



THE INTERNATIONAL SYMPOSIUM ON
“Metrology – Improving the Quality and Safety of Human Life”

**METROLOGY IN FOOD SAFETY:
THE CHALLENGES OF QUALITY
ASSURANCE IN VIETNAM**

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VIETNAM METROLOGY INSTITUTE

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Pullman Danang Beach Resort, Da Nang, Vietnam

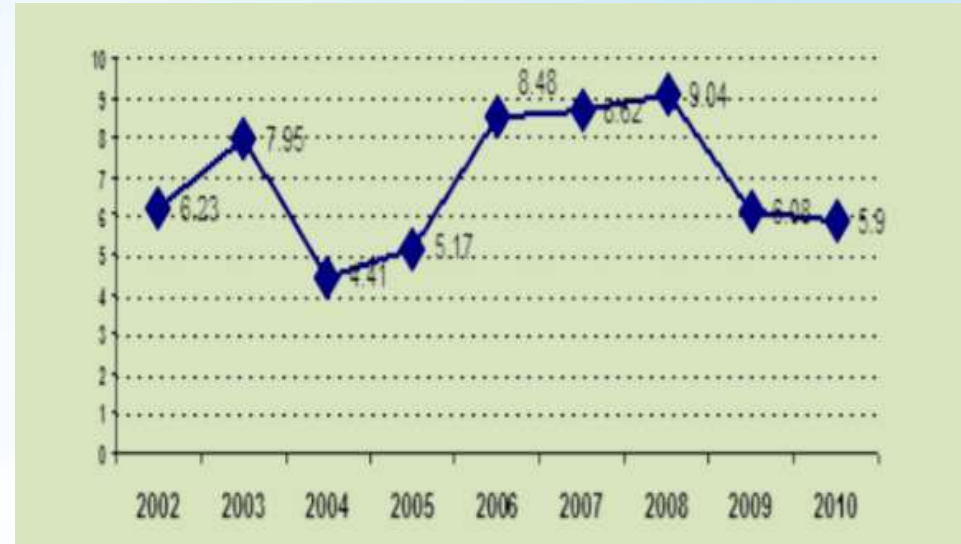


Outline

- ❖ **Introduction**
 - Challenge in food safety*
 - Role of metrology in food safety*
- ❖ **Vietnam Metrology Institute (VMI)**
 - Brief introduction*
 - Current Research & Activities*

Food poisoning outbreak in Viet Nam 2000 – 2010 *

N	Year	Number of outbreaks (cases)*	Infected	Deaths
1	2000	213	4.233	59
2	2001	245	3.901	63
3	2002	218	4.984	71
4	2003	238	6.428	37
5	2004	145	3.584	41
6	2005	144	4.304	53
7	2006	165	7.135	57
8	2007	247	7.329	55
9	2008	205	7.828	61
10	2009	152	5.212	35
11	2010	175	5.664	51
Total		2.147	60.602	583



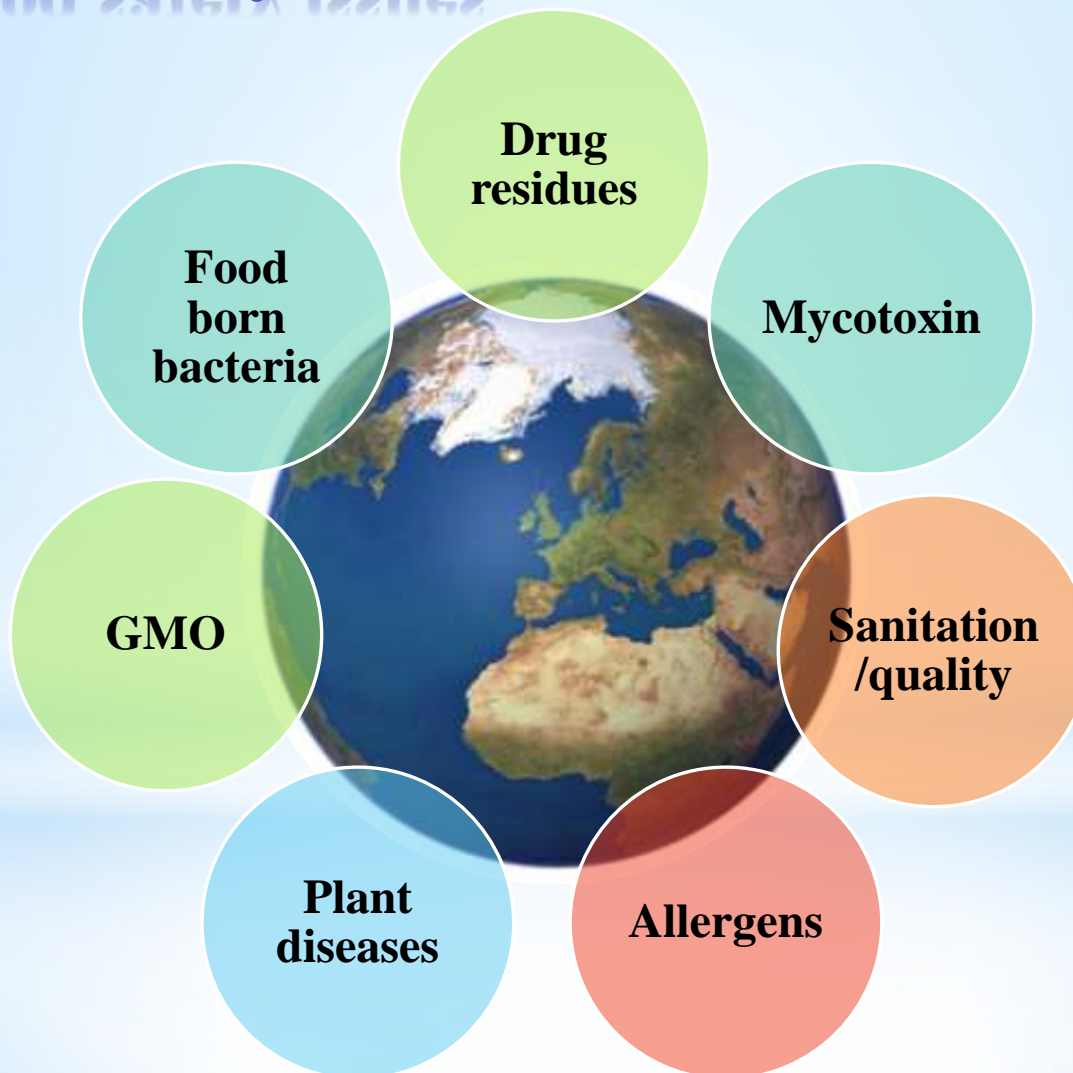
Average rate of food poisoning/ 100,000 habitats

No. of food poisoning cases 2000 - 2010

Since 1990, Food safety have becoming among the most concern and priority issues in Viet Nam

* source: Lam Quoc Hung, VFA, 2010

Global food safety issues



Food contaminants



Emerging food contaminants

- ❖ Veterinary drug residue
 - Pesticide/fungicide
 - Antibiotics

- ❖ Environmental contaminants
 - Heavy metal
 - Pesticide residue
 - POPs

- ❖ Technological toxins
 - 3-MCPD
 - Acrylamide, etc

Safety in food industry



Clenbuterol/
Salbutamol
in pork meat

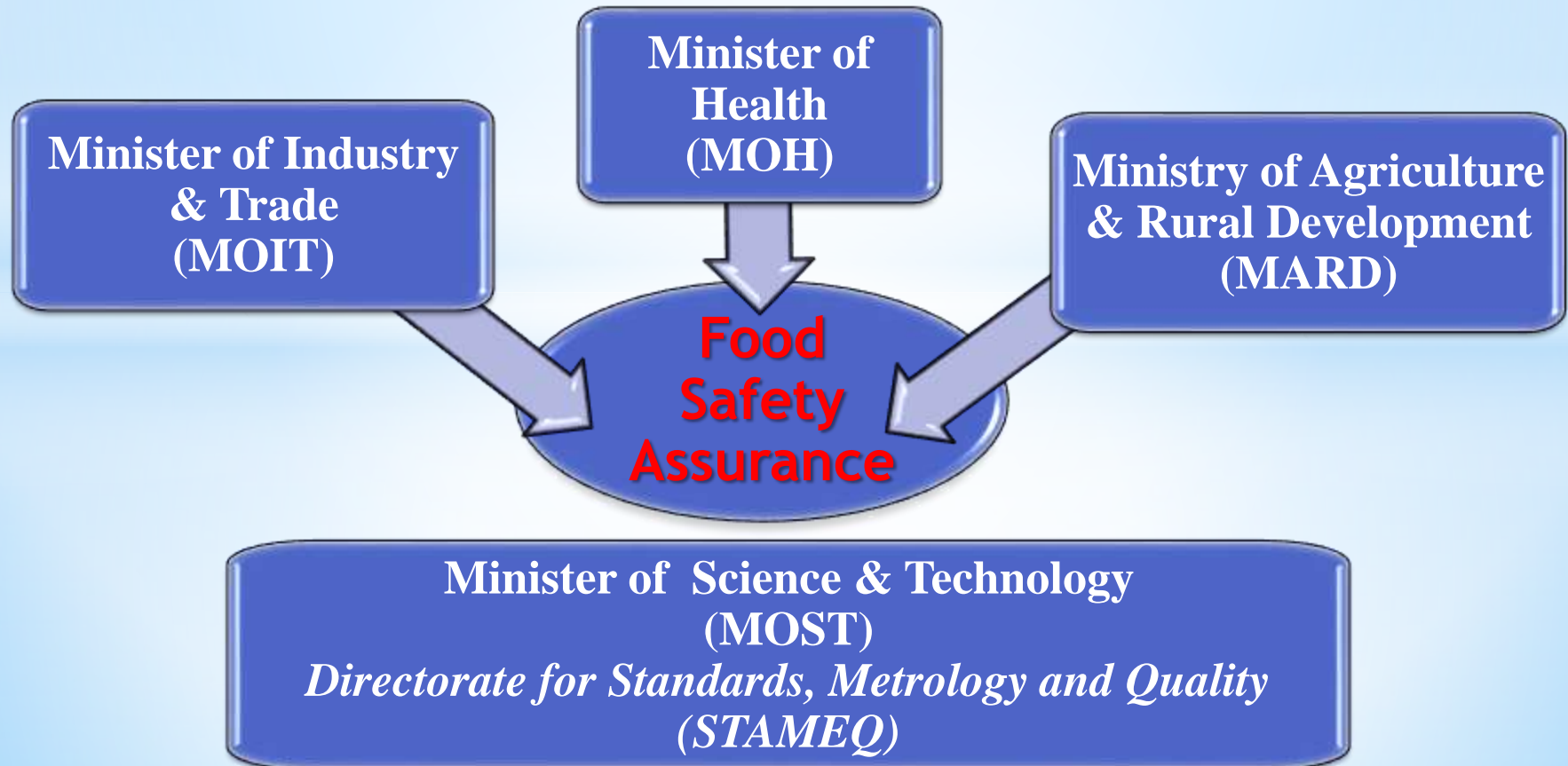


Chloramphenicol
/
in catfish,
shrimp...

Vietnam ranks high for exports of various agricultural products and aquatic products

Food Safety Management System

Government





Food Safety Management System

Government

MOIT

Alcohol, beer, soft drinking,
Processed milk, vegetable
oil, products of processed
powder and starches;
Issuing the market plan

MOH

Food additives, aid
processing, bottled
drinking water, natural
mineral water, functional
foods

MARD

Cereals, meat and meat
products, Fisheries and
fishery products,
vegetables, eggs and
egg products, fresh
milk, honey and honey
products, genetically
modified foods, salts,
primary production,
products of agriculture,
fishery and forestry

MOST

STAMEQ have the responsibility to advise the
Government on issues in the fields of
standardization, metrology, productivity and
quality management in the country and
representing Viet Nam in relevant international
and regional organizations.



Metrology = Science of Measurement

***Metrology is relevant for any measurement:
from simplest to the most sophisticated***

Chemical measurement \approx Chemical analysis

Metrology and “High Food Quality?”

Traceability
+

Nutritional
Quality
+

Safety

Heavy Metals
Veterinary drugs
Mycotoxins
...etc

Chemical
Safety

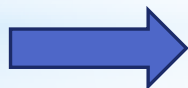
Microbiological
Safety



Are metrology important ???

Globalism and Comparability of Measurement

**Criterion of
Anti-bio X:
1.0 mg/kg**



**Result:
0.9 mg/kg**



**Result:
1.2 mg/kg**



One testing

Mutual Recognition Arrangement (MRA)

Quality of Measurements

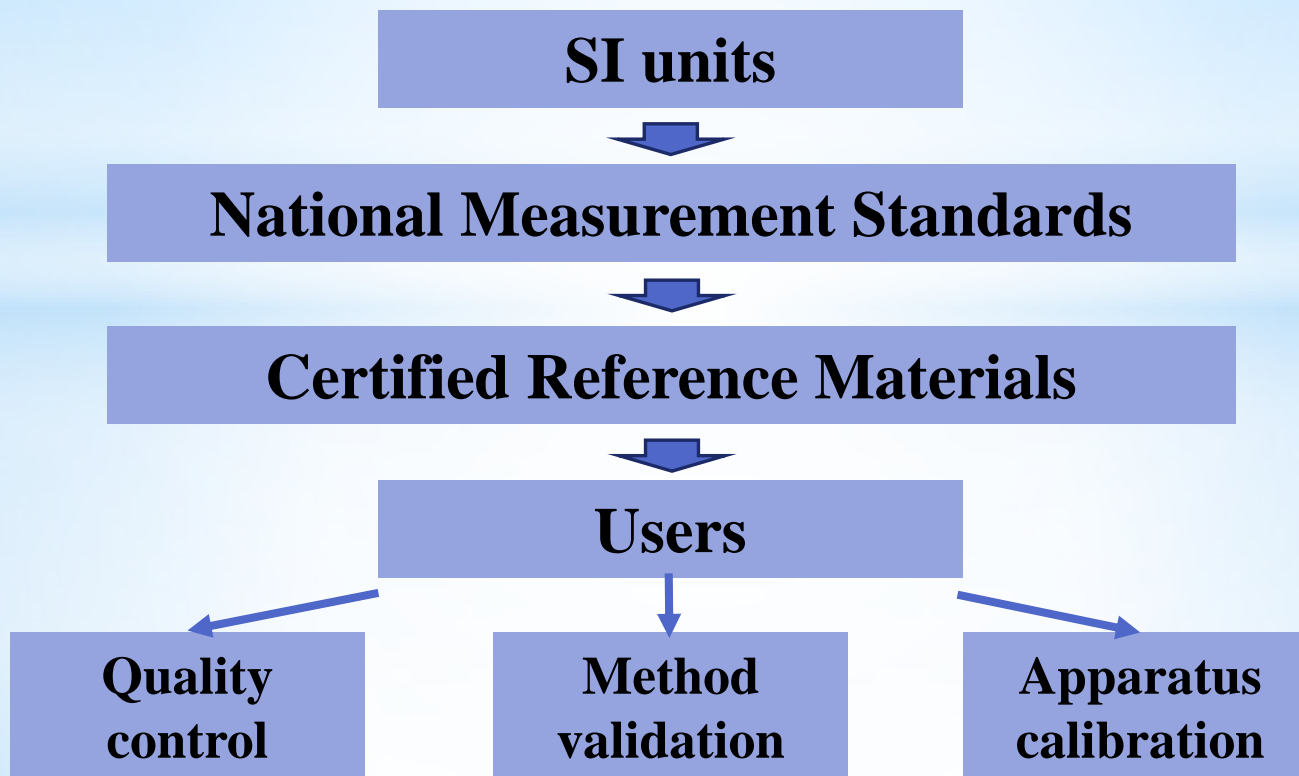
- Human: be **educated**
- **Validated** measurement procedures.
- Estimated measurement **uncertainty**.
- Establish **traceability** of measurement results.
- Participate in activities of **inter-laboratory comparisons**:
KC, PT,...
- Accredited **quality management system**.



CRMs: important ?

ROLE OF CRMs

- Certified value with uncertainty
- Traceability to SI unit.
- Quality control, method validation, calibration...





Quality Assurance process as a metrological tool for food safety implementation

Validation of analytical methods

Performance characteristics of an analytical method (*such as trueness, precision under various conditions, calibration linearity*) are established and the fitness-for-purpose is proven.

Use of Certified Reference Materials (CRMs)

Method validation usually includes the use of CRMs to establish the trueness of the method.

Employment of routine internal quality control

Involves the analysis of “control materials” within every run of analysis to check how the method performs over time.

Proficiency testing

The means of ensuring that single laboratory validation and within-laboratory procedures are working satisfactorily.

Metrology: Traceability, Quality & Reliability of Measurements

Incorporating metrological approaches into the measurement process enhances the reliability of analytical findings.

Metrological approach include:

- ✓ **high-quality reference standards,**
- ✓ **validated methods,**
- ✓ **robust sampling practices,**
- ✓ **proven calibration approaches,**
- ✓ **natural matrix reference materials,**
- ✓ **speciation chemistry,**
- ✓ **assessment of measurement uncertainty,**
- ✓ **establishment of traceability links,**
- ✓ **certified reference materials,**
- ✓ **proficiency testing.**



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VIETNAM METROLOGY INSTITUTE (VMI)



Vietnam Metrology Institute

Vietnam Metrology Institute (VMI) is a National Metrology Institute (NMI) of Viet Nam, belonging to the Directorate for Standards, Metrology and Quality (STAMEQ), under the control of the Ministry of Science and Technology (MOST).





Brief history

1962 The Institute for Metrology and Standards (IMS) was established placed under the State Committee of Science and Technology (MOST now).

1970 IMS was separated into Metrology Institute and Standards Institute.

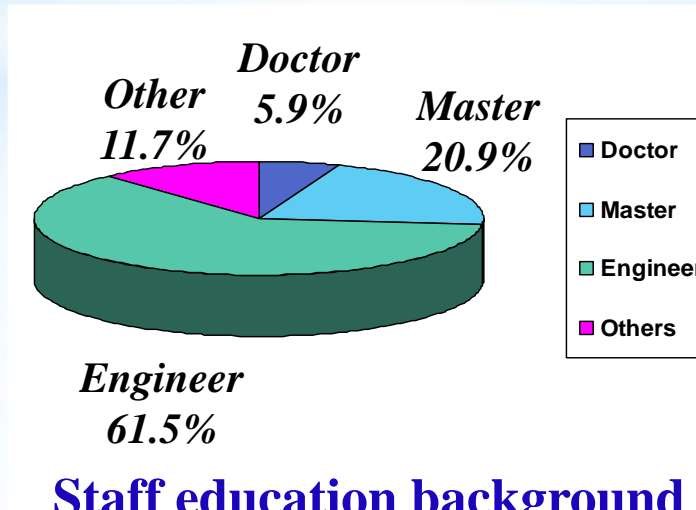
1975 The Metrology Institute renamed to Central Metrology Department.

1979 National Metrology Center was established based on Central Metrology Department. At this time, it was under the State Department for Standards, Metrology and Quality (STAMEQ now).

1994 The name of National Metrology Center in English has been changed to Vietnam Metrology Institute (VMI).

Mission

- Develop, maintain and disseminate the national measurement standards system;
- Implement R & D activities on metrology;
- Design, manufacture, supply measurement standards;
- Verify, calibrate, test the measuring standard/ instrument and to certify reference materials;
- Train the technical staff for verification, calibration and testing.

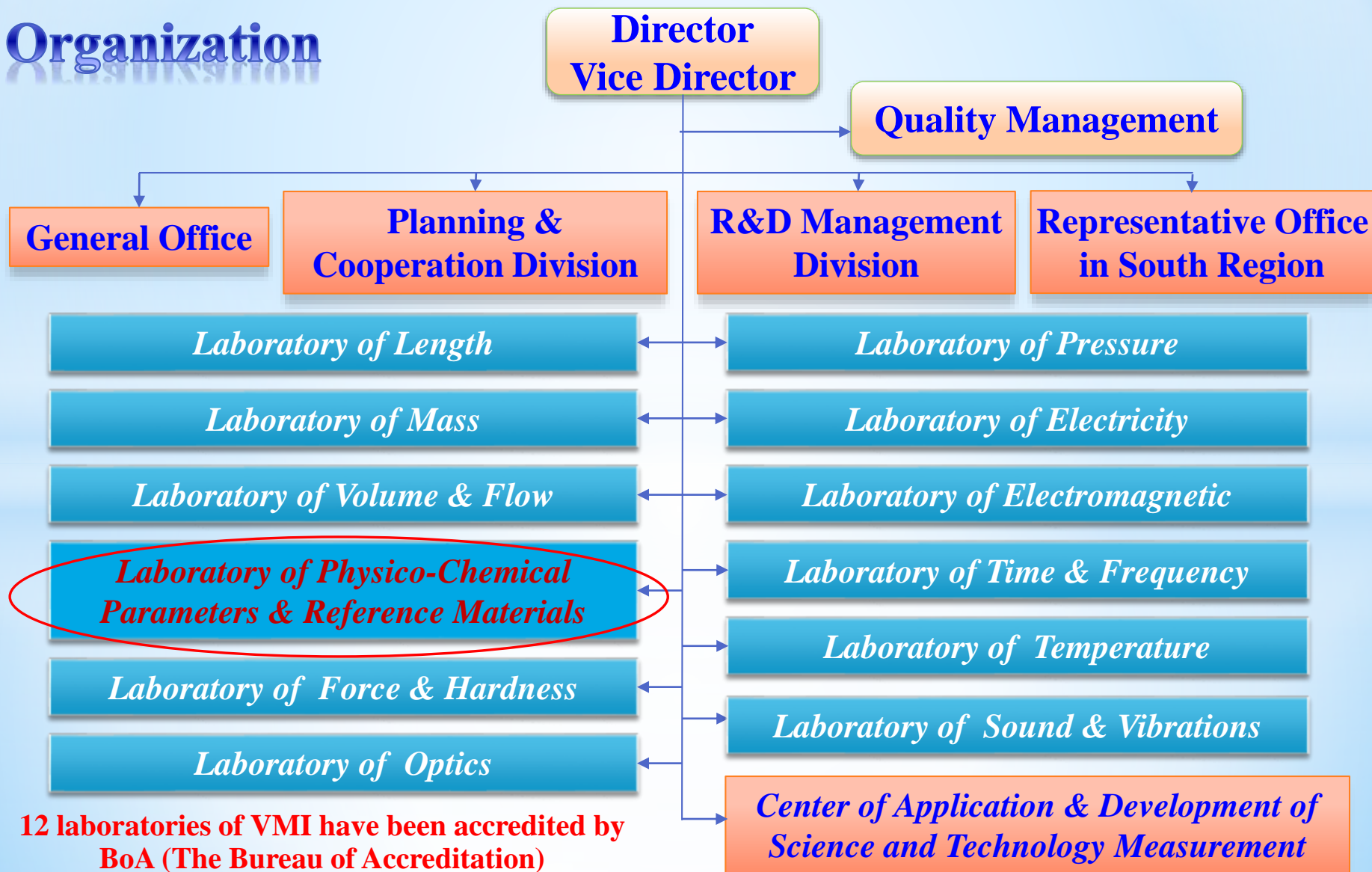


Staff education background

Total: 150 employer



Organization



12 laboratories of VMI have been accredited by BoA (The Bureau of Accreditation) according to the standard ISO/IEC 17025:2005



VIETNAM METROLOGY INSTITUTE

**Lab. of Physico-Chemical Parameters &
Reference Materials**

*Inorganic
Measurement*

*Organic
Measurement*

*Gas
Measurement*

*Physico-Chemistry &
ElectroChemistry Measurement*

*Bio
Measurement*

*Reference Material &
Strategic Research*

Focus on

- *Environment*
- *Food*
- *Health*



Dissemination of National Measurement Standards





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CURRENT RESEARCH & ACTIVITIES

FIELDS OF INTEREST

**Food
Safety**



**Environmental
Monitoring**



**Medical
Measurement**





Food Safety

Pesticide, veterinary drug residue.

Nutrient: vitamin, protein...

Mycotoxin: acrylamine, aflatoxin...

Food additives: preservatives, antioxidants, colorants, sweeteners.

Environmental Monitoring

Heavy metal, pesticide.

Polychlorinate biphenyl (PCBs)

Environmental gases: - High purity gas.

- In-house gas.

Medical Measurement

Clinical substrate: glucose, creatinine, uric acid, urea, cholesterol ...

Medicine quality.

Main components of living organism: protein, nucleic acid, carbohydrate, lipid...



Current research & Activities (1)

- ❖ Establishment and maintenance of environment, food, clinical related organic standards.
- ❖ Development and dissemination of certified reference materials.
- ❖ Participation in activities of international comparisons through KC, PT.
- ❖ Technical support and organization of proficiency test.
- ❖ Technical training



Current research & Activities (2)

Training:

- Training and dissemination of calibration and verification skills to satisfy development demands of society.

Consultancy:

- Implement a quality assurance system of the laboratory according to requirements of ISO/IEC 17025:2005.
- Setup testing and calibration laboratory relating to the fields of physico-chemical and reference materials.
- Operation and maintain the calibrated measuring instruments in the specific measurement fields.

Calibration service

- Calibration and verification measurement equipment.

Infrastructure – *Electrochemistry*



Humidity Analyzer



Density meter



Viscosity measuring system



Infrastructure - *Inorganic*



ICP - MS



Automatic titrator



Ultra pure water system

Infrastructure – Gas



Gas Chromatography



CO analyzer



NO/NO₂/NO_x analyzer



CO₂ analyzer



O₂ analyzer



H₂S analyzer



SO₂ analyzer

Gas analyzers



Infrastructure – Organic



GC - MS



LC - MSMS



Balance



Lab. facilities

Reference materials (1)

Ethanol standard solution



Concentration (mg/L)	Uncertainty
0.2 ÷ 2.0	1%

Metal standard solution



As, Pb, Cd, Hg, Cu, Mn, Zn, Fe, Ni, Cr,
Na, K, Ca

Concentration (mg/L)	Uncertainty
1000	1%

Reference materials (2)

... in preparation

<i>Pesticide standard solution</i>	Concentration	Uncertainty
4,4'-DDT, 4,4'-DDE, Lindane, α -endosulfan, β -Endosulfan, Diazinon, Fenitrothion, Malathion, Parathion, Chlorpyrifos	100 mg/kg	3 %

<i>PCB standard solution</i>	Concentration	Uncertainty
PCB 28, PCB 52, PCB 101, PCB 138, PCB 153, PCB 180	10 mg/kg	5 %

Reference Material production in future plan

Food

- Metal, Pesticide, and Veterinary drug residue in Food:
 - + *Acrylamide in potato chip (start 2017)*
 - + *Metal (Pb, Cd...) in rice (2018 ~)*
 - + *Antibiotics (chloramphenicol) in fish, scrimp (2018 ~)*
 - + *Beta-agonist (salbutamol, clenbuterol, ractopamine) in meat (2020 ~)*
 - . + *Pesticide (lindan, chlopyrifos, endosulfan) in vegetable.*
- Food additive:
 - Benzoic acid, sorbic acid; Orange II, Sudan, Rhodamine B,*
 - Heavy metal (Pb, Cd) in Beverage (2018 ~)*

Environmental analysis

Metal, Pesticides, PCBs, PAHs and other environmental contaminants in water, soil.



International comparisons

No	Description	Time
APMP.QM-K9	pH solution	2009
AFRIMETS.QM-K27	Alcohol concentration in solution	2011
APMP.QM-K19	pH solution	2013
APLAC T095	Determination of Elements (Calcium and Cadmium) in Drinking Water	2015
APMP.QM-P30	Elemental Calibration Solutions of Pb, As, Ni and Fe	2016

Towards leading NMI

Excellence

- ❖ Fundamental Metrology
- ❖ Emerging Technologies
- ❖ Human resources
- ❖ Process innovation

Contribution

- ❖ Industry
- ❖ Society
- ❖ Quality of Life

Cooperation

- ❖ Metrology Activity
- ❖ Global Issues
- ❖ Product dissemination



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***THANK YOU FOR YOUR
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