



# Co-operation of the JRC with Polish Research Institutions

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# The role of JRC Institute for Reference Materials and Measurements

The mission of the IRMM is to promote a common and reliable European measurement system in support of EU policies.



## ***IRMM - CONFIDENCE IN MEASUREMENTS®***

- complementary to national activities: providing common quality assurance tools for all MS

# The IRMM prime objective is...

...to build confidence in measurements and ensuring their comparability.

## Quality Assurance:

- Method development and validation
- Validated data & databases
- Reference measurements
- Production of reference materials



- Inter-laboratory comparisons
- Training



**IRMM - CONFIDENCE IN  
MEASUREMENTS®!**





# JRC-IRMM core competences & research areas

## Core competences

- Reference materials
- Food analysis & bio-analysis
- Chemical/isotopic reference measurements: Metrology in Chemistry
- Radionuclide metrology
- Neutron physics

## Applied in the fields of

- Food and feed safety and quality
- Environment and health
- Biotechnology
- Industrial standards
- Nuclear safety & safeguards
- Nuclear waste treatment



**NETWORKING**





- Acrylamide
- **Mycotoxins \***
- Meat and bone meal
- Central nervous system (CNS) tissue in meat products
- Dioxins
- Pesticide residues
- Food allergens
- **Feed Additives Authorisation and Control\***
- Sweeteners
- Antibiotics
- Semicarbazide
- Smoke flavorings, **PAH \***
- Organic food, authentication
- Antioxidants
- Cocoa butter/chocolate
- Methyl mercury in fish
- Se speciation in yeast
- Trace elements in food
- **Heavy metals in food \***

\* **CRL@JRC-IRMM**

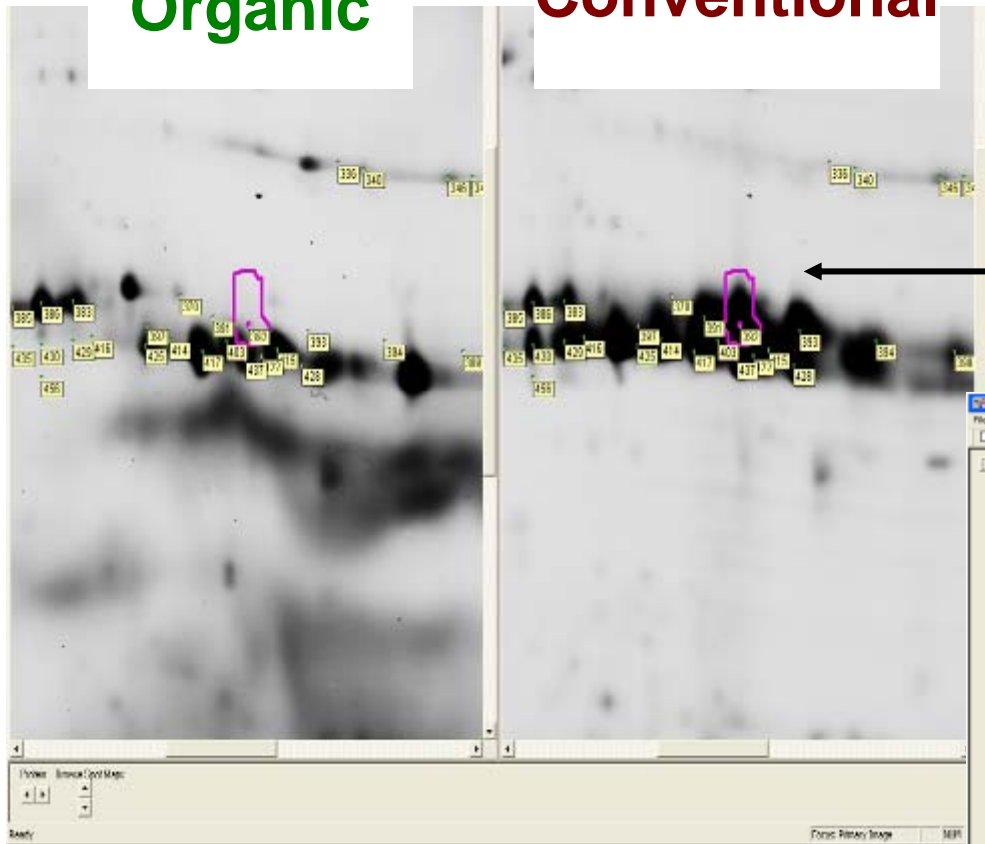
.....***Demand driven!***

# Protein determination using 2D-GE

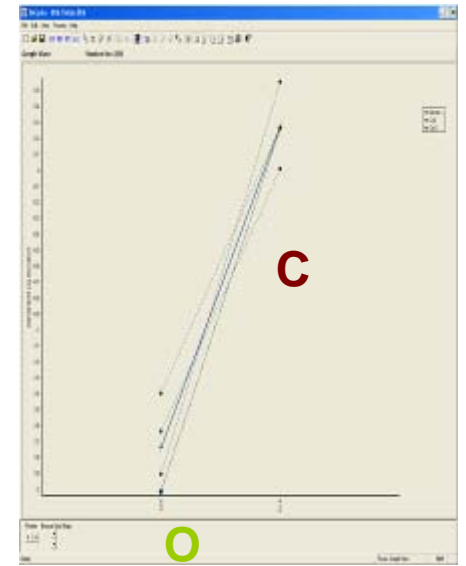
Potato tubers grown:

Organic

Conventional

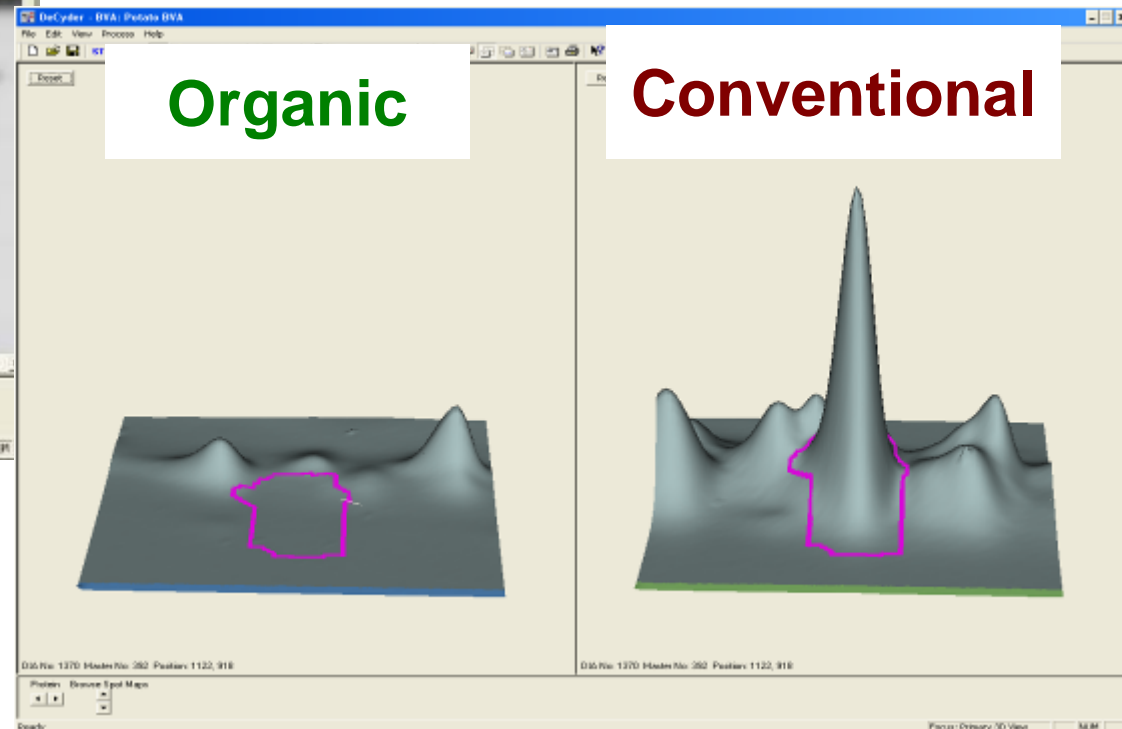


“Patatin”  
 (main potato  
 storage protein)



Organic

Conventional





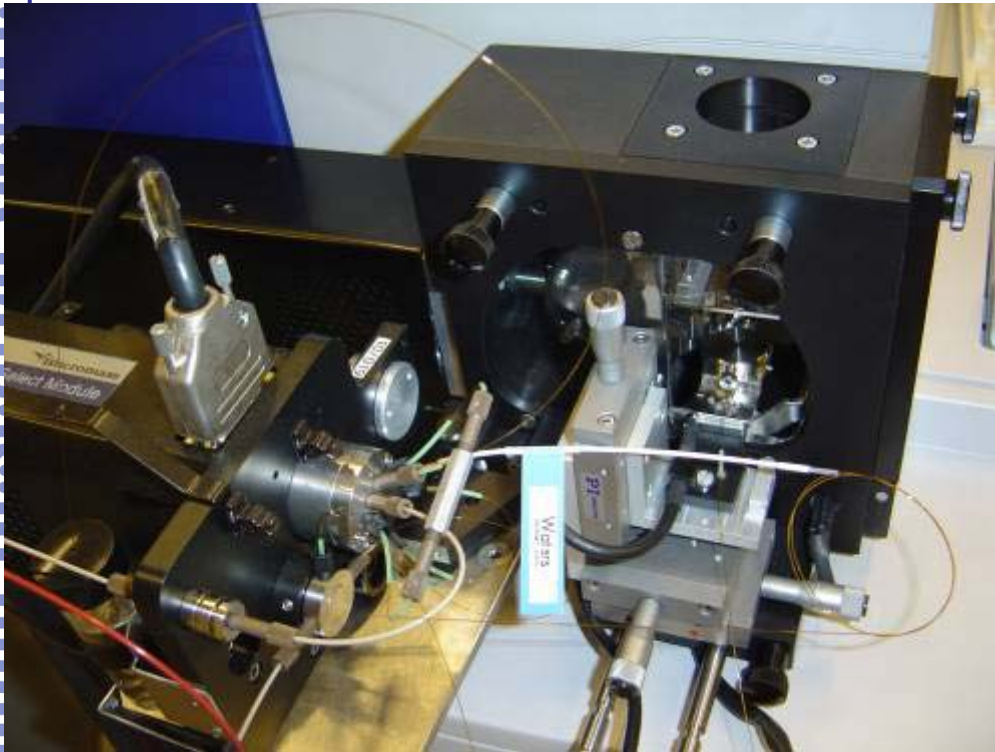
# Allergens detection: comparison of techniques

	<b>ELISA</b>	<b>PCR</b>	<b>LC-MS/MS</b>
<b>Detection</b>	Intact proteins	DNA	Intact proteins, peptides
<b>Sensitivity</b>	1-5 ppm	lower	1-10 ppm
<b>Quantification</b>	yes	yes (RT-PCR)	confirmatory
<b>False positives</b>	yes	yes	no



# Sample introduction and MS acquisition

nano-spray flow 1  $\mu\text{l}/\text{min}$  after splitting 1/10



*Sample introduction*



*Q TOF system*





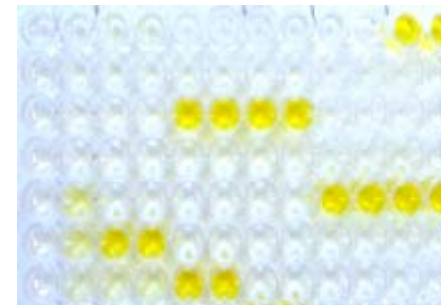
# TSE/BSE testing

Since 2001 animals older than 30 months & fallen stock above 24 months must be tested for BSE before entering food chain

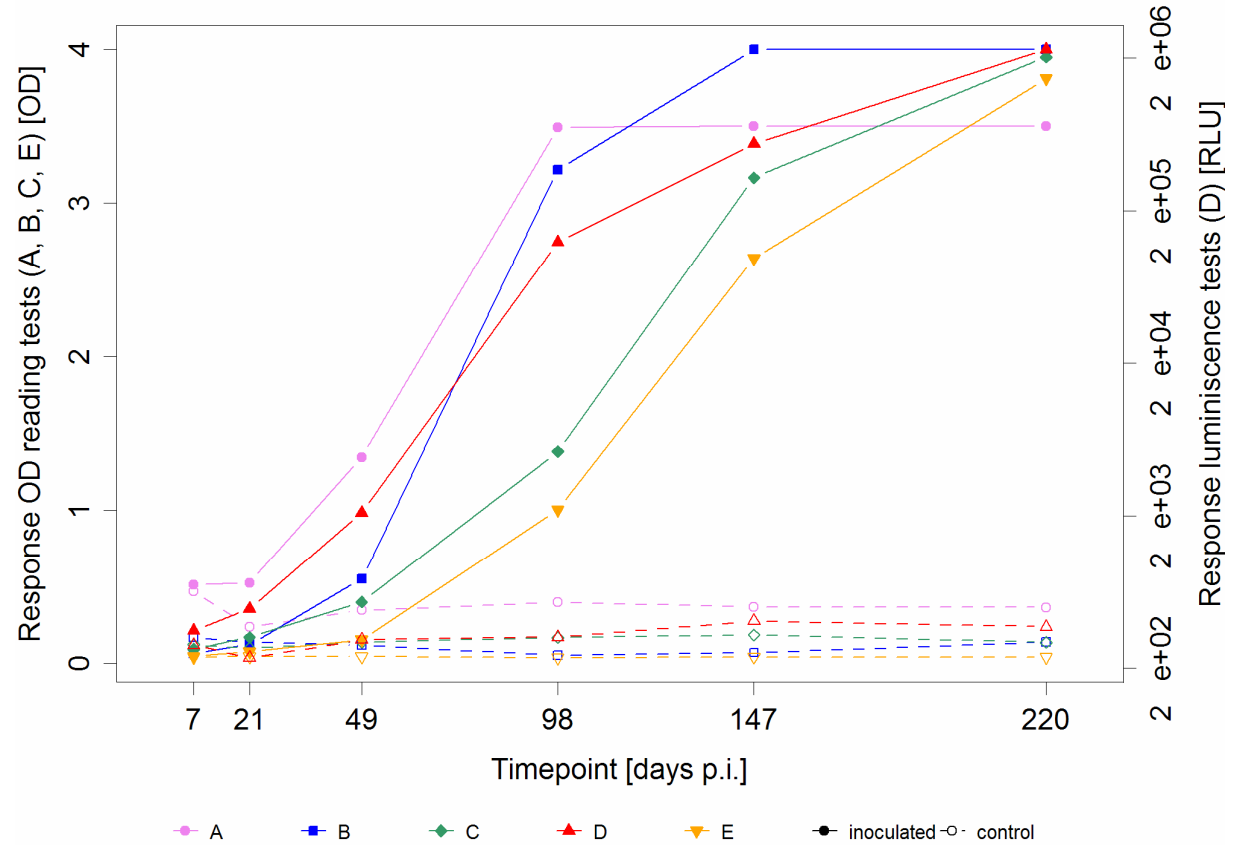
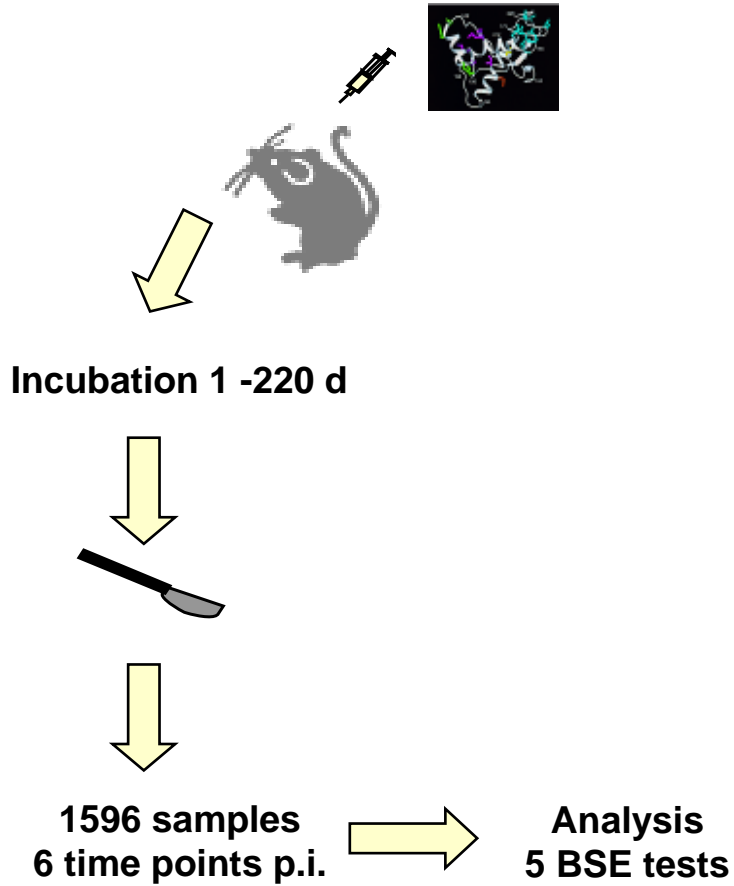
→ 10 - 11 million BSE tests/year in the EU

## How to ensure reliable BSE diagnostics?

- **by independent test evaluation**
  - JRC-IRMM, 30 methods evaluated
- **by quality control**
  - JRC-IRMM has developed a “golden standard”, in collaboration with Nobel Prize winner Prof. S. Prusiner
- **proficiency testing**
  - all national reference laboratories of Member States and Candidate Countries



# Surrogate reference materials: BSE infected bovine tg mouse brains



tg mouse brains + bovine brainstem =  
“the golden standard” for BSE



# Standardisation of *in vitro* diagnostics: The Joint Committee for Traceability in Laboratory Medicine (JCTLM)

## Directive 98/79/EC on *in vitro* diagnostic medical devices

*'...the traceability of values assigned to calibrators and control materials for in vitro diagnostics must be assured through available reference measurement procedures and/or materials of higher order.'*

**Establishing of JCTLM** (Joint Committee on Traceability in Laboratory Medicine) by **BIPM, IFCC, ILAC**

**JRC-IRMM co-chairs with NIST JCTLM WG 1**, contributes to scientific review of procedures/materials, develops & provides reference materials as internationally accepted standards





# Standards for clinical diagnostics

- lack of comparability of data between testing laboratories within the EU and **world-wide**:

**false +<sub>s</sub> vs. false -<sub>s</sub>**

## ***Joint venture with the IFCC:***

- ~ 40 different enzyme and protein reference materials are available from JRC-IRMM
- tumour markers, markers for infectious diseases and cardiac damage, hormones, diabetes, genetic disorders
- recently developed with NIST (selected measurements):  
thyroid hormones (thyroxine T4 and thyronine T3)





## Acquired competence in protein analysis can be further exploited in other policy areas:

- development of reference materials for human diagnostics, which behave like real patient's samples, **“commutable”** suited for the calibration of in vitro diagnostics devices **(new generation of serum proteins CRM)**
- use of hyphenated methods for the characterisation of proteins to the level required to ensure reproducibility of standards. **Contribution to the proteomics community**
- application of quality assurance concepts in other areas like microbiology **(microbial toxins)**, food analysis (authenticity, immuno-reactive substances and **allergens, ...**)



# GMOs – common standards for comparability

- **IHCP is Community Reference Laboratory for GM Food and Feed: Validation of detection and quantification methods**
  - *IRMM is a member of the steering committee of the European Network of GMO Laboratories (ENGL, 72 members)*
- **IRMM does the production and distribution of reference materials for quantitative comparability (re. labelling)**
- ***Plasmids as calibrants***

GMO or not GMO?

# Definition of the Measurement Unit

Legal threshold has been understood as mass percentage



$$\frac{\text{mass}_{\text{GM}}}{\text{mass}_{\text{GM}} + \text{mass}_{\text{non-GM0}}}$$

**Recommendation 2004/787/EC points to DNA copy number ratio as new measurement unit:**

**transgenic sequence**  
**endogenous sequence**

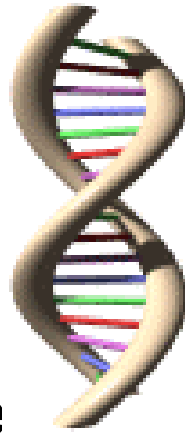
- of advantage for the rt-PCR measurements (zygosity)
- need for CRMs, certified for their copy number



**Acquired competence in gene analysis can be further exploited in other policy areas:**

## **Examples of DNA testing applications to support policies:**

- Trade issues / fraud detection / support to intervention scheme (e.g. authenticity of **Basmati rice: length of micro-satellite sequences**)
- Food quality, e.g. origin of ingredients: **Pig or Poultry?**
- Food safety: **molecular microbiology** (e.g. DNA standards for rapid testing methods for food pathogens)
- Surveillance of quotas (e.g. **fishing quotas** for genetically distinguishable fish populations like herring from North and Baltic Sea)
- Zoonosis related issues (e.g. control of animal diseases relevant to agriculture and trade)
- ***Genetic testing for human diseases***





# Networks in human genetic testing

## Network of Human Genetics Laboratories

International Federation of Clinical Chemistry and Laboratory Medicine (IFCC)

European Commission

In-Vitro Diagnostic Industry Device Manufacturers

DGs RTD, ENTR, SANCO, JRC

Network of Excellence: EUROGENTEST

Network for Reference Materials CRMGEN

FP6: 2004-2010

FP5: 2001-2005

*IRMM+IPTs*





# IRMM – Confidence in measurements®

## Thank you!



<http://www.irmm.jrc.be>

