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Microbiology proficiency testing schemes factsheet

Introduction

In the food industry, major decisions are made on the basis of analytical results. Whether it be nutritional analysis for a food label declaration, or pesticide or microbiological analysis for quality control purposes, it is absolutely imperative that the results are right and interpreted correctly. Correct interpretation itself is dependent not only on the result (i.e. the answer) being correct, but also on the right question having been asked in the first place (i.e. the appropriate analysis having been undertaken).

Microbiological analyses have particular issues associated with them that make it difficult to know in isolation how accurate they are. Different techniques could provide very different results, which in turn could lead to erroneous conclusions if there isn't a full understanding of what analysis was carried out and why. Put simply, the analysts in the laboratory must know which tests to apply and must be able to perform the analyses competently. How can you tell if your laboratory is performing adequately? The answer is to compare your results for a sample containing a known number of the target microorganism(s) with results obtained by other laboratories - that is, participate in a proficiency scheme.

This fact sheet briefly outlines how proficiency schemes work, and why they are important. For more information on proficiency schemes in general, and the Campden Microbiology Proficiency Scheme in particular, please contact Fiona Cawkell on +44(0)1386 842142 or e-mail microproficiency@campdenbri.co.uk.

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Why are proficiency schemes necessary?

When carrying out microbiological analyses, there are many areas where inaccuracies or uncertainties could creep in. These include:

- sample handling and storage errors
- inadequate staff training
- incorrect or inappropriate methods
- equipment and culture media failures
- calculation errors
- reporting errors

These might seem to be rather gross 'all or nothing' issues, but they also cover what would be considered to be 'normal' uncertainty factors and margins of error. When they are all added together, the primary concern is that they don't result in an incorrect representation of what the true answer is. More information on calculation of uncertainty in microbiological measurements is given in Campden BRI Guideline 47 - *Microbiological measurement uncertainty - a practical guide* and in our factsheet *'Uncertainty of measurement: what it means'*. To receive a free copy of the latter, e-mail auto@campdenbri.co.uk with the subject line: **send uncertainty**

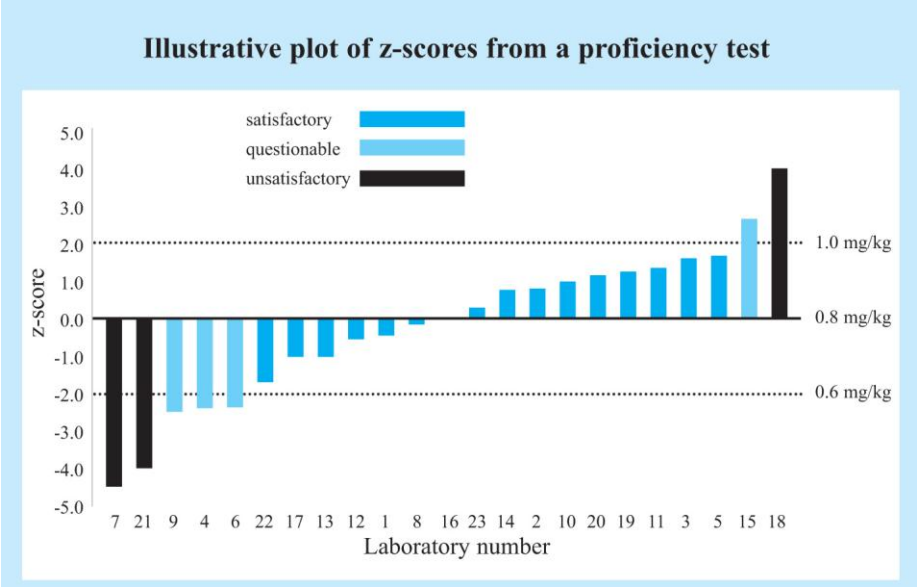
Uncertainty measurement cannot, however, be applied to all of the potential problems listed above. To be confident that the methods that you are using are appropriate, that they are being carried out effectively and in the correct way, and that all equipment is operating adequately, you need to test your results regularly against some kind of known standard. Participating in a proficiency scheme is the most effective way of doing this.

Because proficiency schemes can be so effective, and because what they are trying to achieve is so necessary, laboratory accreditation schemes generally require you to participate in a proficiency scheme as a prerequisite for accreditation.

How do proficiency schemes work?

All proficiency schemes, be they for chemical, physical or microbiological analyses typically work by providing participating laboratories with standard samples for the laboratory to analyse ‘blind’. In microbiological analysis schemes, the organisers know the level of the microorganisms (and the nature of the cocktail of mixtures) provided, but the test laboratories do not. Each laboratory analyses the sample(s) using its usual methods (which might differ from one laboratory to another) and submits its results to the organiser. The organiser compiles and statistically analyses these results (e.g. plotted as a histogram) and includes them in a report that also contains the ‘true’ result and, for each laboratory, a score (called a z-score) reflecting how close it was to the ‘true’ value (see Figure). The laboratories are not named but are coded, and each is told only its own code. This means that it can compare its result with the ‘true’ value and with the results obtained by other laboratories. It can also compare its score with other laboratories without confidentiality being breached. This gives a laboratory good independent feedback of its performance for a particular test. An example of a z-score plot is shown below.

Figure – Simplified plot of z-scores from a proficiency test



The figure shows the z-scores obtained by several laboratories. z-scores between –2 and +2 indicate a satisfactory performance. Z-scores between –3 and –2 or between +2 and +3 indicate a questionable result. Z-scores outside the range –3 to +3 indicate an unsatisfactory result. Where a laboratory obtains a 'questionable' or 'unsatisfactory' result, it should investigate the cause.

Campden Microbiology Proficiency Scheme (CMPS) - Now Re-launched!

Different schemes will have different features and allow laboratories to evaluate their performance in detecting/identifying and/or enumerating specific organisms or groups of organisms. At Campden BRI, we operate three types of scheme, depending on your requirements, and each includes two choices of test material - depending on whether you are set up for handling pathogens or not. In addition, we also offer a tailored scheme which could, for example, allow you to compare the performance of different laboratories within your company.

A freeze-dried sample is sent to all laboratories in the scheme with the simple instruction to detect and/or enumerate the microorganisms it contains. The laboratory can use whatever methods it likes and be as specific or generic as it wishes in what results it reports. The laboratory then sends the results back to us to collate and statistically analyse them. We then send the results to the individual participant laboratories, which can each see all of the results anonymously and are also told which results are from their own analyses. In this way each can compare its performance with all other participants, but in a confidential and anonymous way.

Some laboratories may only want to report on total viable count (TVC), whereas others may routinely analyse for specific groups of organisms. Depending on the laboratories' requirements, the sample may contain a mixture of pathogens and spoilage organisms, or merely a spoilage cocktail.

Two types of test material samples are available, and are sent in an easy-to-open vial. The first contains mixtures of non-pathogenic organisms, for enumerating TVC, coliforms, Enterobacteriaceae, lactic acid bacteria, yeasts and moulds, as well as pathogens that are usually quantitatively analysed. The second might additionally contain *Salmonella, Listeria, Vibrio* and *Campylobacter*, and is designed for companies who have suitable laboratory facilities and experience with handling pathogens.

Non-toxigenic E. coli O157, thermophilic spores, and osmophilic yeasts and moulds have recently been added to our samples. Other new features include z scores for all count results, and extra statistical information. Results can also be trended for clients over a minimum 12-month period.

Summary

In summary, microbiology proficiency schemes allow you to:

- measure your performance against that of other laboratories and a known standard
- have confidence in the reliability of your analytical data
- facilitate continuous improvement of laboratory performance
- compare different methods

For more details on the detailed features of the Campden Microbiology Proficiency Scheme, and how you can participate, please contact:

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