are currently six product safety standards for: baby walkers; children's nightwear; children's toys; cigarette lighters; household cots and pedal cycles. Businesses must make sure they're aware of the requirements relevant to them. It's a breach of the Fair Trading Act to not comply with the requirements of product safety standard regulations.

Unsafe goods notices (product bans)

The Minister of Consumer Affairs has the power to stop the sale of goods by declaring them to be 'unsafe goods'. This action can be taken 'where it appears to the Minister that goods of any description or any class or classes of goods will or may cause injury'. A ban stays in force for 18 months, unless withdrawn earlier by the Minister. At this point it can be imposed indefinitely or for a further specified time.

There are unsafe goods notices for: lead in children's toys; hot water bottles; candles with lead in the wicks and candlewicks containing lead; and, pistol crossbows.

The Commerce Commission investigates complaints about products that have a product safety standard or have an unsafe goods notice attached to them.

Compulsory recall

The Minister of Consumer Affairs can order a compulsory product recall where goods being sold do not comply with a product safety standard; or are of a kind which will or may cause injury and the supplier has not recalled the goods or taken good enough action to recall the goods.

New Zealand does not require notification of voluntary recalls, but the Ministry of Consumer Affairs does offer assistance to companies undertaking a recall.

How the laws work together

The Ministry of Consumer Affairs investigates complaints about consumer products that are not subject to mandatory product safety standards (this is done by the Commerce Commission), or otherwise covered by other regulations (e. g. food, medicines). The Ministry of Consumer Affairs also monitors voluntary compliance with national standards where there's information that there may be the potential for injury but the need for formal government intervention has not yet been established.

Using the Consumer Guarantees Act condition that a product must be safe, the Ministry adopts the philosophy that voluntary national standards (NZ, Australian, European etc.) provide a reasonable minimum benchmark for safety requirements. There is an expectation that the products will comply with the critical safety requirements of voluntary national standards, and that redress is available to consumers where they do not. When an investigation concludes that critical safety requirements are not being met, the Ministry assesses whether the powers of the Fair Trading Act are required, depending on the potential injury risk involved, and the ability and or willingness of the suppliers to voluntarily self-regulate.

Providing information

The Ministry of Consumer Affairs publishes a range of information resources on both the Consumer Guarantees Act and product safety issues. These resources are available on the Ministry's website. The Commerce Commission also provides a range of information on rights and obligations under the Fair Trading Act, how the Commission intends to enforce the Act and how the Act or regulation applies to a particular business or industry. It also provides information to consumers.

Role of business

Business New Zealand (and the many industry sector associations under its umbrella) and the NZ Retailers Association play an active role in promoting self-regulation. They are involved in the development of industry codes of practice, provision to business of advice on suppliers' responsibilities under the Consumer Guarantees Act, and the development of national standards through participation on standards technical committees.

Other consumer product safety legislation & who complaints should be referred to:

Product	Relevant organisation	Contact details
Products subject to a product safety standard or unsafe goods notice	Commerce Commission	www. comcom. govt. nz
Food	New Zealand Food Safety Authority (NZSFA)	www. nzfsa. govt. nz
Medicines and therapeutic goods	Ministry of Health	www. moh. govt. nz

Product	Relevant organisation	Contact details
Motor vehicles	Ministry of Transport Land Transport New Zealand	www. mot. govt. nz www. ltsa. govt. nz
Gas and electrical products	Energy Safety (part of the Ministry of Economic Development)	www. energysafety. govt. nz
Hazardous products and products used in the workplace	Occupational Safety and Health (a division of the Department of Labour)	www. osh. govt. nz
Hazardous substances and organisms	Environmental Risk Management the Authority (ERMA)	www. erma. govt. nz
Products used in building and construction	Department of Building and Housing	www. dbh. govt. nz

Overlaps between safety regimes and working together

Government action will generally be taken by the agency that has the lead interest in the class of product. Ministerial recall powers under the Fair Trading Act apply to any product that may cause injury. There are a range of formal and informal understandings between agencies with overlapping jurisdiction. If another safety regime does not adequately address the safety issue, or provide effective remedial powers to address it, the Fair Trading Act provisions can be used to assist in any recall of unsafe products.

Further information

The product safety standard regulations are available from selected bookshops or on the New Zealand Legislation website: www. legislation. govt. nz. Any relevant standards referred to in the product safety standard regulations and unsafe goods notices can be purchased from Standards New Zealand www. standards. co. nz.

The Ministry of Consumer Affairs also has copies of the toy standard, both the mandatory and voluntary parts, for viewing by suppliers and members of the public at its offices in Auckland, Wellington, Petone and Christchurch. For further information, call the Ministry's free phone number on: 0508 627 774.

Establishment of National Chemical Metrology Traceability System for RoHS Directive

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Hangzhou, June 2008

Outline

- ◆Back Ground
- ◆The Valid Measurement Results are urgently needed for RoHS
- ◆National Metrology Traceability System
- ◆Main Research Works (what we have done)
  - ➢Methods and CRMs Development
  - ➢International Collaborations and Comparisons
  - ➢National Reference Labs and National Proficiency Tests
  - ➢Information Resource and Database Sharing
- ◆Great Effect of national proficiency tests organized by NIM
- ◆Conclusions

1.Back Ground

RoHS Directive Aroused from Environmental and Human Being Health Problems

- ➢ **Along with development of technology and economy, the life quality is developing very fast continually, however countries around world face on serious Electronic Waste Problems.**
- ➢ **When the Electronic Waste has been thrown away into environment, soil and water would be polluted, and the pollution will be continued for a long history period, human being health would be threatened through the biosphere circle, fearful diseases would be occurred, especially the disease for cerebra, nerve system, bone and lymph system.**

Pollution from Electronic Waste

RoHS Directive
(Restriction of Hazardous Substances)

- RoHS Directive, 2002/95/EC, **was passed in the European Parliament and the Council of European Community and put into effect in February 2003.**
- **The Directive calls for EU countries to ensure that** *from July 2006*, new EEEs (electrical and electronic equipment) put on the EU market dose not contain four *(4) heavy metals*, *PBB* and *PBDE*, **excepting a handful number of those listed in the Annex.**
- **European Commission circulated a consultation document that proposed the maximum concentration values of RoHS materials for the judgment whether EEEs met the requirement of Directive.**

Regulated Values of RoHS

- **Four Kinds of Heavy Metals**
  - Cadmium ≤ 0.01%
  - Mercury ≤ 0.1%
  - Chromium (VI) ≤ 0.1%
  - Lead ≤0.1%
- **Brominated Flame Retardants**
  - Polybrominated biphenyls (PBB) ≤ 0.1%
  - Polybrominated diphenyl ethers (PBDE) ≤ 0.1%

Same Regulations for Hazardous Substances in the World

- EU : **Restriction of Hazardous Substances (RoHS)**
  - **(began since July, 2006)**
- China: **Management Methods on the Prevention and Control of Pollution Caused by Electronic information Products (Chinese RoHS)**
  - **(began since March, 2007)**
- Japan: **The Marking of Presence of the Specific Chemical Substances for Electrical and Electronic Equipment (J-Moss; JIS C 0950)**
- Korea: **The Act for Resource Recycling of Electrical/Electronic Products and Automobiles (Korean WEEE, RoHS, EuP)**
- USA **(California): Electronic Waste Recycling Act (S.B. 20), Electronic Waste, Advanced Disposal Fees (S.B. 50)**
- Norway **Prohibition on Certain Hazardous Substances in Consumer Products (PoHS)**

Regulations of Hazardous Substances in the World

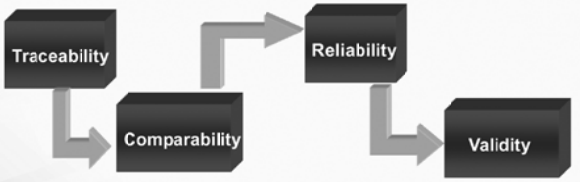
Note: **Indicates the countries/regions having completed or planning to complete legislation on electronic wastes before 2010**

Getting more and more Attention from Government, relevant Departments and Manufacturers in China

- China is one of the biggest EEEs manufacture and consumption country in the world.
- China is also one of the biggest EEEs export country in the world.
- Total EEEs exported annually from China is more than 400 billions USD, and 60 billions USD products which concern with RoHS Directive exported to Europe.
- Responding from government, relevant departments and manufacturers are very quickly.
- The purposes are not only for protection of European Market and Chinese Market, but also for protection of Environment and Health of Human Being.

2.The valid measurement results are urgently needed for RoHS Directive

- The validity and reliability of results basically come from the measurement traceability.

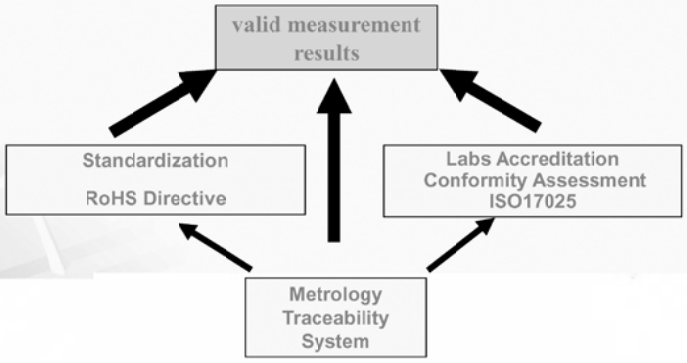


Catchwords

One Measurement, One Management, Accepted all over the Word.

One Word, One Dream, One Olympic.

Three technical pillars for RoHS valid results



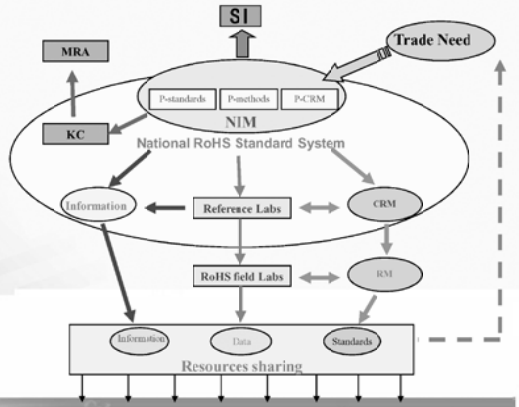
3.National Metrology Traceability System

How can measurements be traceable?

Sketch Map of Measurement Traceability in Chemistry Drawn by ISO/REMCO

- None but the result vertically compared (traceable) may have the comparability horizontally.
- Traceability needs to be realized in a system, what we call "National Metrology Traceability System" (NMTS).
- The system consist of organizational & technical elements under certain institutional arrangement .

National Metrology Traceability System for RoHS Directive



All of the RoHS testing

The Aim of Establishing National Chemical Metrology Traceability System for RoHS

purposes

Sharing standards resource

Getting results comparable

Getting results MRA
Responding Trade bulwark
Improving Quality of EEEs
Preventing Environment pollution
Protecting Human Health

Focus on

- RoHS measurement methods research
- RoHS CRMs development
- Organized National Reference Labs
- International Comparisons
- National proficiency tests
- Education and Knowledge Sharing

4.Main Research Works in NIM

- Measurement methods research and certain CRMs development
- International cooperation and comparisons for MRA
- National reference laboratories and national proficiency tests
- Resource sharing

Measurement methods research and certain CRMs development

Challenges

- Different matrix materials

  polymers (plastics), alloys, glass, rubbers, pigments, coatings, ceramics, etc.
- Difficult sample pre-treatment

  sampling，preparation and digestion procedures
- Diverse instrument measurement methods

  ID-ICP-MS, ICP-MS, ICP-AES, AAS, AFS, IC, XRF, etc. for elements (Cd, Pb, Cr, Hg)

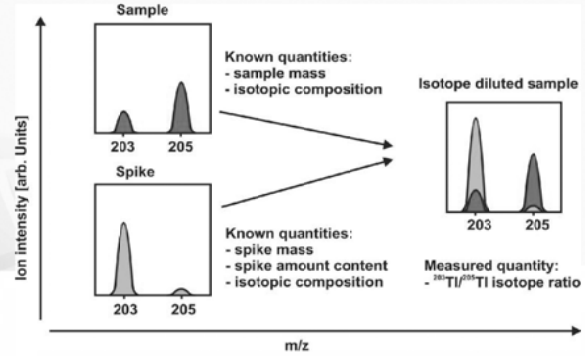
  HPLC- ICP-MS, GC-ICP-MS for brominated flame retardants (PBB and PBDE)

Measurement methods research

- **Primary methods**
- ID-ICP-MS for determining of prohibited elements (Pb,Cd,Hg,Cr) in plastic.
- **Reference methods**
- Microwave digestion process for ICP-MS determining heavy metals (Pb,Cd,Hg and Cr) in RoHS products.
- Microwave digestion process for ICP-OES determining heavy metals (Pb,Cd,Hg and Cr) in RoHS products.
- HPLC- ICP-MS for determining of PBB and PBDE
- GC-ICP-MS for determining of PBB and PBDE
- …

Advantage of IDMS

Principle of isotope dilution mass spectrometry



IDMS – system of equations I

Definition of an isotope ratio:

$$R = \frac{N_a}{N_b}$$

N: Number of atoms of an isotope
a: Major isotope of the spike
b: Reference isotope of the sample

For an isotope diluted sample *xy*, that is a blend from spike *y* and sample *x*, applies:

$$R_{xy} = \frac{N_x \cdot a_{x,a} + N_y \cdot a_{y,a}}{N_x \cdot a_{x,b} + N_y \cdot a_{y,b}}$$

a: Isotope abundance
x: Sample
y: Spike
xy: Blend from x and y

IDMS – system of equations II

$$C_x = C_{y,b} \cdot \frac{M_x \cdot m_y}{M_b \cdot m_x \cdot a_{x,b}} \cdot \frac{(R_y - R_{xy})}{(R_{xy} - R_x)}$$

Equation only consists of the isotope ratio of the blend, the masses of sample and spike as well as known or tabulated quantities.

The result can easily be calculated and the set-up of an uncertainty budget is straight forward.

Comparison of equations: Vogl, J. (2007)

Performance of IDMS

Advantage

- Losses of analyte do not affect the accuracy of the result
- Nearly matrix independent
- Major (%) to ultra-trace components (< pg/g)
- Elements, species and compounds
- Various matrices
- High trueness together with smallest uncertainty

Disadvantage

- **Not a non-destructive method**
- **Complete isotopic exchange needs to be guaranteed**
- **At least two isotopes are needed, which are free from any interferences**
- **Expensive instrument and spike**

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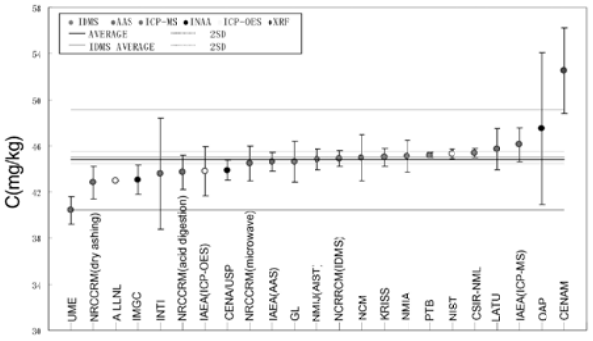
CCQM-P64 Zn in Nonfat Soybean Powder



Advantages of IDMS clearly visible

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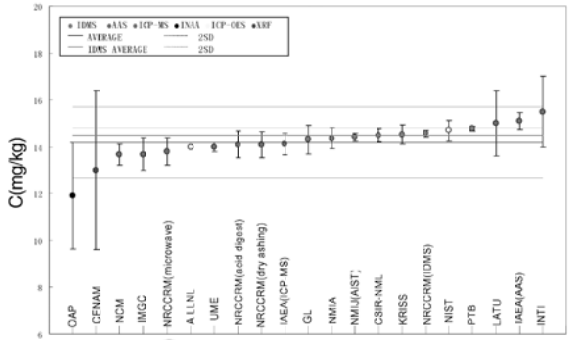
CCQM-P64 Cu in Nonfat Soybean Powder



Advantages of IDMS clearly visible

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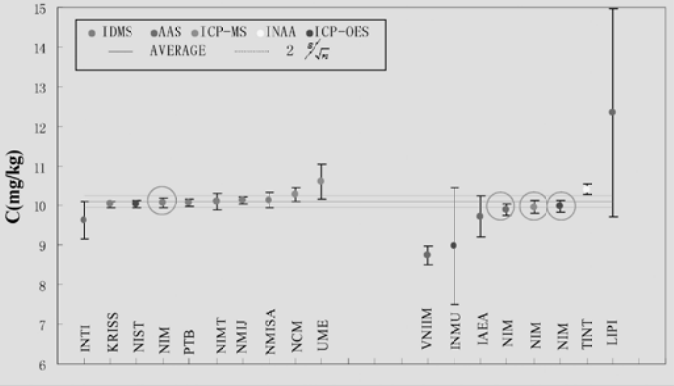
CCQM-K56 & CCQM-P64.1 Cu in Whole Fat Soybean Powder



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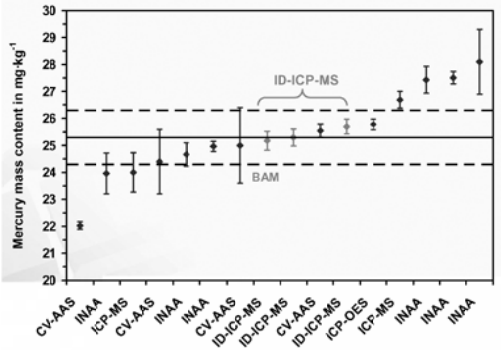
Hg in Polyethylene, certification of BCR 680



- Organic matrix
- Polyethylene (PE)
- Volatile analyte: Hg
- Risk of analyte loss
- High ionization potential
- Huge memory effects
- Low concentration: (25.3±1.0) mg·kg⁻¹

► Advantages of IDMS clearly visible

Lamberty et al. (2001)

RoHS CRMs Completed in NIM China

☺ Calibration solutions for Cd, Cr, Hg, Pb (GBW08612, 08614, 08617, 08619)

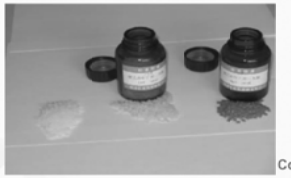
☺ Heavy metals (Cd, Cr, Pb, Hg) in Polypropylene (PP) – grain Include 2 levels and blank(GBW08404,GBW08405)

☺ Calibration solutions for PBB and PBDE GBW08709, GBW（E) 081124、GBW（E)081125

☺ Heavy metals (Cd, Cr, Pb, Hg) in Polypropylene (PP) – disks, used for XRF(**X-ray fluorescence**), include 3 levels and blank. GBW(E)081121、GBW(E)081122、 GBW(E)081123

CRMs Development will be completed in NIM China

PBDE in PE -grain include 2 levels and blank.



Cd, Cr, Pb, Hg, Br in ABS both grain and disk include 5 levels and blank

Heavy metals (Pb, Cd) in soldering tin iInclude 2 levels and blank.

New CRMs Development in Progress

- Heavy metals (Pb,Cr,(Hg),Cd, As,Ba) in glass
  – Include powder/ disk，each for 2 levels and blank.
- Cd, Cr, Pb, Hg, Br (As) in PE (**polythene**), – (grain/ disk)
- Cd, Cr, Pb, Hg, Br (As) in PVC (**polyvinylchloride**), – (grain/ disk)
- Cd, Cr, Pb, Hg, Br (As) in PS (**polystyrene**) – (grain/ disk)

– All of the polymer CRMs include grain and disk, 5 levels and blank for each kinds of grain and disk.

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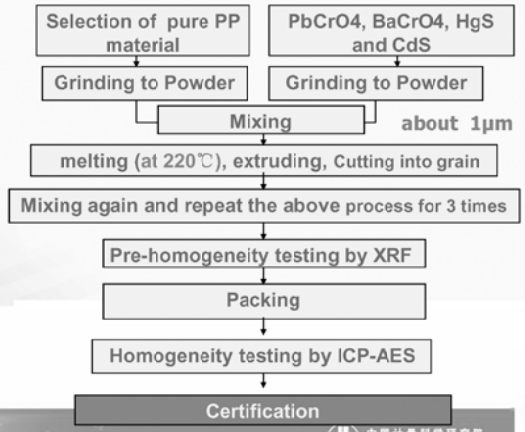
The preparation process of samples



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Available CRMs related with the RoHS directive in the world

- **欧盟(EU)**
  - Polymer matrices: VDA1-4; ERM 680/681
  - Ceramic matrices : BCR-164;
  - Metal matrices : BCR-691; BCR-355
  - Glass matrices：BCR-664, BCR-126, etc.

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美国(USA) NIST

Existing SRMs for RoHS Testing

- Aluminum Alloys
  - SRM 87a Aluminum-Silicon Alloy
  - SRM 855a Aluminum casting Alloy 356
  - SRMs 1710-1715 Aluminum Alloys 3004 and 5182
- Copper Alloys
  - SRMs C11251a-C1253 Phosphorus Deoxidized Copper
  - SRMs 1107-1108 Naval Brass
  - SRMs 1110-1111 Red Brass
  - SRMs 1115-1117 Commercial Bronze A (cast)
  - SRMs C1115-C1117 Commercial Bronzes (chill cast)
- Cupro Nickel Alloy
  - SRM 1276a Cupro-Nickel (CDA 715)
- Glass
  - SRM 89 Lead Barium Glass
- Steel Alloys
- SRMs 1731-1768 Low Alloy Steels
- SRMs 2155-2169 Low Alloy Steels
- Tin
  - SRM 1727 Anode tin
- Tin-lead Solder
  - SRM 127b Solder 40Sn-60Pb
  - SRM 1129 Solder 63Sn-40Pb
  - SRM 1131 Solder 60Pb-40Sn
  - SRM 2321 Sn-Pb Alloy Coating Thickness
- Zinc Alloys
  - SRMs 625-630 Zn-Base Die Casing Alloys

New SRMs under Development

- Elements in Polyvinylchloride (PVC)
- Pb-Free Solder
- Brominated Flame Retardants in Plastic

日本(Japan) NMIJ

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ABS Resin for Cd, Cr & Pb:

- ***8102-a : Low Level (pellet)***
- ***8103-a : High Level (pellet)***
- ***8105-a : Low Level (disk)***
- ***8106-a : High Level (disk)***

ABS Resin for Cd, Cr, Pb & Hg:

- **8113-a : High Level (pellet)**
- ***8112-a : Low Level (pellet)***
- ***8116-a : High Level (disk)***
- ***8115-a : Low Level (disk)*** *(in preparation)*

PVC Resin for Cd, Cr, Pb & Hg:

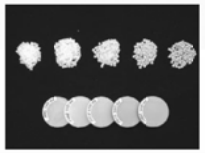
- ***8123-a : High Level (pellet)*** *(in preparation)*
- ***8126-a : High Level (disk)*** *(in preparation)*

Plastics for Brominated Flame Retardants

- ***8108-a DBDE in Polystyrene (disk)***
- ***8109-a DBDE in PVC (disk)*** *(under certification)*

韩国(Korea) KRISS Polypropylene (PP)

Element	Target Concentration/ mg. kg⁻¹ (CRM No.:113-03-Pxx)					
	-01	-02	-03	-04	-05	
As, Cr, Hg, Pb, Zn	-	15	150	500	1000	PPL
Cd	-	2	15	50	100	
S	-	1.5	15	40	85	
Ba	-	40	400	1100	2300	PPH



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Effect of RoHS CRMs development

- Validating measurement methods and measurement results
- Ensuring effective traceability systems

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International cooperation and comparisons for MRA

✓NIM, NMIJ, KRISS for RoHS CRM collaboration and co-certification

Coordinating Lab	NMIJ（Japan）	NIM（China）	KRISS（Korea）
Matrix	**ABS**	**PP**	**PP**
Cd (low/high) mg/kg	**10/100**	**10/100**	**15/100**
Cr,Hg,Pb (low/high) mg/kg	**100/1000**	**100/1000**	**150/1000**
Beginning time	**Oct. 2005**	**Jun. 2006**	**Oct. 2006**
Result discussion time	**Jun. 2006 Mar.2007**	**Mar.2007**	**Mar.2007**

✓NIM and NIST collaboration for methods research and new CRM development (co-production of PVC CRMs).

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Results of NMIJ candidate CRM ABS

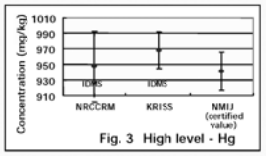


Fig. 3 High level - Hg

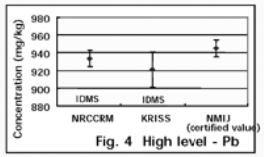
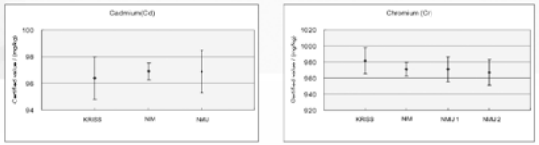


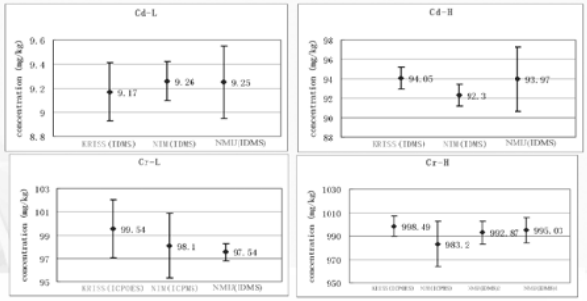
Fig. 4 High level - Pb

Results of KRISS candidate CRM PP

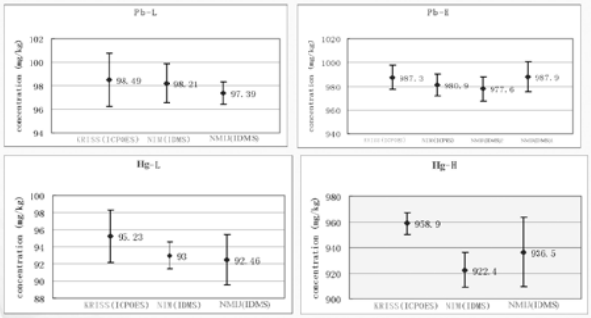


Regarding heavy metals in NMIJ and KRISS sample, the results of 3 NMIs are equivalent.

Results of NIM candidate CRM



According to the graph, the same analytical methods (IDMS) are used and the results of the three NMIs are equivalent.



International collaboration and comparison work can check the established national metrology tractability system, link with other NMIs, make global comparable, and get mutual recognition.

ACRM WG3 (RoHS Working Group)

CCQM-P106
Determination of Cd, Cr, Hg and Pb in Polypropylene

- NIM combined with NMIJ and KRISS proposed this comparison work in IAWG/CCQM/BIPM meeting, April 2007 .
- It was approved as a pilot study of CCQM (CCQM-P106), and also a second typical feasibility study by IAWG.

- Participated Labs... 22 NMIs

- Time schedule

Deadline for registration: 15, Nov. 2007
Dispatch of the samples: 20, Nov. 2007
Deadline for receipt of the result report: 30, Jun. 2008
Discussion of results at CCQM/ IAWG meeting: Oct 2008
1st draft report: Oct 2008

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CCQM-P106 Participating Labs

22 NMIs have already registered.

No.	Participant	Economy	No.	Participant	Economy
1	BAM (1)	Germany	12	CENAM	Mexico
2	NIST	USA	13	NMISA	South Africa
3	UL	USA	14	NMIJ	Japan
4	LNE	France	15	CCHEN	Chili
5	GL	HK China	16	DSS	Thailand
6	PTB	Germany	17	TISTR	Thailand
7	NIMT	Thiland	18	KRISS	Korea
8	INTI	Argentina	19	I.N.RI.M.	Italy
9	VNIIM	Russia	20	LGC	UK
10	IRMM	EU	21	NIM	China
11	CENA/USP	Brazil	22	BAM (2)	Germany

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National reference labs and proficiency tests

national reference labs organized in RoHS filed by NIM

- National Institute of Measurement &Test Technology
- University of Electronic Science and Technology
- General Research Institute for Nonferrous Metals
- National Research Center of Geoanalysis
- Nan Jing geological Center
- Guangdong Bureau of Entry-Exit Inspection and Quarantine
- Beijing Bureau of Entry-Exit Inspection and Quarantine

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National reference labs and proficiency tests

national proficiency tests

Organized 4 national proficiency tests by NIM China.

CNAS T0329 **Determination of heavy metals in PP** （123 labs, Completed）

CNAS T0331 **PBDE in Octane Solution**（79labs, Completed）

CNAS T0399 **Determination of heavy metals in ABS**（109 labs, Ongoing）

CNAS T0398 **PBDE in PE**（88 labs, Ongoing）

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123 labs from quality supervision, inspection and quarantine, manufactures in China has participated the completed CNAS-T0329 PT project.

Participants of the CNAS-T0329 PT program

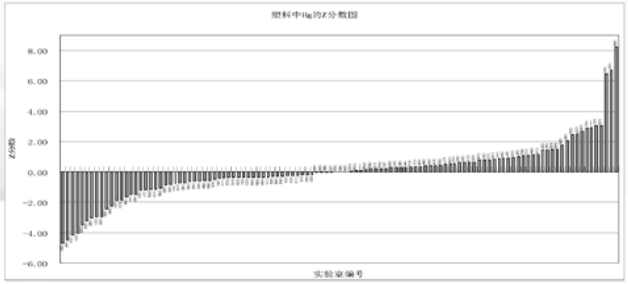
Province	Labs amount	Province	Labs amount
北京Beijing	12	江苏Jiangsu	20
广东Guangdong	45	上海Shanghai	13
山东Shendong	2	湖北Hubei	1
浙江zhejiang	11	天津Taijin	3
福建Fajian	7	河南Henan	1
四川Sichuan	1	吉林Jilin	1
新疆Xinjiang	1	贵州Guizhou	2
河北Hebei	2	山西Shanxi	1

Moreover, 9 labs out of China (USA, Korea, Thailand, Mexico, Philippines…) also resisted the two ongoing PT projects.

Statistical results of PT CNAS T0329

$$Z = \frac{(x - X_{median})}{NIQR}$$

|Z|≤2 satisfied
2<|Z|<3 suspicious
|Z|≥3 unsatisfied



CNAS T0329 塑料中重金属元素检测能力验证Hg结果

Information Database and Resource Sharing

The contents of the database include:

laws and regulations, **technical regulation, methods, CRMs,** reference Labs, **measurement instruments, international standard documents,** international comparisons, proficiency test, traceability examples, **uncertainty evaluation, etc.**

The website: www.nams.cn

Great Effect of national proficiency tests organized by NIM

Investigated the RoHS testing ability of relevant China labs.

Provided a platform for communication and discussion.

Improved the measurement ability of relevant labs by using the new RoHS matrices CRMs and technical training by NMI.

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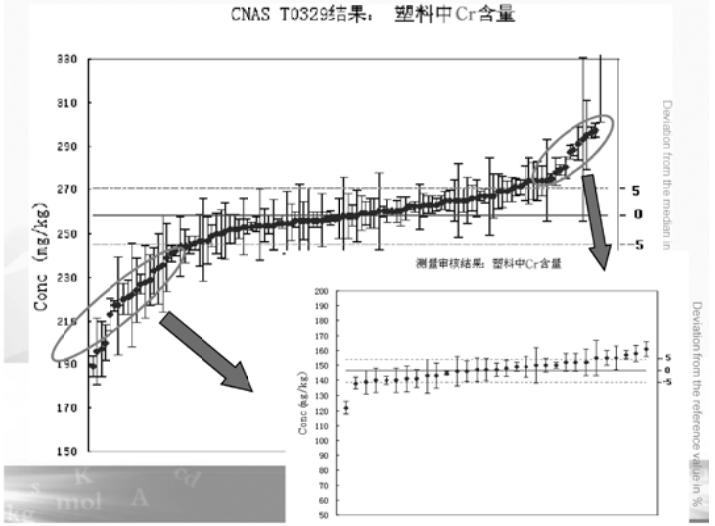

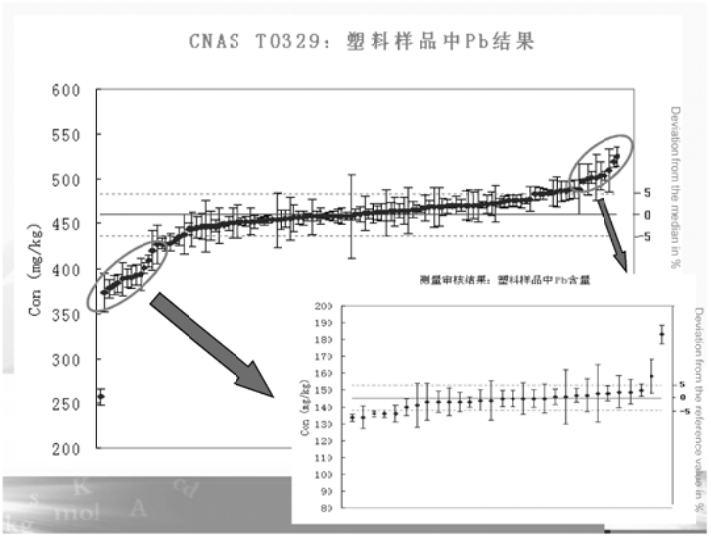

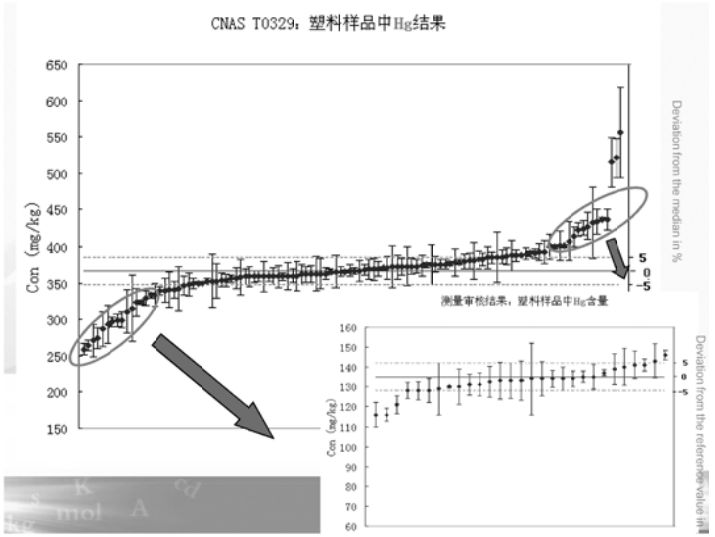

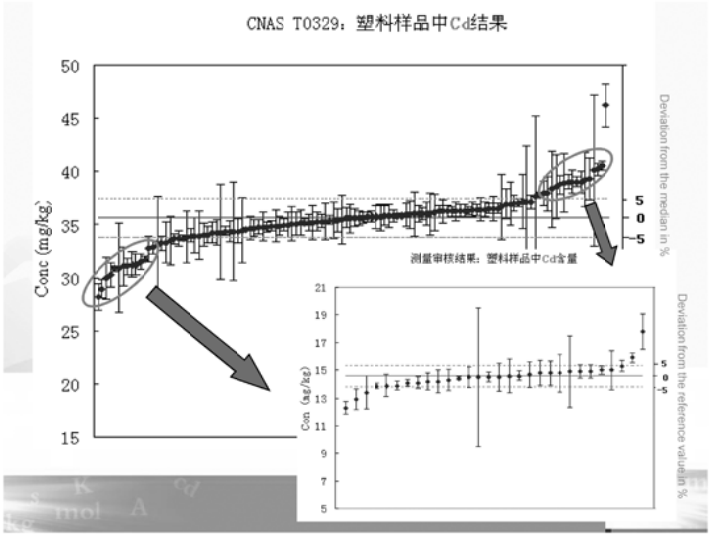

Through PT programs,
the measurement capabilities of
testing labs all over the country
were greatly improved.

Education and Knowledge Sharing

Also several technical seminars were organized by NIM.

Through the seminars,

- Many labs from quality supervision, inspection and quarantine, manufactures in China has participated.
- Relevant information such as RoHS metrology system, conformity assessment were shared.
- Detection techniques were discussed and trained.
- NEW RoHS CRMs were propagandized and popularized.

Education and Knowledge Sharing

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Conclusion

Great Effection of the Program

(Establishment of National Chemical Metrology Traceability System for RoHS Directive)

- Laying a foundation for comparable measurement results in RoHS field
- Ensuring RoHS regulation implemented on a technical base for the government to carry on public management
- Supporting National Accreditation Service for Conformity Assessment
- Improving measurement capability of RoHS relevant labs
- Responding international trade bulwark
- Underpinning technical innovation for EEEs
- Preventing Environment pollution
- Protecting Human Being Health

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☺Thank You

☺for Your Attention! ! !

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