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PROFICIENCY TEST « RAEMA »

SCHEME N° 71
(5th OCTOBER 2020)

GENERAL REPORT

ACCREDITATION N°1-1836 SCOPE AVAILABLE ON WWW.COFRAC.FR

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1. GENERAL DATA

1.1.PARTICIPATING LABORATORIES

345 laboratories participated to the 71th scheme. The sending was made on Monday 5th October 2020. We received **341** answers (98.8%).

1.2.DELIVERY TIME OF THE PARCEL

Reception	J0	J0+1	J0+2	J0+3	J0+4	J0+5	J0+7	J0+8	J0+9	J0+11	J0+14
Nb of laboratories	3	204	80	24	12	1	6	2	3	3	3

1.3.INFORMATIONS ABOUT SAMPLE

1.3.1. NATURE

The sample included :
- one strain of *Enterococcus sp.* at a concentration level of 10^5 cfu/g in 5 units ;
- one strain of *Citrobacter sp.* at a concentration level of 10^3 cfu/g in 5 units ;
- one strain of *Serratia liquefaciens* at a concentration level of 5.10^2 cfu/g in 5 units ;
- one strain of *Escherichia coli* at a concentration level of 10^2 cfu/g in 5 units ;
- one strain of *Clostridium perfringens* at a concentration level of 10^2 cfu/g in 3 units ;
- one strain of *Staphylococcus aureus* at a concentration level of 4.10^3 cfu/g in 5 units ;
- one strain of *Salmonella* Anatum at a concentration level of 25 cfu/g in 3 units ;
- one strain of *Listeria monocytogenes* at a concentration level of 2.10^3 cfu/g in 2 units .

1.3.2. SIZE

180 kilogrammes of powder were produced, and distributed after contamination in bottles containing 75 grammes at least. Bottles were covered by a label with a 6 digit identification number.

[(1)]Coordinator of the proficiency test « RAEMA »

1.3.3. HOMOGENEITY AND STABILITY TEST OF THE CONTAMINATION

Homogeneity and stability of samples are checked during the statistical analysis of participants results.
A supplementary check of the contamination's homogeneity was realized on 10 samples for each unit by a double enumeration of aerobic microorganisms at 30°C.
The contamination's stability was also checked by enumeration / detection of all flora on 12, 19 and 26 October 2020. These checks were realized by a subcontractor accreditated by Cofrac.
Homogeneity and stability of samples have been validated.

1.3.4. FLORA FOR ENUMERATION / DETECTION

Enumeration of the following flora was proposed : microorganisms at 30°C, Enterobacteriaceae, total and thermotolerant coliforms, beta-glucuronidase positive *Escherichia coli*, anaerobic sulfite-reducing bacteria, *Clostridium perfringens*, coagulase positive staphylococci, *Listeria monocytogenes*, as well as detection of *Salmonella* and *Listeria monocytogenes*.

1.4.EXECUTION OF ANALYZES

1.4.1. DELIVERY TIME OF SAMPLES / BEGINNING OF ANALYZES

341 laboratories (100%) specified it.

Analysis time	J0	J0+1	J0+2	J0+3	J0+4	J0+5	J0+7	J0+8	J0+9	J0+11	J0+14	J0+15	J0+16
Nb of laboratories	1	28	42	44	10	2	138	48	9	1	13	4	1

1.4.2. PRESERVATION TEMPERATURE OF SAMPLES BEFORE ANALYSIS

337 laboratories (98.8%) specified it. The average temperature is **3.9°C** with a standard deviation of 0.8°C. The given data 22, 30 and 44°C given by 3 laboratories were not taken into account for this calculation.

2. EXPLOITATION OF ANALYSIS REPORT

2.1.PREPARATION OF THE INITIAL SUSPENSION

For **341** answers (100%) :
213 laboratories (62.5%) prepare the initial suspension with adding diluent to powder.
128 laboratories (37.5%) prepare the initial suspension with adding powder to diluent.

2.2.DILUENT USED FOR THE INITIAL SUSPENSION

For **340** answers (99.7%) :
282 laboratories (82.7%) use Buffered Peptone Water for the initial suspension.
48 laboratories (14.1%) use Peptone salt for the initial suspension.
10 laboratories (2.9%) used another diluent for the initial suspension.

2.3.HOMOGENEIZATION TECHNIQUE

For **341** answers (100%) :
314 laboratories (92.1%) homogeneize their sampling with a Stomacher[ND].
27 laboratories (7.9%) used another technique (manual, magnétic or other).

2.4.RESUSCITATION'S CONDITIONS

2.4.1. DURATION

324 laboratories (95%) specified it.
The average duration is **26.8 min** with a standard deviation of 13.9 min. The data 90, 120 and 1440 min given by 3 laboratories was not taken into account for this calculation.

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2.4.2. TEMPERATURE

324 laboratories (95.0%) specified it.
The average temperature is **21.4°C** with a standard deviation of 3.0°C.

2.5.MICROORGANISM AT 30°C

319 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF EN ISO 4833-1	202
	AFNOR 3M-01/1-09/89	52
	NF EN ISO 4833-2	16
	NM ISO 4833-1	15
	AFNOR BIO-12/35-05/13	11
	XP V08-034	6
	Other	17
	+ V08-100 (spiral)	14
Culture medium	Plate Count Agar	239
	Petrifilms	52
	Plate Count Agar + Milk	16
	Tempo AC	11
	Other	0
Preparation	Home made	111
	Ready to use not pre-poured	134
	Ready to use, plate, film, card	72
Plating method	Surface	73
	Pour	225
	Culture medium for card	11
1st dilution retained	- 1	10
	- 2	20
	- 3	271
	- 4	6
	- 5	2
	1/400	5
	1/4000	4
Incubation temperature	30°C	316
	37°C	1
Incubation duration	68-73 h	262
	40-48 h	51
	24-26 h	2

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2.6.ENTEROBACTERIACEA

286 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF V08-054	113
	→ *NM 08.0.109*(1)	24
	NF EN ISO 21528-2	70
	AFNOR 3M-01/6-09/97	48
	AFNOR BIO-12/21-12/06	10
	AFNOR AES-10/07-01/08	9
	AFNOR BRD-07/24-11/13	6
	Other	6
	+ V08-100 (spiral)	1
Culture medium	VRBG	210
	Petrifilms	50
	Tempo EB	10
	Rebecca	9
	Rapid'Enterobacteriaceae	6
	Other	0
Preparation	Home made	91
	Ready to use not pre-poured	132
	Ready to use, plate, film, card	61
1st dilution retained	- 1	192
	- 2	81
	- 3	3
	1/40	2
	1/400	7
Incubation temperature	37±1°C	181
	30°C	92
	35±1°C	11
Incubation duration	20-27 h	274
	48 h	8
	2-4 h	2
Confirmatory test	Yes	57
	No	222

(1) *Similar method to NF V08-054 according to ONSSA (Office National de Sécurité Sanitaire des produits Alimentaires).*

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2.7.TOTAL COLIFORMS

240 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF V08-050	119
	→ *NM 08.0.142*[(2)]	12
	NF ISO 4832	52
	AFNOR 3M	25
	NM ISO 4832	16
	AFNOR BIO-12/17-12/05	7
	AFNOR BRD-07/08-12/04	4
	Other	5
	+ V08-100 (spiral)	1
Culture medium	VRBL	199
	Petrifilms	26
	Tempo TC	7
	Rapid Ecoli	5
	Other	3
Preparation	Home made	86
	Ready to use not pre-poured	120
	Ready to use, plate, film, card	33
1st dilution retained	-1	195
	-2	37
	-3	1
	1/40	2
	1/400	3
Incubation temperature	30°C	220
	35-37°C	19
Incubation duration	20-26 h	236
	48 h	2
	96 h	1

AFNOR 3M method including :
2 laboratories specified utilization of AFNOR 3M-01/02-09/89 A method.
1 laboratory specified utilization of AFNOR 3M-01/02-09/89 method.
2 laboratories specified utilization of AFNOR 3M Petrifilm CC method.

(2) *Similar method to NF V 08-050 according to ONSSA.*

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2.8.THERMOTOLERANT COLIFORMS

214 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF V08-060	146
	→ *NM 08.0.124*(3)	27
	AFNOR 3M	28
	NF ISO 4832	9
	Other	4
	+ V08-100 (spiral)	0
Culture medium	VRBL	183
	Petrifilms	29
	Other	2
Preparation	Home made	80
	Ready to use not pre-poured	106
	Ready to use, plate, film, card	27
1st dilution retained	-1	180
	-2	32
Incubation temperature	42-45°C	211
	35-37°C	2
	30°C	1
Incubation duration	20-26 h	210
	48 h	3
	96 h	1

AFNOR 3M method including :

3 laboratories specified utilization of AFNOR 3M-01/02-09/89 C method.
1 laboratory specified utilization of AFNOR 3M-01/05-03/97 method.
2 laboratories specified utilization of AFNOR 3M Petrifilm CC method.
1 laboratory specified utilization of AFNOR 3M Petrifilm EC method.

(3) *Similar method to NF V08-060 according to ONSSA.*

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2.9.ESCHERICHIA COLI

300 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF ISO 16649-2	172
	AFNOR 3M	44
	NM ISO 16649-2	22
	AFNOR BRD-07/01-07/93	17
	AFNOR BIO-12/13-02/05	11
	AFNOR AES-10/06-01/08	8
	AFNOR BIO-12/05-01/99	6
	NF EN ISO 16649-3	1
	Other	17
	+ V08-100 (spiral)	1
Culture medium	TBX	201
	Petrifilms	46
	Rapid E. coli	22
	Tempo EC	11
	Rebecca	9
	Coli ID	8
	Other	1
Preparation	Home made	89
	Ready to use not pre-poured	153
	Ready to use, plate, film, card	55
Plating method	Surface	45
	Pour	236
	Culture medium for card	12
1st dilution retained	-1	282
	-2	7
	1/40	3
	1/400	6
Incubation temperature	41-45°C	263
	35-37°C	34
	30°C	1
Incubation duration	18-28 h	293
	48 h	4
	216	1

AFNOR 3M method including :

14 laboratories specified utilization of AFNOR 3M-01/08-06/01 (*SELECT'E. COLI*) method.
1 laboratory specified utilization of AFNOR 3M-01/04-09/92 method.
1 laboratory specified utilization of AFNOR 3M Petrifilm EC method.

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2.10. ANAEROBIC SULFITE-REDUCING BACTERIA

242 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF V08-061	161
	→ *NM 08.0.154*[(4)]	5
	→ *NM 08.0.125*[(4)]	12
	NF ISO 15213	42
	NM ISO 15213	10
	Other	12
Culture medium	TSC	221
	Iron Sulfite agar	6
	TSN	7
	Other	5
Preparation	Home made	96
	Ready to use not pre-poured	116
	Ready to use, plate, film, card	30
Seeding way	Plates	150
	Tubes	89
1st dilution retained	-1	205
	-2	36
Incubation temperature	44-48°C	176
	37°C	66
Incubation duration	18-24 h	201
	44-48 h	30
	72 h	8
	12-16 h	3

(4) *Similar method to NF V08-061 according to ONSSA.*

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2.11. CLOSTRIDIUM PERFRINGENS

195 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF EN ISO 7937	155
	NM ISO 7937	22
	Other	18
Culture medium	TSC	189
	Other	3
Preparation	Home made	68
	Ready to use not pre-poured	119
	Ready to use, plate, film, card	6
1st dilution retained	-1	182
	-2	12
Incubation temperature	37±1°C	183
	44-46°C	10
	34°C	1
Incubation duration	18-24 h	188
	48 h	4
	72 h	2
Confirmation test	None	35
	Lactose-sulfite	141
	Strip	8
	Other	6

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2.12. COAGULASE POSITIVE STAPHYLOCOCCI

298 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF EN ISO 6888-2	141
	NF EN ISO 6888-1	61
	NM ISO 6888-1	18
	AFNOR 3M-01/9-04/03	17
	AFNOR BKR-23/10-12/15	16
	AFNOR BIO-12/28-04/10	10
	NordVal No :049	4
	NM ISO 6888-2	4
	Other	26
	+ V08-100 (spiral)	1
Culture medium	RPF	139
	BP+egg yolk tellurite	81
	Petrifilm	18
	Easy Staph	18
	BP+egg yolk tellurite+ sulfamethazine	17
	Tempo STA	13
	Rapid Staph	4
	Other	4
Preparation	Home made	69
	Ready to use not pre-poured	131
	Ready to use, plate, film, cards	96
Plating method	Surface	147
	Pour	137
	Culture medium for card	11
1st dilution retained	-1	110
	-2	174
	-3	4
	1/40	3
	1/400	5
Incubation temperature	36-37°C	295
	30°C	1
Incubation duration	42-48 h	206
	18-25 h	86
	72 h	2
	34 h	1
	96 h	1
Confirmation test	None	182
	Staphylo-coagulase	83
	Clumping factor	9
	DNase	11
	Other	6

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2.13. LISTERIA MONOCYTOGENES – ENUMERATION

239 laboratories performed the enumeration.

RESUSCITATION

67 laboratories announce the realization of a resuscitation step.
The average duration for these laboratories is **41.1 min** with a standard deviation of 19.2 min (The data 1440 min given by 1 laboratory was not taken into account for this calculation).
The average temperature for these laboratories is **21.1°C** with a standard deviation of 2.8°C.

Parameters	Mode	Nb laboratories
Method	NF EN ISO 11290-2	72
	AFNOR AES-10/05-09/06	65
	AFNOR BKR-23/05-12/07	43
	AFNOR BRD-07/05-09/01	24
	NM ISO 11290-2	21
	AFNOR BRD-07/17-01/09	5
	Other	8
Resuscitation step	Yes	67
	No	159
Resuscitation medium	Buffered Peptone Water	56
	Fraser base	7
	Other	1
Enumeration medium	ALOA Count	116
	Compass Listeria	73
	Rapid Lmono	26
	AL Agar	12
	OCLA	5
	Palcam	3
	Other	3
Preparation	Home made	27
	Ready to use not pre-poured	51
	Ready to use, plate, film, card	159
Plating method	Surface	198
	Pour	36
	Culture medium for card	0

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Parameters	Mode	Nb laboratories
1st dilution retained	-1	174
	-2	64
Incubation temperature	37°C	234
	30°C	4
Incubation duration	40-48 h	193
	22-27 h	45
Confirmation test	None	44
	Biochemical	144
	Biochemical + CAMP	37
	Other	6
Nb of colonies tested per plate	1	66
	2-4	19
	5	94
	6	1

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2.14. SALMONELLA – DETECTION

307 laboratories performed the detection.
Methods used by laboratories are clarified in the following table :

Parameter	Mode	Nb laboratories
Method	NF EN ISO 6579-1	94
	AFNOR BKR 23/07-10/11 (IRIS Salmonella)	68
	AFNOR BRD 07/11-12/05 (Rapid Salmonella)	28
	NM ISO 6579-1	27
	AFNOR BIO 12/41-03/17 (SALMA One day)	27
	AFNOR BIO 12/16-09/05 (VIDAS Easy Salmonella)	25
	AFNOR BIO 12/32-10/11 (VIDAS SPT)	24
	Other	14

No detail of methodology was asked to laboratories using other methods than NF EN ISO 6579-1 and NM ISO 6579-1 methods and proposed in the questionnaire.

You will find below a short description of these methods :

Method	Pre-enrichment	Enrichment	Isolation
AFNOR BIO 12/16-09/05 **VIDAS Easy Salmonella**	BPW / 37°C - 16/20h	SX2 / 41,5°C - 22/26h	Chrom ID / 37°C - 24h
AFNOR BIO 12/32-10/11 **VIDAS SPT**		BPW + Salmonella supplement / 41,5°C - 18/24h	Chrom ID / 37°C - 24h
AFNOR BKR 23/07-10/11 **IRIS Salmonella**		IRIS Salmonella Enrichment / 41,5°C - 18±2h	IRIS / 37°C - 24±3h
AFNOR BRD 07/11-12/05 **Rapid Salmonella**		BPW + Salmonella capsule / 41,5°C - 18±2h	Rapid Salmonella / 37°C - 24±2h
AFNOR BIO 12/41-03/17 **SALMA One day**		BPW + Salmonella supplement / 41.5°C – 16/24h	SALMA / 37°C - 24±3h

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The detail of the methodology followed by 121 laboratories using NF EN ISO 6579-1 and NM ISO 6579-1 method, and the 14 laboratories using another method, is clarified in the following table :

Parameter	Mode	Nb laboratories
Method	NF EN ISO 6579-1	94
	NM ISO 6579-1	27
	Other	14
Pre-enrichment medium	Buffered Peptone Water	128
	Other	6
Pre-enrichment temperature	37±1°C	121
	41-42.5°C	8
	20-23°C	4
Pre-enrichment duration	16-20 h	93
	22-24 h	40
Enrichment medium	RVS	115
	MKTTn	111
	Selenite-cystine broth	25
	Other	7
Isolation medium	XLD	101
	Hektoen	37
	Bismuth Sulfate	20
	Rapid Salmonella	17
	IRIS Salmonella agar	14
	ASAP	13
	Brilliance Salmonella	9
	GVB	9
	SS	9
	Compass Salmonella	5
	Rambach	1
	Other	9
Confirmation test	Biochemical	52
	Biochemical + serological agglutination	69
	Other	7

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2.15. LISTERIA MONOCYTOGENES – DETECTION

272 laboratories performed the detection.

Parameter	Mode	Nb laboratories
Method	NF EN ISO 11290-1	67
	AFNOR AES 10/03-09/00 (ALOA one day)	59
	AFNOR BKR 23/02-11/02 (Compass L. mono)	50
	AFNOR BRD 07/04-09/98 (Rapid' L. mono)	25
	NM ISO 11290-1	22
	AFNOR BIO 12/11-03/04 (VIDAS LMO2-37°C)	13
	AFNOR BIO 12/27-02/10 (VIDAS LMX)	8
	AFNOR BIO 12/02-06/94 (VIDAS Listeria)	5
	AFNOR BRD 07/16-01/09 (Agar Listeria)	4
	AFNOR UNI 03/04-04/05 (Listeria Precis)	3
	AFNOR BIO 12/18-03/06 (VIDAS LDUO)	3
	AFNOR BIO 12/40-11/16 (GENE UP LMO)	2
	Other	11

No detail of methodology was asked to laboratories using other method than NF EN ISO 11290-1 and NM ISO 11290-1 methods and proposed in the questionnaire.

You will find below a short description of these methods :

Méthod	Primary enrichment		Secondary enrichment		Isolation
	Medium	Incubation	Medium	Incubation	
AFNOR BRD 07/04-09/98 **Rapid' L. mono**	Fraser 1/2	30°C - 24±2h			Rapid L'mono 37°C – 24h
AFNOR BIO 12/02-06/94 **VIDAS Listeria**	Fraser 1/2	37°C - 26/30h	Fraser	30°C - 24/26h	Palcam et Oxford 37°C – 24h
AFNOR BIO 12/27-02/10 **VIDAS LMX**	LMX	37°C - 26/30h			ChromID 37°C – 24h
AFNOR BIO 12/11-03/04 **VIDAS LMO2 (37°C)**	Fraser 1/2	30°C - 24/26h	Fraser	37°C - 24/26h	Chromogenic medium / Palcam / Oxford
AFNOR AES 10/03-09/00 **ALOA one day**	Fraser 1/2	30°C - 24±2h			ALOA One Day 37°C – 24/48h
AFNOR BKR 23/02-11/02 **Compass L. mono**	Fraser 1/2	30°C - 24±2h			Compass Listeria Agar 37°C – 24h
AFNOR BRD 07/16-01/09 **Agar Listeria**	Fraser 1/2	30°C - 24±2h			Agar Listeria 37°C – 24h
AFNOR UNI 03/04-04/05 **Listeria Precis**	One Broth Listeria	30°C - 24±2h			Brilliance Listeria 37°C – 24h
AFNOR BIO 12/40-11/16 **GENE UP LMO**	LPT	35-37°C - 24±2h			ALOA 35-37°C – 24/48h
AFNOR BIO 12/18-03/06 **VIDAS LDUO**	LX	30°C - 24±2h	LX	30°C - 24/26h	Chromogenic medium / Palcam / Oxford

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The detail of the methodology followed by 89 laboratories using NF EN ISO 11290-1 and NM ISO 11290-1 methods, and the 11 laboratories using another method, is clarified in the following table :

Parameter	Mode	Nb laboratories
Method	NF EN ISO 11290-1	67
	NM ISO 11290-1	22
	Other	11
Primary enrichment medium	Half-Fraser	89
	One broth Listeria	2
	Other	8
Primary enrichment temperature	30°C	92
	37°C	5
	22°C	1
Primary enrichment duration	23-27 h	96
	48 h	1
	1 h	1
Secondary enrichment medium	Fraser	88
	Other	1
Secondary enrichment temperature	37±1°C	85
	30°C	2
	22°C	1
Secondary enrichment duration	20-27 h	69
	48 h	18
	1 h	1
Isolation medium	Palcam	65
	Ottaviani et Agosti	53
	Compass Listeria	32
	Oxford	15
	Rapid L'mono	7
	Brilliance Listeria	2
	Other	1
Isolation temperature	37°C	96
	30°C	1
Isolation duration	47-48 h	57
	22-24 h	39
Confirmation test	None	8
	Biochemical	59
	Biochemical + CAMP	26
	Other	4
Nb of colonies per plate	1	27
	2-3	7
	5	45
	6	1

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3. ASSESSMENT OF PERFORMANCE (INDIVIDUEL REPORTS)

3.1.PERFORMANCES IN ENUMERATION

Performance is assessed on two criteria : **precision and trueness**.
The assigned value of the contamination used to assess the trueness and the reference value for the assessment of the precision are consensual values obtained with the results of all the participants. These values are obtained by robust estimation methods in order to eliminate influence of aberrant results. However some results are excluded of the statistical analysis. That is the case when laboratories do not give results for all contaminated units, when results are "less than CFU/g", when samples are analyzed after the deadline (time of receipt > 4 days after sending or time of analysis >15 days after sending) or when this information is not specified.

A statistical analysis has also be done to highlight potential relations between techniques used (delay of analysis, preservation temperature, preparation of the initial suspension, homogenization technique, resuscitation conditions , method used, media used, manufacturers of media, preparation mode, plating method, incubation conditions) and results obtained. We need to clarify that this statistical link is not involved in a cause - effect relationship. Indeed, this link may be due to a not documented factor.

When a significant statistical link is identified between use of a technique and the obtained results, the assessment of performance is done considering the influence of one or several factors involved if their effect translates into a contamination's difference higher than 0.15 log CFU/g for non-selective media or higher than 0.30 log CFU/g for selective media (these limits match with productivity limits of culture media usually recommended in the standard NF EN ISO 11133).

PRECISION
The precision reflects the repeatability (or reproducibility intra-laboratory) of your work.

The standard deviation of your results, *s*, is compared to the robust estimation of the standard deviation (reference standard deviation of precision), *s**, obtained with algorithm S from the standard ISO 13528 applied to all standard deviations obtained by laboratories included in the statistical analysis.

An index score is then calculated using the following formula : $i = (k-1) \cdot \frac{s^2}{s^{*2}}$ (with k, number of contaminated units and retained in the statistical analysis, usually 5).

The standard ISO 13528 do not provide warning and action limits for this score, so its interpretation is left to your discretion.

As an indicator, we suggest following values by analogy with those indicated for the evaluation of trueness.
For k=5, a score lower than 0.1 or higher than 18 may be considered as an action signal and a score lower than 0.45 or higher than 11.5 may be considered as a warning signal.
For k=4, a score lower than 0.03 or higher than 15.5 may be considered as an action signal and a score lower than 0.2 or higher than 9.5 may be considered as a warning signal.
For k=3, a score lower than 0.003 or higher than 13.2 may be considered as an action signal and a score lower than 0.05 or higher than 7.5 may be considered as a warning signal.
For k=2, a score lower than 0.000002 or higher than 10.3 may be considered as an action signal and a score lower than 0.0008 or higher than 5.2 may be considered as a warning signal.

TRUENESS

The trueness reflects the closeness of the mean of your results to the contamination's assigned value of samples. It has been evaluated for all enumerated flora.

The mean of your results in log CFU/g, *m* (on contaminated units and included in the statistical analysis), is compared to the contamination's assigned value, m_{pt}, obtained with algorithm A from the standard ISO 13528 applied to all laboratories mean included in the statistical analysis. When groups are formed, each one is characterize by its own assigned value.

A z score is then calculated with the following formula : $z = \frac{m - m_{pt}}{\sigma_{pt}}$, where σ_{pt} is the standard deviation for proficiency assessment (robust estimation of the standard deviation obtained by participants).

The standard ISO 13528 specifies that *z* score lower than -3 or higher than +3 must be considered as an action signal and that a z score lower than -2 or higher than +2 must be considered as a warning signal.

In this report, we specify, estimations of interlaboratories standard deviation for enumerations proposed as well as reproducibility standard deviation or global standard deviation for the test (parameters including interlaboratories variability and the variability of the precision).

INDIVIDUAL REPORTS – FOR EACH CRITERIA YOU FIND THE FOLLOWING INFORMATIONS

- your results in logarithm base 10 (-1 when the answer is < limit and NaN when there is no answer). Comment : the presentation order of your results does not necessarily correspond to the order you sent them, this order is the same for all the flora.
- histogram for the studied parameter (laboratories standard deviations for the precision and laboratorie's means for the trueness) with an asterisk indicating the location of your result,
- standard deviation (precision) or mean (trueness) of your results (on contaminated units and retained in the statistical analysis),
- the method declared in your results input,
- when necessary, your group in relation to the technique used,
- precision score or z score,
- number of laboratories which made analysis (and belonging to your group),
- number of laboratories included in the statistical analysis,
- reference standard deviation for the precision or assigned value of the contamination and standard deviation aptitude assessment (trueness),
- number of laboratories with a satisfactory signal,
- number of laboratories with a warning signal,
- number of laboratories with an action signal.

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3.1.1. MICROORGANISMS AT 30°C

None significant effect of the analysis technique has been highlighted.

Microorganisms at 30°C	
Assigned value of the contamination (log CFU/g)	4.907
Assigned value uncertainty (log CFU/g)	0.0064
Standard deviation for proficiency assessment (log CFU/g)	0.0882
Standard deviation for precision (log CFU/g)	0.0596
Interlaboratory's standard deviation (log CFU/g)	0.0840
Reproducibility standard deviation (log CFU/g)	0.1030

3.1.2. ENTEROBACTERIACEAE

A significant "effect" of the culture media, manufacturer and the retained dilution has been highlighted. This effect results in a contamination's difference higher than 0.3 log CFU/g, then results have been gathered in two groups :

Enterobacteriaceae	Group 1	Group 2
Assigned value of the contamination (log CFU/g)	2.767	3.223
Assigned value uncertainty (log CFU/g)	0.0269	0.0239
Standard deviation for proficiency assessment (log CFU/g)	0.2906	0.1794
Standard deviation for precision (log CFU/g)	0.1036	
Interlaboratory's standard deviation (log CFU/g)	0.5371	0.4210
Reproducibility standard deviation (log CFU/g)	0.5470	0.4335

3.1.3. TOTAL COLIFORMS

A significant "effect" of the culture media, manufacturer, preparation mode and the retained dilution has been highlighted. This effect results in a contamination's difference higher than 0.3 log CFU/g, then results have been gathered in three groups :

Total coliforms	Group 1	Group 2	Group 3
Assigned value of the contamination (log CFU/g)	2.469	2.750	3.099
Assigned value uncertainty (log CFU/g)	0.0430	0.0365	0.0497
Standard deviation for proficiency assessment (log CFU/g)	0.2644	0.3175	0.2727
Standard deviation for precision (log CFU/g)	0.1089		
Interlaboratory's standard deviation (log CFU/g)	0.2599	0.3137	0.2683
Reproducibility standard deviation (log CFU/g)	0.2798	0.3304	0.2876

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3.1.4. THERMOTOLERANT COLIFORMS

A significant "effect" of the diluent and the retained dilution has been highlighted. This effect results in a contamination's difference higher than 0.3 log CFU/g, then results have been gathered in two groups :

Thermotolerant coliforms	Group 1	Group 2
Assigned value of the contamination (log CFU/g)	2.560	2.863
Assigned value uncertainty (log CFU/g)	0.0310	0.0672
Standard deviation for proficiency assessment (log CFU/g)	0.3047	0.3688
Standard deviation for precision (log CFU/g)	0.1253	
Interlaboratory's standard deviation (log CFU/g)	0.2995	0.3645
Reproducibility standard deviation (log CFU/g)	0.3169	0.3789

3.1.5. *ESCHERICHIA COLI*

A significant "effect" of the culture media, manufacturer and the plating method has been highlighted. This effect results in a contamination's difference lower than 0.3 log CFU/g, then results have been gathered in one group :

Escherichia coli	
Assigned value of the contamination (log CFU/g)	2.228
Assigned value uncertainty (log CFU/g)	0.0128
Standard deviation for proficiency assessment (log CFU/g)	0.1710
Standard deviation for precision (log CFU/g)	0.1312
Interlaboratory's standard deviation (log CFU/g)	0.1606
Reproducibility standard deviation (log CFU/g)	0.2074

3.1.6. ANAEROBIC SULFITE-REDUCING BACTERIA

Only units n°3, 4 and 5 were artificially contaminated.

A significant "effect" of the retained dilution has been highlighted. This effect results in a contamination's difference lower than 0.3 log CFU/g, then results have been gathered in one group :

Anaerobic sulfite-reducing bacteria	
Assigned value of the contamination (log CFU/g)	2.170
Assigned value uncertainty (log CFU/g)	0.0173
Standard deviation for proficiency assessment (log CFU/g)	0.2044
Standard deviation for precision (log CFU/g)	0.1314
Interlaboratory's standard deviation (log CFU/g)	0.1898
Reproducibility standard deviation (log CFU/g)	0.2309

Comment :
- 7 laboratories detected ASR in unit n°1 non-artificially contaminated by *C. perfringens* with a contamination level from 1 to 2500 CFU/g.
- 7 laboratories detected ASR in unit n°2 non-artificially contaminated by *C. perfringens* with a contamination level from 10 to 2600 CFU/g.

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3.1.7. *CLOSTRIDIUM PERFRINGENS*

Only units n°3, 4 and 5 were artificially contaminated.

None significant effect of the analysis technique has been highlighted.

Clostridium perfringens	
Assigned value of the contamination (log CFU/g)	2.143
Assigned value uncertainty (log CFU/g)	0.0205
Standard deviation for proficiency assessment (log CFU/g)	0.2229
Standard deviation for precision (log CFU/g)	0.1178
Interlaboratory's standard deviation (log CFU/g)	0.2122
Reproducibility standard deviation (log CFU/g)	0.2427

Comment :
- 4 laboratories detected *C. perfringens* in unit n°1 non-artificially contaminated by *C. perfringens* with a contamination level from 150 to 2000 CFU/g.
- 3 laboratories detected *C. perfringens* in unit n°2 non-artificially contaminated by *C. perfringens* with a contamination level from 110 to 2600 CFU/g.

3.1.8. COAGULASE POSITIVE STAPHYLOCOCCI

None significant effect of the analysis technique has been highlighted.

Coagulase positive Staphylococci	
Assigned value of the contamination (log CFU/g)	3.625
Assigned value uncertainty (log CFU/g)	0.0107
Standard deviation for proficiency assessment (log CFU/g)	0.1436
Standard deviation for precision (log CFU/g)	0.0720
Interlaboratory's standard deviation (log CFU/g)	0.1400
Reproducibility standard deviation (log CFU/g)	0.1574

3.1.9. *LISTERIA MONOCYTOGENES*

Only units n°4 and 5 were artificially contaminated.

A significant "effect" of the retained dilution has been highlighted. This effect results in a contamination's difference lower than 0.3 log CFU/g, then results have been gathered in one group :

Listeria monocytogenes	
Assigned value of the contamination (log CFU/g)	3.318
Assigned value uncertainty (log CFU/g)	0.0099
Standard deviation for proficiency assessment (log CFU/g)	0.1206
Standard deviation for precision (log CFU/g)	0.0758
Interlaboratory's standard deviation (log CFU/g)	0.1080
Reproducibility standard deviation (log CFU/g)	0.1319

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3.2.PERFORMANCES IN DETECTION

The performance is assessed by the capacity to detect only samples contaminated by *Salmonella* and *Listeria monocytogenes* (no false positive or false negative results).

3.2.1. DETECTION – *SALMONELLA*

Only units n°3, 4 and 5 were artificially contaminated.
289 laboratories obtained correct results.
6 laboratories obtained false positive results (respectively 5 and 3 false-positive for units n°1 and 2).
15 laboratories obtained false negative results (respectively 9, 9 and 7 false-negative for units n°3, 4 and 5).

3.2.2. DETECTION – *LISTERIA MONOCYTOGENES*

Only units n°4 and 5 were artificially contaminated.
267 laboratories obtained correct results.
4 laboratories obtained false positive results (respectively 1, 2 and 4 false-positive for units n°1, 2 and 3).
4 laboratories obtained false negative results (respectively 2 and 4 false-negative for units n°4 and 5).

3.3.EVOLUTION OF PERFORMANCE

You will find, on each page of your performance's assessment, a graph representing evolution of it on different tests since the 51th scheme.

In order to interpret your control card with z scores, you can refer to the standard ISO 13528 §10.8.2.2, explaining the 3 « out of control » situations :

- Just one overtaking of the action limit (z<-3 or z>3),
- 2 consecutives z scores out of 3 overtaking of the warning limit (2<z<3 or -3<z<-2),
- 6 consecutives z scores regularly increasing or decreasing.

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