

The benefits of taking part in international laboratory tests.

A guidance note for laboratories and Fapas[®] agents.

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Many countries operate national proficiency tests (PT), usually for specific industry sectors. Funded or part-funded by government sources, these tend to be cost-effective for the laboratories taking part. These are attractive because they tend to be simple, conducted in the local language, frequent and there are no sample shipping issues.

However, there are certain benefits of participation in PTs from an international PT provider such as Fapas®, which should be considered in the external quality assessment portfolio of a world class analytical laboratory. This technical note describes the benefits to participant laboratories of taking part in international PTs and how to balance the cost and frequency with their national PT providers. Case studies are used to demonstrate the use of international PTs by Fapas® participants.

The main topics discussed here are:

- Accreditation status
- Standard methods
- International regulations and trade
- International food corporations and testing industries
- Language
- PT interface and reporting
- Statistical viability
- Peer review
- Matrix / analyte combinations
- International recognition and visibility, including papers and conferences
- Balancing frequency and cost

Accreditation status

ISO/IEC 17025, ISO/IEC 17020 and ISO 15189 require laboratories and inspection bodies to evaluate suppliers, this includes PT providers. [ISO/IEC 17043](#) contains criteria for the competence of PT scheme providers, covering: statistical rigor, confirmation of suitability of test materials (including homogeneity and stability), confidentiality, etc. This standard is recognised as an acceptable basis for such an evaluation of a PT provider.

Gaining and maintaining accreditation to ISO 17043 (general requirements for PT providers) takes time, money and effort. For national PTs this is not always an economically worthwhile activity, so many will remain as non-accredited. This activity only becomes economically worthwhile for larger-scale international PTs which are commercially viable.

Standard methods

Methods of analysis take time and considerable scientific expertise to develop from first principles. Hence, most laboratories will purchase a standard method from a national or international standards body, or an equipment manufacturer. Alternatively, standard methods might be available freely online or in peer-reviewed scientific papers.

Standard methods, therefore, tend to be those adopted by the majority of laboratories undertaking the same analysis anywhere in the world. This includes national standard methods which tend to be directly adapted from existing international methods. It is unusual for a national standard method to be much different from the internationally available version. There is a risk, however, that a national standard contains a prescriptive clause not present in the international version which presents a method bias. With this in mind, it makes more sense to participate in an international PT so that a comparison can be made of the result to a large pool of other laboratories that are largely using the same method. Any bias resulting from a prescriptive national method will become evident against the wider population of results.

The majority of proficiency tests are intended to be independent of method. Therefore, most laboratories will slightly modify an international standard method to suit their local circumstances. A national PT that mandates a specific national method does not allow comparison of the participants' performance in an equivalent manner to their international peers.

International Regulations and Trade

Many countries have their own regulations concerning food and drinking water against which laboratories are analysing samples for compliance. However, many continental geographic regions have their own regulations spanning many countries which are in close proximity. This situation enables ease of trade and equivalence with minimal effort of regulations which can be directly adopted by each country in that geographic region. The European Union is the best example of this type. Analyses which are undertaken on commodities common to that geographic region should therefore have equivalence, for which an international PT serves to ensure equivalent standards of quality assurance.

Intercontinental international trade generally requires that the exporter can demonstrate compliance with the receiving country's regulations. This may additionally require that the importer undertakes checks to ensure that compliance. Sometimes there can be disagreements between the data generated by the importer and the exporter. Performance assessments from international PTs of the laboratories involved can help to alleviate any lack of confidence in the trade sample compliance (CXG 70-2009). This is evidenced by the number of official control laboratories that take part in Fapas® PTs. To take only one example, a recent Fapas® PT for Chloramphenicol in prawns attracted 127 laboratories, of which 49 were known official control laboratories from 23 different countries.

[Ref. CXG 70-2009, the Codex Alimentarius Guidelines for Settling Disputes on Analytical (Test) Results]

International food corporations and testing industries

The food industry is a global industry. Similarly, the third-party food testing industry is a global industry. International food production corporations and international food testing companies all seek to take part in international PTs. This ensures that there is equivalence of food production and testing to equivalent specifications across all global sites of a business. This cannot be achieved with only a national PT. The global corporations that work with Fapas® regularly requires that all of their sites take part in Fapas® PTs, in both scheduled and bespoke PTs.

Language

The majority of international science journals, conferences and trade exhibitions are in English. The majority of international PTs are also presented in English, so that the evidence of competence is similarly comprehensible. Although this may present a disadvantage when compared with a national PT in the local language, most participants in an international PT will be reporting in a non-native language. The local agents engaged by Fapas® in some territories can help with translation.

PT interface and reporting

National PTs may not have the resource to enable a fully comprehensive internet browser interface for their participants. International commercial PTs conducted on a large scale have this advantage. The benefit for the participant is that their data will be securely entered by themselves; there is no danger of transposition or transcription errors by the PT provider from emailed, scanned or posted forms.

A sophisticated user interface will also handle the registration and financial transactions in a secure manner with no delays due to different time zones or national holiday periods. A user interface that includes a comprehensive charting function (as available to Fapas® participants) to show both long term precision and bias to meet the requirements of ISO 17025 adds to the flexibility of the user experience. A further advantage of such a system is the ability to enter multiple results (from different analysts) helping to assess analyst competence, another requirement of ISO 17025.

Statistical viability

Small scale PTs run on a national basis will potentially have a low number of participants. There is a risk that the low number of data points will compromise the calculations of the assigned values and z-scores. This is referred to as having low statistical power.

The statistical model might also be simpler than that applied in an international PT and this simplicity may mask problems in the data. The impact is that a small-scale PT will appear to give a high proportion of satisfactory z-scores when, in fact, it hides the statistical limitations of the PT. Participants would probably be unaware of such limitations until it's too late to defend in, for example, a trade dispute. High value commodities, such as the wine sector, are especially prone to this.

Matrix / Analyte combinations

National PTs tend to focus on matrix / analyte combinations that are only in the national interest. Although this is important for ensuring compliance of national regulations, it may not be relevant for international trade purposes. An international PT will attempt to be as relevant as possible to global trade in terms of the matrix / analyte combinations employed.

International recognition and visibility, including papers and conferences

International PTs achieve a level of recognition to customers of laboratories and accreditation bodies that small-scale national PTs might not. In addition, the results of international PTs are more likely to be disseminated to a wider audience in the form of papers in peer reviewed scientific literature and relevant conference proceedings. International PTs might also be represented at trade exhibitions.

A customer of a laboratory recognising that the laboratory has taken part in an internationally renowned PT is likely to have more confidence in that laboratory's capabilities. Laboratories will often use international PTs in method performance studies and disseminate this in papers and presentations.

Balancing frequency and cost

National PTs will usually be more frequent and less costly than an international PT. It's important to recognise that participation in an international PT will not necessarily replace the national PT but should complement it. The international PT provides a level of interlaboratory comparison that is unlikely to be achievable with a national PT.

A national PT, however, continues to serve the purpose of very frequent quality assurance exercises. Therefore, participation once or twice a year in an international PT will not place undue financial burden on the laboratory but will provide a better understanding of the laboratory's performance in the international market. The average cost of a food recall (USD 10 million, FDA, 2012) puts the price of a PT to mitigate such recalls into perspective.

Case Studies

Pesticide residues in Tomato

Tomatoes and tomato products are a global commodity and cultivated throughout the world, either outdoors in warmer climates, or in glasshouses or polytunnels in cooler temperate regions. Plant protection products are widely used in both and so tomatoes are monitored extensively for pesticide residues. The associated PT remains an extremely popular annual PT for [Fapas®](#).

Fapas® PT 19268 (May-June 2019) for pesticide residues in tomato purée attracted in excess of 130 participants from 41 countries in 5 continental regions. The top three countries with the most participants were South Korea, Spain and China. These three countries have more locally-available PT providers but there is clearly a greater attraction for the international PT from [Fapas®](#).

Olive oil quality parameters

Fapas® has a reputation as an international provider which takes us into product areas that the UK is not particularly associated, such as olive oil, for which the major production takes place in southern Europe. Olive oil, however, is analysed by laboratories across many countries for its quality parameters (peroxide value, acidity, optical transmittance, for example).

Fapas® PT 14198 (March-April 2019) for quality indicators in olive oil attracted in excess of 60 participants from 23 countries in 5 continental regions. These include laboratories from olive oil producing countries but also from non-producing countries, such as the UK.

Salmonella in chicken

Chickens are raised for meat and egg production in all countries and the risk of microbiological contamination similarly occurs in all areas. Whether the chicken meat is consumed locally or traded internationally, many countries are working hard to reduce the incidence of Salmonella and other pathogens in their breeding and laying flocks.

This is supported by regular monitoring programmes. The production of microbiology PT materials is particularly difficult, especially combined in real food matrices such as the Fapas® products. This difficulty of production provides a greater challenge for small scale national PT providers.

The Fapas® PT M245d071 (September 2019) for Salmonella detection in chicken attracted in excess of 60 participants from 30 countries in 4 continental regions. However, the country distribution included some small, low population countries that may not have access to similar national PTs.

Postscript: Global SARS-CoV-2 Pandemic and UK Exit from the European Union

At the time of finalising this document, the world continues to deal with the pandemic caused by coronavirus SARS-CoV-2 (and variant strains) which can cause the potentially fatal respiratory disease Covid-19. At the same time, the United Kingdom has left the European Union, and the associated changes in global supply chains brought about by this combination of events has increased pressure on established international food trade routes and supplies.

Retailers are under pressure to find alternatives at short notice, raising concerns with consumers that food quality might be compromised. Food testing laboratories play a vital part therefore, in continuing to ensure food safety through this rapidly evolving situation, and as part of that, the role of international proficiency testing remains just as important, or perhaps even more so, than it has always been. Fapas® continues to operate for all our customers without issues for the great majority of global destinations.

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