Has Proficiency Testing Come of Age?
21 years of FAPAS

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Overview/Introduction

• Introduction to Fera and FAPAS
• The Present
• The Past
• The Continuation
Introduction to Fera and FAPAS

The Food and Environment Research Agency

~900 staff

Created on 1 April 2009, from;

Central Science Laboratory, Plant Health Division, Plant Variety Rights Office and Seeds Division, Government Decontamination Service

UK Executive Agency of Defra, Department for Environment, Food and Rural Affairs

www.defra.gov.uk/fera
Fera site, Sand Hutton, York, UK
FAPAS

Food Analysis Performance Assessment Scheme

Proficiency Testing Group (PTG) at Fera

21 years old in 2011

200 Reports, 15068 Samples, 2293 customers (FAPAS 2010)

>110 countries

~30 staff

FAPAS
FEPAS
GeMMA
LEAP

Pie chart showing distribution:
- Rest of world: 32%
- EU: 49%
- UK: 15%

PhytoPAS
A brief history

- **FAPAS**: established 1990 by MAFF at their Food Science Laboratory in Norwich, due to concern over UK analytical standards
- Quality Assessment Scheme commissioned in 1993 by MAFF to test their UK food surveillance micro labs – FEPAS launched 1997
- **LEAP**: set up in 1970s by Yorkshire Water, externalised 1994 and taken over by CSL in 2000
- **GMO Scheme**: launched by CSL in April 2001 and later branded as GeMMA
- **Plant Health Scheme** (**PhytoPAS**) launched by CSL in 2005
FAPAS PT

Scheme growth - number of participants per scheme per annum

No. of participants


LEAP GeMMA FEPAS FAPAS
What is proficiency testing?

If I ask you to do an analysis, how do I know you are giving me the right answer?

Validation?
Internal Quality Control?
Accreditation? (ISO 17025)

Bias against external reference
ISO/IEC 17025
Requirement to have Quality Control procedure, such as participation in a PT scheme if a suitable scheme exists

EC 882/2004
Official control laboratories for food and feed required to be accredited to ISO/IEC 17025

EC 83/1998
Water testing laboratories, quality of water intended for human consumption
PT and Accreditation (2)

ISO/IEC 17043:2010
*PT is the evaluation of participant performance against pre-established criteria by means of interlaboratory comparisons*

ILAC P9:11/2010 (also, UKAS TSP47 in the UK)
*Requirements for accreditation bodies on the use of PT activities*

EA 4/18:2010
*Promote harmonization between accreditation bodies on level and frequency of participation*

Eurachem PT Guide 2011
Database and website tools
Report 0101
March 1990
Issued 18/04/1991

Ministry of Agriculture
Fisheries and Food
FAPAS Secretariat
Food Science Laboratory
Food Safety Directorate
Colney Lane
Norwich NR4 7UQ
1. INTRODUCTION

FAPAS Series IV (Aflatoxins) was initiated by the FAPAS Secretariat in September 1990. Thirty four laboratories wished to participate and were sent samples. Each laboratory was given a code number. (Each code shown in this series of reports for each laboratory will be different in future Rounds. If it participates in other concurrent Series of FAPAS the code in each Series will be different.) Participants could use any method of analysis; the level of expertise and the range of equipment available in the participating laboratories varied widely. Twenty eight laboratories returned results within the time scale demanded by the Scheme. This report is to be read in conjunction with the FAPAS Protocol.
As aflatoxin analysis is known to be an area of analytical difficulty, the "true value" $x_t$, was estimated in two ways;

1. From the aflatoxin value obtained from the laboratory preparing the samples ($x_{t_1}$), and

2. From the consensus mean obtained from a group of specialist laboratories ($x_{t_2}$).

The $\sigma$ value is calculated from $a + bx_t$, where $a = \text{detection limit}/3$

$$b = \%\text{RSD}_R/100$$

($\text{RSD}_R \text{ in } \% = 2^{(1-0.5\log x_t)}$), to calculate $b$. 

0401 Report continued...
Rationale

In order to promote the effective implementation and enforcement of the Food and Environmental Protection Act (FEPA) (particularly in relation to pesticide residues in food), the Food Safety Act and of regulations deriving from the "New Approach" and other "Single Market" legislation, MAFF has introduced a scheme for voluntary assessment of the technical performance of food analysis laboratories in UK: this scheme is known as the Food Analysis Performance Assessment Scheme (FAPAS).
FAPAS® Secretariat
CSL FOOD SCIENCE LABORATORY
Norwich Research Park, Colney Tel: 01603 590239
Norwich NR4 7UQ, UK Fax: 01603 590281
[Int. code +44 - do not dial first zero]

REPORT TO PARTICIPANTS IN

FOOD ANALYSIS PERFORMANCE ASSESSMENT SCHEME FAPAS®

PESTICIDES (FRUIT & VEGETABLES):

SERIES XIX : ROUND 1 : JULY 1997

No. 1901

£35 net
(but issued free to participants in Round)

[QCs £30 (£15)]
$z = (x - \hat{X})/\sigma$

$$\text{RSD}_R \text{ in } \% = 2^{(1 - 0.5 \log \hat{X})}$$

4.2.1. The Rescaled Sum of Scores, RSZ

$$\text{RSZ} = \Sigma z/\sqrt{m}$$

4.2.2. Sum of Squares Scores, SSZ

$$\text{SSZ} = \Sigma z^2$$
FIGURE 1 Report 1901

z-SCORES FOR HEPTENOPHOS (414.6µg/kg) IN CELERY TEST MATERIAL

For heptenophos = 0, z-score = -5.5
Recent trends in inter-laboratory precision at ppb and sub-ppb concentrations in relation to fitness for purpose criteria in proficiency testing

Michael Thompson

School of Biological and Chemical Sciences, Birkbeck College (University of London), Gordon House, 29 Gordon Square, London, UK WC1H 0PP

Analyst, 2000, 125, 385-386
Horwitz equation for SD

\[ \sigma = 0.02c^{0.8495} \]

\[ \sigma = 0.01c^{0.5} \]

\[ \sigma = 0.22c \]
Standard deviation $\sigma_p$

**Objective and prescriptive** – define in advance what is acceptable

*Not* descriptive of the observed PT data – caution!

$\sigma_p$ from:

- Predictive models (e.g., Horwitz equation)
- Inter-laboratory reproducibility $R$, $s_R$, $RSD_R$
- Expert judgement, fit for purpose
International Harmonized Protocol for the Proficiency Testing of Analytical Chemistry Laboratories

The PT process

Test Material Procurement and Homogeneity Testing

Distribution of Test Materials

Participants Analyse Test Materials

Participants Return Results

Statistical Analysis of Data

Distribution of a Confidential Report

Recommendations for Future Rounds
THE INTERNATIONAL HARMONISED PROTOCOL FOR THE PROFICIENCY TESTING OF (CHEMICAL) ANALYTICAL LABORATORIES
(Technical Report)
Resulting from the symposium on Harmonization of Quality Assurance Systems in Chemical Analysis, Geneva, Switzerland, May 1991
held under the sponsorship of IUPAC, ISO & AOAC
Prepared for publication by
MIKE THOMPSON & ROGER WOOD

1993 original
(26 pages)

2006 revision
Thompson, Ellison and Wood
(52 pages)
“no substantive modifications”
“additional guidance...interpretation of results”
Z-score based on normal distribution

RSC AMC Tech Briefs 12 and 16 (pdf files)
Accreditation and Quality

For a PT Scheme to be accredited, it must conform to ISO/IEC 17043:2010

The previous standard was ISO Guide 43, as detailed in the International Laboratory Accreditation Co-operation (ILAC) Guide 13:2007

FAPAS (all 4 schemes) is accredited to ISO17043

ISO 13528 revision...

PT conferences and WGs
Useful references


[3] M. Thompson, Recent trends in inter-laboratory precision at ppb and sub-ppb concentrations in relation to fitness for purpose criteria in proficiency testing, Analyst, 2000, 125, 385-386

[4] ISO 17043 Conformity Assessment – General requirements for proficiency testing


What can participants do to help themselves?

- Read the instructions
- Understand the instructions
- Follow the instructions
- Include method details
What can FAPAS do to improve?

• Ask expert advice (or ask Mark to look into it)
• Make improvements to future tests
• Publish results


1. Proficiency Testing

Proficiency testing aims to provide an independent assessment of the competence of participating laboratories. Together with the use of validated methods, proficiency testing is an essential element of laboratory quality assurance. Further details of the FAPAS® proficiency testing scheme are available in our protocols.

$$z = \frac{(x - x_a)}{\sigma_p}$$

Has PT come of age?
Thanks to…

Duncan Campbell, APA
FAPAS colleagues
FAPAS customers

www.fapas.com