Proficiency testing – How much and how often?

Introduction

An accredited laboratory needs to define in which PT schemes it should enrol (**level**) and how often (**frequency**). This is addressed in the advisory document EA-4/18 from the European Co-operation for Accreditation [1] and further explained in a Eurachem Guide [2].

A balanced selection of tools

Quality related to technical work is dealt with in several ways and is specific to each laboratory. Thus EA-4/18 stresses that a laboratory should define its own level and frequency of PT participation after careful analysis of its other quality assurance (QA) measures, such as:

- Participation in method development and validation work;
- Experience from reference material (RM) characterization studies;
- Regular use of RMs or certified reference materials (CRM);
- Internal quality control (IQC);
- Internal studies, e.g. checks using independent techniques or analysis of blind samples;
- Participation in other interlaboratory comparisons.

These 'tools' are complementary but not perfect and they do not automatically ensure fit-for-purpose results! Important limitations should be identified, e.g. problems in obtaining a stable IQC sample or CRMs/RMs whose composition deviates from that of routine test samples. Also note that legislation may stipulate a minimum frequency of PT participation in certain areas. Frequently, some PT providers offer a flexible participation, e.g. 2, 4, 6 or 12 rounds/year; in rare cases, participation in PT may not be feasible at all.

Areas of technical competence

When planning PT participation, the laboratory starts the planning process by listing its areas of technical competence, defined in terms of three parameters:

- A measurement technique;
- A property;
- A product.
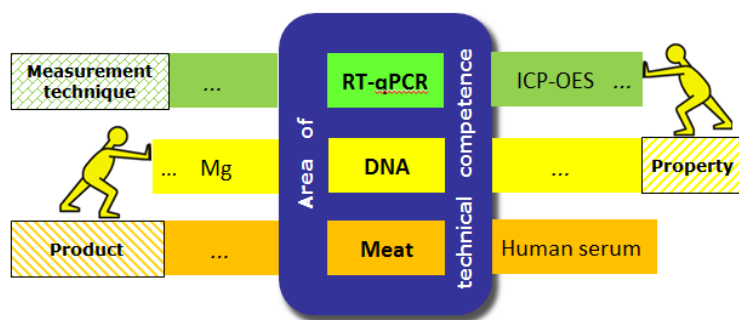
Two examples are "Quantitative real-time PCR (RT-qPCR) for the determination of DNA sequences of pathogens in meat" and "Inductively coupled plasma atomic emission spectroscopy (ICP-AES) for the determination of magnesium concentration in human serum".

An area of technical competence may encompass different, but equivalent and comparable, measurement techniques, different properties and/or different products. The laboratory can refer to the scope of a standardized procedure, or its method validation data, when planning its level of PT participation. If suitable PT schemes are available, the laboratory is expected to participate at least in a proficiency test related to each of its areas of technical competence.

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Risk assessment

In order to decide on a suitable level and frequency of PT participation, the laboratory should conduct a simple risk assessment by considering, for example:

- Limitations in methodology, e.g. instrument instability or interferences from matrix components;
- Experience, knowledge and turnover of technical staff;
- Quality and availability of RMs, etc.;
- How the results will be used, e.g. forensic science and environmental control, and the consequences of a wrong result being reported to a customer;
- Number of tests/calibrations/measurements undertaken between PT rounds;
- Complexity of the test procedure and changes in requirements, e.g. lower compliance limits.

Case studies

1. A laboratory determines a wide range of pesticides in fruits and vegetables. Depending on the specific pesticide, the laboratory uses two technically different measurement techniques, LC-MS and/or GC-MS. Additionally, different sample preparation techniques are required depending on whether the matrices are high water content (e.g. cucumbers, pears etc.) or low water content (e.g. chillies, peanuts). Thus, the laboratory would divide its activities into four areas of technical competence for which the laboratory would need to participate in PTs. The laboratory predominately assesses fruits and vegetables of high water content, so it chooses to participate in a PT scheme for high water content fruits/vegetables more frequently.

Area of technical competence	Measurement technique	Property (*)	Product fruit & vegetables
1	LC-MS	Pesticides (1)	High water content
2	LC-MS	Pesticides (1)	Low water content
3	GC-MS	Pesticides (2)	High water content
4	GC-MS	Pesticides (2)	Low water content

(*) *pesticides analysed in the laboratory by LC-MS (1) or GC-MS (2)*

2. A company has two laboratories, at different sites, both determining a range of minerals and trace elements in various meat, fish and cereal products, using ICP-MS but with different sample preparation techniques for meat/fish matrices and cereal products. Thus, each laboratory would define its PT participation in terms of two areas of technical competence: (i) content of minerals/trace elements in meat/fish using ICP-MS; and (ii) content of minerals/trace elements in cereals using ICP-MS. Each laboratory would need to participate in PT schemes that cover both matrices. However, the staff in one laboratory are generally less experienced due to greater staff turnover. The company decides that this laboratory should participate at a greater frequency than the other laboratory.

The PT strategy

Once the level and frequency of participation is established, the PT strategy, as part of the laboratory's overall quality control plan, is in place. The PT strategy could cover, at least, the period between full reassessments, being reviewed on an annual basis. During audits, the laboratory should be prepared to justify the technical arguments that have led to its decision on the "level" and "frequency" of PT participation.

More information or further reading

[1] EA-4/18:2010 – Guidance on the level and frequency of proficiency testing participation, www.european-accreditation.org
[2] I. Mann and B. Brookman (eds.) Eurachem Guide: Selection, Use and Interpretation of Proficiency Testing Schemes (2nd ed. 2011), www.eurachem.org.

Information about PT providers and schemes can be obtained from your national accreditation body, from the EPTIS website (www.eptis.org) or from other national or international organizations.