



CaSS | Forensic and Scientific Services
A CLINICAL AND STATEWIDE SERVICE

'What do you do when CRMs are not available?'



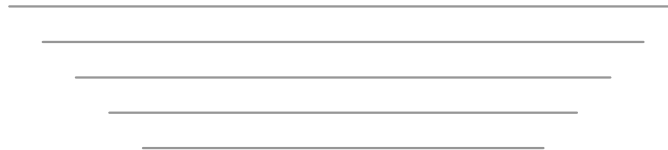
The Development of Food Matrix Reference Materials in the Asia Pacific Region

8th IFDC
1-3 October 2009
Bangkok, Thailand

Pieter Scheelings
Principal Scientist,
Forensic and Scientific Services
Queensland, AUSTRALIA



Queensland Government
Queensland Health





Outline of presentation

Purpose: to provide a 'snapshot' of the RM activities within the Asia Pacific Region

- RMs/CRMs
- Support needs of developing country labs
- OCEANIAFOODS
- Regional training activities of the Asia Pacific Food Analysis Network (APFAN)
- ASEANFOODS PT studies and RM development
- AusAID supported regional training programs
- Programs in Indonesia, the Philippines and Vietnam
- Development of RM/CRMs in Australia
- Production of CRMs by NMI
- In-house QC samples



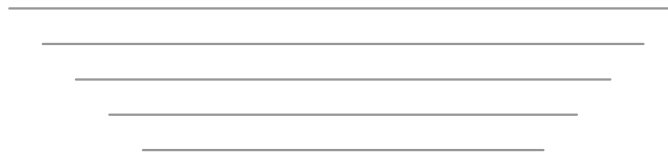
CaSS | Forensic and Scientific Services
A CLINICAL AND STATEWIDE SERVICE



Why promote use of CRM/RMs (in Food Analysis?)

- A requirement under ISO 17025
- Provide a benchmark for method accuracy
- Critical to chemical metrology
- Invaluable in MDV
- Underpins quality in legal analysis
- Provides information which support adjustment of results for low/high recoveries
- estimation of bias contribution in MU estimates (based on top-down approach)

CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE




Use of CRMs in Food Analysis

- provide a reliable estimate of bias of the analytical process
- Metrological traceability to SI units

But....

- Matrix-based CRMs are not readily available for many food analytes, and
- labour intensive to prepare and costly to purchase


CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE



Some QA Strategies where CRMs are unavailable

1. Spiked recoveries of blank matrix samples (particularly for multi-residue methods)
2. Use of internal standards (and/or isotope dilution in MS-based methods)
3. Use of alternative standard methods
4. Performance in relevant PT studies
5. Development and use of secondary RMs

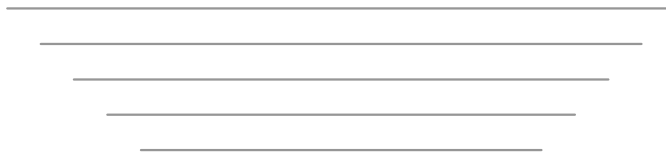

CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE



What defines a RM?

For the purpose of this talk:
'a reference material or food is defined as a material which has been prepared in accordance with ISO guide 34 and whose analytical properties are assigned on statistically evaluated results in accordance with ISO 13528 derived from inter-laboratory studies undertaken in accordance with ISO Guide 43'

CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE

Some background information to lab quality assurance within the region



- Most Australian labs are accredited to ISO 17025 by NATA (since the early 60s)
- The National Association of Testing Authorities (NATA) is the oldest Lab accreditation body established in 1940s
- Increasing demand on developing countries to set up accredited labs to support the certification of foods for export
- Scientific networks established to assist developing country scientists involved in food composition analysis: ASEANFOODS (1986), OCEANIAFOODS (1987), APFAN(1989)

CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE

8th International Food Data Conference

October 1-3, 2009

Bangkok, Thailand




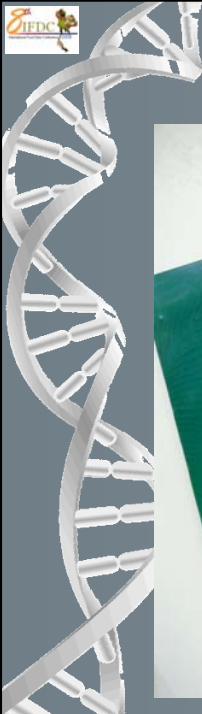
OCEANIAFOODS

Established in 1987 by the Australian Food Authority (ANZFA) to:

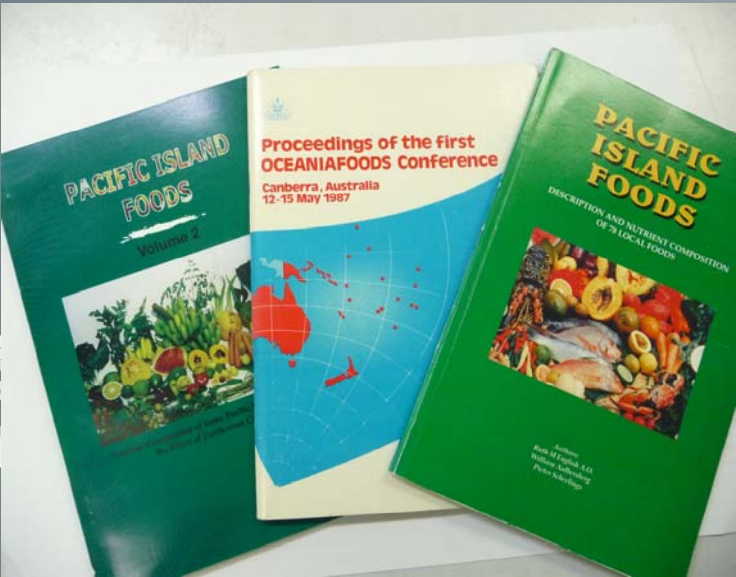
1. promote exchange of common food composition data within the Oceania region and
2. to assist member countries to set up their own food analysis programs with a focus on composition of traditional indigenous foods.

- part of the INFOODS network (International Network of Food Data Systems) coordinated from FAO.

CaSS | Forensic and Scientific Services
A CLINICAL AND STATEWIDE SERVICE



OCEANIAFOODS Reports





PACIFIC ISLAND FOODS
Volume 2

Proceedings of the first OCEANIAFOODS Conference
Canberra, Australia
12-15 May 1987

PACIFIC ISLAND FOODS
DESCRIPTION AND NUTRIENT COMPOSITION
OF 29 LOCAL FOODS



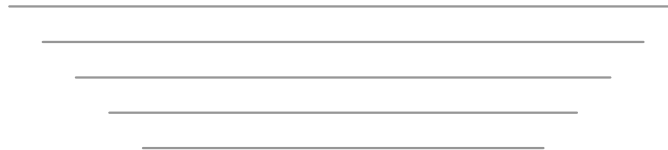
A CLINICAL AND STATEWIDE SERVICE



ASEANFOODS - PT Studies and Development of RMs


- ASEANFOODS established in 1986 within Mahidol University, Bangkok
- Mission is to promote analytical competence in food analysis in the ASEAN region and provide second order food matrix RMs at cost to regional labs
- Dr Prapasri Puwastien (2008 recipient of AOAC TDRM award) has coordinated the PT studies and subsequent RM assignment
- Since its establishment, ASEANFOODS have undertaken 8 major PT studies and generated RMs based on consensus values derived from the studies

CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE



ASEANFOODS PT Studies

- The food-based PT studies have included:
 - Proximates
 - Metals (Na and Fe have been particularly problematic in a number of developing country Labs)
 - B Vitamins
 - folates
 - Dietary fibre



CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE

ASEANFOODS - PT studies

PT sample preparation room with controlled temperature and humidity

CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE

ASEANFOODS

Sample preparation instruments from IAEA and AusAID

CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE





ASIA PACIFIC FOOD ANALYSIS NETWORK (APFAN)




Food Analysis is Vital to Food Quality and Safety

CaSS | Forensic and Scientific Services
A CHEMICAL AND STATEWIDE SERVICE



Asia Pacific Food Analysis Network





- APFAN was established as a 'program' within the **Federation of Asian Chemical Societies (FACS)** in Brisbane, Australia in 1989 to support competency in food analysis in the Asia Pacific region.
- The aim was to support and provide targeted training for food scientists from developing countries in Brisbane and to support the development of RMs and PT studies at Mahidol University.

CaSS | Forensic and Scientific Services
A CHEMICAL AND STATEWIDE SERVICE

8th International Food Data Conference

October 1-3, 2009

Bangkok, Thailand



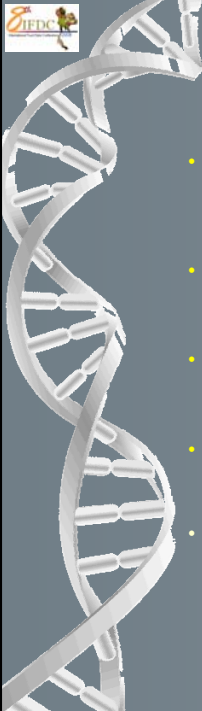
Asia Pacific Food Analysis Network

- Some 140 scientist from 18 countries have been trained at FSS in Brisbane since 1989,
- Many trained scientists have become 'quality drivers' in their own countries
- **INDOFAN (Indonesian Food Analysis Network)** established along the format of APFAN to provide training and technical support to food scientists within Indonesia

CaSS | Forensic and Scientific Services
A CLINICAL AND STATEWIDE SERVICE



CaSS | Forensic and Scientific Services
A CLINICAL AND STATEWIDE SERVICE

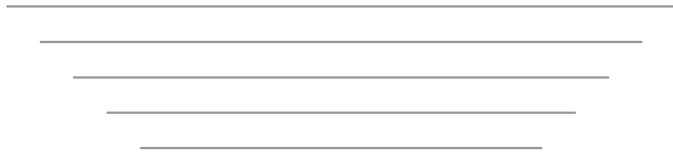



AusAID funded Training Programs 1996-2007





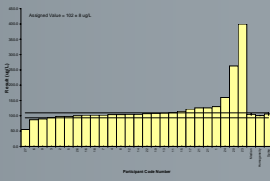
- 1996/8: a number of quality-based training programs in food analysis undertaken by QHSS scientists in collaboration with the **Research and Development Centre of Applied Chemistry (LIPI)** in Indonesia
- focus: **capacity building in food and water analysis and the development of food reference materials**
- 2001: follow-up training workshops in Jakarta and Bandung coordinated by Stewart Jones (AGAL/QHSS).
- 2005/06: three training workshops in Indonesia, the Philippines and Thailand with a focus on PT studies and RM production coordinated by NMI.
- Participants prepared 6 RMs during 5 day workshops

Long-term objective is the development of a **regional food reference material network**.


CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE

RM Preparation workshop Bangkok 2006


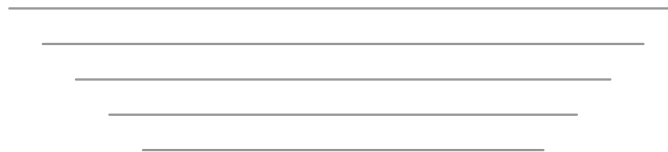
CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE



PT/RM activities in Indonesia

- RM program commenced in 1996/7 as part of the initial **AusAID** programs
- 5 food matrix RMs prepared including soy bean, fish powder, instant noodle, cereal, ginseng
- Program coordination between **LIPI** and **INDOFAN**
- Planned restructure of LIPI to a **National Measurement Institute** providing greater focus on physical and chemical metrology in Indonesia


CaSS | Forensic and Scientific Services
A CHEMICAL AND STATISTICAL SERVICE



PT/RM Activities in The Philippines

- Underpinned by DOST project "provision of **reference materials and subsequent conduct of PT studies**"
- Project managed by **Ms Teresita Portugal**, FNRI
- Project supported by IRMM training on '**Preparation of Reference Materials**' in 2003 followed by IAEA course on '**Organisation, Reporting and certification Aspects of PT**' in Vienna in 2004
- 3 regional studies undertaken in accordance with ISO 34 for proximates, metals, vitamins on wheat flour, powdered tonic food drink and dried shrimp
- Surplus samples with assigned values distributed gratis to DOST laboratories for MDV and QC


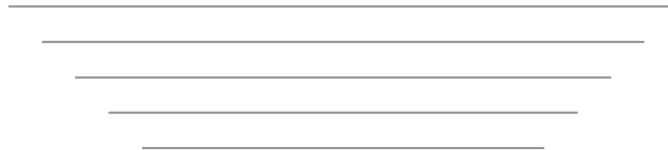
CaSS | Forensic and Scientific Services
A CHEMICAL AND STATISTICAL SERVICE



**UNIDO project in Vietnam
Potential RM production capabilities**

- Quatest 3 government laboratory in HCMC provides national PT studies in foods and other materials.
- Technical Advantages:
 - Associated with a competent food and residue lab
 - Keen/intelligent staff
 - Member of ASEAN reference laboratory network (with responsibility for microbiology)
 - RM production sits well with PT study capability
- Current challenges:
 - Unit requiring accreditation to ILAC G13:2007
 - PT staff require further training in matrix preparation, equipment and statistical analysis
 - Need additional funding to extend capabilities

CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE





**RM Production Capabilities in Australia
- Role of NATA**

National Accreditation of Testing Authority (NATA)

- oldest lab accreditation body
- Accredits labs to ISO 17025, PT study providers (ISO 43) and RM production (ISO 34)
- Underpinned by a number of technical advisory committees from academia, government and industry including:
 - Laboratory accreditation advisory committee
 - Accreditation of RM providers advisory committee
 - PT advisory committee
 - Food technical advisory committee



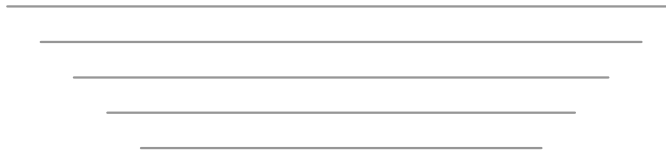
CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE



RM/CRM Providers in Australia

- Currently 17 sites accredited for CRM production
 - 6 for reference gases (NMI + others)
 - 7 for reference grains
 - 2 for ethanol (in blood) solutions (FSS + 1 other)
 - 1 for low level water nutrients (FSS)
 - 1 for drugs and organic compounds (NMI)
- A further 17 organisations are NATA accredited PT providers (most in medical testing + 1 overseas) and presumably are potential sources of RMs
- 2 commercial suppliers (in addition to NMI) of CRMs and calibration standards serving the laboratory community



CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE



National Measurement Institute (NMI) Australia

- NMI formed some 5 years ago by integrating the former AGAL with the national physical metrology facilities under the National Measurement Act 1960
- AGAL contracted Bernard King from LGC as a consultant to develop its chemical metrology capabilities from a 'collection and distribution' service to 'a production and certification role'
- **focus:** to meet Australian laboratories needs for CRMs and RMs for certification of trade commodities and forensic and drugs in sport

CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE



NMI Role and Responsibilities

Current focus for CRMs/RMs is:

- Forensic drugs Agriculture and veterinary chemicals
- Substances banned for use in sport
- Gas mixtures
- Some matrix-based RMs, particularly for pesticide residues



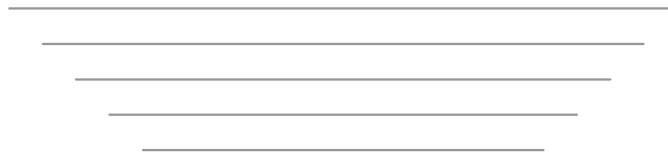
The current catalogue on RMs includes:

- ~250 CRMs and several 1000 RMs and chemical standards

Matrix-based CRMs planned for release in 09/10:

- 3 testosterone and metabolites samples in urine
- Nitrofurans in freeze-dried prawn
- Mercury in freeze-dried prawn
- Trace metals in pharmaceutical tablets


CaSS | Forensic and Scientific Services
A CHEMICAL AND STATISTICAL SERVICE



NMI Role and Responsibilities

- increasing interest in the extension of NMIs PT scope for new studies and RMs, e.g., folic acid and iodine in bread-making flour to support the recent mandatory fortification of bread-making flour in Australasia.
- national need for the development of allergen-based RMs to underpin compliance testing of allergen-free labelled foods
- initial focus on the low gluten commercial custard powder as a potential candidate for a collaborative study and, if suitable, development as a low gluten RM/CRM

CaSS | Forensic and Scientific Services
A CHEMICAL AND STATISTICAL SERVICE




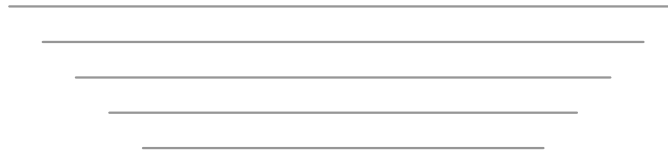
What about the status of in-house RMs/QC Samples?

- The value of in-house matrix-based RMs and QC samples should not be underestimated
- Source of in-house QC samples:
 - Surplus PT study samples
 - Surplus client samples
 - Spiked samples
 - Supermarket shelf samples

Required properties:

- Homogeneity
- Analytes of interest at appropriate levels (check nutritional table)
- Shelf-life stability over the usage time (may provide traceability of results to ISO standards when analysed in parallel with CRMs)

CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE



Acknowledgements

- Dr Howard Bradbury - APFAN founding coordinator
- Mr Graham Craven - founding APFAN member
- Dr Prapasri Puwastien - Mahidol University, Thailand
- Dr Julia Kantasubrata - LIPI, Indonesia
- Ms Teresita Portugal - FNRI, DOST, The Philippines
- Mr Stewart Jones - Operations Manager, NMI, Western Australia
- Dr Lindsey Mackay - Branch Manager, NMI, NSW, Australia

CaSS | Forensic and Scientific Services
A CLINICAL AND STATISTICAL SERVICE