



APLAC

Asia Pacific Laboratory Accreditation Cooperation

**WHY ARE THESE TEST RESULTS SO DIFFERENT?
The importance of testing methods in chemical and
microbiological testing**

PURPOSE

This document gives an explanation for the lay person of the reasons for difference in test results for chemical and microbiological testing, especially when empirical methods are used.

AUTHORSHIP

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BACKGROUND

International trade in goods relies on the results of testing to verify conformity with national and international standards in order to protect public health and safety, to protect the consumer in regard to truth of labelling and to monitor and enforce tariff and quota requirements in trade agreements. All too frequently, test results produced at the origin of export verifying conformity are not supported by test results generated in the importing economy. Such incidents are costly in terms of goods being delayed in their release to market and in the subsequent investigations and additional testing required. More importantly, these incidences undermine the often hard earned confidence between trading partners.

In a lot of cases relating to tests of a chemical or microbiological nature, and particularly so in the trade in food and agricultural products, the apparent differences in test results are in fact scientifically justifiable and reflect not so much the compliance status of the goods nor the ability of the laboratories to conduct the testing, but rather how the testing was carried out in the different laboratories.

WHAT ARE THE DIFFERENCES?

In many instances in chemical testing, and even more prevalent in microbiological testing, the attribute being measured is not well defined or evenly distributed in the sample. Examples in the trade in food and agricultural products include moisture content, fat content, pesticide and antibiotic residues, and others. In microbiological testing, it is not possible to isolate each individual organism cell and count it.

To overcome this lack of definition, testing scientists define and measure the amount of an attribute or the number of micro-organisms by the test method used. For example, the moisture content of a sample is defined by the loss in weight when a sample is dried for a set time at a set temperature – and the number that is produced is not necessarily the same as if the water molecules were isolated then weighed. Similarly, micro-organism can be defined by the number of colonies grown in a Petri dish under specified conditions after a specified period of time, and this number may not equate to the unrealisable count of individual cells of that particular organism in the food sample.

Such defining test methods are often called empirical methods – the result you obtain is dependent on the method selected to make the measurement. In all but the most sophisticated of chemical tests, and in essentially all microbiological testing, the tests results are empirical in nature.

WHAT DOES THIS MEAN?

It means that two different methods used to measure nominally the same attribute will likely produce two different results. And therein lies a common reason behind disputes over test results in traded goods. The exporter uses Method A (a method in common use in the exporting economy) to measure Attribute X and declares that the goods conform. The importing economy uses Method B (which is that commonly used in laboratories in that economy) and is also measuring Attribute X but gets a different answer. Both results are probably correct but in reality are probably measuring either:

- (i) slightly different attributes that both economies call Attribute X, or;
- (ii) the same Attribute X but to different levels of accuracy, as produced by the different Methods A and B.

While the cause of the difference could be determined after investigation, the situation could have been easily avoided by prior agreement between the two parties as to whether both

Method A and Method B were equivalent and acceptable, or (less ideally) agreeing which single method was to be used to measure the critical attributes. Alternatively, the differences in Method A and Method B could be formalised recognised and different pass/fail criteria established for the goods depending on the method selected for use.

HOW TO AVOID THE UNNECESSARY CONFLICT

The scientific resolution to the issue of empirical test methods and the differences they introduce is the subject of much work within the laboratory community. It is likely the resolution will come, not from specifying only a single method to be used by all trading parties, but from recognition of different methods as being equivalent (within defined “fitness-for-purpose” criteria). In the interim, important attributes associated with the regulated control in the trade of goods across borders will continue to be test method dependent and it is important for regulators involved in trade negotiations and in the control and enforcement of trade agreements to consider the selection of mutually agreed methods for the testing of the traded goods.

As mentioned earlier, there are variations in the methods of preference between economies. While test methods standards may exist at the national, regional and international level, these standards may not always be equivalent and may yield differences in test results. The testing community has, in many instances, attempted to overcome these anomalies by mutually agreeing on internationally accepted reference test methods – often referred to as primary methods. The accepted correct result of an attribute to the highest degree of accuracy is thus the result achieved by the primary method, and the accuracy of national, regional and in some cases other international methods are measured against those of the primary method. These are often called secondary methods.

Current global trade agreements such as the Technical Barriers to Trade (TBT) agreement of the World Trade Organisation (WTO) encourage or require the use of international standards in the assessment of conformity in traded goods and services. This includes the testing of such products and by association the test methods used. Variations from the use of international standards must be technically justifiable and fully transparent. The situation of an importing economy specifying its own unique test method when an international reference method is available is no longer acceptable and would be considered a technical barrier to trade given that the exporting economy would need to go to the unnecessary expense of changing its test methodology – and may have to do this for each and every economy it exports to.

Thus international primary methods should be the agreed methods of choice, and secondary methods could also be accepted provided they can (transparently) demonstrate they are (technically) equivalent to the primary method (using pre-defined equivalence criteria) for the attribute they are measuring.

SUMMARY

Trade negotiators and regulators involved in the monitoring and enforcement of trade agreements need to be aware of the importance of the selection of test methodology used in the testing of traded goods. The testing of chemical and microbiological attributes of such goods more often than not gives different results depending on the choice of test methodology used. At the very least all parties to a trade agreement must agree on exactly what the attribute is that is being measured and the test methodologies that define it. The method selection should be international reference methods themselves, or methods that have been shown to produce equivalent results as the international method.

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Trade officials are encouraged to consult and involve expert scientific testing advice when developing and implementing trade agreements to ensure method selection decisions are appropriate and justifiable and thereby avoiding unnecessary disputes over test results in future transactions.