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PROFICIENCY TEST « RAEMA »

POWDER SCHEME N° 82
(10th MARCH 2026)
GENERAL REPORT

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1- GENERAL DATA

1.1. PARTICIPATING LABORATORIES

318 laboratories participated to the 82th scheme. The sending was made on Tuesday 10th March 2026. We received **316** answers (99.4%).

1.2. DELIVERY TIME OF THE PARCEL

Delivery time	J0	J0+1	J0+2	J0+3	J0+6	J0+7	J0+8	J0+9	J0+10	J0+13	J0+14	J0+15	J0+16	J0+20
Nb of laboratories	17	186	24	21	13	16	14	11	3	3	2	4	1	1

Note : A transport issue arose during this scheme, resulting in longer delivery time for some participants.

1.3. INFORMATIONS ABOUT SAMPLE

1.3.1. NATURE

The sample included :
- one strain of *Enterococcus sp*. at a concentration level of $1{,}5.10^5$ cfu/g in 5 units ;
- one strain of *Citrobacter sp.* at a concentration level of 3.10^3 cfu/g in 5 units ;
- one strain of *Serratia marcescens* at a concentration level of 2.10^3 cfu/g in 5 units ;
- one strain of *Escherichia coli* at a concentration level of $7{,}5.10^2$ 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 3.10^3 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 1.10^3 cfu/g in 2 units.

Samples have been prepared between January and February 2026. The maintenance of bacterial strains and check of their contamination are entrusted to an external provider.

1.3.2. SIZE

180 kilogrammes of milk 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 16, 23 and 30 March 2026. These checks were realized by an external provider 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

316 laboratories (100%) specified it.

Beginning of analysis	J0+1	J0+2	J0+3	J0+4	J0+5	J0+6	J0+7	J0+8	J0+9	J0+10	J0+13	J0+14	J0+15	J0+16	J0+18	J0+20
Nb of laboratories	32	30	8	1	1	109	65	15	7	1	21	16	4	3	1	2

Note : The delivery issues encountered during this scheme led to delays in the processing of test results for some participants.

1.4.2. PRESERVATION TEMPERATURE OF SAMPLES BEFORE ANALYSIS

316 laboratories (100%) specified it. The average temperature is **4.2°C** with a standard deviation of 1.3°C. The given data 20, 22, 25, 27 and 27.6°C given by 9 laboratories were not taken into account for this calculation.

2. EXPLOITATION OF ANALYSIS REPORT

2.1. SIZE OF THE SAMPLES

312 laboratories specified it (98.7%).
The average size is **17.9 g** with a standard deviation of 7.8 g. The minimum size indicated is 1 g and the maximum one is 32 g.

2.2. PREPARATION OF THE INITIAL SUSPENSION

For **313** answers (99.1%) :
188 laboratories (59.5%) prepare the initial suspension with adding diluent to powder.
123 laboratories (38.9%) prepare the initial suspension with adding powder to diluent.
2 laboratories (0.6%) prepare the initial suspension in another way.

2.3. DILUENT USED FOR THE INITIAL SUSPENSION

For **312** answers (98.7%) :
278 laboratories (88.0%) use Buffered Peptone Water (or equivalent) for the initial suspension.
32 laboratories (10.1%) use Peptone salt for the initial suspension.
2 laboratories (0.6%) used another diluent for the initial suspension.

2.4. HOMOGENEIZATION TECHNIQUE

For **310** answers (98.1%) :
279 laboratories (88.3%) homogeneize their sampling with a StomacherND.
22 laboratories (7.0%) used a manual homogenization.
7 laboratories (2.2%) used a Vortex mixer.
2 laboratories (0.6%) used another technique.

2.5. RESUSCITATION'S CONDITIONS

2.5.1. DURATION

296 laboratories (93.7%) specified it.
The average duration is **26.6 min** with a standard deviation of 15.4 min.

2.5.2. TEMPERATURE

296 laboratories (93.7%) specified it.
The average temperature is **21.4°C** with a standard deviation of 3.4°C.

2.6. MICROORGANISM AT 30°C

301 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	ISO/NF EN ISO 4833-1 (+A1)	187
	AFNOR 3M-01/1-09/89	43
	NM ISO 4833-1	33
	AFNOR BIO-12/35-05/13	12
	ISO/NF EN ISO 4833-2 (+A1)	9
	Internal method	5
	XP V08-034	4
	AFNOR 3M-01/17-11/16	2
	NM ISO 4833-2	2
	Other	4
	+ Spiral metho	17
Culture medium	Plate Count Agar	224
	Neogen® Petrifilms®	46
	Plate Count Agar + Milk	17
	Tempo AC	12
	Other	1
Preparation	Home made	97
	Ready to use not pre-poured	137
	Ready to use, plate, film, card	65
Plating method	Surface	59
	Pour	225
	Transfer Tempo filler®	12
1st dilution retained	- 1	9
	- 2	10
	- 3	249
	- 4	22
	- 5	1
	1/400	4
	1/4000	3
Incubation temperature	30°C	296
	35-37°C	3
	25°C	1
	33°C	1
Incubation duration	68-72 h	252
	40-48 h	47
	85 h	1
	26 h	1

2.7. ENTEROBACTERIACEAE

275 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF V08-054	99
	→ *NM 08.0.109*[(1)]	14
	ISO/NF EN ISO 21528-2	70
	AFNOR 3M-01/6-09/97	48
	NM ISO 21528-2	18
	AFNOR BRD-07/24-11/13	8
	AFNOR AES-10/07-01/08	7
	AFNOR BIO-12/21-12/06	6
	Internal method	4
	Other	1
Culture medium	VRBG	201
	Neogen® Petrifilms®	50
	Rapid'Enterobacteriaceae	9
	Rebecca	8
	Tempo EB	6
	Other	1
Preparation	Home made	79
	Ready to use not pre-poured	135
	Ready to use, plate, film, card	60
1st dilution retained	- 1	65
	- 2	201
	- 3	3
	1/400	3
Incubation temperature	37°C	181
	30°C	86
	35°C	7
Incubation duration	20-25.5 h	271
	48 h	3
Confirmatory test	Yes	68
	No	202

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

2.8. TOTAL COLIFORMS

206 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF V08-050	102
	→ *NM 08.0.142*(2)	9
	ISO/NF ISO 4832	44
	NM ISO 4832	25
	AFNOR 3M	15
	AFNOR BRD-07/08-12/04	4
	AFNOR BIO-12/17-12/05	3
	Internal method	3
	AFNOR BIO-12/20-12/06	1
Culture medium	VRBL	180
	Neogen® Petrifilms®	16
	Rapid Ecoli 2	5
	Tempo TC	3
	Coli ID	2
Preparation	Home made	80
	Ready to use not pre-poured	107
	Ready to use, plate, film, card	19
1st dilution retained	-1	78
	-2	125
Incubation temperature	30°C	189
	35-37°C	16
Incubation duration	20-25 h	201
	48 h	4

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

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

2.9. THERMOTOLERANT COLIFORMS

181 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF V08-060	119
	→ *NM 08.0.124*(3)	32
	AFNOR 3M	16
	ISO/NF ISO 4832	9
	Internal method	2
	Other	2
Culture medium	VRBL	161
	Neogen® Petrifilms®	16
	Other	3
Preparation	Home made	73
	Ready to use not pre-poured	91
	Ready to use, plate, film, card	16
1st dilution retained	-1	136
	-2	43
Incubation temperature	42-44°C	177
	37°C	3
	30°C	1
Incubation duration	20-24 h	178
	48 h	2
	30 h	1

AFNOR 3M method including :

2 laboratories specified utilization of AFNOR 3M-01/02-09/89 C method.

1 laboratory specified utilization of AFNOR 3M-high sensitivity method.

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

2.10. ESCHERICHIA COLI

284 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	ISO/NF ISO 16649-2	163
	AFNOR 3M	42
	NM ISO 16649-2	28
	AFNOR BRD-07/01-07/93	10
	AFNOR BIO-12/13-02/05	10
	AFNOR AES-10/06-01/08	8
	NM 08.0.108	7
	AFNOR BRD-07/07-12/04	5
	Internal method	4
	AFNOR BIO-12/05-01/99	2
	ISO/NF EN ISO 16649-3	1
	Other	4
Culture medium	TBX	200
	Neogen® Petrifilms®	43
	Rapid E. coli 2	16
	Tempo EC	10
	Rebecca	9
	Coli ID	4
	Other	2
Preparation	Home made	78
	Ready to use not pre-poured	149
	Ready to use, plate, film, card	57
Plating method	Surface	42
	Pour	226
	Transfer Tempo filler®	11
1st dilution retained	-1	227
	-2	48
	1/40	1
	1/400	5
Incubation temperature	40-46°C	255
	37°C	27
	30°C	1
Incubation duration	18-25 h	279
	48 h	3
	37 h	1

2.11. ANAEROBIC SULFITE-REDUCING BACTERIA

212 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	NF V08-061	132
	→ *NM 08.0.125*[4]	16
	ISO/NF ISO 15213-1	45
	NM ISO 15213-1	13
	Internal method	4
	Other	2
Culture medium	TSC (with D-cycloserin)	162
	Iron Sulfite agar	37
	TSN	4
	Other	9
Preparation	Home made	70
	Ready to use not pre-poured	124
	Ready to use, plate, film, card	17
Seeding way	Plates	154
	Tubes	55
1st dilution retained	-1	142
	-2	63
	-3	3
Incubation temperature	44-48°C	147
	36-37°C	64
Incubation duration	14-24 h	167
	44-48 h	41
	72 h	3

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

2.12. CLOSTRIDIUM PERFRINGENS

186 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	ISO/NF ISO 15213-2	102
	ISO/NF EN ISO 7937* *(repealed)*	45
	NM ISO 15213-2	21
	NM ISO 7937* *(repealed)*	5
	Internal method	4
	NM 08.0.111	3
	Other	4
Culture medium	TSC (with D-cycloserin)	181
	Other	4
Preparation	Home made	55
	Ready to use not pre-poured	121
	Ready to use, plate, film, card	8
1st dilution retained	-1	146
	-2	38
	-3	1
Incubation temperature	36-37°C	178
	44-46°C	7
Incubation duration	18-24 h	178
	48 h	7
Confirmation test	None	37
	SIM agar	85
	Lactose-sulfite	37
	Acid phosphatase	8
	MALDI-TOF mass spectrometry	6
	Strip	1
	Other	5

*Comment: ISO 7937 methods have been repealed and replaced by ISO 15213-2 methods since November 2023.

2.13. COAGULASE POSITIVE STAPHYLOCOCCI

274 laboratories performed the enumeration.

Parameters	Mode	Nb laboratories
Method	ISO/NF EN ISO 6888-2 (+A1)	125
	ISO/NF EN ISO 6888-1 (+A1)	56
	AFNOR BKR-23/10-12/15	32
	NM ISO 6888-1	23
	AFNOR 3M-01/09-04/03	12
	AFNOR BIO-12/28-04/10	8
	NM ISO 6888-2	5
	Internal method	3
	NM 08.0.112	3
	NordVal No :049	2
	ISO/NF EN ISO 6888-3	1
	Other	4
Culture medium	RPF	133
	BP+egg yolk tellurite	70
	Easy Staph	36
	Neogen® Petrifilm®	13
	Tempo STA	8
	BP+egg yolk tellurite+ sulfamethazine	8
	Rapid Staph	3
	Other	3
Preparation	Home made	68
	Ready to use not pre-poured	125
	Ready to use, plate, film, cards	80
Plating method	Surface	126
	Pour	137
	Transfer Tempo filler®	8
1st dilution retained	-1	108
	-2	158
	-3	1
	1/400	4
Incubation temperature	35-37°C	272
	30°C	1
Incubation duration	44-49 h	177
	18-25 h	95
	32 h	1
Confirmation test	None	185
	Staphylo-coagulase	62
	Clumping factor	13
	DNase	6
	MALDI-TOF mass spectrometry	4

2.14. LISTERIA MONOCYTOGENES – ENUMERATION

221 laboratories performed the enumeration.

RESUSCITATION

70 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	ISO/NF EN ISO 11290-2	62
	AFNOR BKR-23/05-12/07	59
	AFNOR AES-10/05-09/06	50
	NM ISO 11290-2	22
	AFNOR BRD-07/05-09/01	18
	AFNOR BRD-07/17-01/09	7
	Other	3
Resuscitation medium	Buffered Peptone Water or equivalent	178
	Half-fraser	37
	Other	3
Enumeration medium	ALOA Count	97
	Compass Listeria	82
	Rapid Lmono	18
	AL Agar	16
	Palcam	3
	Brilliance Listeria	2
	OCLA	1
	Other	1
Preparation	Home made	35
	Ready to use not pre-poured	55
	Ready to use, plate, film, card	130
Plating method	Surface	172
	Pour	45

Parameters	Mode	Nb laboratories
1st dilution retained	-1	196
	-2	22
Incubation temperature	36-37°C	220
	30°C	1
Incubation duration	42-49 h	187
	21-24 h	34
Confirmation test	None	41
	Biochemical	127
	Biochemical + CAMP	34
	MALDI-TOF mass spectrometry	9
	Other	7
Nb of colonies tested per plate	1	52
	2-4	7
	5	105
	150	2

2.15. SALMONELLA – DETECTION

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

Parameter	Mode	Nb laboratories
Method	ISO/NF EN ISO 6579-1 (+A1)	75
	AFNOR BKR 23/07-10/11 (IRIS Salmonella)	70
	NM ISO 6579-1	36
	AFNOR BRD 07/11-12/05 (Rapid Salmonella)	28
	AFNOR BIO 12/32-10/11 (VIDAS SPT)	20
	AFNOR BIO 12/41-03/17 (SALMA One day)	14
	AFNOR BIO 12/16-09/05 (VIDAS Easy Salmonella)	13
	AFNOR BIO 12/01-04/94 (VIDAS SLM)	9
	AFNOR UNI 03/07-11/13 (PCR)	5
	AFNOR BIO 12/38-06/16 (GENE UP Salmonella)	4
	AFNOR UNI 03/06-12/07 (Salmonella precis)	3
	AFNOR BRD 07/06-07/04 (PCR)	3
	Internal method	2
	AFNOR NEO 35/01-10/11 (Reveal 2.0 Salmonella)	2
	AFNOR TRA 02/12-01/09 (Assurance GDS Salmonella Tq)	1
	AFNOR TRA 02/08-03/01 (TRANSIA PLATE Salmonella GOLD)	1
	Other	2

No detail of methodology was asked to laboratories using other methods than ISO/NF EN ISO 6579-1 (+A1) 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 supplement / 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 BIO 12/38-06/16 **GENE UP Salmonella**		BPW / 42°C – 18/24h	Lysis + PCR
AFNOR UNI 03/06-12/07 **Salmonella precis**		One broth-Salmonella / 42°C – 16/24h	Brilliance Salmonella / 37°C – 24±2h
AFNOR BRD 07/06-07/04 **PCR**		BPW / 37°C – 18/21h	Lysis + PCR
AFNOR NEO 35/01-10/11 **Reveal 2.0 Salmonella**	REVIVE / 37°C - 5±1h	REVIVE / 41.5°C – 18±2h	Antigen / Antibody reaction

Method	Pre-enrichment	Enrichment	Isolation
AFNOR TRA 02/12-01/09 **Assurance GDS for Salmonella Tq**		EPT / 37°C - 18/24h	Amplification + detection
AFNOR TRA 02/08-03/01 **TRANSIA PLATE Salmonella GOLD**	BPW / 37°C – 16/20h	RVS / 41.5°C – 18/24h	ELISA test
AFNOR QUA 18/03-11/02 **BAX SYSTEM PCR**		BPW / 37°C – 16/20h	Lysis + PCR

The detail of the methodology followed by 111 laboratories using ISO/NF EN ISO 6579-1 (+A1) and NM ISO 6579-1 methods, and the 4 laboratories using an internal or another method, is clarified in the following table :

Parameter	Mode	Nb laboratories
Method	ISO/NF EN ISO 6579-1 (+A1)	75
	NM ISO 6579-1	36
	Internal method	2
	Other	2
Pre-enrichment medium	None pre-enrichment	1
	Buffered Peptone Water	112
	Other	1
Pre-enrichment temperature	36-37°C	105
	41-42.5°C	8
	22°C	1
	30°C	1
Pre-enrichment duration	16-20 h	71
	22-24 h	44
Enrichment medium	None enrichment	3
	RVS	104
	MKTTn	102
	Selenite-cystine broth	24
	Other	2
Isolation medium	XLD	102
	Hektoen	28
	Bismuth Sulfate	27
	IRIS Salmonella agar	13
	GVB	12
	ASAP	11
	SS	9
	Rapid Salmonella	8
	Brilliance Salmonella	3
	Compass Salmonella	2
	Rambach	2
	Other	10
Confirmation test	Biochemical	41
	Biochemical + serological agglutination	61
	MALDI-TOF mass spectrometry	6
	Other	4

2.16. LISTERIA MONOCYTOGENES – DETECTION

260 laboratories performed the detection.

Parameter	Mode	Nb laboratories
Method	AFNOR BKR 23/02-11/02 (Compass L. mono)	64
	ISO/NF EN ISO 11290-1	58
	AFNOR AES 10/03-09/00 (ALOA one day)	45
	NM ISO 11290-1	26
	AFNOR BRD 07/04-09/98 (Rapid' L. mono)	15
	AFNOR BRD 07/16-01/09 (Agar Listeria)	14
	AFNOR BIO 12/11-03/04 (VIDAS LMO2-37°C)	7
	AFNOR BIO 12/27-02/10 (VIDAS LMX)	7
	AFNOR BIO 12/40-11/16 (GENE UP LMO)	4
	AFNOR UNI 03/04-04/05 (Listeria Precis)	4
	AFNOR BIO 12/18-03/06 (VIDAS LDUO)	3
	AFNOR UNI 03/08-11/13 (PCR)	3
	AFNOR BRD 07/10-04/05 (IQ Check Listeria)	3
	AFNOR BIO 12/02-06/94 (VIDAS LIS)	2
	AOAC 070702 (Assurance® GDS for *Listeria monocytogenes*)	1
	Internal method	1
	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 BKR 23/02-11/02 **Compass L. mono**	Half-Fraser	30°C - 24±2h			Compass Listeria Agar 37°C – 24h
AFNOR AES 10/03-09/00 **ALOA one day**	Half-Fraser	30°C - 24±2h			ALOA One Day 37°C – 24/48h
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 12/40-11/16 **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
AFNOR BIO 12/18-03/06 **VIDAS LDUO**	LX	30°C - 24±2h	LX	30°C - 24/26h	Chromogenic medium / Palcam / Oxford
AFNOR UNI 03/08-11/13 **PCR**	LEB	37°C - 24/28h			Lysis + PCR
AFNOR BRD 07/10-04/05 **IQ Check Listeria**	Half-Fraser / LSB	30°C – 23/25h			Lysis + PCR

Méthod	Primary enrichment		Secondary enrichment		Isolation
	Medium	Incubation	Medium	Incubation	
AFNOR BIO 12/02-06/94 **VIDAS LIS**	Half-Fraser	30°C – 20-26h	Fraser	30°C - 20/26h	Chromogenic medium / Palcam / Oxford
AOAC 070702 **Assurance GDS for Listeria monocytogenes**	Fraser 1/2	30°C – 22/26h			Amplification + detection

The detail of the methodology followed by 84 laboratories using NF ISO/EN ISO 11290-1 and NM ISO 11290-1 methods, and the 4 laboratories using an internal or another method, is clarified in the following table :

Parameter	Mode	Nb laboratories
Method	ISO/NF EN ISO 11290-1	58
	NM ISO 11290-1	26
	Internal method	1
	Other	3
Primary enrichment medium	None primary enrichment	1
	Half-Fraser	82
	One Broth Listeria	1
	Other	4
Primary enrichment temperature	30°C	78
	37°C	10
Primary enrichment duration	18-26 h	86
	48 h	1
Secondary enrichment medium	None secondary enrichment	8
	Fraser	80
Secondary enrichment temperature	37±1°C	75
	27-30°C	6
Secondary enrichment duration	20-25 h	68
	48 h	12
	34 h	1
Isolation medium	Palcam	59
	Ottaviani et Agosti	46
	Compass Listeria	30
	Oxford	16
	Rapid L'mono	5
	Brilliance Listeria	2
	Other	1
Isolation temperature	36-37°C	86
	30°C	1
Isolation duration	45-48 h	51
	21-24 h	36

Parameter	Mode	Nb laboratories
Confirmation test	None	8
	Biochemical	50
	Biochemical + CAMP	26
	MALDI-TOF mass spectrometry	4
	Other	1
Nb of colonies per plate	1	23
	2-3	5
	5	48

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 is used to assess the trueness, the reference standard deviation is used for the assessment of the precision ; those are consensual values obtained with the results of all the participants. These values are obtained by robust estimation methods 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 x 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.

***Note** : Due to the transport issues encountered during the RAEMA 82 scheme, the selection criteria for the laboratories chosen for the calculation of the assigned values have been broadened. Laboratories that received their samples more than 4 days after dispatch and carried out the analyses up to 13 days after the initial dispatch have been included. In accordance with our quality system, an internal exemption has been granted.*

A statistical analysis has also been 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, dilution) 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 NF 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 NF 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 NF 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.
The assigned value uncertainty is calculated with the following formula :

$$u(Xpt) = 1{,}25 \times \frac{\sigma pt}{\sqrt{p}}$$

with σ_{pt}, robust standard deviation (standard deviation for proficiency assessment) and p, number of laboratories.

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 NF ISO 13528 specifies that:
- $|z| \leq 2{,}0$ is considered as satisfactory (acceptable),
- $2{,}0 < |z| < 3{,}0$ is considered as a warning signal,
- $|z| \geq 3{,}0$ is considered as an action signal (or not acceptable).

The ranges of concentrations values expected to be satisfactory are mentioned in this report for each of the flora proposed for enumeration.

In this report, we also 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

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 :

Microorganisms at 30°C	
Assigned value of the contamination (log cfu/g)	5.180
Assigned value uncertainty (log cfu/g)	0.0057
Standard deviation for proficiency assessment (log cfu/g)	0.0764
Range of expected satisfactory values (log cfu/g)	[5.028 ;5.333]
Standard deviation for precision (log cfu/g)	0.0502
Interlaboratory’s standard deviation (log cfu/g)	0.0730
Reproducibility standard deviation (log cfu/g)	0.0886

3.1.2. ENTEROBACTERIACEAE

A significant “effect” of the manufacturer of the diluent, the manufacturer of the culture medium, the culture medium, 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 (30 laboratories)	Group 2 (225 laboratories)
Assigned value of the contamination (log cfu/g)	3.269	3.621
Assigned value uncertainty (log cfu/g)	0.0575	0.0188
Standard deviation for proficiency assessment (log cfu/g)	0.2520	0.2259
Range of expected satisfactory values (log cfu/g)	[2.765 ; 3.773]	[3.169 ; 4.073]
Standard deviation for precision (log cfu/g)	0.0687	
Interlaboratory’s standard deviation (log cfu/g)	0.2501	0.2238
Reproducibility standard deviation (log cfu/g)	0.2594	0.2341

3.1.3. TOTAL COLIFORMS

A significant "effect" of the manufacturer of the diluent, the method, the culture medium, the manufacturer of the culture medium, the preparation of the culture medium 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 :

Total coliforms	
Assigned value of the contamination (log cfu/g)	3.470
Assigned value uncertainty (log cfu/g)	0.0258
Standard deviation for proficiency assessment (log cfu/g)	0.2802
Range of expected satisfactory values (log cfu/g)	[2.909 ; 4.030]
Standard deviation for precision (log cfu/g)	0.0724
Interlaboratory's standard deviation (log cfu/g)	0.2783
Reproducibility standard deviation (log cfu/g)	0.2876

3.1.4. THERMOTOLERANT COLIFORMS

A significant "effect" of the manufacturer of the diluent, the method, the culture medium, the manufacturer of the culture medium 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 :

Thermotolerant coliforms	Group 1 (19 laboratories)	Group 2 (121 laboratories)	Group 3 (20 laboratories)
Assigned value of the contamination (log cfu/g)	2.797	3.049	3.329
Assigned value uncertainty (log cfu/g)	0.0513	0.0280	0.0509
Standard deviation for proficiency assessment (log cfu/g)	0.1788	0.2461	0.1822
Range of expected satisfactory values (log cfu/g)	[2.440 ; 3.155]	[2.556 ; 3.541]	[2.964 ; 3.693]
Standard deviation for precision (log cfu/g)	0.0901		
Interlaboratory's standard deviation (log cfu/g)	0.1742	0.2428	0.1777
Reproducibility standard deviation (log cfu/g)	0.1962	0.2590	0.1993

3.1.5. *ESCHERICHIA COLI*

A significant "effect" of the manufacturer of the diluent, the method, the culture medium, the manufacturer of the culture medium, the plating method, the incubation temperature 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 :

Escherichia coli	
Assigned value of the contamination (log cfu/g)	2.970
Assigned value uncertainty (log cfu/g)	0.0152
Standard deviation for proficiency assessment (log cfu/g)	0.1953
Range of expected satisfactory values (log cfu/g)	[2.579 ; 3.360]
Standard deviation for precision (log cfu/g)	0.0720
Interlaboratory's standard deviation (log cfu/g)	0.1926
Reproducibility standard deviation (log cfu/g)	0.2056

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3.1.6. ANAEROBIC SULFITE-REDUCING BACTERIA

Only units n°2, 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)	2.805
Assigned value uncertainty (log cfu/g)	0.0153
Standard deviation for proficiency assessment (log cfu/g)	0.1694
Range of expected satisfactory values (log cfu/g)	[2.466 ; 3.144]
Standard deviation for precision (log cfu/g)	0.0925
Interlaboratory’s standard deviation (log cfu/g)	0.1630
Reproducibility standard deviation (log cfu/g)	0.1874

Comment :
- 8 laboratories detected ASR in unit n°1 non-artificially contaminated by *C. perfringens* with a contamination level from 100 to 5000 cfu/g.

3.1.7. *CLOSTRIDIUM PERFRINGENS*

Only units n°2, 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)	2.789
Assigned value uncertainty (log cfu/g)	0.0158
Standard deviation for proficiency assessment (log cfu/g)	0.1620
Range of expected satisfactory values (log cfu/g)	[2.465 ; 3.113]
Standard deviation for precision (log cfu/g)	0.0781
Interlaboratory’s standard deviation (log cfu/g)	0.1572
Reproducibility standard deviation (log cfu/g)	0.1755

Comment :
- 6 laboratories detected *C. perfringens* in unit n°1 non-artificially contaminated by *C. perfringens* with a contamination level from 180 to 910 cfu/g.

3.1.8. COAGULASE POSITIVE STAPHYLOCOCCI

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 :

Coagulase positive Staphylococci	
Assigned value of the contamination (log cfu/g)	3.566
Assigned value uncertainty (log cfu/g)	0.0117
Standard deviation for proficiency assessment (log cfu/g)	0.1488
Range of expected satisfactory values (log cfu/g)	[3.268 ; 3.864]
Standard deviation for precision (log cfu/g)	0.0706
Interlaboratory’s standard deviation (log cfu/g)	0.1454
Reproducibility standard deviation (log cfu/g)	0.1617

3.1.9. *LISTERIA MONOCYTOGENES*

Only units n°3 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)	3.141
Assigned value uncertainty (log cfu/g)	0.0087
Standard deviation for proficiency assessment (log cfu/g)	0.1008
Range of expected satisfactory values (log cfu/g)	[2.939 ; 3.342]
Standard deviation for precision (log cfu/g)	0.0654
Interlaboratory’s standard deviation (log cfu/g)	0.0895
Reproducibility standard deviation (log cfu/g)	0.1109

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

3.2.2. DETECTION – *LISTERIA MONOCYTOGENES*

Only units n°3 and 5 were artificially contaminated.
254 laboratories obtained correct results.
6 laboratories obtained false positive results (respectively 3, 4 and 3 false-positive for units n°1, 2 and 4).
3 laboratories obtained false negative results (respectively 3 and 1 false-negative for units n°3 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 62th scheme.

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