Industry guidelines of quality control for Microbial Food Cultures used in Meat Fermentation

Contents

1 Scope

This international industry guideline specifies characteristics of industrial Microbial Food Cultures (MFC) to be used for the manufacture of meat-containing products. The cultures mainly belong to the following genus: *Lactobacillus, Pediococcus, Lactococcus*, *Leuconostoc*, non-toxic and non-pathogenic staphylococci, *Kocuria*, *Streptomyces*, yeasts and moulds (Bourdichon et al. 2012).

2 Terms and definitions

For the purpose of this international industry guideline the following terms and definitions apply.

2.1. Microbial Food Cultures

Preparation of cultures that contains one or several strains of microorganisms at high counts (in general more than 10^8 colony forming units (CFU) per g or ml) on a carrier being added to provide a desirable metabolic activity (e.g. fermentation of nutrients and carbohydrates resulting in acid production or other metabolic activities directly related to specific product properties).

2.2. Food safety criterion

The conditions that determine the acceptability of a food product placed on the market (Commission Regulation EC No. 2073 2005).

2.3. Process hygiene criterion

Condition determining the acceptable functioning of the production process, but which is not applicable to products placed on the market, setting an indicative contamination value above which corrective actions are required in order to maintain the hygiene of the process in compliance with food regulations (Commission Regulation EC No. 2073 2005).

3 Principle

A description is given of the characteristics of MFC regarding cell concentration, contaminants, quality and safety management, and product information. It also provides examples of analytical methods to assess compliance with declared specifications.

4 Essential composition

The following microbiological criteria are recommended for products placed on the market. Products should comply with those criteria for the duration of their shelf-life. Recommended analytical methods are specified in Annex A.

4.1. Viable cell counts

The number of viable cells expressed as CFU per gram, ml or selling unit shall meet the minimum specification claimed by the MFC manufacturer/supplier when using the manufacturers' methods.

In general, population concentration is the main criteria for the functionality of MFC in the manufacture of meat products.

MFC for the manufacture of meat products contain in most cases more than 10^8 CFU/g or ml or the equivalent population concentration measured with the use of alternative methods (e.g. flow cytometry and optical density).

For certain applications, the functionality of the MFC may be measured by controlling the metabolic activity (acidification activity, texturing potential, etc.).

4.2. Contaminants

The manufacturer shall establish control measures to prevent potential contamination according to 5.2.

MFC preparations have to comply with the microbiological specifications shown in Table 1. Microbiological criteria and specifications fall in two categories: process hygiene and food safety. The sensitivity of the available analytical methods (see Annex A) has been considered when setting specifications.

Table 1a — Specifications for mandatory microbiological criteria

Type of criteria	**Contaminants**[a)]	**Units**	**Liquid and frozen**	**Dry**
Process hygiene criteria	*Enterobacteriaceae*	CFU/g or ml	<10	$<10^2$
	Coagulase-positive staphylococci [b)]	CFU/g or ml	<50	$<5x10^2$
	Other than specified yeasts and moulds	CFU/g or ml	$<10^2$	$<10^3$
Food safety criteria	Anaerobic sulphite-reducing bacteria	CFU/g or ml	<10	$<10^2$
	Salmonella spp.	Absence/presence in 1 g or ml	Absence	Absence
	Listeria monocytogenes	Absence/presence in 1 g or ml	Absence	Absence

a) Contaminants can be tested in process environment and in product samples. The set-up of environmental samples compared to product samples shall be based on HACCP principles (ISO 22000) and justified against the specifications given here.

b) Not relevant for products containing high level of staphylococci due to culture background (risk of false positive, detection limit and/or pressure selection issue).

Table 1b — Specifications for suggested optional microbial criteria (if relevant)

Type of criteria	**Contaminants**[a)]	**Units**	**Specification**
Process hygiene criteria	Mesophilic micro-organisms other than specified ones	CFU/g or ml	$<10^3$
	Enterococcus	CFU/g or ml	$<10^3$

a) Contaminants can be tested in process environment and in product samples. The set-up of environmental samples compared to product samples shall be based on HACCP principles and justified against the specifications given here.

Additional microbiological criteria than those defined in Table 1b may be relevant depending on the application of the MFC.

The manufacturer shall establish control measures to prevent potential cross-contamination from other products that might affect the quality of the product.
It shall also be evaluated whether cross-contamination testing needs to be implemented on product, process samples, or in the process environment.

5 Quality and food safety management

5.1 Quality management

To control the essential composition of starter cultures the manufacturer shall put in place, implement and maintain a quality management system (e.g. ISO 9001).

5.2 Food safety management

To control the essential composition of MFC, the manufacturer shall put in place, implement and maintain a permanent procedure or procedures based on pre-requisite programs and Hazard Analysis Critical Control Point (HACCP) principles (ISO 22000).

5.3 Product quality

To comply with the levels given in 4.1 and 4.2 product quality shall be secured and documented according to 5.1 and 5.2.

6 Product information

6.1 Labelling, product documentation or accompanying documents

Labelling/information shall be in accordance with national legislation, where applicable.

The following items are recommended to be on the product label or accompanying documents:

1. Commercial name of product
2. Species name
3. Other ingredients
4. Allergens as required by legislation
5. Type of product (e.g. liquid, frozen or freeze-dried)
6. Net content which may be indicated in one of the following units: g, ml, units, doses (in accordance with any applicable law, if any available)
7. Name and address of the manufacturer, distributor, importer, exporter or vendor
8. Code and lot identification
9. Best before date (month and year)
10. Storage conditions

6.2 Technical data

The following information could be made available to the user:

1. Application areas of use
2. Instructions for use (inoculation rate, etc.)
3. Composition
4. Certificate of Analysis, Certificate of Compliance or similar

7 Methods of analyses

Recommended analytical methods are given in annex A.

In general, analytical methods recommended both for cell counts and contaminants have not been validated for MFC but for food products. Therefore, when appropriate, the validation of methods shall take place by the manufacturer of the relevant product(s). Other methods can be used when validated, and therefore annex A shall be seen as indicative rather than mandatory.

Annex A

Recommended analytical methods

A.1. General

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

A.2. Preparation of samples

The sample to be tested shall be homogenous and truly representative of the batch of product to be tested. For preparation of the sample, the rules specified in ISO 6887-1 and ISO 6887-2 are recommended.

Diluents listed in ISO 6887-1 and ISO 6887-2 or other equivalent diluents can be used when preparing initial suspensions from samples and further dilutions.

Examples of procedure for diluting

Several methods for dilution can be used (see ISO 6887-1 and ISO 6887-2).

Example 1
Weigh 10 g of well-mixed culture blend under sterile conditions into 90 ml sterile dilution medium **or** add 90 g sterile dilution medium into the Stomacher bag with the culture.

Homogenize until the culture is completely dispersed **either** by shaking the bottle for 7 seconds 20-25 times in an angle of 30° **or** use sterilized Ultra-Turrax bar and homogenize sample 2 x 1 minute at

13500 re/minute **or** treat for 2 minutes in a Stomacher **or** treat on a stirring table for 15 minutes. This is called the 10^{-1} dilution.

If the solution is not transferred right away shake it before transferring.

Transfer 1.0 ml from 10^{-1} dilution into 99 ml of sterile peptone water. Shake the bottle for 7 seconds 20-25 times in an angle of 30°. This is called 10^{-3} dilution. Alternatively transfer 1.0 ml into 9.0 ml of sterile dilution medium and Vortex the tube 3 times for minimum 1 second. This is called the 10^{-2} dilution. Continue to dilute as described above until appropriate dilutions are obtained.

Example 2
For cell count: weigh 1 g of well-mixed culture blend under sterile conditions into 99 ml bottle of sterile dilution medium. Treat on a stirring table for 45 minutes. This is called the 10^{-2} dilution. Transfer 1.0 ml from 10^{-2} dilution into 99 ml of sterile diluent. Shake vigorously the bottle for 30 seconds. This is called 10^{-4} dilution. Continue to dilute as described above until appropriate dilutions are obtained.

Example 3
For contaminants: weight 5 g of well-mixed culture blend under sterile conditions into 45 ml bottle of sterile dilution medium. Homogenize by shaking the bottle for 30 seconds or use stomacher. Rehydrate the culture during 45 minutes. This is called the 10^{-1} dilution. Transfer 1.0 ml from 10^{-1} dilution into 9 ml of sterile diluent and Vortex the tube 3 times for minimum 10 sec. This is called the 10^{-2} dilution. Continue to dilute as described above until appropriate dilutions are obtained.

A.3. Procedure for plating and incubating

See ISO 7218. For double determination: 2 plates for each dilution step.

A.4. Procedure for counting colonies

Counting colonies
For cell counts, plates with 30-300 typical colonies are used. Petri dishes with less than 300 typical colonies are selected for counting, unless described differently in A.6 and A.7. All typical colonies are counted.

For contaminants and if not described differently in chapter A.7, Petri dishes with less than 150 typical colonies are used for counting. All typical colonies are counted.

Enumeration of cell counts
For each sample, perform 1 dilution on 2 plates. After counting, calculate the average and the standard deviation.

After counting, a statistical test needs to be carried out on the plate counts e.g. x^2-test (chi square), variation coefficient or an equivalent test. If the statistical test is not accepted, the results must be rejected and the analysis has to be repeated (Niemelä, 1982).

If the statistical test is accepted, the count of colonies is determined by the 'weighed' arithmetic average (c). The total amount of counted colonies is calculated as shown below:

$$C = \frac{\Sigma c}{(n1 \times 1 + n2 \times 0.1) \times d}$$

∑c sum of colonies counted on all Petri dishes investigated (lowest dilution and following dilutions).

n1 number of Petri dishes of the lowest (first) dilution.

n2 number of Petri dishes of the following higher (second) dilutions.

d dilution factor corresponding to the lowest (first) dilution put into investigation (n1).

Example:

Enumeration of colonies gave the following results (two Petri dishes per dilution):

- first dilution (10^{-8}): 280 and 299 colonies

- second dilution (10^{-9}): 31 and 36 colonies

$$C = \frac{\Sigma c}{(n1 \times 1 + n2 \times 0.1) \times d} = \frac{280 + 299 + 31 + 36}{(2 + 0.1 \times 2) \times 10^{-8}} = \frac{646}{2.2 \times 10^{-8}}$$

$$C = 294 \times 10^{8} CFU / g = 2.9 \times 10^{10} CFU / g$$

In cases where only one Petri dish per dilution is evaluated, the counted bacteria will be given as c. This fact has to be noted in the report.

Low levels of contaminants
The number of colonies found to be the investigated contaminant is reported in CFU/g or CFU/ml by multiplying the counted colonies with the dilution factor. If no colonies are found, the result is reported as e.g. <1 CFU/g or CFU/ml.

Enrichment procedure
By using enrichment procedure, the determination is expressed as presence or absence in g or ml sample.

A.5. Expression of results

The calculated cell count may be reported as the example above or as rounded number with two significant digits. The results of the count should be expressed as the number of microorganisms per

g or ml of starter culture, i.e. number of colonies x the inverse of the dilution or stated e.g. $<10^2$ CFU/g or CFU/ml if no colonies are detected on -1 dilution surface plated with 0.1 ml.

A.6. Methods for cell counts

An internationally recognized enumeration method which scope is applicable to MFC incorporated in food products only exists today for lactic acid bacteria.

In the absence of a method acknowledged by a legislation, standardized or which has been the subject to a ring test for the enumeration of *Staphylococcus*, yeasts and moulds, microbial food cultures producers may use internal methods validated in house to guarantee the compliance of the MFC product with declared specifications.

Table 2 – Examples of cell count methods

ISO Standard	**Microorganism**	**Purpose:** Methods recommended for enumeration
ISO 6887-1	General	Microbiology of food and animal feeding stuffs - Preparation of test samples, initial suspension and decimal dilutions for microbiological examination - Part 1: General rules for the preparation of the initial suspension and decimal dilutions
ISO 16140	General	Microbiology of food and animal feeding stuffs - Protocol for the validation of alternative methods
ISO 3534-1	General	Statistics - Vocabulary and symbols - Part 1: General statistical terms and terms used in probability
ISO 15214	Lactic acid bacteria	Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of mesophilic lactic acid bacteria -- Colony-count technique at 30 degrees C
ISO 6888-1 modified	*Staphylococcus*	See ISO 6888-1:2000 For distinction between *Staphylococcus* and *Kocuria*, the use of agar containing furazolidone is recommended
ISO 6611 - IDF 94 ISO 21527-1 ISO 21527-2	Yeast and moulds	Enumeration of colony-forming units of yeasts and/or moulds - colony-count technique at 25 degrees C Enumeration of colony-forming units of yeasts and/or moulds Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of yeasts and moulds - Part 1: Colony count technique in products with water activity greater than 0,95 - Part 2 Colony count technique in products with water activity less or equal to 0,95

A.7. Methods for detection and enumeration of contaminants

The listed methods might be adapted and evaluated on a company level in order to fulfil specific requirements and incorporate experience. Note that when using the following standards, starter cultures may lower the pH to an extent that may inhibit the contaminants (target organisms) and therefore may need neutralization. This is seen as part of the validation of methods for relevant products.

Table 3 - Recommended methods for contaminants

Contaminant	Literature
Enterobacteriaceae	ISO 21528-1 and ISO 21528-2 NF V08-054
Enterococcus	NMKL 68 Slanetz and Bartley, 1957 APHA 1992. Comp. for microbial examinations of foods in Vanderzant and Splittstoessor, 1992 BVL L 06.00-32
Anaerobic sulphite-reducing bacteria	NMKL 56 ISO 15213 NF V08-061
Coagulase-positive staphylococci	NMKL 66 NF V08-057-1 ISO 6888-1 ISO 6888-2 and ISO 6888-3
Other than specified yeasts and moulds	ISO 6611 - IDF 94 ISO 21527-1 and ISO 21527-2 NF V08-059 NMKL 98
Salmonella spp.	ISO 6579 Amtliche Sammlung (BVL L 00.00-20) NMKL 71 NF V06-052-1 AOAC Official Method 2004.03
Listeria monocytogenes	ISO 11290-1 Amtliche Sammlung (BVL L 00.00-32) NMKL 136 NF V08-028-1 NF V08-055 AOAC Official Method 993.12 AOAC Official Method 2004.06
Mesophilic microorganisms other than specified ones	ISO 4833-1 Enumeration of colony-forming units of yeasts and/or moulds

References

AOAC Official Method 2004.03. 2008. Salmonella in foods, AOAC INTERNATIONAL, 2275 Research Boulevard #300, Rockville, MD 20850, USA. http://www.eoma.aoac.org/methods/info.asp?ID=5860

AOAC Official Method 2004.06. Listeria in foods. Modified VIDAS® Listeria (LIS) immunoassay. 2275 AOAC INTERNATIONAL, 2275 Research Boulevard #300, Rockville, MD 20850, USA.

AOAC Official Method 993.12. 2000. *Listeria monocytogenes* in milk and dairy products, selective enrichment and isolation method (IDF method). In *Official methods of analysis of AOAC INTERNATIONAL*, ed. W. Horwitz. 17th ed., 138-139. AOAC INTERNATIONAL, 2275 Research Boulevard #300, Rockville, MD 20850, USA.

Bourdichon, F., S. Casaregola, C. Farrokh, J. C. Frisvad, M. G. Gerds, W. P. Hammes, J. Harnett, G. Huys, S. Laulund, A. Ouwehand, I. B. Powell, J. B. Prajapati, Y. Seto, E. T. Schure, A. Van Boven, V. Vankerckhoven, A. Zgoda, S. Tuijtelaars, E. Bech Hansen. 2012. Food fermentations: Microorganisms with technological beneficial use. *International Journal of Food Microbiology* 154, page 87-97. http://www.ncbi.nlm.nih.gov/pubmed/22257932

BVL L 00.00-20. 2008. Untersuchung von lebensmitteln - horizontales verfahren zum nachweis von salmonella spp. in lebensmitteln (übernahme der gleichnamigen norm DIN EN ISO 6579, ausgabe oktober 2007). http://www.methodensammlung-bvl.de

BVL L 00.00-32. 2006. Untersuchung von lebensmitteln - horizontales verfahren für den nachweis und die zählung von Listeria monocytogenes - teil 1: Nachweisverfahren (übernahme der gleichnamigen norm DIN EN ISO 11290-1, ausgabe januar 2005). http://www.methodensammlung-bvl.de

BVL L 06.00-32. 1992-6. Bestimmung von Enterococcus faecalis und Enterococcus faecium in fleisch und fleischerzeugnissen, spatelverfahren (referenzverfahren). http://www.methodensammlung-bvl.de

Microbial Criteria for Foodstuffs, (2005): Commission Regulation EU No 2073/2005, Off. J. 2005 L338, pp. 1-26. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:338:0001:0026:EN:PDF

ISO 11290-1. 1996. Microbiology of food and animal feeding stuffs — horizontal method for the detection and enumeration of listeria monocytogenes — part 1: Detection method. https://www.iso.org/obp/ui/#iso:std:iso:11290:-1:ed-1:v1:en

ISO 15213. 2003. Microbiology of food and animal feeding stuffs — horizontal method for the enumeration of sulphite-reducing bacteria growing under anaerobic conditions. https://www.iso.org/obp/ui/#iso:std:iso:15213:ed-1:v1:en

ISO 15214. 1998. Microbiology of food and animal feeding stuffs — horizontal method for the enumeration of mesophilic lactic acid bacteria — colony count technique at 30 degrees C. https://www.iso.org/obp/ui/#iso:std:iso:15214:ed-1:v1:en

ISO 16140. 2003. Microbiology of food and animal feeding stuffs -- protocol for the validation of alternative methods. http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=30158

ISO 21527-1. 2008. Microbiology of food and animal feeding stuffs -- horizontal method for the enumeration of yeasts and moulds -- part 1: Colony count technique in products with water activity greater than 0.95. http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=38275

ISO 21527-2. 2008. Microbiology of food and animal feeding stuffs -- horizontal method for the enumeration of yeasts and moulds -- part 2: Colony count technique in products with water activity less than or equal to 0.95. https://www.iso.org/obp/ui/#iso:std:iso:21527:-2:ed-1:v1:en

ISO 21528-1. 2004. Microbiology of food and animal feeding stuffs — horizontal methods for the detection and enumeration of Enterobacteriaceae — part 1: Detection and enumeration by MPN technique with pre-enrichment. https://www.iso.org/obp/ui/#iso:std:iso:21528:-1:ed-1:v1:en

ISO 21528-2. 2004. Microbiology of food and animal feeding stuffs — horizontal methods for the detection and enumeration of Enterobacteriaceae — part 2: Colony count method. https://www.iso.org/obp/ui/#iso:std:iso:21528:-2:ed-1:v1:en

ISO 22000. 2005. Food safety management systems – requirements for any organization in the food chain. http://www.iso.org/iso/catalogue_detail?csnumber=35466

ISO 3534-1. 2006. Statistics — vocabulary and symbols — part 1: General statistical terms and terms used in probability. , https://www.iso.org/obp/ui/#iso:std:iso:3534:-1:ed-2:v2:en

ISO 4833-1. 2013. Microbiology of the food chain -- horizontal method for the enumeration of microorganisms -- part 1: Colony count at 30 degrees C by the pour plate technique. http://www.iso.org/iso/catalogue_detail.htm?csnumber=53728

ISO 6579. 2002. Microbiology of food and animal feeding stuffs — horizontal method for the detection of Salmonella spp. https://www.iso.org/obp/ui/#iso:std:iso:6579:ed-4:v1:en

ISO 6611 - IDF 94. 2004. Enumeration of colony-forming units of yeasts and/or moulds -- colony-count technique at 25 degrees C. https://www.iso.org/obp/ui/#iso:std:iso:6611:ed-2:v1:en

ISO 6887-1. 1999. Microbiology of food and animal feeding stuffs -- preparation of test samples, initial suspension and decimal dilutions for microbiological examination -- part 1: General rules for the preparation of the initial suspension and decimal dilutions. http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=63335

ISO 6887-2. 1999. Microbiology of food and animal feeding stuffs -- preparation of test samples, initial suspension and decimal dilutions for microbiological examination -- part 2: Specific rules for the preparation of meat and meat products. http://www.iso.org/iso/home/store/catalogue_ics/catalogue_detail_ics.htm?ics1=07&ics2=100&ics3=30&csnumber=63336

ISO 6888-1. 1999. Microbiology of food and animal feeding stuffs — horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species) — part 1: Technique using Baird-Parker agar medium. https://www.iso.org/obp/ui/#iso:std:iso:6888:-1:ed-1:v1:en

ISO 6888-2. 1999. Microbiology of food and animal feeding stuffs — horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species) — part 2: Technique using rabbit plasma fibrinogen agar medium. https://www.iso.org/obp/ui/#iso:std:iso:6888:-2:ed-1:v1:en

ISO 6888-3. 2003. Microbiology of food and animal feeding stuffs — horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species) — part 3: Detection and MPN technique for low numbers. https://www.iso.org/obp/ui/#iso:std:iso:6888:-3:ed-1:v2:en

ISO 7218. 2007. Enumeration of colony-forming units of yeasts and/or moulds -- colony-count technique at 25 degrees C

http://www.iso.org/iso/catalogue_detail?csnumber=36534

ISO 9001. 2008. Quality management systems — requirements. https://www.iso.org/obp/ui/#iso:std:iso:9001:ed-4:v2:en

NF V06-052-1. 1997. Microbiology of food and animal feeding stuffs. Detection of Salmonella. Routine method. http://www.freestd.us/soft/329081.htm

NF V08-028-1. 2005. Microbiology of food and animal feeding stuffs - horizontal method for the detection and enumeration of listeria monocytogenes - part 1: Detection method - amendment 1: Modification of the isolation media, of the haemolysis test and inclusion of precis. http://www.freestd.us/soft3/863519.htm

NF V08-054. 2009. Microbiology of food and animal feeding stuffs - enumeration of presumptive enterobacteria by colony count technique at 30 C or 37 C. http://www.freestd.us/soft1/523248.htm

NF V08-055. 1997. Microbiology of food and animal feeding stuffs. Detection of Listeria monocytogenes. Routine method. http://www.freestd.us/soft1/523250.htm

NF V08-057-1. 2004. Microbiology of food and animal feeding stuffs - routine method for enumeration of coagulase-positive staphylococci by colony-count technique at 37 C, part 1: Technique with confirmation of the colonies. http://www.freestd.us/soft/329084.htm

NF V08-059. 2002. Microbiology of food animal feeding stuffs - enumeration of yeasts and moulds by colony-count technique at 25 C - routine method. http://www.freestd.us/soft/329086.htm

NF V08-061. 2009. Microbiology of food and animal feeding stuffs - anaerobic enumeration of sulphite-reducing bacteria by colony count technique at 46 C. http://www.freestd.us/soft1/523253.htm

Niemelä, S. 1982. Report no. 1. Statistical evaluation of results from quantitative microbiological examinations. *Nordic Committee on Food Analysis*. http://shop.nmkl.org/html/ProductBig.asp?Productno=rep1&Searchtype=Searchproduct&search=statistical&x=0&y=0

NMKL 136. 2010. *Listeria monocytogenes*. Påvisning i næringsmidler og foder samt kvantifisering i næringsmidler. *Listeria monocytogenes. Detection in foods and feeding stuffs and enumeration in foods. Nordic Committee on Food Analysis*.

http://www.nmkl.org/index.php?option=com_zoo&task=item&item_id=310&Itemid=319&lang=nb

NMKL 56. 2008. Anaerobe sulfit-reduserende bakterier. Bestemmelse i næringsmidler. Anaerobic sulphite-reducing bacteria. Determination in foods. *Nordic Committee on Food Analysis*. http://www.nmkl.org/index.php?option=com_zoo&task=item&item_id=258&Itemid=319&lang=nb

NMKL 66. 2009. Koagulase-positive stafylokokker. Bestemmelse i næringsmidler. *Coagulase-positive staphylococci. Enumeration in foods. Nordic Committee on Food Analysis*. http://www.nmkl.org/index.php?option=com_zoo&task=item&item_id=262&Itemid=319&lang=nb

NMKL 68. 2011. Enterrococcus. Bestemmelse i næringsmidler og foder. Determination in foods and feeds. *Nordic Committee on Food Analysis*. http://www.nmkl.org/index.php?option=com_zoo&task=item&item_id=264&Itemid=319&lang=nb

NMKL 71. 1999. *Salmonella*. Påvisning i livsmedel. *Salmonella. Detection in foods*. *Nordic Committee on Food Analysis*. http://www.nmkl.org/index.php?option=com_zoo&task=item&item_id=266&Itemid=319&lang=nb

NMKL 98. 2005. Mögel och jäst. Bestämning i livsmedel och foder. Mould and yeasts. Determination in foods and feed. *Nordic Committee on Food Analysis*. http://www.nmkl.org/index.php?option=com_zoo&task=item&item_id=280&Itemid=319&lang=nb

Slanetz, L. M., and C. H. Bartley, 1957. Numbers of enterococci in water, sewage, and faeces determined by the membrane filter technique with an improved medium. *Journal of Bacteriology* 74, (No. 5, November). http://www.ncbi.nlm.nih.gov/pmc/articles/PMC289968/

Vanderzant, C., and D. F. Splittstoessor, eds. 1992. *APHA compendium of methods for the microbiological examination of foods*. 3th ed. Washington DC, USA. American Public Health Association.