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PROFICIENCY TEST « RAEMA »

réseau d'analyses et d'échanges en microbiologie des aliments

SCHEME N° 75
(3rd OCTOBER 2022)
GENERAL REPORT

« The general report is public, it is available on the Website of ASA, results and informations are anonymous, they do not contain any confidential information »

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1- GENERAL DATA

1.1. PARTICIPATING LABORATORIES

341 laboratories participated to the 75th scheme. The sending was made on Monday 3rd October 2022. We received **333** answers (97.7%).

1.2. DELIVERY TIME OF THE PARCEL

Reception	J0	J0+1	J0+2	J0+3	J0+4	J0+5	J0+6	J0+7	J0+8	J0+9	J0+10	J0+11	J+13
Nb of laboratories	7	200	67	21	19	1	1	5	6	3	1	1	1

1.3. INFORMATIONS ABOUT SAMPLE

1.3.1. NATURE

The sample included :

- one strain of *Enterococcus sp*. At a concentration level of 1.10^5 cfu/g in 5 units ;
- one strain of *Citrobacter sp.* At a concentration level of 1.10^3 cfu/g in 5 units ;
- one strain of *Serratia liquefaciens* at a concentration level of 1.10^3 cfu/g in 5 units ;
- one strain of *Escherichia coli* at a concentration level of 5.10^2 cfu/g in 5 units ;
- one strain of *Clostridium perfringens* at a concentration level of 5.10^2 cfu/g in 4 units ;
- one strain of *Staphylococcus aureus* at a concentration level of 5.10^3 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 5.10^2 cfu/g in 4 units.

Samples have been prepared between August and October 2022. The maintenance of bacterial strains, check of their contamination and check of the purity are entrusted to a subcontractor.

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.

1.3.3. 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 10, 17 and 24 October 2022. 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*.

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1.4. EXECUTION OF ANALYZES

1.4.1. DELIVERY TIME OF SAMPLES / BEGINNING OF ANALYZES

333 laboratories (100%) specified it.

Analysis time	J0+1	J0+2	J0+3	J0+4	J0+5	J0+7	J0+8	J0+9	J0+10	J0+11	J0+14	J0+15
Nb of laboratories	35	40	28	4	3	130	51	20	7	3	7	5

1.4.2. PRESERVATION TEMPERATURE OF SAMPLES BEFORE ANALYSIS

332 laboratories (99.7%) specified it. The average temperature is **4.0°C** with a standard deviation of 0.9°C. The given data 15.2, 20, 22, 24.5 and 25°C given by 7 laboratories were not taken into account for this calculation.

2. EXPLOITATION OF ANALYSIS REPORT

2.1. SIZE OF THE SAMPLES

329 laboratories specified it (98.8%).
The average size is **17.8 g** with a standard deviation of 7.9 g. The minimum size indicated is 1 g and the maximum one is 50 g.

2.2. PREPARATION OF THE INITIAL SUSPENSION

For **333** answers (100%) :
212 laboratories (63.7%) prepare the initial suspension with adding diluent to powder.
118 laboratories (35.4%) prepare the initial suspension with adding powder to diluent.
3 laboratories (0.9%) used another technique to prepare the initial suspension.

2.3. DILUENT USED FOR THE INITIAL SUSPENSION

For **332** answers (99.7%) :
287 laboratories (86.2%) use Buffered Peptone Water (or equivalent) for the initial suspension.
40 laboratories (12.0%) use Peptone salt for the initial suspension.
5 laboratories (1.5%) used another diluent for the initial suspension.

2.4. HOMOGENEIZATION TECHNIQUE

For **332** answers (99.7%) :
296 laboratories (88.9%) homogeneize their sampling with a StomacherND.
28 laboratories (8.4%) used a manual homogenization.
5 laboratories (1.5%) used a Vortex mixer.
3 laboratories (0.9%) used another technique.

2.5. RESUSCITATION'S CONDITIONS

2.5.1. DURATION

320 laboratories (96.1%) specified it.
The average duration is **26.4 min** with a standard deviation of 15.6 min. The data 120 and 1440 min given by 7 laboratories were not taken into account for this calculation.

2.5.2. TEMPERATURE

320 laboratories (96.1%) specified it.
The average temperature is **21.6°C** with a standard deviation of 4.1°C.

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2.6. MICROORGANISM AT 30°C

318 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	ISO/NF EN ISO 4833-1	198
	AFNOR 3M-01/1-09/89	47
	NM ISO 4833-1	24
	ISO/NF EN ISO 4833-2	17
	AFNOR BIO-12/35-05/13	12
	Internal method	9
	XP V08-034	2
	Other	9
	+ V08-100 (spiral)	14
Culture medium	Plate Count Agar	236
	Petrifilms	49
	Plate Count Agar + Milk	20
	Tempo AC	12
	Other	1
Preparation	Home made	107
	Ready to use not pre-poured	141
	Ready to use, plate, film, card	69
Plating method	Surface	67
	Pour	236
	Culture medium for card	12
1st dilution retained	- 1	9
	- 2	14
	- 3	259
	- 4	24
	1/400	4
	1/4000	4
Incubation temperature	30°C	311
	32.5-35°C	4
	37°C	2
	25°C	1
Incubation duration	69-74 h	265
	40-48 h	49
	24-26 h	2
	144 h	1
	Autre	1

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2.7. ENTEROBACTERIACEA

277 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF V08-054	107
	→ *NM 08.0.109*(1)	17
	ISO/NF EN ISO 21528-2	63
	AFNOR 3M-01/6-09/97	44
	NM ISO 21528-2	12
	AFNOR BIO-12/21-12/06	10
	AFNOR AES-10/07-01/08	9
	AFNOR BRD-07/24-11/13	8
	Internal method	3
	Other	4
Culture medium	VRBG	203
	Petrifilms	45
	Tempo EB	10
	Rebecca	10
	Rapid'Enterobacteriaceae	8
	Other	1
Preparation	Home made	83
	Ready to use not pre-poured	139
	Ready to use, plate, film, card	53
1st dilution retained	- 1	148
	- 2	119
	- 3	1
	1/400	7
Incubation temperature	37°C	179
	30°C	86
	32.5-35°C	12
Incubation duration	22-27 h	270
	48 h	5
	72 h	1
	Other	1
Confirmatory test	Yes	66
	No	205

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

2.8. TOTAL COLIFORMS

230 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF V08-050	106
	→ *NM 08.0.142*(2)	9
	ISO/NF ISO 4832	54
	NM ISO 4832	24
	AFNOR 3M	18
	AFNOR BIO-12/17-12/05	7
	AFNOR BRD-07/08-12/04	6
	Internal method	3
	Other	3
Culture medium	VRBL	193
	Petrifilms	20
	Rapid Ecoli	8
	Tempo TC	7
	Other	2
Preparation	Home made	80
	Ready to use not pre-poured	124
	Ready to use, plate, film, card	25
1st dilution retained	-1	154
	-2	71
	1/40	1
	1/400	3
Incubation temperature	30°C	209
	35-37°C	20
Incubation duration	20-26 h	226
	48 h	3

AFNOR 3M method including :
4 laboratories specified utilization of AFNOR 3M-01/02-09/89 A method.

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

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2.9. THERMOTOLERANT COLIFORMS

210 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF V08-060	138
	→ *NM 08.0.124*(3)	29
	AFNOR 3M	23
	ISO/NF ISO 4832	15
	Internal method	3
	Other	1
Culture medium	VRBL	185
	Petrifilms	23
	Other	2
Preparation	Home made	78
	Ready to use not pre-poured	111
	Ready to use, plate, film, card	21
1st dilution retained	-1	151
	-2	57
Incubation temperature	42-45°C	205
	37°C	3
	30°C	1
Incubation duration	22-25 h	203
	44-48 h	5

AFNOR 3M method including :

5 laboratories specified utilization of AFNOR 3M-01/02-09/89 C method.
1 laboratory specified utilization of AFNOR 3M-01/05-03/97 B 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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2.10. ESCHERICHIA COLI

299 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	ISO/NF ISO 16649-2	171
	AFNOR 3M	40
	NM ISO 16649-2	22
	AFNOR BRD-07/01-07/93	18
	AFNOR BIO-12/13-02/05	12
	AFNOR AES-10/06-01/08	9
	NM 08.0.108	6
	Internal method	5
	AFNOR BIO-12/05-01/99	4
	ISO/NF EN ISO 16649-3	3
	Other	9
Culture medium	TBX	205
	Petrifilms	41
	Rapid E. coli	22
	Tempo EC	12
	Rebecca	11
	Coli ID	6
	Other	2
Preparation	Home made	86
	Ready to use not pre-poured	163
	Ready to use, plate, film, card	49
Plating method	Surface	39
	Pour	241
	Culture medium for card	13
1st dilution retained	-1	269
	-2	16
	1/40	2
	1/400	7
Incubation temperature	41-46°C	262
	36-37°C	32
	30°C	3
Incubation duration	18-27 h	291
	48 h	4
	30 h	1
	Autre	1

AFNOR 3M method including :

12 laboratories specified utilization of AFNOR 3M-01/08-06/01 (*SELECT'E. COLI*) method.

1 laboratory specified utilization of AFNOR 3M Petrifilm EC method.

2.11. ANAEROBIC SULFITE-REDUCING BACTERIA

242 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF V08-061	155
	→ *NM 08.0.125*[4]	17
	ISO/NF ISO 15213	45
	NM ISO 15213	14
	Internal method	8
	Other	3
Culture medium	TSC	226
	TSN	7
	Iron Sulfite agar	7
	Other	2
Preparation	Home made	88
	Ready to use not pre-poured	126
	Ready to use, plate, film, card	27
Seeding way	Plates	161
	Tubes	78
1st dilution retained	-1	162
	-2	76
	-3	1
Incubation temperature	44-48°C	173
	37°C	69
Incubation duration	18-24 h	197
	45-48 h	37
	72 h	7
	14 h	1

[4] *Similar method to NF V08-061 according to ONSSA.*

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2.12. CLOSTRIDIUM PERFRINGENS

192 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	ISO/NF EN ISO 7937	151
	NM ISO 7937	29
	NM 08.0.111	3
	Internal method	2
	Other	7
Culture medium	TSC	191
	Other	1
Preparation	Home made	64
	Ready to use not pre-poured	120
	Ready to use, plate, film, card	7
1st dilution retained	-1	155
	-2	34
	-3	1
Incubation temperature	37°C	184
	44-46°C	7
Incubation duration	18-25 h	188
	48 h	3
Confirmation test	None	34
	Lactose-sulfite	144
	Strip	7
	MALDI-TOF mass spectrometry	4

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2.13. COAGULASE POSITIVE STAPHYLOCOCCI

298 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	ISO/NF EN ISO 6888-2	139
	ISO/NF EN ISO 6888-1	68
	NM ISO 6888-1	22
	AFNOR BKR-23/10-12/15	21
	AFNOR 3M-01/9-04/03	12
	AFNOR BIO-12/28-04/10	11
	Internal method	5
	NM ISO 6888-2	4
	NM 08.0.112	4
	NordVal No :049	2
	ISO/NF EN ISO 6888-3	2
	Other	7
Culture medium	RPF	134
	BP+egg yolk tellurite	90
	Easy Staph	27
	BP+egg yolk tellurite+ sulfamethazine	16
	Petrifilm	13
	Tempo STA	11
	Rapid Staph	2
	Other	4
Preparation	Home made	68
	Ready to use not pre-poured	136
	Ready to use, plate, film, cards	93
Plating method	Surface	144
	Pour	138
	Culture medium for card	11
1st dilution retained	-1	105
	-2	170
	-3	12
	1/40	5
	1/400	2
Incubation temperature	37±1°C	294
	30-32.5°C	2
Incubation duration	42-48.5 h	199
	20-27 h	95
	72 h	1
	Autre	1
Confirmation test	None	189
	Staphylo-coagulase	78
	Clumping factor	13
	DNase	8
	MALDI-TOF mass spectrometry	2
	Other	4

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2.14. LISTERIA MONOCYTOGENES – ENUMERATION

235 laboratories performed the enumeration.

RESUSCITATION

85 laboratories announce the realization of a resuscitation step.

Details concerning temperature and average duration of this step are not required anymore in the input form.

Parameters	Mode	Nb laboratories
Method	AFNOR AES-10/05-09/06	69
	ISO/NF EN ISO 11290-2	56
	AFNOR BKR-23/05-12/07	50
	NM ISO 11290-2	24
	AFNOR BRD-07/05-09/01	23
	AFNOR BRD-07/17-01/09	9
	Internal method	2
	Other	2
Resuscitation medium	Buffered Peptone Water or equivalent	179
	Half-fraser	45
	Fraser base	5
	Other	3
Enumeration medium	ALOA Count	111
	Compass Listeria	77
	Rapid Lmono	26
	AL Agar	15
	OCLA	3
	Palcam	1
	Other	2
Preparation	Home made	34
	Ready to use not pre-poured	50
	Ready to use, plate, film, card	149
Plating method	Surface	197
	Pour	35

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Parameters	Mode	Nb laboratories
1st dilution retained	-1	217
	-2	14
Incubation temperature	36-37°C	233
	30°C	2
Incubation duration	44-48.5 h	194
	24-28 h	41
Confirmation test	None	47
	Biochemical	129
	Biochemical + CAMP	38
	MALDI-TOF mass spectrometry	4
	Other	5
Nb of colonies tested per plate	1	61
	2-3	13
	5	96
	150	1

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2.15. SALMONELLA – DETECTION

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

Parameter	Mode	Nb laboratories
Method	AFNOR BKR 23/07-10/11 (IRIS Salmonella)	72
	ISO/NF EN ISO 6579-1	67
	NM ISO 6579-1	39
	AFNOR BRD 07/11-12/05 (Rapid Salmonella)	30
	AFNOR BIO 12/32-10/11 (VIDAS SPT)	28
	AFNOR BIO 12/41-03/17 (SALMA One day)	23
	AFNOR BIO 12/16-09/05 (VIDAS Easy Salmonella)	18
	AFNOR BIO 12/01-04/94 (VIDAS SLM)	6
	AFNOR UNI 03/07-11/13 (PCR)	3
	AFNOR BIO 12/38-06/16 (GENE UP Salmonella)	3
	AFNOR QUA 18/03-11/02 (BAX SYSTEM PCR)	2
	AFNOR BRD 07/06-07/04 (PCR)	1
	AFNOR TRA 02/08-03/01 (TRANSIA PLATE Salmonella GOLD)	1
	Internal method	2
	Other	10

No detail of methodology was asked to laboratories using other methods than ISO/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 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 12/32-10/11 **VIDAS SPT**		BPW + Salmonella supplement / 41,5°C - 18/24h	Chrom ID / 37°C - 24h
AFNOR BIO 12/41-03/17 **SALMA One day**		BPW + Salmonella supplement / 41.5°C – 16/24h	SALMA / 37°C - 24±3h
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 12/01-04/94 **VIDAS SLM**	BPW / 35°C – 24±2h	Tetrathionate (42°C - 6/8h) – Selenite cystine (35-37°C – 6/8h) + M-Broth (42°C – 18h)	Vidas Heat & Go
AFNOR UNI 03/07-11/13 **PCR**		BPW + supplement / 34-38°C – 20/24h	Lysis + PCR
AFNOR BRD 07/06-07/04 **PCR**		BPW / 37°C – 18/21h	Lysis + PCR
AFNOR BIO 12/38-06/16 **GENE UP Salmonella**		BPW / 42°C – 18/24h	Lysis + PCR
AFNOR QUA 18/03-11/02 **BAX SYSTEM PCR**		BPW / 37°C – 16/20h	Lysis + PCR
AFNOR TRA 02/08-03/01 **TRANSIA PLATE Salmonella GOLD**	BPW / 37°C – 16/20h	RVS / 41.5°C – 18/24h	ELISA test

The detail of the methodology followed by 106 laboratories using ISO/NF EN ISO 6579-1 and NM ISO 6579-1 method, and the 12 laboratories using an internal or another method, is clarified in the following table :

Parameter	Mode	Nb laboratories
Method	ISO/NF EN ISO 6579-1	67
	NM ISO 6579-1	39
	Internal method	2
	Other	10
Pre-enrichment medium	None pre-enrichment	3
	Buffered Peptone Water	110
	Other	5
Pre-enrichment temperature	36-37°C	106
	41-42.5°C	5
	20-22°C	3
	33°C	1
Pre-enrichment duration	16-21 h	85
	22-25 h	29
	30 h	1
Enrichment medium	None enrichment	3
	RVS	106
	MKTTn	101
	Selenite-cystine broth	28
	Other	5
Isolation medium	XLD	101
	Hektoen	28
	Bismuth Sulfate	25
	IRIS Salmonella agar	13
	SS	13
	GVB	12
	ASAP	11
	Brilliance Salmonella	9
	Rapid Salmonella	7
	Compass Salmonella	6
	Rambach	2
	Other	3
Confirmation test	Biochemical	43
	Biochemical + serological agglutination	65
	MALDI-TOF mass spectrometry	5
	Other	1

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2.16. LISTERIA MONOCYTOGENES – DETECTION

273 laboratories performed the detection.

Parameter	Mode	Nb laboratories
Method	AFNOR AES 10/03-09/00 (ALOA one day)	64
	AFNOR BKR 23/02-11/02 (Compass L. mono)	63
	ISO/NF EN ISO 11290-1	47
	NM ISO 11290-1	26
	AFNOR BRD 07/04-09/98 (Rapid' L. mono)	24
	AFNOR BIO 12/11-03/04 (VIDAS LMO2-37°C)	12
	AFNOR BIO 12/27-02/10 (VIDAS LMX)	8
	AFNOR BRD 07/16-01/09 (Agar Listeria)	5
	AFNOR BIO 12/40-11/16 (GENE UP LMO)	4
	AFNOR UNI 03/04-04/05 (Listeria Precis)	4
	AFNOR BIO 12/02-06/94 (VIDAS Listeria)	3
	AFNOR BIO 12/18-03/06 (VIDAS LDUO)	3
	AFNOR BRD 07/10-04/05 (IQ Check Listeria)	3
	AFNOR UNI 03/08-11/13 (PCR)	2
	Internal method	2
	Other	3

No detail of methodology was asked to laboratories using other method than ISO/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 AES 10/03-09/00 **ALOA one day**	Half-Fraser	30°C - 24±2h			ALOA One Day 37°C – 24/48h
AFNOR BKR 23/02-11/02 **Compass L. mono**	Half-Fraser	30°C - 24±2h			Compass Listeria Agar 37°C – 24h
AFNOR BRD 07/04-09/98 **Rapid' L. mono**	Half-Fraser	30°C - 24±2h			Rapid L'mono 37°C – 24h
AFNOR BRD 07/16-01/09 **Agar Listeria**	Half-Fraser	30°C - 24±2h			Agar Listeria 37°C – 24h
AFNOR BIO 12/11-03/04 **VIDAS LMO2 (37°C)**	Half-Fraser	30°C - 24/26h	Fraser	37°C - 24/26h	Chromogenic medium / Palcam / Oxford
AFNOR BIO 12/27-02/10 **VIDAS LMX**	LMX	37°C - 26/30h			ChromID 37°C – 24h
AFNOR BIO 12/02-06/94 **VIDAS Listeria**	Half-Fraser	37°C - 26/30h	Fraser	30°C - 24/26h	Palcam et Oxford 37°C – 24h
AFNOR BIO 12/18-03/06 **VIDAS LDUO**	LX	30°C - 24±2h	LX	30°C - 24/26h	Chromogenic medium / Palcam / Oxford
AFNOR BRD 07/10-04/05 **IQ Check Listeria**	Half-Fraser / LSB	30°C – 23/25h			Lysis + PCR
AFNOR UNI 03/08-11/13 **PCR**	LEB	37°C - 24/28h			Lysis + PCR
AFNOR BIO 12/40-11/16 **GENE UP LMO**	LPT	35-37°C - 24±2h			ALOA 35-37°C – 24/48h
AFNOR UNI 03/04-04/05 **Listeria Precis**	One Broth Listeria	30°C - 24±2h			Brilliance Listeria 37°C – 24h

The detail of the methodology followed by 73 laboratories using NF ISO/EN ISO 11290-1 and NM ISO 11290-1 methods, and the 5 laboratories using an internal or another method, is clarified in the following table :

Parameter	Mode	Nb laboratories
Method	ISO/NF EN ISO 11290-1	47
	NM ISO 11290-1	26
	Internal method	2
	Other	3
Primary enrichment medium	Half-Fraser	72
	One broth Listeria	1
	Other	5
Primary enrichment temperature	30°C	73
	37°C	4
	22°C	1
Primary enrichment duration	23-26 h	76
	48 h	1
	12 h	1
Secondary enrichment medium	None secondary enrichment	5
	Fraser	70
	Other	2
Secondary enrichment temperature	37°C	71
	30°C	1
Secondary enrichment duration	20-25 h	60
	48 h	12
Isolation medium	Palcam	54
	Ottaviani et Agosti	38
	Compass Listeria	31
	Oxford	11
	Rapid L'mono	7
	Brilliance Listeria	3
	Other	2
Isolation temperature	36-37°C	77
	30°C	1
Isolation duration	42-48 h	49
	24-25 h	29
Confirmation test	None	4
	Biochemical	42
	Biochemical + CAMP	28
	MALDI-TOF mass spectrometry	2
Nb of colonies per plate	1	25
	2-3	7
	5	39

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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 standard deviation 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.

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)	5.231
Assigned value uncertainty (log cfu/g)	0.0056
Standard deviation for proficiency assessment (log cfu/g)	0.0775
Standard deviation for precision (log cfu/g)	0.0531
Interlaboratory's standard deviation (log cfu/g)	0.0737
Reproducibility standard deviation (log cfu/g)	0.0908

3.1.2. ENTEROBACTERIACEAE

A significant "effect" of the culture medium, 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 three groups :

Enterobacteriaceae	Group 1	Group 2	Group 3
Assigned value of the contamination (log cfu/g)	2.907	3.015	3.428
Assigned value uncertainty (log cfu/g)	0.0315	0.0402	0.0206
Standard deviation for proficiency assessment (log cfu/g)	0.2299	0.1874	0.1946
Standard deviation for precision (log cfu/g)		0.0957	
Interlaboratory's standard deviation (log cfu/g)	0.2259	0.1824	0.1898
Reproducibility standard deviation (log cfu/g)	0.2060	0.2126	0.3065

3.1.3. TOTAL COLIFORMS

A significant "effect" of the culture medium, 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 three groups :

Total coliforms	Group 1	Group 2	Group 3
Assigned value of the contamination (log cfu/g)	2.925	3.186	3.488
Assigned value uncertainty (log cfu/g)	0.0297	0.0480	0.0304
Standard deviation for proficiency assessment (log cfu/g)	0.2945	0.1760	0.1438
Standard deviation for precision (log cfu/g)		0.0991	
Interlaboratory's standard deviation (log cfu/g)	0.2912	0.1703	0.1368
Reproducibility standard deviation (log cfu/g)	0.3065	0.1954	0.1670

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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)	2.855	3.345
Assigned value uncertainty (log cfu/g)	0.0264	0.0303
Standard deviation for proficiency assessment (log cfu/g)	0.2476	0.1765
Standard deviation for precision (log cfu/g)	0.1013	
Interlaboratory’s standard deviation (log cfu/g)	0.2434	0.1706
Reproducibility standard deviation (log cfu/g)	0.2615	0.1956

3.1.5. *ESCHERICHIA COLI*

A significant “effect” of the preparation mode of the culture medium 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)	2.655
Assigned value uncertainty (log cfu/g)	0.0152
Standard deviation for proficiency assessment (log cfu/g)	0.2028
Standard deviation for precision (log cfu/g)	0.1418
Interlaboratory’s standard deviation (log cfu/g)	0.1926
Reproducibility standard deviation (log cfu/g)	0.2392

3.1.6. ANAEROBIC SULFITE-REDUCING BACTERIA

Only units n°1, 2, 3 and 4 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)	2.759
Assigned value uncertainty (log cfu/g)	0.0151
Standard deviation for proficiency assessment (log cfu/g)	0.1796
Standard deviation for precision (log cfu/g)	0.1029
Interlaboratory’s standard deviation (log cfu/g)	0.1721
Reproducibility standard deviation (log cfu/g)	0.2005

Comment :
- 8 laboratories detected ASR in unit n°5 non-artificially contaminated by *C. perfringens* with a contamination level from 10 to 5700 cfu/g.

3.1.7. *CLOSTRIDIUM PERFRINGENS*

Only units n°1, 2, 3 and 4 were artificially contaminated.

A significant “effect” of the preparation mode of the culture medium 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)	2.739
Assigned value uncertainty (log cfu/g)	0.0183
Standard deviation for proficiency assessment (log cfu/g)	0.1941
Standard deviation for precision (log cfu/g)	0.0860
Interlaboratory’s standard deviation (log cfu/g)	0.1892
Reproducibility standard deviation (log cfu/g)	0.2078

Comment :
- 3 laboratories detected *C. perfringens* in unit n°5 non-artificially contaminated by *C. perfringens* with a contamination level from 1 to 750 cfu/g.

3.1.8. COAGULASE POSITIVE STAPHYLOCOCCI

A significant “effect” of the resuscitation’s duration and 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 :

Coagulase positive Staphylococci	
Assigned value of the contamination (log cfu/g)	3.846
Assigned value uncertainty (log cfu/g)	0.0119
Standard deviation for proficiency assessment (log cfu/g)	0.1570
Standard deviation for precision (log cfu/g)	0.0683
Interlaboratory’s standard deviation (log cfu/g)	0.1540
Reproducibility standard deviation (log cfu/g)	0.1685

3.1.9. *LISTERIA MONOCYTOGENES*

Only units n°1, 2, 3 and 4 were artificially contaminated.

None significant effect of the analysis technique has been highlighted.

Listeria monocytogenes	
Assigned value of the contamination (log cfu/g)	2.844
Assigned value uncertainty (log cfu/g)	0.0087
Standard deviation for proficiency assessment (log cfu/g)	0.1035
Standard deviation for precision (log cfu/g)	0.0767
Interlaboratory’s standard deviation (log cfu/g)	0.0961
Reproducibility standard deviation (log cfu/g)	0.1230

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°2, 3 and 4 were artificially contaminated.
292 laboratories obtained correct results.
8 laboratories obtained false positive results (respectively 3 and 6 false-positive for units n° 1 and 5).
10 laboratories obtained false negative results (respectively 3, 5 and 5 false-negative for units n° 2, 3 and 4).

3.2.2. DETECTION – *LISTERIA MONOCYTOGENES*

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

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 55th 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.