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PROFICIENCY TEST « RAEMA »

SCHEME N° 68
(12 MARCH 2019)

GENERAL REPORT

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

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1. GENERAL DATA

1.1.PARTICIPATING LABORATORIES

359 laboratories participated to the 68th scheme. The sending was made on Tuesday 12 March 2019. We received **358** answers (99.7%).

1.2.DELIVERY TIME OF THE PARCEL

Reception	J0	J0+1	J0+2	J0+3	J0+5	J0+6	J0+7	J0+8	J0+9	J0+10
Nb of laboratories	11	240	60	29	2	11	1	1	1	1

One laboratory did not give this information.

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 10^3 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 5.10^2 cfu/g in 3 units ;
- one strain of *Staphylococcus aureus* at a concentration level of 10^4 cfu/g in 5 units ;
- one strain of *Salmonella* Anatum at a concentration level of 50 cfu/g in 3 units ;
- one strain of *Listeria monocytogenes* at a concentration level of 10^3 cfu/g in 2 units .

1.3.2. SIZE

200 kilogrammes of powder were produced, and distributed after contamination in bottles containing 70 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 18 March, 25 March and 1 April 2019. These checks were realized by a subcontractor accreditated by Cofrac.

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

357 laboratories (99.7%) specified it.

Analysis time	J0	J0+1	J0+2	J0+3	J0+4	J0+5	J0+6	J0+7	J0+8	J0+9	J0+10	J0+11	J0+13	J0+14
Nb of laboratories	1	33	43	14	4	2	156	64	18	3	3	1	10	5

One laboratory did not give this information.

1.4.2. PRESERVATION TEMPERATURE OF SAMPLES BEFORE ANALYSIS

356 laboratories (99.4%) specified it. The average temperature is **4.0°C** with a standard deviation of 1.1°C. The given data 18, 20, and 25°C given by 4 laboratories were not taken into account for this calculation.

2. EXPLOITATION OF ANALYSIS REPORT

2.1.PREPARATION OF THE INITIAL SUSPENSION

For **357** answers (99.7%) :
242 laboratories (67.6%) prepare the initial suspension with adding diluent to powder.
115 laboratories (32.1%) prepare the initial suspension with adding powder to diluent.

2.2.HOMOGENEIZATION TECHNIQUE

For **357** answers (99.7%) :
336 laboratories (93.8%) homogeneize their sampling with a StomacherND.
21 laboratories (5.9%) used another technique (manual, magnétic or other).

2.3. RESUSCITATION'S CONDITIONS

2.3.1. DURATION

346 laboratories (96.6%) specified it.
The average duration is **27.3 min** with a standard deviation of 15.3 min. The data 120 min given by 5 laboratories was not taken into account for this calculation.

2.3.2. TEMPERATURE

346 laboratories (96.6%) specified it.
The average temperature is **21.4°C** with a standard deviation of 3.5°C.

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2.4. MICROORGANISMS AT 30°C

342 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF EN ISO 4833-1	227
	→ *NM ISO 4833-1*[(1)]	13
	AFNOR 3M-01/1-09/89	52
	NF EN ISO 4833-2	17
	AFNOR BIO-12/35-05/13	14
	Other	19
	+ V08-100 (spiral)	19
Culture medium	Plate Count Agar	274
	Petrifilms	51
	Tempo AC	14
	Other	3
Preparation	Home made	126
	Ready to use not pre-poured	145
	Ready to use, plate, film, card	71
Plating method	Surface	69
	Pour	257
	Culture medium for card	14
1st dilution retained	- 1	13
	- 2	14
	- 3	278
	- 4	18
	- 5	1
	1/400	11
	1/4000	1
Incubation temperature	30±1°C	337
	37±1°C	3
	25°C	1
Incubation duration	69-73 h	289
	44-48 h	49
	24 h	3

(1) *Similar method to NF EN ISO 4833-1 according to ONSSA (Office National de Sécurité Sanitaire des produits Alimentaires).*

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2.5.ENTEROBACTERIACEA

302 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF V08-054	126
	→ *NM 08.0.109*[(2)]	19
	NF EN ISO 21528-2	75
	AFNOR 3M-01/6-09/97	49
	AFNOR BIO-12/21-12/06	13
	AFNOR AES-10/07-01/08	13
	AFNOR BRD-07/24-11/13	3
	Other	4
	+ V08-100 (spiral)	2
Culture medium	VRBG	222
	Petrifilms	50
	Tempo EB	13
	Rebecca	13
	Rapid'Enterobacteriaceae	4
	Other	0
Preparation	Home made	97
	Ready to use not pre-poured	139
	Ready to use, plate, film, card	66
1st dilution retained	- 1	206
	- 2	80
	- 3	1
	1/40	2
	1/400	9
Incubation temperature	37±1°C	182
	30°C	108
	35°C	12
Incubation duration	20-25 h	298
	48 h	4

(2) *Similar method to NF V08-054 according to ONSSA.*

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2.6.TOTAL COLIFORMS

251 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF V08-050	132
	→ *NM 08.0.142*[3]	7
	NF ISO 4832	59
	→ *NM ISO 4832*[4]	12
	AFNOR 3M	25
	AFNOR BIO-12/17-12/05	7
	AFNOR BRD-07/08-12/04	4
	Other	5
	+ V08-100 (spiral)	4
Culture medium	VRBL	210
	Petrifilms	25
	Tempo TC	7
	Rapid Ecoli	6
	Other	3
Preparation	Home made	100
	Ready to use not pre-poured	118
	Ready to use, plate, film, card	33
1st dilution retained	-1	203
	-2	36
	-3	1
	1/40	3
	1/400	3
Incubation temperature	30±1°C	233
	37±1°C	18
Incubation duration	20-26 h	245
	48 h	6

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 B method.
1 laboratory specified utilization of AFNOR 3M-01/02-09/89 method.
1 laboratory specified utilization of Petrifilm CC method.

[3] *Similar method to NF V 08-050 according to ONSSA.*
[4] *Similar method to NF ISO 4832 according to ONSSA.*

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2.7.THERMOTOLERANT COLIFORMS

225 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF V08-060	165
	→ *NM 08.0.124*[(5)]	20
	AFNOR 3M	26
	NF ISO 4832	11
	Other	3
	+ V08-100 (spiral)	1
Culture medium	VRBL	195
	Petrifilms	27
	Other	3
Preparation	Home made	92
	Ready to use not pre-poured	108
	Ready to use, plate, film, card	25
1st dilution retained	-1	195
	-2	26
Incubation temperature	42-45°C	223
	30°C	1
	37°C	1
Incubation duration	20-24 h	220
	48 h	4
	37 h	1

AFNOR 3M method including :

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

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

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2.8.ESCHERICHIA COLI

317 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF ISO 16649-2	187
	→ *NM ISO 16649-2*[6]	15
	AFNOR 3M	46
	AFNOR BRD-07/01-07/93	17
	AFNOR AES-10/06-01/08	14
	AFNOR BIO-12/13-02/05	13
	AFNOR BIO-12/05-01/99	5
	NF EN ISO 16649-3	2
	Other	18
	+ V08-100 (spiral)	1
Culture medium	TBX	210
	Petrifilms	46
	Rapid E. coli	20
	Rebecca	14
	Tempo EC	13
	Coli ID	9
	Other	3
Preparation	Home made	90
	Ready to use not pre-poured	166
	Ready to use, plate, film, card	60
Plating method	Surface	50
	Pour	252
	Culture medium for card	14
1st dilution retained	-1	291
	-2	10
	1/40	1
	1/400	9
Incubation temperature	41-46°C	276
	37°C	39
	30°C	2
Incubation duration	16-25 h	308
	48 h	7
	37 h	1
	30 h	1

AFNOR 3M method including :
13 laboratories specified utilization of AFNOR 3M-01/08-06/01 method.
2 laboratories specified utilization of Petrifilm EC method.

[6] *Similar method to NF ISO 16649-2 according to ONSSA.*

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2.9.ANAEROBIC SULFITE-REDUCING BACTERIA

255 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF V08-061	177
	→ *NM 08.0.154*[7]	3
	→ *NM 08.0.125*[7]	6
	NF ISO 15213	48
	→ *NM ISO 15213*[8]	8
	Other	11
Culture medium	TSC	239
	TSN	9
	Gélose sulfite de fer	5
	Other	2
Preparation	Home made	105
	Ready to use not pre-poured	116
	Ready to use, plate, film, card	34
1st dilution retained	-1	180
	-2	67
Incubation temperature	44-46°C	183
	37°C	72
Incubation duration	15-24 h	215
	40-48 h	33
	72 h	6
	30 h	1

[7] *Similar method to NF V08-061 according to ONSSA.*
[8] *Similar method to NF ISO 15213 according to ONSSA.*

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2.10. CLOSTRIDIUM PERFRINGENS

203 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF EN ISO 7937	169
	→ *NM ISO 7937*[9]	15
	Other	19
Culture medium	TSC	202
	Other	1
Preparation	Home made	75
	Ready to use not pre-poured	119
	Ready to use, plate, film, card	8
1st dilution retained	-1	172
	-2	28
Incubation temperature	36-37°C	188
	44-46°C	15
Incubation duration	18-24 h	196
	48 h	6
	72 h	1
Confirmation test	None	33
	Lactose-sulfite	151
	Strip	8
	Other	8

[9] *Similar method to NF EN ISO 7937 according to ONSSA.*

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2.11. COAGULASE POSITIVE STAPHYLOCOCCI

319 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF EN ISO 6888-2	140
	→ *NM ISO 6888-2*[10]	4
	NF V 08-057-1	62
	→ *NM 08.0.112*[11]	4
	NF EN ISO 6888-1	47
	→ *NM ISO 6888-1*[12]	11
	AFNOR 3M-01/9-04/03	20
	AFNOR BIO-12/28-04/10	11
	AFNOR BKR-23/10-12/15	9
	NordVal No :049	1
	Other	9
	+ V08-100 (spiral)	4
Culture medium	RPF	138
	BP+jaune d'œuf tellurite	105
	BP+jaune d'œuf tellurite + sulfaméthazine	22
	Petrifilm	21
	Easy Staph	15
	Tempo STA	11
	Rapid Staph	3
	Other	4
Preparation	Home made	76
	Ready to use not pre-poured	128
	Ready to use, plate, film, cards	115
Plating method	Surface	166
	Pour	141
	Culture medium for card	11
1st dilution retained	-1	98
	-2	190
	-3	15
	1/40	7
	1/400	3
Incubation temperature	36-37°C	317
	30°C	2
Incubation duration	40-48 h	227
	18-26 h	91
	72 h	1
Confirmation test	None	186
	Staphylo-coagulase	107
	Clumping factor	7
	DNase	10
	Other	26

[10] *Similar method to NF EN ISO 6888-2 according to ONSSA.*
[11] *Similar method to NF V 08-057-1 according to ONSSA.*
[12] *Similar method to NF EN ISO 6888-1 according to ONSSA.*

2.12. LISTERIA MONOCYTOGENES – ENUMERATION

250 laboratories performed the enumeration.

RESUSCITATION

115 laboratoires announce the realization of a resuscitation step.
The average duration for these laboratories is **42.9 min** with a standard deviation of 22.3 min.
The average temperature for these laboratories is **20.8°C** with a standard deviation of 3.7°C.

Parameters	Mode	Nb laboratories
Method	NF EN ISO 11290-2	79
	→ *NM ISO 11290-2*[13]	16
	AFNOR AES-10/05-09/06	63
	AFNOR BKR-23/05-12/07	50
	AFNOR BRD-07/05-09/01	24
	AFNOR BRD-07/17-01/09	9
	Other	8
Resuscitation medium	Buffered Peptone Water	99
	Fraser base	10
	Other	5
Enumeration medium	ALOA Count	119
	Compass Listeria	67
	Rapid Lmono	25
	AL Agar	19
	Palcam	7
	OCLA	5
	Other	8
Preparation	Home made	32
	Ready to use not pre-poured	51
	Ready to use, plate, film, card	167
Plating method	Surface	206
	Pour	43
	Culture medium for card	0

[13] *Similar method to NF EN ISO 11290-2 according to ONSSA.*

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Parameters	Mode	Nb laboratories
1st dilution retained	-1	227
	-2	16
Incubation temperature	37°C	247
	30°C	3
Incubation duration	40-49 h	205
	24 h	45
Confirmation test	None	43
	Biochemical	151
	Biochemical + CAMP	40
	Other	10
Nb of colonies tested per plate	1	65
	2-4	15
	5	109

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2.13. SALMONELLA – DETECTION

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

Parameter	Mode	Nb laboratories
Method	NF EN ISO 6579-1	88
	→ *NM ISO 6579-1*(14)	23
	AFNOR BKR 23/07-10/11 (IRIS Salmonella)	68
	AFNOR BRD 07/11-12/05 (Rapid Salmonella)	36
	AFNOR BIO 12/16-09/05 (VIDAS Easy Salmonella)	27
	AFNOR BIO 12/32-10/11 (VIDAS SPT)	20
	AFNOR AES 10/11-07/11 (IBISA)	19
	AFNOR BIO 12/41-03/17 (SALMA One day)	13
	Other	23

No detail of methodology was asked to laboratories using other methods than NF EN ISO 6579-1 method 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 AES 10/11-07/11 **IBISA**		BPW + ISS / 41,5°C - 16/20h	IBISA / 37°C - 24±3h
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

(14) *Similar method to NF EN ISO 6579-1 according to ONSSA.*

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The detail of the methodology followed by 111 laboratories using NF EN ISO 6579-1 and NM ISO 6579-1 method, and the 23 laboratories using another method, is clarified in the following table :

Parameter	Mode	Nb laboratories
Method	NF EN ISO 6579-1	88
	→ *NM ISO 6579-1*[(14)]	23
	Other	23
Pre-enrichment medium	Buffered Peptone Water	130
	Other	3
Pre-enrichment temperature	36-37°C	124
	41.5-44°C	6
	20-22°C	2
Pre-enrichment duration	16-21 h	93
	22-24 h	38
	1 h	1
Enrichment medium	RVS	115
	MKTTn	106
	Other	19
Isolation medium	XLD	105
	Hektoen	37
	ASAP	13
	Rapid Salmonella	12
	GVB	12
	Brilliance Salmonella	11
	IRIS Salmonella agar	10
	SS	9
	Compass Salmonella	6
	Rambach	3
	Other	26
Confirmation test	Biochemical	53
	Biochemical + serological agglutination	68
	Other	11

(14) *Similar method to NF EN ISO 6579-1 according to ONSSA.*

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2.14. LISTERIA MONOCYTOGENES – DETECTION

285 laboratories performed the detection.

Parameter	Mode	Nb laboratories
Method	NF EN ISO 11290-1	72
	→ *NM ISO 11290-1*[15]	18
	AFNOR AES 10/03-09/00 (ALOA one day)	72
	AFNOR BKR 23/02-11/02 (Compass L. mono)	57
	AFNOR BRD 07/04-09/98 (Rapid' L. mono)	23
	AFNOR BIO 12/27-02/10 (VIDAS LMX)	8
	AFNOR BIO 12/11-03/04 (VIDAS LMO2-37°C)	7
	AFNOR BRD 07/16-01/09 (Agar Listeria)	6
	AFNOR BIO 12/02-06/94 (VIDAS Listeria)	3
	Other	19

No detail of methodology was asked to laboratories using other method than NF EN ISO 11290-1 method 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	ChromID 37°C – 24h
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

[15] *Similar method to NF EN ISO 11290-1 according to ONSSA.*

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The detail of the methodology followed by 90 laboratories using NF EN ISO 11290-1 and NM ISO 11290-1 methods, and the 19 laboratories using another method, is clarified in the following table :

Parameter	Mode	Nb laboratories
Method	NF EN ISO 11290-1	72
	→ *NM ISO 11290-1*[(15)]	18
	Other	19
Primary enrichment medium	Fraser demi	94
	Other	15
Primary enrichment temperature	30±1°C	101
	37°C	7
	20°C	1
Primary enrichment duration	18-26 h	106
	28-30 h	2
Secondary enrichment medium	Fraser	89
	Other	3
Secondary enrichment temperature	36-37°C	86
	30°C	5
	24°C	1
Secondary enrichment duration	22-26 h	69
	48 h	23
Isolation medium	Ottaviani et Agosti	68
	Palcam	65
	Compass Listeria	23
	Oxford	18
	Rapid L'mono	12
	Other	9
Isolation temperature	36-37°C	107
Isolation duration	48±1 h	69
	24-26 h	38
Confirmation test	None	6
	Biochemical	68
	Biochemical + CAMP	30
	Other	4
Nb of colonies per plate	1	30
	2-4	10
	5	52

(15) *Similar method to NF EN ISO 11290-1 according to ONSSA.*

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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.

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

A significant "effect" of the incubation duration has been highlighted. This effect results in a contamination's difference lower than 0.15 log CFU/g, then results have been gathered in one group :

Microorganisms at 30°C	
Assigned value of the contamination (log CFU/g)	5.200
Assigned value uncertainty (log CFU/g)	0.0059
Standard deviation for proficiency assessment (log CFU/g)	0.0855
Standard deviation for precision (log CFU/g)	0.0528
Interlaboratory's standard deviation (log CFU/g)	0.0821
Reproducibility standard deviation (log CFU/g)	0.0976

3.1.2. ENTEROBACTERIACEAE

A significant "effect" of the preparation 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)	2.725	3.111
Assigned value uncertainty (log CFU/g)	0.0270	0.0217
Standard deviation for proficiency assessment (log CFU/g)	0.2874	0.1813
Standard deviation for precision (log CFU/g)	0.1066	
Interlaboratory's standard deviation (log CFU/g)	0.2834	0.1749
Reproducibility standard deviation (log CFU/g)	0.3028	0.2049

3.1.3. TOTAL COLIFORMS

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 :

Total coliforms	Group 1	Group 2
Assigned value of the contamination (log CFU/g)	2.633	3.060
Assigned value uncertainty (log CFU/g)	0.0289	0.0405
Standard deviation for proficiency assessment (log CFU/g)	0.3248	0.1973
Standard deviation for precision (log CFU/g)	0.1073	
Interlaboratory's standard deviation (log CFU/g)	0.3212	0.1914
Reproducibility standard deviation (log CFU/g)	0.3387	0.2194

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3.1.4. THERMOTOLERANT COLIFORMS

A significant "effect" of 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)	2.571	2.935
Assigned value uncertainty (log CFU/g)	0.0244	0.0727
Standard deviation for proficiency assessment (log CFU/g)	0.2673	0.2909
Standard deviation for precision (log CFU/g)	0.1152	
Interlaboratory's standard deviation (log CFU/g)	0.2623	0.2863
Reproducibility standard deviation (log CFU/g)	0.2834	0.3058

3.1.5. *ESCHERICHIA COLI*

A significant "effect" of the culture media and manufacturer 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)	2.282
Assigned value uncertainty (log CFU/g)	0.0129
Standard deviation for proficiency assessment (log CFU/g)	0.1778
Standard deviation for precision (log CFU/g)	0.1246
Interlaboratory's standard deviation (log CFU/g)	0.1689
Reproducibility standard deviation (log CFU/g)	0.2099

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)	2.627
Assigned value uncertainty (log CFU/g)	0.0157
Standard deviation for proficiency assessment (log CFU/g)	0.1934
Standard deviation for precision (log CFU/g)	0.1080
Interlaboratory's standard deviation (log CFU/g)	0.1831
Reproducibility standard deviation (log CFU/g)	0.2126

Comment :
- 8 laboratories detected ASR in unit n°1 non-artificially contaminated by *C. perfringens* with a contamination level from 1 to 3500 CFU/g.
- 5 laboratories detected ASR in unit n°2 non-artificially contaminated by *C. perfringens* with a contamination level from 300 to 2000 CFU/g.

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3.1.7. *CLOSTRIDIUM PERFRINGENS*

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 :

Clostridium perfringens	
Assigned value of the contamination (log CFU/g)	2.611
Assigned value uncertainty (log CFU/g)	0.0171
Standard deviation for proficiency assessment (log CFU/g)	0.1878
Standard deviation for precision (log CFU/g)	0.0944
Interlaboratory's standard deviation (log CFU/g)	0.1798
Reproducibility standard deviation (log CFU/g)	0.2030

Comment :
- 1 laboratory detected *C. perfringens* in unit n°1 non-artificially contaminated by *C. perfringens* with a contamination level of 150 CFU/g.
- 1 laboratory detected *C. perfringens* in unit n°2 non-artificially contaminated by *C. perfringens* with a contamination level of 40 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)	3.892
Assigned value uncertainty (log CFU/g)	0.0095
Standard deviation for proficiency assessment (log CFU/g)	0.1320
Standard deviation for precision (log CFU/g)	0.0691
Interlaboratory's standard deviation (log CFU/g)	0.1283
Reproducibility standard deviation (log CFU/g)	0.1457

3.1.9. *LISTERIA MONOCYTOGENES*

Only units n°4 and 5 were artificially contaminated.

None significant effect of the analysis technique has been highlighted.

Listeria monocytogenes	
Assigned value of the contamination (log CFU/g)	3.090
Assigned value uncertainty (log CFU/g)	0.0092
Standard deviation for proficiency assessment (log CFU/g)	0.1135
Standard deviation for precision (log CFU/g)	0.0661
Interlaboratory's standard deviation (log CFU/g)	0.1034
Reproducibility standard deviation (log CFU/g)	0.1227

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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.
304 laboratories obtained correct results.
4 laboratories obtained false positive results (respectively 3 and 1 false-positive for units n°1 and 2).
11 laboratories obtained false negative results (respectively 5, 4 and 5 false-negative for units n°3, 4 and 5).

3.2.2. DETECTION – *LISTERIA MONOCYTOGENES*

Only units n° 4 and 5 were artificially contaminated.
282 laboratories obtained correct results.
2 laboratories obtained false positive results (respectively 1, 2 and 1 false-positive for units n°1, 2 and 3).
1 laboratory obtained false negative results (respectively 1 and 1 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 48th 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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