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Microbiological analysis of foods: standards applicable to meat and dairy products

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Micro-organisms are present in many foods. Some are useful for producing wine, yogurt or cheese by fermentation, while others can be dangerous to human health, like *Salmonella* and *Listeria monocytogenes*, causing illnesses (gastroenteritis, meningitis) when ingested by consumers.

International Standards for the microbiological analysis of foods are vital for ensuring consumer safety.

In September 2004, an article in *ISO Focus* (p.16-17) was devoted to the activities of the ISO/TC 34, *Food products*, subcommittee SC 9, *Microbiology*, for the standardization of microbiological horizontal methods¹⁾.

Within ISO/TC 34, standardization of microbiological vertical methods, or those specifically applicable to a given family of products, is currently conducted in two cases :

- Meat and meat products, by working group WG 1, *Microbiological analysis of meat and meat products* of SC 9; and
- Milk and dairy products, by SC 5, *Milk and milk products*, under Dutch responsibility, in close cooperation with the International Dairy Federation (IDF), (see the article in *ISO Focus*, September 2004, p. 18-19).

1) Methods used that are broadly applicable not only to all foods, but also to animal feed, environmental samples in the area of food production and food handling. Other general standards define requirements and recommendations for microbiological examinations (such as ISO 7218).

Harmonizing horizontal and vertical microbiological standards

From a scientific point of view, the need to have different methods, depending on the type of food, for the determination (detection or enumeration) of the same micro-organism does not seem to be justified in the general case.

Today, standards in food microbiology are still mainly based on conventional Pasteur microbiology²⁾. The microbiological methods are mainly designed, in terms of culture media (composition and incubation conditions -temperature, duration) and selection of confirmation tests, as to allow the optimal growth of the target micro-organism and to prevent the growth of competitors and background flora that may be present in the food.

Standards for sample preparation

Only the initial steps of the analysis – sampling of the test portion in the test sample and preparation of the initial suspension – need to be conducted in a way very specific to the product. This initial stage uses the matrix (the test portion) and needs to be adapted to its characteristics, for example by:

- Defining the appropriate sampling of the test portion (one or several parts of the test sample, depending on the expected distribution of the contamination within the product); or
- Using an appropriate diluent to prepare the initial suspension, depending on the salinity, pH, a_w of the matrix.

SC 9 developed ISO 6887 that consists of four parts under the general title, *Microbiology – General guidance for the preparation of dilutions for microbiological examination*:

- Part 1, defining general rules for the preparation of initial suspension and decimal dilutions;
- Part 2, specific rules for the preparation of the test sample and initial suspension for meat and meat products;

- Part 3, specific rules for the preparation of the test sample and initial suspension for fish and fish products; and
- Part 4, specific rules for the preparation of the test sample and initial suspension for other products which require microbiological testing.

In addition, specific rules for milk and dairy products are given in ISO 8261 developed by SC 5.

Given that the initial stages of the microbiological analysis is covered by these specific texts, the following steps can be conducted according to a procedure common to all food types and specific to each target micro-organism.

From a practical point of view, microbiological laboratories often analyse a wide variety of food product types. This is especially true for official control, private laboratories and laboratories belonging to multi-sectorial food industries. It is easier for these laboratories to implement one method only for a given determination, because different methods often mean (i) different incubation temperatures (several incubators each needing to be characterized, maintained) (ii) different culture media (each needing to be prepared or bought, performance tested, stored and managed, etc.).

Moreover, for those using the standard (laboratories or customers of the analyses), it is confusing to find two or more standards for the same determination, one applicable to all foods including the food types for which vertical standards would co-exist. So which standard do we choose?

Harmonizing Standards in food microbiology

For these reasons, SC 9, *Microbiology, SC 6, Meat and meat products* (formerly in charge of developing standards on microbiological analysis of meat and meat products), SC 5, *Milk and milk products*, and the International Dairy Federation (IDF) strengthened their cooperation and defined principles for avoiding the duplication of standards. It was agreed that only horizontal standards should exist for a given determina-

tion, except if the sectorial body considered, with sound scientific justifications, that the horizontal standard would not be applicable to the given food family. SC 9 emphasized that a good horizontal standard should not exist without being fully applicable to meat and dairy products – two major families in terms of food hygiene – and that it counted on participation from both SC 6 and SC 5/IDF, in developing horizontal standards. These harmonization principles were introduced to ensure that the horizontal standards are applicable to these types of food, and were agreed to at the 1998 meeting of SC 9 in The Hague. This was also the first time that a SC 9 meeting was held in conjunction with IDF and SC 5.

Harmonizing within the meat sector

Cooperation with the meat sector has a long history. SC 6 decided to subdivide its activities between microbiology and chemistry. The microbiological section agreed to hold its meetings with SC 9, which allowed a cross participation and

2) The ability of micro-organisms to grow in culture media: this being the case, the result of an analysis is completely dependent on the method used (especially in cases of enumeration of micro-organisms).

About the author



Bertrand Lombard graduated in 1988 from the College of Agricultural and Agro-food Sciences of Paris-Grignon, obtaining a post-graduate

diploma in spectrochemistry, and received his PhD for inter-laboratory studies in food microbiology in 2004. He has been Chair of ISO/TC 34/SC 9 since 1998, as well as a scientist at the French Food Safety Agency (AFSSA) and coordinator of the European Community Reference Laboratory on “milk”.



gradual harmonization of methods. Consequently, the microbiological section of SC 6, at its request, officially became a working group of SC 9 in 1998. The Secretariat of WG 1, *Meat and meat products*, is still ensured by The Netherlands Standardization Institute (NEN) and is convened by the former chair of the microbiological section of SC 6, Dr. Enne De Boer.

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Most of the sectorial standards that co-existed with horizontal standards have been withdrawn, except for the following:

- Enumeration of *Escherichia coli* (ISO 6391, to be replaced by the horizontal standard ISO 16649-1);
- Enumeration of yeasts and moulds (ISO 13681, to be replaced by the horizontal standard ISO 21527 under development);
- Enumeration of *Pseudomonas* (ISO 13720, method specific to meat and meat products);

- Enumeration of *Brochothrix thermosphacta* (ISO 13722, a micro-organism specific to meat & meat products);
- Carcass sampling (ISO 17604).

Harmonizing within the dairy sector

More recently, SC 9 has entered a more formal cooperation with the dairy sector, which was strengthened by the harmonization agreement. Together with SC 5 and the IDF, standardization work is conducted by joint expert groups called Joint Action Teams (JAT). The JAT on microbiological harmonization was specifically established to harmonize horizontal and dairy standards, is chaired by Dr. Heinz Becker and includes the Secretary and Chairman of SC 9. A reorganization within SC 5 and the IDF resulted in responsibility of all dairy microbiology standards (except lactic acid bacteria and starters) being given to this JAT, thus easing the harmonization process.

To date, the JAT has recommended to withdraw certain vertical standards and to replace them with the corresponding horizontal standards.

The JAT recommended maintaining vertical standards for the following bacteria, considering that the corresponding horizontal standards were not satisfactorily applicable to milk and dairy products:

- Enumeration of *E. coli*: MPN technique using MUG and colony-count technique using membranes (Parts 2 and 3 of ISO 11866);
- Detection of *Salmonella* (ISO 6785).

Thus, the process of harmonization between horizontal and vertical standards in food microbiology has already been conducted to a large extent, with the strong commitment of interested parties – leaders of both horizontal and vertical structures and standardization institutes supporting them. It is hoped that this harmonization will be completed in the coming years when horizontal standards for the determinations concerned (*E. coli*, *Salmonella*) will have been revised. ■



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