

# Proficiency testing and other tools for assuring quality standards

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Laboratories that undertake food testing must be able to produce accurate, reliable, unbiased results. Incorrect results may have significant effects for public health and for food producers' reputations; financial consequences of incorrect results may be far-reaching.

Mistakes occur in laboratories, often due

to sample handling errors, use of inappropriate methods, inadequate training, equipment failures or reporting errors. Of course, these mistakes are likely to be reduced if a laboratory has a robust quality system in place.

The total process whereby the quality of the results can be guaranteed is termed 'quality assurance'.

This is not the same as 'quality control' which is a component of quality assurance and comprises the internal processes under-

taken to check that equipment, reagents and culture media are performing within specifications. Quality control testing may include the use of certified reference materials (CRMs).

## Proficiency testing

By contrast, 'proficiency testing' (PT), also an important component of quality assurance, is the challenge of the effectiveness of a laboratory's quality system with externally provided samples of known but undisclosed content.

The PT provider submits samples for examination in the testing laboratory and the results are revealed by the PT provider only after testing has been completed; the testing laboratories must undertake investigations if their results for the PT samples are unsatisfactory.

However, laboratories should be cautious of amending their procedures based on PT results alone. PT providers will often provide guidance to help laboratories identify potential sources of error, such as the Health Protection Agency's guidance available from [www.hpa.org.uk/eqa/docs](http://www.hpa.org.uk/eqa/docs).

It is important that a laboratory selects an appropriate PT scheme. Ideally, they will seek a provider that is accredited to the international standard, ISO 17043:2010.

## Sufficient expertise

Testing laboratories may also consider whether the PT provider has sufficient expertise in the relevant field; for example are microbiology samples prepared by qualified microbiologists who understand the routine testing procedures?

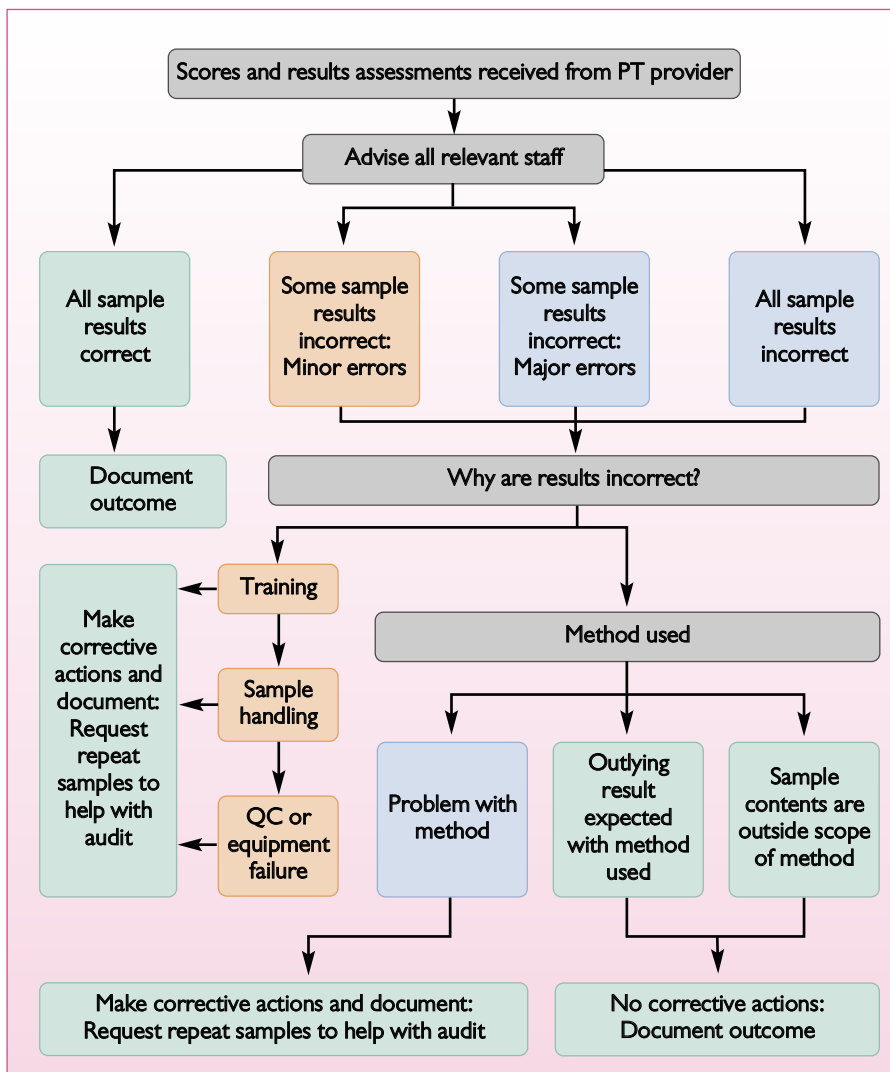
Another point for consideration by the testing laboratory is the type of PT sample provided; most microbiology PT schemes will provide samples without a food matrix or in a relatively inert matrix such as milk powder or another dried product.

Those schemes focus on the microbiology testing procedures rather than the sampling and pre-sample treatment stages.

The reason that these PT sample types are

*Continued on page 24*

Fig. 1. Guide for the use of proficiency testing.



Continued from page 23

provided is because it is difficult to meet homogeneity and stability requirements for PT samples if real food matrices are used for international accredited schemes.

Cost is also a significant factor, and some schemes provide samples that can be tested for a wide range of micro-organisms rather than as single parameter samples.

Schemes such as those provided by the HPA provide repeat samples free of charge so laboratories that experience difficulties with their examinations may repeat the tests after they have undertaken an investigation and completed corrective actions to ensure that their actions were effective.

## Effective insight

PT results will provide an effective insight into routine results only if PT samples are treated in the same way as routine samples.

This means that every stage of testing from sample receipt, through all stages of the testing process, to reporting of results, is undertaken by the same people who would normally do the tests using the same procedures.

If PT samples are treated differently from routine samples then the PT results may be excellent, but little will be learnt about the

quality of the routine service. PT is of limited value without the other quality components such as quality control procedures and the use of reference materials and while PT will identify problems with testing it will not solve the problems; PT can help to confirm that problems have been eliminated.

The trend in food testing is moving towards core centralised laboratories concentrating on high volume throughput with some of these laboratories processing over a million samples per year.

These larger laboratories require more staff members and the trend is leading to a corresponding change in skill-mix.

In part, this has been brought about by increased automation and pressure to achieve cost reductions and increased efficiencies.

There is a significant emphasis on quality and value for money as competition between laboratory networks increases. In response, laboratories may need other externally provided tools to supplement PT, to help demonstrate the competence of individual staff members or the effectiveness of their training programmes. This data may also be required to help to maintain accreditation or for reassurance of managers or clients.

The Health Protection Agency's new CompetencyCheck range of products is an

example of such a tool, recommended to supplement the overarching performance assessments provided with the HPA food microbiology PT schemes.

The products consist of preserved micro-organisms, in the format of Lenticule discs, with contents designed to help to confirm competence with salmonella detection, listeria detection and listeria enumeration.

This type of sample differs from PT samples and certified reference materials, as demonstrated in Table 1.

## Summary

Laboratory testing makes an important contribution to assuring quality standards in foods, provided that the testing is undertaken accurately.

Robust quality assurance systems are likely to improve the quality of results; PT is an important component of a quality assurance system although PT can be effective only if used correctly.

The increasing availability of supplementary products designed to demonstrate individual staff competency and assessment of the performance of new methods allows PT samples to be used correctly for the purpose for which they are designed. ■

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**Table 1. Comparison of sample types.**

	<b>Proficiency testing (PT) samples</b>	<b>Samples for training and competency assessment (for example the HPA CompetencyCheck range)</b>	<b>Certified Reference Materials (CRMs)</b>
<b>Description</b>	Sample contents are unknown by the testing laboratory until after testing. The contents normally consist of a mixture of wild-type strains simulating the micro-flora of real samples.	Sample contents are unknown by the testing laboratory until after testing. The contents normally consist of a mixture of wild-type strains simulating the micro-flora of real samples.	CRMs are pure cultures of control strains from national collections such as the National Collection of Type Cultures (NCTC). They contain known levels of micro-organisms; the testing laboratory knows the content of the CRM at the point of purchase.
<b>Standard operating procedures</b>	Routine procedures should be used throughout for the PT samples to demonstrate the effectiveness of laboratory processes and identify systematic errors.	Routine procedures against which competency is being tested should be used; however, in addition, samples may be used to demonstrate competency with new laboratory methods, methods undergoing trial or validation studies (for example, for molecular methods).	Designed for use as a process control alongside the routine procedure. If the control fails there may be a problem with the process that can be investigated immediately. Useful for the control of culture media.
<b>Staff competence</b>	The procedures must be undertaken by the same members of the team who would normally undertake the various stages with routine foods - from sample receipt through the practical testing procedures to reporting results.	The same member of staff may undertake all stages of testing. If errors are identified then the individual can concentrate on improving their performance at the relevant stage(s).	Not designed to challenge staff competence although CRMs can be used as support materials.
<b>Training programmes</b>	PT samples are not designed for training purposes, and although they can be used for training, this is not the most cost effective use of PT samples.	Samples may be used for training or to demonstrate the effectiveness of a laboratory's training programme.	CRMs are not designed for staff training although they can be used as a supporting tool.
<b>Replicate samples</b>	PT schemes are usually designed to allow one sample per laboratory; this more accurately simulates the situation with real foods where microbiology laboratories are unlikely to receive two identical samples.	Laboratories may test as many replicates of each sample as they need. For example, they may choose to provide a replicate of the same sample for every member of staff.	Not applicable.

# Assisting laboratories world wide in maintaining standards of excellence



Food, water and environmental laboratories play a vital role in protecting the public's health by helping to ensure that food is safe to consume, waters are safe to drink and that environmental and recreational waters do not make people ill.

Proficiency testing or external quality assessment provides laboratories with an independent external assessment of their performance. Regular participation in proficiency testing schemes is an important part of laboratories quality procedures and helps to ensure that the results of their tests are accurate.

With over 25 years of experience, Public Health England's Food and Environmental Proficiency Testing Unit is a world leader in providing microbiology proficiency testing schemes to food, water and environmental laboratories both in the UK and in over 70 countries internationally.

Our dedicated team of experts has unrivalled professional, scientific and technical expertise in proficiency testing. Participants also have the additional advantage of drawing on the full scientific resources of Public Health England.

## Benefits of participating in Public Health England's food and water proficiency testing schemes:

- Unique schemes provided:
  - that support both EU and non-EU legislation
  - inclusion of organisms such as *Mycobacterium* spp. in endoscope rinse waters
  - Molecular scheme for Shiga-toxin producing *Escherichia coli*
  - *Vibrio cholerae* testing
  - *Staphylococcus aureus* Enterotoxin
  - Norovirus and Hepatitis A virus
- Free of charge repeat samples
- Access to expert food and water microbiologists
- Bespoke schemes reports provided
- PHE and z-scores provided in some scheme reports
- Ability to make extremely low level samples

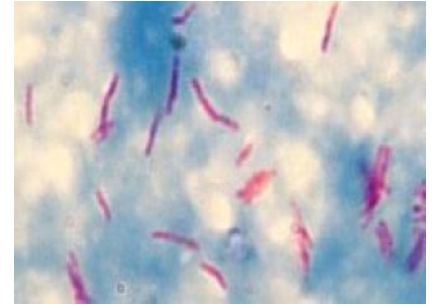
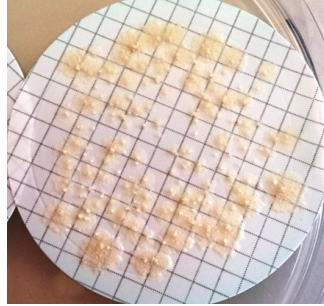
## PT Schemes available include:

Environmental Swab  
European Food Microbiology Legislation  
Standard Scheme  
Non-Pathogen  
Norovirus and Hepatitis A virus  
Pathogenic *Vibrio*  
Shellfish  
Shiga toxin-producing *Escherichia coli*  
*Staphylococcus aureus* enterotoxin  
Bottled and Mineral Water  
Dialysis Water  
Drinking Water  
Endoscope Rinse Water  
Hospital Tap Water  
*Legionella* Isolation  
*Legionella* Molecular

**All schemes are accredited by the United Kingdom Accreditation Service (UKAS)  
to the international standard ISO/IEC 17043:2010**



# *Mycobacterium* spp. in Water Scheme



This unique microbiology scheme provides proficiency testing (PT) samples to laboratories that examine endoscope rinse and heater cooler unit (HCU) waters for *Mycobacterium* spp. This scheme challenges the detection, accurate enumeration and identification of this organism from these hospital water samples.

HCUs are used during open heart surgeries to warm or cool a patient as part of their care. It has recently been recognised that there is the potential for *Mycobacterium chimaera* or other species to grow in a water tank in the HCU. When the water evaporates, the mycobacteria may become dispersed into the environment as aerosols and may infect a patient during certain types of open heart surgery.

Flexible endoscopes are complex reusable instruments that require unique consideration with respect to decontamination. Their external surfaces and internal channels for air, water, aspiration and accessories are all potentially exposed to body fluids and other contaminants. Environmental non-pathogenic mycobacteria present a particular problem when they occur in the final rinse-water of some instruments used for diagnosis.

This PT scheme helps you to identify gaps in your processes, highlighting where quality improvements can be made. It also provides an opportunity to improve staffs knowledge and experience with organisms not frequently encountered.

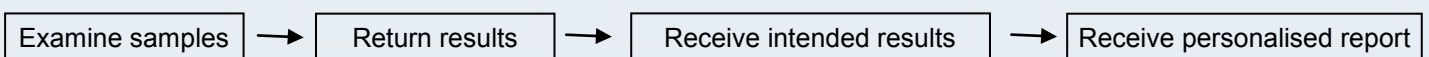
The scheme focuses on raising awareness of:

- the variation of different methods and media used and highlighting subsequent impact on PT results
- interpreting the microbiological results obtained
- the importance of testing *Mycobacterium* spp. and highlighting the difficulties associated with isolating this organism

**Up to four distributions available per year, each containing two samples**

**Two distributions for Endoscope rinse water**

**Two distributions for Heater cooler water**



Your laboratory's personalised report will contain information such as:

- the contents and the levels of the sample
- performance data for each examination for you to compare your performance against other laboratories
- your on-going performance over a year which demonstrates your commitment to quality to clients and colleagues
- where relevant actions to take to ensure that your laboratory retains high standards of testing
- educational information on difficult and challenging samples

For your investigation repeat samples are provided free of charge and further expertise can be provided by our panel of renowned food and water microbiologists

**Satisfactory performance with your PT provides assurance that your laboratory is compliant with testing standards, thereby meeting and maintaining accreditation requirements.**