iQ-Check™ Legionella spp. for detection and quantification of Legionella spp in all types of water

Summary report
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*Competencies of the laboratory are certified by COFRAC accreditation for the analysis marked with the symbol**

Foreword

***Studied method**:*
iQ-Check™ *Legionella* spp.

Validation standard
Validation protocol for commercial methods of detection and quantification of *Legionella* and *Legionella pneumophila* by concentration and gene amplification by polymerase chain reaction (PCR) V3.0

Reference method*
NF T90-471 (June 2015): Water quality- Detection and quantification of *Legionella* and/or *Legionella pneumophila* by concentration and genic amplification by real time polymerase chain reaction (qPCR)
ISO/TS 12869 (April 2019)**:** Water quality - Detection and quantification of *Legionella* spp. and/or *Legionella pneumophila* by concentration and genic amplification by quantitative polymerase chain reaction (qPCR)

Scope
All types of water

Certification body
AFNOR Certification (https://nf-validation.afnor.org/en/)

1 Introduction

iQ-Check™ *Legionella* spp. and iQ-Check™ *Legionella* pneumophila kits were validated in 2007. Then, they were renewed in 2011, 2015, 2019 and extended in 2012 and 2020.

In 2025, Bio-Rad extend the use of this method on their new CFX Duet Real-Time PCR System.

2 Review of changes in the alternative method since the previous validation

2.1 History of validation

2007:

- ❖ The method was initially validated in 2007.

2011:

- ❖ 2010/211 study for renewal of validation considered the modifications of validated kit and of validation protocol (renewal n°1 considering norm NF T90-471 published in April 2010).
- ❖ A third-party study has focused on two first phases of validation protocol aiming to verify supplier announced performances for new formulation of iQ-Check™ *Legionella* spp. kit:
  - Phase 1: Study of limit of detection and limit of quantification of PCR step, calibrating function, link to primary standard, efficiency and robustness of extraction with Aquadien™ kit. New thermal cycler CFX 96 was implemented.
  - Phase 2: Study of inclusivity and of exclusivity, of practicability and of reagents quality.
- ❖ Interlaboratory study realized in 2007 was not made again
- ❖ New modification from initial validation was:
  - iQ-Check™ *Legionella* spp. kit: New origin of Taq polymerase and chemical evolution of IPC probe (TEXAS RED fluorophore was replaced by HEX fluorophore)
  - Aquadien Kit: two modalities of utilization according to sample filterability (protocol W2 for clogging samples added to classical protocol) and horizontal double- tangential microfiltration for DNA purification step. Membranes and materials composition do not change.
  - New thermal cycler can be used: CFX96 with CFX Manager Software Industrial Diagnostic Edition version V1.1.

2012:

- Validation extension was pronounced in 2012 after evolution of characteristics of thermal cycler CFX96 which becomes CFX96 Deepwell Touch. Modifications concern reactional volume of heating block, user interface (keyboard and screen), and software CFX Manager which pass in version V1.2
- AFNOR Certification Technical office qualified theses evolutions as minority and without impact on kit performance. No new assays were performed.

2013:

- **Late May 2013**: Validation of iQ-Check™ *Legionella* spp. method was extended to norm ISO/TS 12869. No study complement was necessary: Assays performed according to norm NF T90-471 answers to requirements of ISO/TS 12869 and follow migration to revision 2 of validation protocol.
- **November 2013:** Evolution of software CFX manager IDE v2.1. No study complement was necessary**.**

2015:

- **March 2015**: Evolution of software CFX manager IDE v2.2. No study complement was necessary.
- **October 2015**: Renewal of iQ-Check™ *Legionella* spp. method with extension on detection (qualitative research) of *Legionella* spp. without supplementary test. AFNOR Certification Technical office qualified this evolution without impact on kit performance. No new assays were performed**.**

2018:

- **June 2018:** Evolution of the CFX manager IDE v3.0 software version. No further validation studies were required

2019:

- **December 2019:** Renewal of iQ-Check™ *Legionella* spp. method. No new assays were performed.

2020:

- **December 2020:** Extension of iQ-Check™ *Legionella* spp. methods. Modifications of the protocols of DNA extraction with Aquadien™ kit. The extension of the iQ-Check™ *Legionella* only concerned the study of the yield and robustness.

2023:

- **June 2023:** Extension of iQ-Check™ *Legionella* spp. methods. Extension of the use of this method on their new CFX Opus real-time PCR systems. The extension of the iQ-Check™ *Legionella* only concerned a verification of the performances of the calibration function of the new thermal cycler in comparison with the previously validated thermal cycler and evolution of the "CFX Manager Industrial Diagnostic Edition" software from version V3.0 to version V3.1. All the thermal cyclers validated can be used with this version of the software. Demonstration of the ability to save the calibration curve generated by a batch for reuse it until the expiration date of the batch

2025:

- **June 2025:** Extension of iQ-Check™ *Legionella* spp. and *Legionella pneumophila* methods. Extension of the use of this method on their new CFX Duet Real-Time PCR System. An internal study was carried out by the supplier Bio-Rad.

The validation history is summarized in the following table:

Method	Date of approval	Type of validation	comments	Expert laboratory	Protocol of validation
iQ-Check™ *Legionella* spp.	18/12/2007	Validation		IPL SED Nord	Rev. 0 (2006)
	10/06/2011	Renewal 1	Evolution of mix PCR 2 extraction modalities (protocol W2) Update according to the version 1 protocol	IPL SED Nord	Rev. 1 (2011)
	04/04/2012	Extension 1	New thermal cycler (Deepwell touch)	Eurofins IPL Nord	Rev. 1 (2011)
	27/05/2013	Extension 2	Protocol of validation V.2	NA	Rev. 2 (2013)
	05/11/2013	Modification	Software V2.1	NA	Rev. 2 (2013)
	09/03/2015	Modification	Software V2.2	NA	Rev. 2 (2013)
	18/12/2015	Renewal 2	The modifications between the version 2.0 and 3.0 of the AFNOR validation protocol relates to the positivity threshold (quantitative detection). There was no additional study.	AdGène (with extension on qualitative test)	Rev. 3 (2015)
	June 2018		Software V3.0		
	Dec. 2019	Renewal 3	There was no additional study.	AdGène	Rev. 3 (2015)
	2020	Extension 3	Evolution of DNA extraction kit Aquadien™ protocols: short protocols & Free DNA Removal Solution protocol (FDRS protocol)	AdGène	Rev. 3 (2015)
	2023	Renewal 4 and Extension 4	New thermal cyclers (CFX Opus 96 and CFX Opus Deepwell) Software V3.1 – Saving of the calibration curve	Upscience	Rev. 3 (2015)
	2025	Extension 5	New thermal cycler CFX Duet Real-Time PCR System (internal study carried out by the supplier Bio-Rad)	NA	Rev. 3 (2015)

2.2 Review of changes in the alternative method

The validation protocol is identical to that of the last renewal.

Changes to the alternative method : none
This extension study is due to the release of the new CFX Duet Real-Time PCR System thermal cycler. The thermal cycler uses the same Peltier heating block, software for interpreting results, and the same thermal profile as Bio-Rad's OPUS line. For this extension, supplier Bio-Rad presented internal data* and demonstrated that this modification had no impact on the performance or results of the certified alternative methods concerned. Indeed, all results obtained met the defined acceptability criteria.

*These data are available from the manufacturer Bio-Rad.

2.3 Review of user complaints about the method

No user customer claims have been registered by AFNOR Certification.

3 Methods protocols

3.1 Principe of alternative method

iQ-Check™ *Legionella* spp. kit is intended to detect or to quantify bacteria genus *Legionella* in water sample, due to Polymerase Chain Reaction (PCR). PCR allows amplification and detection of specific sequences with specific primers and fluorescent probe.

Principle is based on three steps:

- Sample filtration
- DNA extraction with Aquadien™ kit (and W2 protocol for clogging samples and Free DNA Removal Solution protocol (FDRS)).
- *Legionella* spp. target sequences amplification.

DNA extraction with Aquadien kit is based on alkaline lysis with thermal shock. It is followed by an ultrafiltration purification step. A DNA fraction is amplified by real-time PCR (Amplification of a virulence gene (*mip*) for *L. pneumophila* and a structural gene (rRNA5S) for L. spp.).

Primers hybridize to target sequence during PCR reaction. Taq polymerase uses primers and nucleosides triphosphate (dNTPs) to stretch DNA and to create copies of *Legionella* spp. target DNA.

Specific probe hybridizes to amplicons during PCR. This probe is labelled with a fluorophore which emit fluorescence only after hybridization. Fluorescence intensity increases proportionally with increasing of PCR products.

Fluorescence is directly measured by optical machinery of the thermal cycler during hybridization step. Thermal cycler software manages in real-time the measured fluorescence function of number of amplification cycles. Software determines a Ct (cycle from which fluorescence is higher than background signal). Reading Ct permits to detect presence of *Legionella* spp. target sequences. Detection of target sequences indicates presence of the bacteria in analyzed water sample.
Quantification is possible by using calibrated DNA solutions iQ-Check™ *Legionella* Quantification Standards. These standards are connected to the primary standard of Centre National de Référence des Légionelles.
PCR inhibition phenomenon is detected by utilization of a synthetic DNA (internal control – IPC) included in amplification solution with each sample. IPC is amplified during same time than target sequences, with same primers but with a different probe and a different fluorophore.

iQ-Check™ *Legionella* spp. kits are validated with the following materials:

Software	Opticon Monitor 3.4	CFX manager Software Industrial Diagnostic Edition V2.2	CFX manager Software Industrial Diagnostic Edition V3.0	CFX manager Software Industrial Diagnostic Edition V3.1
Thermal cyclers	Chromo4	CFX96	CFX96 CFX96 Deepwell	CFX96 CFX96 Deepwell CFX Opus 96 CFX Opus Deepwell CFX Duet

3.2 Protocol references

Aquadien™ (Ref. 3578121): 12/2015 – Code : 881116
iQ-Check™ *Legionella* spp. (Ref. 3578102): 12/2015 – Code : 881117

3.3 Restrictions

The kit certification is for use with Bio-Rad Chromo™4; CFX96; CFX96 Deepwell; CFX Opus 96, CFX Opus Deepwell and CFX Duet thermal cyclers.

3.4 Reference method*

- **NF T90-471 (June 2015):** Water quality- Detection and quantification of *Legionella* and/or *Legionella pneumophila* by concentration and genic amplification by real time polymerase chain reaction (qPCR)

- **ISO/TS 12869 (April 2019):** Water quality - Detection and quantification of *Legionella* spp. and/or *Legionella pneumophila* by concentration and genic amplification by quantitative polymerase chain reaction (qPCR)

- Validation protocol for commercial methods of detection and quantification of *Legionella* and *Legionella pneumophila* by concentration and gene amplification by polymerase chain reaction (PCR) V3.0

4 Summary of results

The results presented below were obtained with the V1.0, V2.0 and the V3.0 revisions of the validation protocol for commercial methods of detection and quantification of *Legionella* and *Legionella pneumophila* by concentration and gene amplification by polymerase chain reaction (PCR).

4.1 Comparative study

4.1.1 Fitting the calibration and the reference material to the primary standard*

*These results have been obtained by the laboratory **IPL SED Nord (2011)**.*

- **Methodology**

Linking of working calibration solution to primary standard is made to cover the quantification domain with 3 ranges of calibrated DNA iQ-Check™ *Legionella* spp. which contain 4 levels of concentrations of Genome Units of *Legionella pneumophila* serogroup (QS1, QS2, QS3, QS4) and 3 independent ranges of primary standard aiming at the 4 levels of concentrations of range of calibrated DNA iQ-Check™ *Legionella* Quantification Standards.

Linking of reference material to primary standard is evaluated analysing results of 2 deposits of reference material given with iQ-Check™ *Legionella* spp. kit.

- **Results**

Analysed parameters for evaluation of linking of calibration solution and of reference material to primary standard on thermal cycler **CFX96** and **Chromo 4** are submitted in next table.

	Regression curve	Correlation	Efficiency (%)
Reference range (CFX96)	C(t) average = -3,198.log(x) + 39,076	0,998	105,5
Reference range (Chromo 4)	C(t) average = -2,891.log(x) + 38,674	0,995	121,75

Calibration solution	Calibration error			
	QS1	QS2	QS3	QS4
Per level (CFX96)	0,07	0,20	0,14	0,07
Per level (Chromo 4)	0,03	0,30	0,23	0,16
Average (CFX96)	0,12			
Average (Chromo 4)	0,18*			
Slopes equivalence (CFX96)	0,00			
Slopes equivalence (Chromo 4)	0,13			

Reference material	Calibration error
CFX96	0,19
Chromo 4	0,19

* Calibration error of calibration solution is 0.18log with thermal cycler Chromo4. However, equivalence of slopes from reference range and calibration solution range is verified.

Calibration error of calibration solution is lower than 0.15log. Slopes from reference range and calibration solution range are equivalent.

The raw data are presented in Appendix 1.

- **Conclusion**

Calibration solution and reference material of iQ-Check™ *Legionella* spp. kit satisfy conditions of linking to primary standard with thermal cycler CFX96.

Calibration solution globally satisfies conditions of linking to primary standard with thermal cycler Chromo 4. Reference material of iQ-Check™ *Legionella* spp. kit satisfies conditions of linking to primary standard with thermal cycler Chromo 4.

4.1.2 Study of the calibration function of the quantitative PCR step*

*These results have been obtained by the laboratory **IPL SED Nord (2011)** and by the laboratory **Upscience (2023).***

- **Methodology**

Study of calibration function is made deposit 5 different reference ranges of calibrated DNA solution iQ-Check™ *Legionella* Quantification Standards (comprising 4 levels of concentration of Genome Units of *Legionella pneumophila*), given with iQ-Check™ *Legionella* spp. kit.

5 measures are made with iQ-Check™ *Legionella* spp. kit for each level of concentration in reproducibility conditions.

- **Results obtained by the laboratory IPL SED Nord (2011)**

Equation of regression curve and efficiency of PCR reaction are defined in these conditions. Results are obtained on **CFX96**.

	QS1	QS2	QS3	QS4
Bias	0,06	-0,10	0,00	0,04
Standard deviation	0,12	0,06	0,08	0,05
Exactitude of linearity	0,13	0,12	0,08	0,07
Uncertainty of linearity	0,42	0,37	0,27	0,22

Regression curve	-3,197.log(x) + 41,347
Efficiency	105,5%
r^2	0,998

- **Results obtained by the laboratory Upscience (2023)**

Results of the comparison obtained on **CFX96** and **CFX Opus 96 :**

CFX96				
	QS1	QS2	QS3	QS4
Bias	0,09	0,10	0,10	0,11
Standard deviation	0,06	0,02	0,02	0,03
Exactitude of linearity	0,11	0,10	0,10	0,11
Uncertainty of linearity	0,31	0,28	0,29	0,32

Regression curve	-3,098.log(x) + 38,859
Efficiency	110,3%
r^2	0,993

CFX Opus 96				
	QS1	QS2	QS3	QS4
Bias	0,00	0,03	0,05	0,02
Standard deviation	0,03	0,01	0,01	0,08
Exactitude of linearity	0,03	0,03	0,05	0,08
Uncertainty of linearity	0,09	0,09	0,13	0,23

Regression curve	-3,048.log(x) + 38,67
Efficiency	112,9%
r^2	0,999

Results of the comparison obtained on **CFX96 Deepwell** and **CFX Opus Deepwell :**

CFX96 Deepwell				
	QS1	QS2	QS3	QS4
Bias	0,07	0,01	0,06	0,03
Standard deviation	0,07	0,11	0,05	0,05
Exactitude of linearity	0,10	0,11	0,08	0,06
Uncertainty of linearity	0,28	0,32	0,21	0,17

Regression curve	-3,052.log(x) + 39,237
Efficiency	112,6%
r^2	0,999

CFX Opus Deepwell				
	QS1	QS2	QS3	QS4
Bias	0,09	0,07	0,05	0,06
Standard deviation	0,04	0,12	0,02	0,04
Exactitude of linearity	0,09	0,14	0,06	0,07
Uncertainty of linearity	0,26	0,38	0,16	0,20

Regression curve	-2,968.log(x) + 39,62
Efficiency	117,2%
r^2	0,998

The raw data are presented in Appendix 2.

- **Conclusion**

Linear regression satisfies exigence of exactitude lower than 0.15log for each level of reference range for the CFX 96; CFX 96 Opus; CFX96 Deepwell and CFX Opus Deepwell thermal cyclers. Linearity is verified on the whole domain cover by the range of calibrated DNA solution iQ-Check™ *Legionella* Quantification Standards given with iQ-Check™ *Legionella* spp. kit.

- **Complementary study – Save of the calibration curve**

In 2023, Bio-Rad wishes to demonstrate the ability to save the calibration curve generated by a batch for reuse it until the expiration date of the batch. For that, calibration curve is analysed with the 4 levels of concentration (QS1; QS2; QS3; QS4) before to save this generated curve. Then, the QS2 point was analysed over several weeks to verify conformity.

Calibration curve				
Nom	QS1	QS2	QS3	QS4
Copy number (log)	1,28	2,59	3,59	4,59
CFX 96	34,90	31,08	28,00	24,15
	34,59	31,03	27,93	24,19
CFX Opus 96	34,94	30,75	27,60	24,26
	34,33	30,92	27,61	24,34

CFX 96					
QS2 =		390 copies (Log : 2,59)			
Date	Point	CT	Copy number	Log copy number	Deviation theoretical value (Log)
15/05/2023	QS2	30,47	510	2,71	0.12
		30,62	457	2,66	0.07
23/05/2023	QS2	30,48	507	2,70	0.11
		30,48	507	2,70	0.11
26/05/2023	QS2	31,06	329	2,52	-0.07
		31,02	339	2,53	-0.06
30/05/2023	QS2	31,02	339	2,53	-0.06
		31,07	327	2,51	-0.08

CFX Opus 96					
QS2 =		390 copies (Log : 2,59)			
Date	Point	CT	Copy number	Log copy number	Deviation theoretical value(Log)
15/05/2023	QS2	30,83	373	2,57	-0.02
		30,85	368	2,57	-0.02
23/05/2023	QS2	30,73	403	2,60	0.01
		30,73	403	2,60	0.01
26/05/2023	QS2	31,23	276	2,44	-0.15
		31,25	272	2,43	-0.16
30/05/2023	QS2	31,17	289	2,46	-0.13
		31,19	284	2,45	-0.14

The calculated quantity of the QS is within ±0.3 log of the theorical value. The results of the save of the calibration curve are satisfactory.

As the curve recall has already been validated on the CFX96 and CFX Opus 96. The CFX96 Deepwell and CFX Opus Deepwell instruments having the same characteristics, *de facto*, this curve recall is also validated for the last two instruments.

4.1.3 Limit of detection*

*These results have been obtained by the laboratory **IPL SED Nord (2011)**.*

- **Methodology**

Evaluation of limit of detection is made from 30 independent dilutions of *Legionella pneumophila* DNA in concentration of 5GU per PCR reaction. Duplicate amplifications are made in repeatability conditions. Results are obtained on **CFX96**.

- **Results**

Echantillons à la concentration 5UG

Sample	C(t)	I.C. C(t)	SQ
e1	37,88	33,12	6,445
e1	37,73	33,12	7,232
e2	39,38	36,36	1,982
e2	38,41	34,8	4,257
e3	37,65	34,56	7,690
e3	38,19	34,14	5,046
e4	37,92	34,09	6,237
e4	38,12	34,01	5,328
e5	38,25	32,97	4,826
e5	37,77	33,71	7,028
e6	38,99	35,71	2,685
e6	38,34	34,12	4,496
e7	38,1	34,39	5,432
e7	38,02	34,24	5,775
e8	39,21	34,53	2,268
e8	37,86	34,21	6,526
e9	37,39	32,78	9,424
e9	37,82	33,79	6,734
e10	41,57	39,12	0,356
e10	37,97	34,42	5,989
e11	38,9	34,49	2,887
e11	38,13	34,04	5,271
e12	38,93	34,35	2,816
e12	37,85	34,08	6,557
e13	37,15	32,87	11,400
e13	38,08	34,53	5,489
e14	38,19	34,68	5,041
e14	38,56	34,31	3,786
e15	37,91	34,44	6,301
e15	38,43	34,93	4,193
e16	38,04	34,35	5,667
e16	37,42	34,07	9,195
e17	37,32	32,73	9,950
e17	38,47	35,11	4,058
e18	40,81	37,79	0,645
e18	38,08	34,36	5,515
e19	37,78	34,27	6,964
e19	37,9	34,15	6,307
e20	38,16	34,63	5,147
e20	39,2	34,48	2,280
e21	37,28	33,31	10,260
e21	41,82	35,38	0,293
e22	39,31	35,69	2,096
e22	37,61	33,71	7,956
e23	37,95	34,28	6,091
e23	38,17	34,39	5,128
e24	38,14	34,38	5,261
e24	37,92	34,65	6,214
e25	37,33	33,41	9,875
e25	37,47	33,94	8,870
e26	37,84	34,55	6,629
e26	37,97	34,48	5,997
e27	38,04	34,37	5,654
e27	37,53	34,6	8,487
e28	38,98	34,64	2,712
e28	38,15	34,36	5,218
e29	37,74	33,16	7,195
e29	41,52	39	0,372
e30	38,16	34,32	5,146
e30	38,22	34,72	4,908

The raw data are presented in Appendix 3.

- **Conclusion**

The 30 duplicates are positives. Limit of detection is validated for 5 GU per PCR reaction.
The majority of Ct in previous table are lower than intercept and the rare values above do not impact the compliance of the detection limit at 5 GU per PCR. Qualitative detection is conforming.

4.1.4 Limit of quantification*

*These results have been obtained by the laboratory **IPL SED Nord (2011)**.*

- **Methodology**

Evaluation of limit of quantification is made from 30 independent dilutions of *Legionella pneumophila* DNA in concentration of 15GU per PCR reaction. Duplicate amplifications are made in repeatability conditions. Results are obtained on **CFX96**.

- **Results**

	Results	Theoretical values or validation criteria
Average x' (Log GU/reaction)	1,309	1,279
Standard deviation (Log GU/ reaction)	0,097	
Bias	0,030	
LQ Exactitude	0,101	0,15
LQ Uncertainty	0,207	

The raw data are presented in Appendix 4.

- **Conclusion**

Value of exactitude of limit of quantification is estimated at 0.101 log. This value is lower than 0.15 log. Limit of quantification is validated for 15 GU per PCR reaction for iQ-Check™ *Legionella* spp. kit.

4.1.5 Positivity threshold

*These results have been obtained by the laboratory **IPL SED Nord (2011)**.*

User manual foresees a Ct of 43 hereafter whose samples are considered as lower than the limit of detection.

All values for characterisation of limit of detection have Ct lower than 43. This value corresponds to the positivity threshold lower than limit of detection.

4.1.6 Study of the yield and robustness*

*Results for Aquadien™ and Aquadien W2 (for clogging waters) protocols have been obtained by the laboratory **IPL SED Nord** in **2011**. Results for Aquadien™; Aquadien W2; and FDRS short protocols have been obtained in **2020** by the laboratory **AdGène**.*

- **Methodology**

Studies of extraction efficiency were realized with extraction kit Aquadien™ in classical and short protocols. Efficiency was evaluated on 10 independent samples, which were artificially contaminated with two levels of concentrations of *Legionella pneumophila* ATCC 33152 (1000 and 100 000 GU / PCR reaction). Samples were 3 different matrices: sterile water, domestic hot water and water from air cooling-tower.

Samples were artificially contaminated by primary bacterial suspension. The concentration was determined by 3 quantifications after an extraction step of DNA by direct lysis on 3 aliquots. Results are obtained on **CFX96**.

- **Results**

YIELD					
		Aquadien Protocol		Aquadien W2 Protocol	
		Log	Average	Log	Average
Domestic hot water	1000 GU/L	-0,29 -0,39	-0,34	-0,16 -0,45	- 0,30
Water from air cooling-tower	100 000 GU/L	-0,09 -0,31	-0,20	-0,45 -0,47	- 0,46
Mineral water	1000 GU/L	-0,25 -0,42	-0,33	-0,55 -0,46	- 0,50
Average efficiency (log)		-0,29		-0,41	
Variance (log)		0,04		0,03	
Global extended uncertainty (log)		0,71		0,89	

		YIELD					
		Aquadien Short Protocol		Aquadien W2 Short Protocol		Aquadien FDRS Short Protocol	
		Log	Average	Log	Average	Log	Average
Domestic hot water	1000 GU/L 100 000 GU/L	-0.37 -0.30	-0.34	-0.26 -0.23	-0.24	-0.30 -0.22	-0.26
Water from cooling-tower	1000 GU/L 100 000 GU/L	-0.37 -0.28	-0.32	-0.37 -0.35	-0.36	-0.35 -0.35	-0.35
Mineral water	1000 GU/L 100 000 GU/L	-0.40 -0.28	-0.34	-0.38 -0.36	-0.37	-0.34 -0.31	-0.32
Average yield (log)		-0.33		-0.32		-0.31	
Variance (log)		0.01		0.02		0.01	
Global extended uncertainty (log)		0.71		0.69		0.66	

The raw data are presented in Appendix 5.

- **Conclusion**

Study of efficiency and robustness of extraction method allows evaluating average efficiency of:

- Aquadien method: -0,34 log
- Aquadien W2 method: -0,49 log
- Aquadien short method: -0,33 log
- Aquadien W2 short method: -0,32 log
- Aquadien FDRS short method: -0,31 log

Efficiencies with five extraction methods are conforming to criteria -0,6 log / +0,3 log (equivalent to efficiency comprise between 25% and 199%).

4.1.7 Selectivity: inclusivity and exclusivity*

*These results have been obtained by the laboratory **IPL SED Nord (2011)**.*

DNA was extracted from pure bacterial suspension for each strain.

- **Inclusivity**

Inclusivity assays were realized on DNA extracts with concentration about 100 GU per PCR reaction. Concentrations were estimated by O.D.$_{600nm}$ of bacterial suspension. DNA of 35 strains of tested *Legionella* (15 *Legionella pneumophila* and 20 *Legionella* spp.) were amplified.

The raw data are presented in Appendix 6.

- **Exclusivity**

Exclusivity assays were realized on DNA extracts with concentration about 10 000 GU per PCR reaction. Concentrations were estimated by $O.D._{600nm}$ of bacterial suspension.
DNA of 16 strains of tested were not amplified, except 5 of them which show weak amplification.

The raw data are presented in Appendix 6.

- **Conclusion**

The selectivity of the iQ-Check™® *Legionella* spp. kit is satisfactory.

4.1.8 Practicability

Protocol	R1 solution	W2 solution	FDRS solution	R2 solution	Time
Aquadien	2 mL	-	-	100 µL	1h10
Aquadien short	1 mL	-	-	100 µL	40 min
Aquadien W2	2 mL	200 µL	-	350 µL	1h10
Aquadien W2 short	1 mL	100 µL	-	225µL	1h10
Aquadien FDRS short	500 µL	-	40µL	100 µL	1h10

- Ease of use: reagents are all supplied with kits and are ready-to-use. Serial analyses from 1 to 30 samples, for quantification, are easy to make. A technician, who knows microbiology and molecular biology techniques and the specific thermal cycler and its software, can be trained in 1 day.

- Fast results report: duration of different phases is compatible with a short results report (4 hours)

- Results security: It guarantees by utilization of inhibition internal control (in same reaction well than sample) and by a software of results analysis. Use of software ensures traceability of complete information.

4.2 Inter-laboratory study

4.2.1 Methodology

Inter-laboratories study was realized in 2007 with 14 collaborating laboratories. Results of one laboratory were not taken into account because of technical problem which invalidated standardization. 13 laboratories were retained for statistical exploitation.

Goal of this study is to evaluate fidelity (repeatability and reproducibility) of iQ-Check™ *Legionella* spp. method:

- For only amplification step (2 DNA solutions of *L. anisa* and *L. pneumophila* sg1 at 2 different levels of concentration).
- For complete analysis (concentration, lysis, extraction, purification and gene amplification) on characterized bacterial suspensions of *L. pneumophila* and *Escherichia coli* (CIP 54.8) at 2 different levels of concentration).
- For whole analysis in real situation (hot domestic water naturally contaminated by *L. pneumophila* and *Legionella* spp.).
- For a water guarantees without any DNA of *Legionella*.

4.2.2 Results

	Sample types	Calibrated DNA solutions		Contaminated hot domestic water		Natural water
Contamination levels (GU/L)	*L. pneumophila* ATCC 33152	2000 GU/µl	20000 GU/µl	4000 GU/200 ml	40000 GU/200 ml	Hot domestic water naturally contaminated
	L. anisa	500 GU/µl	5000 GU/µl	1000 GU/200 ml	10000 GU/200 ml	
	E. coli			5000 GU/200 ml	50000 GU/200 ml	
Number of laboratories	participating	14	14	14	14	14
	Retain	13	13	13	13	13
Homogeneity assay	Analysis number	20	20	9	9	9
	Average (Log)	2.91	3.97	3.42	4.41	3.76
	Average (Log)	3.02	4.11	3.52	4.47	3.69
	r (Log)	0.18	0.15	0.28	0.34	0.46
	R (Log)	0.43	0.32	0.72	0.66	0.8
	Sr (Log)	0.06	0.06	0.10	0.12	0.16
	SR (Log)	0.14	0.10	0.24	0.20	0.23

4.2.3 Conclusion

Repeatability values in r (log) are about 0.15 for DNA solutions (only PCR step) and about 0.7 for bacterial suspensions (global method). This is acceptable. Signification of these results is that we can wait for factor 2 measurement of deviation in a same laboratory. Repeatability is not a major source of error.

Reproducibility values in R (log) are about 0.4 for DNA solutions (only PCR step) and about 0.7 for bacterial suspensions (global method). Compared to repeatability, this order of magnitude is equivalent to values that we can obtain for environmental microbiology analyses. Signification of these results is that we can wait for factor 5 of measurement deviation between 2 different laboratories. Reproducibility does not participate in an unreasonable way to result dispersion.

5 General conclusions

Performances of iQ-Check™ *Legionella* spp. method are conforming to requirement of norms NF T90-471 and ISO/TS 12869, and of AFNOR validation protocol: “Validation protocol for commercial methods of detection and quantification of *Legionella* and *Legionella pneumophila* by concentration and gene amplification by polymerase chain reaction (PCR) V3.0”.

The evolution of the "CFX Manager Industrial Diagnostic Edition" software from version V3.0 to version V3.1 required for piloting current and the new thermal cyclers, does not affect the results given that the calculation algorithm as well as the criteria for interpreting the results remain unchanged.

iQ-Check™® *Legionella* spp. kit is a kit validated for **<u>Detection and Quantification</u>** of *Legionella* and/or *Legionella pneumophila* by concentration and gene amplification by real-time Polymerase Chain Reaction (qPCR).

Done at Thury-Harcourt, July 07, 2025
Mickaël MORVAN
Research & Development Engineer

6 Bibliography

Six studies have been published since 2008:

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- Ditommaso, S., M.,Elisa Ricciardi , S., Giacomuzzi, R. Arauco Rivera , S., M. Zotti, C., **2015**. ***Legionella*** in water samples: How can you interpret the results obtained by quantitative PCR? *Molecular and Cellular Probes*. 29:7–12.

- Ditommaso, S., Giacomuzzi, M.,Elisa Ricciardi, M. Zotti, C., **2016**. Cultural and Molecular Evidence of ***Legionella*** spp. Colonization in Dental Unit Waterlines: Which Is the Best Method for Risk Assessment? *International Journal of Environmental Research and Public Health*. 13(2): 211

- Montagna, M. T., De Giglio, O., Cristina, M.L., Napoli, C., Pacifico, C., Agodi., A., Baldovin, T., Casini, B., Coniglio., M. A., Mario D'Errico, M., Delia, S. A., Deriu, M. G., Guida, M., Laganà, P., Liguori, G., Moro, M., Mura, I., Pennino, F., Privitera, G., Spica, V.R., Sembeni, S., Spagnolo, A.M., Tardivo, S., Torre, I., Valeriani, F., Albertini, R., Pasquarella, C., **2017**. Evaluation of ***Legionella*** Air Contamination in Healthcare Facilities by Different Sampling Methods: An Italian Multicenter Study. *International Journal of Environmental Research and Public Health.* 14(7): 670

- Bonetta, S., Pignata, C., Bonetta, S., Meucci, L., Giacosa, D., Marino, E., Gilli, G., Carraro, E., **2017**. Viability of ***Legionella*** *pneumophila* in Water Samples: A Comparison of Propidium Monoazide (PMA) Treatment on Membrane Filters and in Liquid. *International Journal of Environmental Research and Public Health.* 14(5), 467

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In six articles, iQ-Check *Legionella* methods were used with satisfaction.

There have been no external validations by another certification body

Appendix 1: Fitting to the primary standard

Results from iQ-Check™ Quanti L. spp – Extension 2011 - v01 achieved by IPL santé, environnement durables Nord

Raccordement sur Chromo 4

Gamme de référence

Niveaux testés	(UG/puits)	15	420	4200	42000
	log (UG/Puits)	1,17609	2,62325	3,62325	4,62325
C(t) obtenus	Gamme étalon 1	35,27	31,28	28,26	24,99
		34,85	31,37	28,18	25,00
	Gamme étalon 2	35,09	31,26	28,43	25,02
		35,01	31,31	28,29	24,97
	Gamme étalon 3	35,03	31,55	28,63	25,31
		35,07	31,57	28,35	25,12

Pente	-2,891
Ordonnée à l'origine	38,674
Corrélation (r^2)	0,995
Efficacité (%)	121,752

Raccordement de la solution calibrante

Solution calibrante

Niveaux estimé	(UG/puits)	19	390	3900	39000
	log (UG/Puits)	1,27875	2,59106	3,59106	4,59106
C(t) obtenus	Gamme calib 1	35,12	32,12	29,06	25,95
		35,06	32,09	29,09	26,12
	Gamme calib 2	34,98	32,02	28,87	25,86
		35,05	32,12	29,04	25,66
	Gamme calib 3	35,18	32,02	28,95	25,84
		35,01	31,92	28,8	25,76
C(t) moyen par niveau		35,07	32,05	28,97	25,87
Quantité retrouvée par niveau (Lc		1,25	2,29	3,36	4,43
Erreur de calibr	par niveau	0,03	0,30	0,23	0,16
	moyenne	0,18			
Vérification de l'équivalence des |		0,13			

Raccordement du matériau de référence

Matériau de référence

Valeur de référ	(UG/puits)	540
	log (UG/Puits)	2,73239
C(t) obtenus	MR1	31,34
	MR2	31,31

C(t) moyen	31,33
Quantité retrouvée par niveau (Log)	2,54
Erreur de calibrage	0,19

Raccordement sur CFX

Gamme de référence

Niveaux testés	(UG/puits)	15	420	4200	42000
	log (UG/Puits)	1,17609	2,62325	3,62325	4,62325
C(t) obtenus	Gamme étalon 1	35,42	31,17	27,62	24,14
		35,34	30,90	27,55	24,31
	Gamme étalon 2	35,33	30,83	27,54	24,47
		35,28	30,79	27,52	24,13
	Gamme étalon 3	34,85	30,80	27,37	24,02
		35,02	30,64	27,57	24,10

Pente	-3,198
Ordonnée à l'origine	39,076
Corrélation (r^2)	0,998
Efficacité (%)	105,466

Raccordement de la solution calibrante

Solution calibrante

Niveaux estimé	(UG/puits)	19	390	3900	39000
	log (UG/Puits)	1,27875	2,59106	3,59106	4,59106
C(t) obtenus	Gamme calib 1	35,52	31,88	28,10	24,72
		35,29	31,38	27,96	24,70
	Gamme calib 2	34,99	31,34	28,03	24,52
		35,69	31,49	28,09	24,63
	Gamme calib 3	35,00	31,32	27,96	24,67
		34,86	31,25	28,17	24,54
C(t) moyen par niveau		35,23	31,44	28,05	24,63
Quantité retrouvée par niveau (Lc		1,20	2,39	3,45	4,52
Erreur de calibr	par niveau	0,07	0,20	0,14	0,07
	moyenne	0,12			
Vérification de l'équivalence des |		0,00			

Raccordement du matériau de référence

Matériau de référence

Valeur de référ	(UG/puits)	540
	log (UG/Puits)	2,73239
C(t) obtenus	MR1	30,93
	MR2	30,99

C(t) moyen	30,96
Quantité retrouvée par niveau (Log)	2,54
Erreur de calibrage	0,19

Appendix 2: Calibration function

Results from iQ-Check™ Quanti L. spp – Extension 2011 - v01 achieved by IPL santé, environnement durables Nord

Niveau (UG/puits)	x_i	19	390	3900	39000	19	390	3900	39000
	x'_i=Log(x_i)	1,28	2,59	3,59	4,59	1,28	2,59	3,59	4,59

gamme	gamme 1	37,08	33,33	29,60	26,49				
y_{ij}		36,49	33,27	29,84	26,72	36,79	33,30	29,72	26,61
	gamme 2	37,02	33,18	29,44	26,36				
k=5 répétitions		36,77	33,33	29,71	26,24	36,90	33,26	29,58	26,30
	gamme 3	37,78	33,30	29,69	26,54				
		36,69	33,31	29,99	26,46	37,24	33,31	29,84	26,50
	gamme 4	37,32	33,81	30,14	26,65				
		37,16	33,32	30,32	26,84	37,24	33,57	30,23	26,75
	gamme 5	37,40	33,57	30,01	26,52				
		36,90	33,41	30,05	26,50	37,15	33,49	30,03	26,51

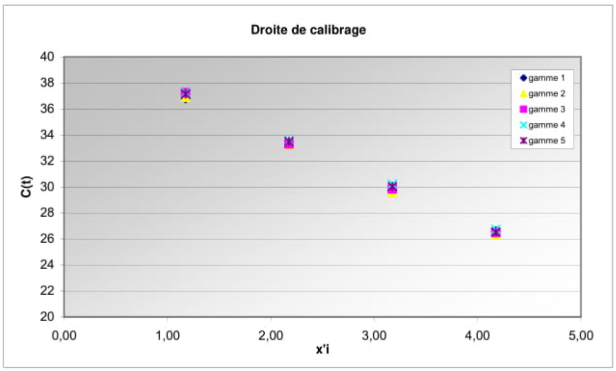
Moyenne	m_i	37,06	33,38	29,88	26,53	37,06	33,38	29,88	26,53

Estimation de la droite de régression

Pente	a =	-3,197
Ordonnée à l'origine	b =	41,347

Estimation de l'efficacité

Efficacité	e =	105,5%



Vérification des performances de la régression linéaire

Niveau	x_i	19	390	3900	39000	19	390	3900	39000
	x'_i=Log(x_i)	1,28	2,59	3,59	4,59	1,28	2,59	3,59	4,59

gamme	gamme 1	1,33	2,51	3,67	4,65				
y_{ij}		1,52	2,53	3,60	4,57	1,43	2,52	3,64	4,61
	gamme 2	1,35	2,55	3,72	4,69				
k=5 répétitions		1,43	2,51	3,64	4,73	1,39	2,53	3,68	4,71
	gamme 3	1,12	2,52	3,65	4,63				
		1,46	2,51	3,55	4,66	1,29	2,52	3,60	4,64
	gamme 4	1,26	2,36	3,51	4,60				
		1,31	2,51	3,45	4,54	1,28	2,43	3,48	4,57
	gamme 5	1,23	2,43	3,55	4,64				
		1,39	2,48	3,53	4,64	1,31	2,46	3,54	4,64

Moyenne	m_i	1,34	2,49	3,59	4,63	1,34	2,49	3,59	4,63

Biais		0,06	-0,10	0,00	0,04
Ecart type	S =	0,12	0,06	0,08	0,05
Exactitude de linéarité	E_{LIN} =	0,13	0,12	0,08	0,07
Incertitude de linéarité	U_{LIN} =	0,42	0,37	0,27	0,22

Results from iQ-Check™ Quanti L. spp – Extension 2023 - achieved by Upscience (CFX96)

Niveau (UG/puits)	x_i	19	390	3900	39000
	x'_i = Log (x_i)	1,28	2,59	3,59	4,59
gamme y_{ij} k = 5 répétitions	Gamme 1	34,90	31,08	28,00	24,15
		34,59	31,03	27,93	24,19
	Gamme 2	34,62	31,15	28,10	24,34
		34,48	31,20	28,04	24,40
	Gamme 3	34,39	31,16	28,08	24,34
		34,32	31,16	28,06	24,39
	Gamme 4	34,70	31,16	28,10	24,32
		34,45	31,15	28,03	24,25
	Gamme 5	34,51	31,15	28,07	24,26
		35,20	31,17	28,09	24,28
Moyenne	m_i	34,61	31,14	28,05	24,29

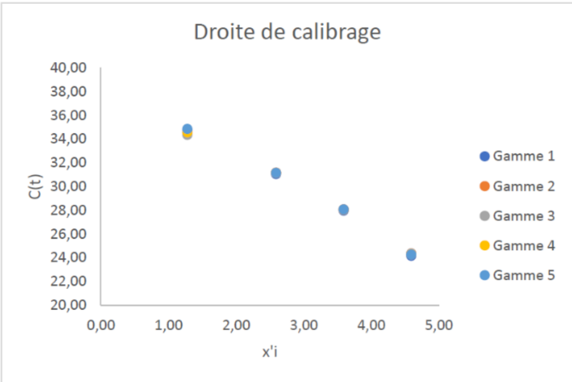
19	390	3900	39000
1,28	2,59	3,59	4,59
34,75	31,05	27,97	24,17
34,55	31,17	28,07	24,37
34,35	31,16	28,07	24,37
34,57	31,16	28,07	24,29
34,85	31,16	28,08	24,27
34,61	31,14	28,05	24,29

Estimation de la droite de régression

Pente	a =	-3,098
Ordonnée à l'origine	b=	38,859

Estimation de l'efficacité

Efficacité	e =	110,3



Vérification des performances de la régession linéaire

Niveau (UG/puits)	x_i	19	390	3900	39000
	x'_i = Log (x_i)	1,28	2,59	3,59	4,59
gamme y_{ij} k = 5 répétitions	Gamme 1	1,28	2,51	3,50	4,75
		1,38	2,53	3,53	4,74
	Gamme 2	1,37	2,49	3,47	4,69
		1,41	2,47	3,49	4,67
	Gamme 3	1,44	2,48	3,48	4,69
		1,47	2,48	3,49	4,67
	Gamme 4	1,34	2,49	3,47	4,69
		1,42	2,49	3,49	4,71
	Gamme 5	1,41	2,49	3,48	4,71
		1,18	2,48	3,48	4,71
Moyenne	m_i	1,37	2,49	3,49	4,70

19	390	3900	39000
1,28	2,59	3,59	4,59
1,33	2,52	3,52	4,74
1,39	2,48	3,48	4,68
1,45	2,48	3,48	4,68
1,38	2,49	3,48	4,70
1,29	2,49	3,48	4,71
1,37	2,49	3,49	4,70

Biais	0,09	0,10	0,10	0,11
Ecart type S =	0,06	0,02	0,02	0,03
Exactitude de linéarité E_{LIN}	0,11	0,10	0,10	0,11
Incertitude de linéarité U_{LIN}	0,31	0,28	0,29	0,32

Niveau (UG/puits)		x_i	19	390	3900	39000
		x'_i = Log (x_i)	1,28	2,59	3,59	4,59
gamme y_{ij} k = 5 répétitions	Gamme 1		34,94	30,75	27,60	24,26
			34,33	30,92	27,61	24,34
	Gamme 2		34,80	30,80	27,59	24,78
			34,84	30,97	27,57	25,03
	Gamme 3		34,48	30,88	27,56	24,80
			34,88	30,89	27,56	24,91
	Gamme 4		34,95	30,80	27,56	24,74
			34,76	30,85	27,60	24,84
	Gamme 5		34,60	30,93	27,62	24,82
			35,00	30,86	27,59	24,86
Moyenne		m_i	34,76	30,87	27,58	24,74

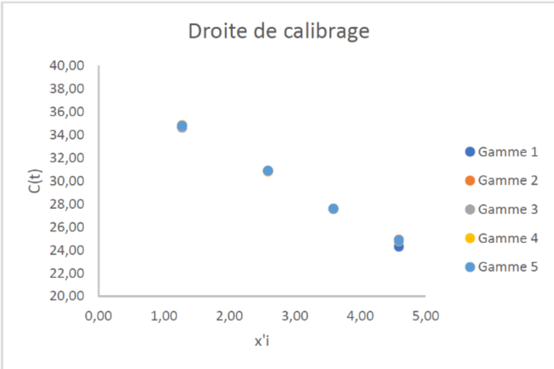
19	390	3900	39000
1,28	2,59	3,59	4,59
34,64	30,83	27,61	24,30
34,82	30,88	27,58	24,91
34,68	30,89	27,56	24,86
34,86	30,83	27,58	24,79
34,80	30,90	27,60	24,84
34,76	30,87	27,58	24,74

Estimation de la droite de régression

Pente	a =	-3,048
Ordonnée à l'origine	b=	38,67

Estimation de l'efficacité

Efficacité	e =	112,9



Vérification des performances de la régession linéaire

Niveau (UG/puits)		x_i	19	390	3900	39000
		x'_i = Log (x_i)	1,28	2,59	3,59	4,59
gamme y_{ij} k = 5 répétitions	Gamme 1		1,22	2,60	3,63	4,73
			1,42	2,54	3,63	4,70
	Gamme 2		1,27	2,58	3,63	4,56
			1,26	2,53	3,64	4,47
	Gamme 3		1,37	2,56	3,65	4,55
			1,24	2,55	3,64	4,51
	Gamme 4		1,22	2,58	3,65	4,57
			1,28	2,56	3,63	4,54
	Gamme 5		1,34	2,54	3,63	4,54
			1,20	2,56	3,64	4,53
Moyenne		m_i	1,28	2,56	3,64	4,57

19	390	3900	39000
1,28	2,59	3,59	4,59
1,32	2,57	3,63	4,72
1,26	2,55	3,64	4,51
1,31	2,55	3,65	4,53
1,25	2,57	3,64	4,55
1,27	2,55	3,63	4,54
1,28	2,56	3,64	4,57

Biais	0,00	0,03	0,05	0,02
Ecart type S =	0,03	0,01	0,01	0,08
Exactitude de linéarité E_{LIN}	0,03	0,03	0,05	0,08
Incertitude de linéarité U_{LIN}	0,09	0,09	0,13	0,23

Results from iQ-Check™ Quanti L. spp – Extension 2023 - achieved by Upscience (CFX96 Deepwell)

Niveau (UG/puits)	x_i / x'_i = Log (x_i)	15 / 1,18	290 / 2,46	2900 / 3,46	29000 / 4,46
gamme y_{ij} k = 5 répétitions	Gamme 1	35,79	31,93	28,55	25,67
		35,66	32,00	28,62	25,78
	Gamme 2	35,38	31,74	28,38	25,44
		35,65	31,89	28,44	25,49
	Gamme 3	35,39	31,20	28,38	25,24
		35,27	31,35	28,31	25,36
	Gamme 4	35,35	32,07	28,74	25,53
		35,67	32,22	28,60	25,61
	Gamme 5	35,09	31,58	28,36	25,47
		35,15	31,47	28,41	25,55
Moyenne	m_i	35,44	31,75	28,48	25,51

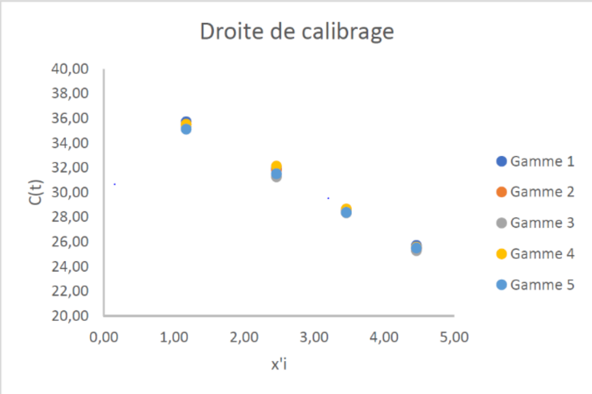
15 / 1,18	290 / 2,46	2900 / 3,46	29000 / 4,46
35,73	31,97	28,59	25,73
35,52	31,82	28,41	25,47
35,33	31,28	28,35	25,30
35,51	32,15	28,67	25,57
35,12	31,53	28,39	25,51
35,44	31,75	28,48	25,51

Estimation de la droite de régression

Pente	a =	-3,0524
Ordonnée à l'origine	b=	39,237

Estimation de l'efficacité

Efficacité	e =	112,6



Vérification des performances de la régession linéaire

Niveau (UG/puits)	x_i / x'_i = Log (x_i)	15 / 1,18	290 / 2,46	2900 / 3,46	29000 / 4,46
gamme y_{ij} k = 5 répétitions	Gamme 1	1,13	2,39	3,50	4,44
		1,17	2,37	3,48	4,41
	Gamme 2	1,26	2,46	3,56	4,52
		1,18	2,41	3,54	4,50
	Gamme 3	1,26	2,63	3,56	4,59
		1,30	2,58	3,58	4,55
	Gamme 4	1,27	2,35	3,44	4,49
		1,17	2,30	3,48	4,46
	Gamme 5	1,36	2,51	3,56	4,51
		1,34	2,54	3,55	4,48
Moyenne	m_i	1,24	2,45	3,52	4,50

15 / 1,18	290 / 2,46	2900 / 3,46	29000 / 4,46
1,15	2,38	3,49	4,43
1,22	2,43	3,55	4,51
1,28	2,61	3,57	4,57
1,22	2,32	3,46	4,48
1,35	2,53	3,56	4,50
1,24	2,45	3,52	4,50

Biais	0,07	-0,01	0,06	0,03
Ecart type S =	0,07	0,11	0,05	0,05
Exactitude de linéarité E_{LIN}	0,10	0,11	0,08	0,06
Incertitude de linéarité U_{LIN}	0,28	0,32	0,21	0,17

Results from iQ-Check™ Quanti L. spp – Extension 2023 - achieved by Upscience (CFX Opus Deepwell)

Niveau (UG/puits)					
	x_i	15	290	2900	29000
	x'_i = Log (x_i)	1,18	2,46	3,46	4,46
gamme y_{ij} k = 5 répétitions	Gamme 1	35,95	32,69	29,23	26,08
		36,07	32,74	29,25	26,27
	Gamme 2	35,82	32,62	29,25	26,21
		36,17	32,69	29,23	26,25
	Gamme 3	35,99	32,11	29,18	26,01
		35,56	32,11	29,02	26,19
	Gamme 4	36,13	32,84	29,22	26,39
		35,56	32,94	29,24	26,45
	Gamme 5	35,65	32,02	29,12	26,09
		35,86	32,27	29,09	26,13
Moyenne	m_i	35,88	32,50	29,18	26,21

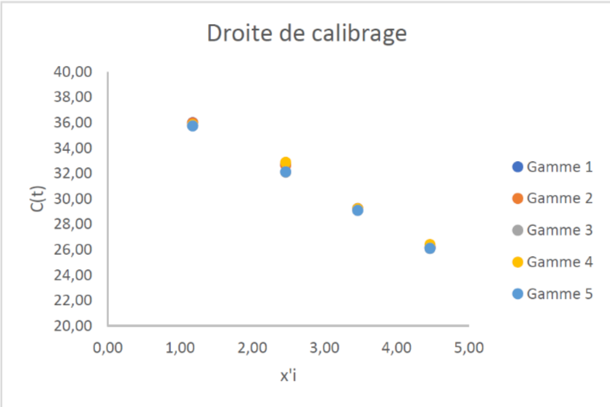
15	290	2900	29000
1,18	2,46	3,46	4,46
36,01	32,72	29,24	26,18
36,00	32,66	29,24	26,23
35,78	32,11	29,10	26,10
35,85	32,89	29,23	26,42
35,76	32,15	29,11	26,11
35,88	32,50	29,18	26,21

Estimation de la droite de régression

Pente	a =	-2,9688
Ordonnée à l'origine	b=	39,62

Estimation de l'efficacité

Efficacité	e =	117,2



Vérification des performances de la régession linéaire

Niveau (UG/puits)					
	x_i	15	290	2900	29000
	x'_i = Log (x_i)	1,18	2,46	3,46	4,46
gamme y_{ij} k = 5 répétitions	Gamme 1	1,24	2,33	3,50	4,56
		1,20	2,32	3,49	4,50
	Gamme 2	1,28	2,36	3,49	4,52
		1,16	2,33	3,50	4,50
	Gamme 3	1,22	2,53	3,52	4,58
		1,37	2,53	3,57	4,52
	Gamme 4	1,18	2,28	3,50	4,46
		1,37	2,25	3,50	4,44
	Gamme 5	1,34	2,56	3,54	4,56
		1,27	2,48	3,55	4,54
Moyenne	m_i	1,26	2,40	3,52	4,52

15	290	2900	29000
1,18	2,46	3,46	4,46
1,22	2,33	3,50	4,53
1,22	2,35	3,50	4,51
1,30	2,53	3,54	4,55
1,27	2,27	3,50	4,45
1,30	2,52	3,54	4,55
1,26	2,40	3,52	4,52

Biais	0,09	-0,07	0,05	0,06
Ecart type S =	0,04	0,12	0,02	0,04
Exactitude de linéarité E_{LIN}	0,09	0,14	0,06	0,07
Incertitude de linéarité U_{LIN}	0,26	0,38	0,16	0,20

Appendix 3: Limit of detection

Results from iQ-Check™ Quanti L. spp – Extension 2011 - v01 achieved by IPL santé, environnement durables Nord

Limite de détection à 5UG

Echantillons à la concentration 5UG

Sample	C(t)	I.C. C(t)	SQ
e1	37,88	33,12	6,445
e1	37,73	33,12	7,232
e2	39,38	36,36	1,982
e2	38,41	34,8	4,257
e3	37,65	34,56	7,690
e3	38,19	34,14	5,046
e4	37,92	34,09	6,237
e4	38,12	34,01	5,328
e5	38,25	32,97	4,826
e5	37,77	33,71	7,028
e6	38,99	35,71	2,685
e6	38,34	34,12	4,496
e7	38,1	34,39	5,432
e7	38,02	34,24	5,775
e8	39,21	34,53	2,268
e8	37,86	34,21	6,526
e9	37,39	32,78	9,424
e9	37,82	33,79	6,734
e10	41,57	39,12	0,356
e10	37,97	34,42	5,989
e11	38,9	34,49	2,887
e11	38,13	34,04	5,271
e12	38,93	34,35	2,816
e12	37,85	34,08	6,557
e13	37,15	32,87	11,400
e13	38,08	34,53	5,489
e14	38,19	34,68	5,041
e14	38,56	34,31	3,786
e15	37,91	34,44	6,301
e15	38,43	34,93	4,193
e16	38,04	34,35	5,667
e16	37,42	34,07	9,195
e17	37,32	32,73	9,950
e17	38,47	35,11	4,058
e18	40,81	37,79	0,645
e18	38,08	34,36	5,515
e19	37,78	34,27	6,964
e19	37,9	34,15	6,307
e20	38,16	34,63	5,147
e20	39,2	34,48	2,280
e21	37,28	33,31	10,260
e21	41,82	35,38	0,293
e22	39,31	35,69	2,096
e22	37,61	33,71	7,956
e23	37,95	34,28	6,091
e23	38,17	34,39	5,128
e24	38,14	34,38	5,261
e24	37,92	34,65	6,214
e25	37,33	33,41	9,875
e25	37,47	33,94	8,870
e26	37,84	34,55	6,629
e26	37,97	34,48	5,997
e27	38,04	34,37	5,654
e27	37,53	34,6	8,487
e28	38,98	34,64	2,712
e28	38,15	34,36	5,218
e29	37,74	33,16	7,195
e29	41,52	39	0,372
e30	38,16	34,32	5,146
e30	38,22	34,72	4,908

Contrôle Gamme Standard

Content	C(t)	I.C. C(t)	SQ
QS1	36,02	33,04	19,00
QS1	36,06	33,22	19,00
QS2	34,01	35,6	390,00
QS2	42,26	N/A	390,00
QS3	29,99	34,11	3900,00
QS3	29,72	33,4	3900,00
QS4	26,4	33,75	39000,00
QS4	26,37	33,98	39000,00

Contrôle négatif

Content	C(t)	I.C. C(t)	SQ
Neg Ctrl	N/A	34,62	N/A
Neg Ctrl	N/A	34,39	N/A

Appendix 4: limit of quantification

Results from iQ-Check™ Quanti L. spp *– Extension 2011 - v01 achieved by IPL santé, environnement durables Nord*

Limite de quantification
LQ à 15UG

Gamme de calibrage QS

	UG/puits	Moy Log (UG/puits)	C(t)
QS1		1,278753601	36,87
	19	1,278753601	37,23
QS2		2,591064607	33,65
	390	2,591064607	33,71
QS3		3,591064607	29,73
	3900	3,591064607	29,87
QS4		4,591064607	26,41
	39000	4,591064607	26,51

Pente	-3,241
Ordonnée origine	41,514
Corrélation (r^2)	0,992
Efficacité (%)	103,474

LQ_{PCR} à 15UG : 30 mesures en réplicat

	C(t)		UG/puits			
	Réplicat	Moyenne	UG/puits	Moy UG/puits	*x'* (Log)	Moyenne *x'*
LQ-1	37,55		16,7		1,223	
	37,87	37,71	13,4	1,50E+01	1,124	1,173
LQ-2	37,57		16,5		1,217	
	37,27	37,42	20,4	1,84E+01	1,309	1,263
LQ-3	37,17		22,0		1,340	
	37,08	37,13	23,3	2,26E+01	1,368	1,354
LQ-4	37,21		21,4		1,328	
	37,49	37,35	17,5	1,94E+01	1,241	1,285
LQ-5	37,53		17,0		1,229	
	37,63	37,58	15,8	1,64E+01	1,198	1,214
LQ-6	37,73		14,7		1,167	
	37,21	37,47	21,3	1,80E+01	1,328	1,248
LQ-7	36,83		27,9		1,445	
	37,00	36,91	24,8	2,63E+01	1,393	1,419
LQ-8	37,07		23,5		1,371	
	37,21	37,14	21,3	2,24E+01	1,328	1,349
LQ-9	37,73		14,8		1,167	
	37,68	37,7	15,2	1,50E+01	1,183	1,175
LQ-10	37,82		13,8		1,140	
	38,15	37,99	11,0	1,24E+01	1,038	1,089
LQ-11	37,25		20,7		1,315	
	37,09	37,17	23,1	2,19E+01	1,365	1,340
LQ-12	36,54		34,4		1,534	
	37,06	36,8	23,7	2,91E+01	1,374	1,454
LQ-13	37,35		19,3		1,285	
	37,26	37,31	20,5	1,99E+01	1,312	1,298
LQ-14	37,56		16,7		1,220	
	37,57	37,57	16,4	1,66E+01	1,217	1,218
LQ-15	37,50		17,3		1,238	
	37,04	37,27	24,0	2,07E+01	1,380	1,309
LQ-16	36,48		35,7		1,553	
	37,37	36,93	19,0	2,73E+01	1,278	1,416
LQ-17	37,13		22,5		1,352	
	37,43	37,28	18,3	2,04E+01	1,260	1,306
LQ-18	37,39		18,7		1,272	
	37,65	37,52	15,6	1,72E+01	1,192	1,232
LQ-19	36,69		30,8		1,488	
	37,00	36,85	24,7	2,77E+01	1,393	1,440
LQ-20	36,57		33,5		1,525	
	37,13	36,85	22,5	2,80E+01	1,352	1,439
LQ-21	37,70		15,0		1,177	
	37,18	37,44	21,8	1,84E+01	1,337	1,257
LQ-22	37,75		14,5		1,161	
	37,68	37,72	15,2	1,49E+01	1,183	1,172
LQ-23	37,29		20,2		1,303	
	37,25	37,27	20,7	2,04E+01	1,315	1,309
LQ-24	37,00		24,7		1,393	
	36,94	36,97	25,8	2,52E+01	1,411	1,402
LQ-25	37,29		20,1		1,303	
	37,62	37,46	15,9	1,80E+01	1,201	1,252
LQ-26	37,55		16,7		1,223	
	36,63	37,09	32,1	2,44E+01	1,507	1,365
LQ-27	36,54		34,3		1,534	
	37,02	36,78	24,4	2,94E+01	1,386	1,460
LQ-28	36,83		28,0		1,445	
	36,99	36,91	24,9	2,64E+01	1,396	1,420
LQ-29	37,58		16,4		1,214	
	37,15	37,37	22,3	1,93E+01	1,346	1,280
LQ-30	37,12		22,8		1,356	
	37,34	37,23	19,5	2,11E+01	1,288	1,322

Moyenne **x'**	1,309
Ecart-type **s**	0,097
Biais	0,030
Exactitude de LQ $\mathbf{E}_{LQ}$	0,101
Incertitude $\mathbf{U}_{LQ}$	0,207

Appendix 5: Yield and robustness

Results from iQ-Check™ Quanti L. spp – Extension 2011 - v01 achieved by IPL santé, environnement durables Nord

Robustesse Eau Chaude Sanitaire

Protocole Aquadien

Niveau N1
100 000 UG/L

Echantillon	Valeur du dopage UG/puits	A (log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B (log)	Rendement log	%
EC1N1	6,55E+02	5,02	29,43 29,67	1,31E+03 1,10E+03	1,20E+03	4,59	-0,44	37%
EC2N1	6,55E+02	5,02	29,7 29,73	1,08E+03 1,06E+03	1,07E+03	4,53	-0,49	33%
EC3N1	6,28E+02	5,00	29,41 29,35	1,19E+03 1,25E+03	1,22E+03	4,59	-0,41	39%
EC4N1	6,28E+02	5,00	29,32 29,31	1,27E+03 1,29E+03	1,28E+03	4,61	-0,39	41%
EC5N1	4,31E+02	4,84	29,24 29,5	1,46E+03 1,20E+03	1,32E+03	4,63	-0,21	61%
EC6N1	4,31E+02	4,84	29,31 29,38	1,39E+03 1,31E+03	1,35E+03	4,64	-0,20	63%
E7N1-100	3,27E+04	6,72	31 30,59	5,01E+02 6,91E+02	5,89E+02	6,27	-0,52	30%
E8N1-100	3,27E+04	6,72	30,88 30,62	5,52E+02 6,78E+02	6,12E+02	6,29	-0,50	31%
E9N1-100	3,27E+04	6,72	30,8 30,7	5,89E+02 6,32E+02	6,10E+02	6,29	-0,50	31%
EC10N1	7,10E+03	6,06	25,8 25,66	2,11E+04 2,34E+04	2,22E+04	5,85	-0,20	63%

Rendement moyen pour le niveau 100 000 UG/L | **-0,39** | 41%

Niveau N2
1 000 UG/L

Echantillon	Valeur du dopage UG/puits	A (log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B (log)	Rendement log	%
EC1N2	2,32E+04	6,57	30,25 30,23	9,11E+02 9,23E+02	9,17E+02	6,47	-0,10	79%
EC2N2	2,32E+04	6,57	30,13 30,12	1,00E+03 1,01E+03	1,00E+03	6,51	-0,06	87%
EC3N2	4,04E+04	6,81	30,24 30,05	8,24E+02 9,53E+02	8,86E+02	6,45	-0,28	53%
EC4N2	4,04E+04	6,81	30,08 29,96	9,29E+02 1,02E+03	9,74E+02	6,49	-0,23	58%
EC5N2	4,04E+04	6,81	30,12 29,98	9,00E+02 1,01E+03	9,54E+02	6,48	-0,24	57%
EC6N2	3,27E+04	6,72	30,29 30,21	8,76E+02 9,28E+02	9,02E+02	6,46	-0,33	46%
EC7N2	3,27E+04	6,72	30,24 30,1	9,07E+02 1,01E+03	9,58E+02	6,49	-0,31	49%
EC8N2	7,10E+03	6,06	31,82 32,06	2,28E+02 1,91E+02	2,09E+02	5,82	-0,23	59%
EC9N2	7,21E+04	7,06	30,05 30,09	1,07E+03 1,04E+03	1,05E+03	6,53	-0,53	29%
EC10N2	7,21E+04	7,06	30,38 30,15	8,41E+02 9,95E+02	9,15E+02	6,47	-0,60	25%

Rendement moyen pour le niveau 1 000 UG/L | **-0,29** | 51%

Rendement moyen Eau chaude sanitaire Aquadien | **-0,34** | 46%

Protocole Aquadien W2

Echantillon	Valeur du dopage UG/puits	A (log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B (log)	Rendement log	%
EC2N1W	2,32E+04	6,57	25,79 25,69	3,27E+04 3,53E+04	3,40E+04	6,09	-0,48	33%
EC2N1W	2,32E+04	6,57	25,88 25,97	3,03E+04 2,83E+04	2,93E+04	6,02	-0,55	28%
EC3N1W	4,31E+02	4,84	30,3 30,32	6,48E+02 6,40E+02	6,44E+02	4,37	-0,47	34%
EC4N1W	4,31E+02	4,84	30,16 30,22	7,22E+02 6,89E+02	7,05E+02	4,40	-0,43	37%
E5N1W-100	3,27E+04	6,72	30,53 30,57	7,23E+02 7,02E+02	7,12E+02	6,41	-0,38	41%
E6N1W-100	3,27E+04	6,72	30,4 30,36	8,00E+02 8,29E+02	8,14E+02	6,47	-0,33	47%
E7N1W-100	3,27E+04	6,72	30,38 30,31	8,17E+02 8,58E+02	8,37E+02	6,48	-0,31	48%
EC8N1W	7,10E+03	6,06	26,87 26,74	9,45E+03 1,04E+04	9,92E+03	5,55	-0,50	31%
E9N1W	7,00E+04	7,05	23,82 23,89	9,00E+04 8,51E+04	8,75E+04	6,50	-0,55	28%
E10N1W	7,00E+04	7,05	23,57 23,63	1,08E+05 1,03E+05	1,06E+05	6,5804756	-0,47	34%

Rendement moyen pour le niveau 100 000 UG/L | **-0,45** | 36%

Echantillon	Valeur du dopage UG/puits	A (log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B (log)	Rendement log	%
EC1N2W	6,55E+02	5,02	34,5 35,3	3,21E+01 1,78E+01	3,21E+01	5,06	0,04	110%
EC2N2W	6,55E+02	5,02	34,74 35,01	2,68E+01 2,20E+01	2,43E+01	4,94	-0,08	83%
EC3N2W	6,28E+02	5,00	34,97 36,8	2,10E+01 5,51E+00	2,10E+01	4,88	-0,12	75%
EC4N2W	6,28E+02	5,00	34,74 35,97	2,46E+01 1,01E+01	2,46E+01	4,95	-0,05	88%
EC5N2W	2,32E+04	6,57	31,16 31,05	4,39E+02 4,79E+02	4,58E+02	6,22	-0,35	45%
EC6N2W	2,32E+04	6,57	30,97 31,21	5,09E+02 4,19E+02	4,62E+02	6,22	-0,35	45%
EC7N2W	4,31E+02	4,84	34,78 35,52	2,09E+01 1,18E+01	2,09E+01	4,88	0,04	109%
EC8N2W	4,31E+02	4,84	34,8 35,57	2,07E+01 1,15E+01	2,07E+01	4,87	0,03	108%
EC9N2W	7,10E+03	6,06	32,14 31,91	1,80E+02 2,14E+02	1,96E+02	5,85	-0,21	62%
E10N2W	7,00E+04	7,05	30,05 29,87	8,90E+02 1,02E+03	9,54E+02	6,48	-0,56	27%

Rendement moyen pour le niveau 1 000 UG/L | **-0,16** | 69%

Rendement moyen Eau chaude sanitaire Aquadien W2 | **-0,30** | 50%

Robustesse Tour Aéroréfrigérante

Protocole Aquadien

Niveau N1
100 000 UG/L

Echantillon	Valeur du dopage		Résultat analyse				Rendement	
	UG/puits	A (log)	C(t)	UG/puits	Moyenne UG/puits	B (log)	log	%
T1N1	2,32E+04	6,57	25,53 25,35	4,01E+04 4,64E+04	4,31E+04	6,14	-0,43	37%
T2N1	2,32E+04	6,57	25,39 25,26	4,52E+04 5,00E+04	4,75E+04	6,18	-0,39	41%
T3N1	4,04E+04	6,81	23,7 23,57	1,45E+05 1,61E+05	1,53E+05	6,69	-0,04	91%
T4N1	4,04E+04	6,81	23,64 23,58	1,52E+05 1,59E+05	1,55E+05	6,70	-0,03	93%
T5N1	4,04E+04	6,81	23,6 23,3	1,57E+05 1,98E+05	1,76E+05	6,75	0,02	105%
T6N1-100	3,27E+04	6,72	31,02 30,81	4,95E+02 5,80E+02	5,36E+02	6,23	-0,49	32%
T7N1-100	3,27E+04	6,72	31,06 30,78	4,78E+02 5,95E+02	5,34E+02	6,23	-0,50	32%
T8N1-100	3,27E+04	6,72	31,09 30,79	4,68E+02 5,93E+02	5,27E+02	6,23	-0,50	31%
T9N1	7,10E+03	6,06	26,26 26,1	1,49E+04 1,68E+04	1,58E+04	5,70	-0,35	45%
T10N1	7,21E+04	7,06	23,41 23,45	1,46E+05 1,42E+05	1,44E+05	6,66	-0,40	40%

Rendement moyen pour le niveau 100 000 UG/L: **-0,31** 49%

Niveau N2
1 000 UG/L

Echantillon	Valeur du dopage		Résultat analyse				Rendement	
	UG/puits	A (log)	C(t)	UG/puits	Moyenne UG/puits	B (log)	log	%
T1N2	6,55E+02	5,02	34,72 34,77	2,72E+01 2,62E+01	2,67E+01	4,93	-0,09	82%
T2N2	6,55E+02	5,02	34,58 34,7	3,01E+01 2,77E+01	2,89E+01	4,97	-0,05	88%
T3N2	6,28E+02	5,00	34,36 34,39	3,27E+01 3,18E+01	3,22E+01	5,01	0,01	103%
T4N2	6,28E+02	5,00	34,94 34,45	2,13E+01 3,04E+01	2,55E+01	4,91	-0,09	81%
T5N2	2,32E+04	6,57	30,86 30,78	5,56E+02 5,91E+02	5,73E+02	6,26	-0,31	50%
T6N2	2,32E+04	6,57	30,84 30,73	5,64E+02 6,18E+02	5,90E+02	6,28	-0,29	51%
T7N2	4,04E+04	6,81	29,4 29,37	1,59E+03 1,64E+03	1,61E+03	6,76	0,04	108%
T8N2	4,04E+04	6,81	29,43 29,78	1,56E+03 1,18E+03	1,36E+03	6,69	-0,04	91%
T9N2-100	3,27E+04	6,72	N/A 35,35	N/A 1,66E+01	1,66E+01	6,73	0,00	99%
T10N2	7,10E+03	6,06	31,45 31,35	3,01E+02 3,24E+02	3,12E+02	6,00	-0,06	88%

Rendement moyen pour le niveau 1 000 UG/L: **-0,09** 82%

Rendement moyen Tour aéroréfrigérante Aquadien: **-0,20** 63%

Protocole Aquadien W2

Echantillon	Valeur du dopage		Résultat analyse				Rendement	
	UG/puits	A (log)	C(t)	UG/puits	Moyenne UG/puits	B (log)	log	%
T1N1W	6,55E+02	5,02	29,71 29,72	1,08E+03 1,07E+03	1,07E+03	4,59	-0,43	37%
T2N1W	2,32E+04	6,57	26,11 26,1	2,52E+04 2,55E+04	2,54E+04	5,96	-0,61	25%
T3N1W	4,31E+02	4,84	30,35 30,41	6,26E+02 5,95E+02	6,10E+02	4,34	-0,50	32%
T4N1W	4,31E+02	4,84	30,26 30,33	6,68E+02 6,33E+02	6,50E+02	4,37	-0,47	34%
T5N1W	4,04E+04	6,81	24,96 25	5,35E+04 5,17E+04	5,26E+04	6,28	-0,45	35%
T6N1W	4,04E+04	6,81	25,24 25,03	4,27E+04 5,04E+04	4,64E+04	6,22	-0,51	31%
T7N1W	4,04E+04	6,81	25,16 25,06	4,57E+04 4,95E+04	4,75E+04	6,23	-0,50	32%
T8N1W-100	3,27E+04	6,72	31,47 31,32	3,47E+02 3,90E+02	3,68E+02	6,12	-0,61	25%
T9N1W	7,10E+03	6,06	26,14 25,92	1,63E+04 1,92E+04	1,77E+04	5,80	-0,25	56%
T10N1W	7,00E+04	7,05	23,3 23,41	1,32E+05 1,22E+05	1,27E+05	6,66	-0,39	41%

Rendement moyen pour le niveau 100 000 UG/L: **-0,47** 34%

Echantillon	Valeur du dopage		Résultat analyse				Rendement	
	UG/puits	A (log)	C(t)	UG/puits	Moyenne UG/puits	B (log)	log	%
T1N2W	2,32E+04	6,57	31,53 31,8	3,24E+02 2,62E+02	2,91E+02	6,02	-0,55	28%
T2N2W	2,32E+04	6,57	31,71 31,53	2,81E+02 3,24E+02	3,02E+02	6,04	-0,53	29%
T3N2W	4,31E+02	4,84	34,8 35,64	2,06E+01 1,08E+01	2,06E+01	4,87	0,03	108%
T4N2W	4,04E+04	6,81	30,74 30,98	5,51E+02 4,58E+02	5,02E+02	6,21	-0,52	30%
T5N2W	4,04E+04	6,81	30,8 30,97	5,27E+02 4,60E+02	4,93E+02	6,20	-0,53	29%
T6N2W	4,04E+04	6,81	30,9 30,95	4,86E+02 4,69E+02	4,77E+02	6,18	-0,54	29%
T7N2W	7,10E+03	6,06	31,76 32,03	2,39E+02 1,95E+02	2,16E+02	5,89	-0,16	68%
T8N2W	7,21E+04	7,06	30,45 30,4	7,96E+02 8,28E+02	8,12E+02	6,47	-0,60	25%
T9N2W	7,00E+04	7,05	30,29 30,01	7,46E+02 9,17E+02	8,27E+02	6,47	-0,58	27%
T10N2W	7,00E+04	7,05	30,01 29,68	9,18E+02 1,18E+03	1,04E+03	6,57	-0,48	33%

Rendement moyen pour le niveau 1 000 UG/L: **-0,45** 36%

Rendement moyen Tour aéroréfrigérante Aquadien W2: **-0,46** 35%

Robustesse Eau Minérale

Protocole Aquadien

Niveau N1
100 000 UG/L

Echantillon	Valeur du dopage UG/puits	A (log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B (log)	Rendement log	%
M1N1	6,55E+02	5,02	29,61 29,65	1,15E+03 1,12E+03	1,14E+03	4,56	-0,46	35%
M2N1	6,55E+02	5,02	29,37 29,47	1,37E+03 1,28E+03	1,33E+03	4,63	-0,39	41%
M3N1	6,28E+02	5,00	29,38 29,22	1,22E+03 1,37E+03	1,29E+03	4,62	-0,39	41%
M4N1	6,28E+02	5,00	29,29 29,14	1,30E+03 1,46E+03	1,38E+03	4,64	-0,36	44%
M5N1	2,32E+04	6,57	25,71 25,65	3,48E+04 3,65E+04	3,56E+04	6,06	-0,51	31%
M6N1	2,32E+04	6,57	25,74 25,64	3,41E+04 3,70E+04	3,55E+04	6,06	-0,51	31%
M7N1	4,31E+02	4,84	29,59 29,65	1,12E+03 1,07E+03	1,09E+03	4,54	-0,29	51%
M8N1	4,31E+02	4,84	29,32 29,54	1,37E+03 1,17E+03	1,27E+03	4,61	-0,23	59%
M9N1	4,04E+04	6,81	25,02 24,87	5,11E+04 5,76E+04	5,42E+04	6,24	-0,49	32%
M10N1	4,04E+04	6,81	25,17 24,87	4,52E+04 5,73E+04	5,09E+04	6,21	-0,52	30%

Rendement moyen pour le niveau 100 000 UG/L **-0,42** 38%

Niveau N2
1 000 UG/L

Echantillon	Valeur du dopage UG/puits	A (log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B (log)	Rendement log	%
M1N2	6,55E+02	5,02	33,66 34,66	5,91E+01 2,84E+01	4,09E+01	5,12	0,10	125%
M2N2	6,55E+02	5,02	34,2 34,72	3,99E+01 2,72E+01	3,29E+01	5,02	0,00	101%
M3N2	6,28E+02	5,00	34,05 33,88	4,08E+01 4,62E+01	4,34E+01	5,14	0,14	138%
M4N2	2,32E+04	6,57	31,09 31,08	4,64E+02 4,66E+02	4,65E+02	6,17	-0,40	40%
M5N2	2,32E+04	6,57	31,13 31,01	4,49E+02 4,94E+02	4,71E+02	6,18	-0,39	41%
M6N2	4,04E+04	6,81	29,85 29,82	1,12E+03 1,15E+03	1,13E+03	6,56	-0,17	68%
M7N2	4,04E+04	6,81	29,81 29,85	1,15E+03 1,12E+03	1,14E+03	6,56	-0,17	68%
M8N2	7,10E+03	6,06	32,53 32,61	1,34E+02 1,26E+02	1,30E+02	5,62	-0,44	37%
M9N2	7,21E+04	7,06	30,22 30,19	9,47E+02 9,65E+02	9,56E+02	6,49	-0,58	27%
M10N2	7,00E+04	7,05	30,12 30,08	8,46E+02 8,71E+02	8,59E+02	6,44	-0,61	25%

Rendement moyen pour le niveau 1 000 UG/L **-0,25** 56%

Rendement moyen Eau minéarle Aquadien **-0,33** 46%

Protocole Aquadien W2

Echantillon	Valeur du dopage UG/puits	A (log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B (log)	Rendement log	%
M1N1W	6,55E+02	5,02	30,16 30,22	7,73E+02 7,37E+02	7,55E+02	4,43	-0,59	26%
M2N1W	6,55E+02	5,02	29,64 30,04	1,13E+03 8,40E+02	8,40E+02	4,48	-0,54	29%
M3N1W	6,28E+02	5,00	29,89 29,71	8,42E+02 9,60E+02	8,99E+02	4,51	-0,49	32%
M4N1W	6,28E+02	5,00	29,74 29,82	9,43E+02 8,89E+02	9,16E+02	4,52	-0,48	33%
M5N1W	4,31E+02	4,84	30,01 30,04	8,09E+02 7,92E+02	8,01E+02	4,46	-0,38	42%
M6N1W	4,31E+02	4,84	29,99 30	8,24E+02 8,16E+02	8,20E+02	4,47	-0,37	43%
M7N1W-100	3,27E+04	6,72	29,29 30,83	1,92E+03 5,73E+02	1,05E+03	6,58	-0,22	61%
M8N1W-100	3,27E+04	6,72	30,76 30,69	6,08E+02 6,39E+02	6,23E+02	6,35	-0,44	36%
M9N1W	7,10E+03	6,06	26,68 26,59	1,09E+04 1,16E+04	1,13E+04	5,61	-0,45	36%
M10N1W	7,21E+04	7,06	24,4 24,47	7,05E+04 6,66E+04	6,85E+04	6,39	-0,60	25%

Rendement moyen pour le niveau 100 000 UG/L **-0,46** 35%

Echantillon	Valeur du dopage UG/puits	A (log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B (log)	Rendement log	%
M1N2W	2,32E+04	6,57	31,84 31,74	2,53E+02 2,75E+02	2,64E+02	5,98	-0,59	26%
M2N2W	2,32E+04	6,57	31,78 31,83	2,66E+02 2,56E+02	2,61E+02	5,97	-0,60	25%
M3N2W	7,10E+03	6,06	32,7 32,93	1,18E+02 9,90E+01	1,08E+02	5,59	-0,47	34%

Rendement moyen pour le niveau 1 000 UG/L **-0,55** 28%

Rendement moyen Eau minérale Aquadien W2 **-0,50** 31%

Robustesse Eau chaude sanitaire

Echantillon	Valeur de dopage UG/puits	A(log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B(log)	Rendement log	%
			33.48	6.29E+01				
1ECS1	3.92E+01	3.8	33.45	6.41E+01	6.35E+01	3.31	-0.49	32.4
			33.12	8.24E+01				
2ECS1	3.92E+01	3.8	33.2	7.77E+01	8.01E+01	3.41	-0.39	40.7
			32.75	7.47E+01				
3ECS1	4.48E+01	3.86	32.6	8.48E+01	7.98E+01	3.41	-0.45	35.5
			32.37	1.03E+02				
4ECS1	4.48E+01	3.86	32.4	1.00E+02	1.02E+02	3.51	-0.35	44.7
			32.1	1.03E+02				
5ECS1	4.89E+01	3.89	32.04	1.08E+02	1.06E+02	3.53	-0.36	43.7
			31.74	1.40E+02				
6ECS1	4.89E+01	3.89	32	1.12E+02	1.26E+02	3.6	-0.29	51.3
			31.79	1.18E+02				
7ECS1	5.33E+01	3.93	31.33	1.76E+02	1.47E+02	3.72	-0.21	61.7
			31.75	1.22E+02				
8ECS1	5.33E+01	3.93	31.77	1.20E+02	1.21E+02	3.64	-0.29	51.3
			33.45	7.29E+01				
9ECS1	6.22E+01	4	33.13	9.35E+01	8.32E+01	3.43	-0.57	26.9
			32.47	1.59E+02				
10ECS1	6.22E+01	4	32.51	1.54E+02	1.57E+02	3.7	-0.3	50.1
Aquadien Short Protocol			Rendement moyen pour le niveau 1 000 UG/L				-0.37	43.8

Echantillon	Valeur de dopage UG/puits	A(log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B(log)	Rendement log	%
			32.61	1.22E+02				
1ECS1W	3.92E+01	3.8	32.37	1.48E+02	1.35E+02	3.69	-0.11	77.6
			32.84	1.03E+02				
2ECS1W	3.92E+01	3.8	32.89	9.85E+01	1.01E+02	3.56	-0.24	57.5
			32.11	1.08E+02				
3ECS1W	4.95E+01	3.9	32.04	1.14E+02	1.11E+02	3.6	-0.3	50.1
			32.17	1.03E+02				
4ECS1W	4.95E+01	3.9	32.08	1.11E+02	1.07E+02	3.59	-0.31	49
			32.14	1.25E+02				
5ECS1W	4.48E+01	3.86	32.07	1.33E+02	1.29E+02	3.67	-0.19	64.6
			32.16	1.24E+02				
6ECS1W	4.48E+01	3.86	32.2	1.19E+02	1.22E+02	3.64	-0.22	60.3
			31.1	1.03E+02				
7ECS1W	4.89E+01	3.89	32.04	1.08E+02	1.06E+02	3.58	-0.31	49
			31.74	1.40E+02				
8ECS1W	4.89E+01	3.89	32	1.12E+02	1.26E+02	3.66	-0.23	58.9
			32.34	1.76E+02				
9ECS1W	6.22E+01	4	32.32	1.78E+02	1.77E+02	3.8	-0.2	63.1
			33.06	9.96E+01				
10ECS1W	6.22E+01	4	33.22	9.72E+01	9.34E+01	3.53	-0.47	33.9
W2 Short Protocol			Rendement moyen pour le niveau 1 000 UG/L				-0.26	56.4

Echantillon	Valeur de dopage UG/puits	A(log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B(log)	Rendement log	%
			27.06	9.24E+03				
1ECS2	2.39E+03	5.58	27.09	9.04E+03	9.14E+03	5.47	-0.11	77.6
			27.31	7.58E+03				
2ECS2	2.39E+03	5.58	27.33	7.50E+03	7.54E+03	5.38	-0.2	63.1
			27.34	7.62E+03				
3ECS2	3.43E+03	5.74	27.26	8.15E+03	7.88E+03	5.4	-0.34	45.7
			27.41	7.20E+03				
4ECS2	3.43E+03	5.74	27.4	7.21E+03	7.21E+03	5.36	-0.38	41.7
			27.46	6.90E+03				
5ECS2	3.43E+03	5.74	27.38	7.34E+03	7.12E+03	5.36	-0.38	41.7
			27.23	83827891				
6ECS2	3.43E+03	5.74	27.13	8.12E+03	8.75E+03	5.45	-0.29	51.3
			27.03	7.92E+03				
7ECS2	3.11E+04	5.7	26.88	9.00E+03	8.46E+03	5.48	-0.22	60.3
			27.29	6.29E+03				
8ECS2	3.11E+04	5.7	27.28	6.36E+03	6.33E+03	5.36	-0.34	45.7
			27.5	8.37E+03				
9ECS2	4.33E+03	5.84	27.37	9.30E+03	8.83E+03	5.45	-0.39	40.7
			27.34	9.49E+03				
10ECS2	4.33E+03	5.84	27.45	8.69E+03	9.09E+03	5.46	-0.38	41.7
			Rendement moyen pour le niveau 100 000 UG/L				-0.30	51.0
			Rendement moyen Eau chaude sanitaire Aquadien Short Protocol				-0.34	47.4

Echantillon	Valeur de dopage UG/puits	A(log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B(log)	Rendement log	%
			27.69	5.65E+03				
1ECS2W	2.39E+03	5.58	27.64	5.88E+03	5.76E+03	5.32	-0.26	55
			27.68	5.68E+03				
2ECS2W	2.39E+03	5.58	27.6	6.02E+03	5.85E+03	5.32	-0.26	55
			27	7.89E+03				
3ECS2W	2.67E+03	5.63	27.01	7.81E+03	7.85E+03	5.45	-0.18	66.1
			26.88	8.71E+03				
4ECS2W	2.67E+03	5.63	27.03	7.67E+03	8.19E+03	5.47	-0.16	69.2
			27.15	8.95E+03				
5ECS2W	3.43E+03	5.74	27.07	9.58E+03	9.27E+03	5.52	-0.22	60.3
			27.18	8.76E+03				
6ECS2W	3.43E+03	5.74	27.28	8.00E+03	8.38E+03	5.48	-0.26	55
			27.08	7.54E+03				
7ECS2W	3.13E+03	5.7	27.01	8.03E+03	7.78E+03	5.45	-0.25	56.2
			27.06	7.66E+03				
8ECS2W	3.13E+03	5.7	27.11	7.36E+03	7.51E+03	5.43	-0.27	53.7
			26.85	1.40E+04				
9ECS2W	4.33E+03	5.84	27.05	1.20E+04	1.30E+04	5.67	-0.17	67.6
			27.16	1.09E+04				
10ECS2W	4.33E+03	5.84	27.21	1.05E+04	1.07E+04	5.59	-0.25	56.2
			Rendement moyen pour le niveau 100 000 UG/L				-0.23	59.4
			Rendement moyen Eau chaude sanitaire W2 Short Protocol				-0.24	57.9

Echantillon	Valeur de dopage UG/puits	Valeur de dopage A(log)	Résultat analyse C(t)	Résultat analyse UG/puits	Résultat analyse Moyenne UG/puits	Résultat analyse B(log)	Rendement log	Rendement %
1ECS1F	3.92E+01	3.8	33.56 33.49	5.85E+01 6.20E+01	6.02E+01	3.34	-0.46	34.7
2ECS1F	3.92E+01	3.8	33.6 33.64	5.57E+01 5.50E+01	5.53E+01	3.3	-0.5	31.6
3ECS1F	4.89E+01	3.89	32.29 32.11	8.76E+01 1.02E+02	9.48E+01	3.53	-0.36	43.7
4ECS1F	4.89E+01	3.89	31.83 32	1.30E+02 1.12E+02	1.21E+02	3.64	-0.25	56.2
5ECS1F	5.82E+01	3.97	31.49 31.42	1.52E+02 1.62E+02	1.57E+02	3.75	-0.22	60.3
6ECS1F	5.82E+01	3.97	31.92 31.88	1.05E+02 1.09E+02	1.07E+02	3.59	-0.38	41.7
7ECS1F	3.44E+01	3.74	32.41 32.44	9.89E+01 9.61E+01	9.75E+01	3.55	-0.19	64.6
8ECS1F	3.44E+01	3.74	32.38 32.31	1.02E+02 1.07E+02	1.04E+02	3.57	-0.17	67.6
9ECS1F	6.22E+01	4	32.4 32.5	1.69E+02 1.55E+02	1.62E+02	3.76	-0.24	57.5
10ECS1F	6.22E+01	4	32.43 32.63	1.64E+02 1.40E+02	1.52E+02	3.74	-0.26	55

FDRS Short Protocol	Rendement moyen pour le niveau 1 000 UG/L	-0.30	51.3

Echantillon	Valeur de dopage UG/puits	Valeur de dopage A(log)	Résultat analyse C(t)	Résultat analyse UG/puits	Résultat analyse Moyenne UG/puits	Résultat analyse B(log)	Rendement log	Rendement %
1ECS2F	2.39E+03	5.58	26.93 26.91	1.02E+04 1.03E+04	1.03E+04	5.57	-0.01	97.7
2ECS2F	2.39E+03	5.58	27.41 27.45	7.01E+03 6.78E+03	6.90E+03	5.4	-0.18	66.1
3ECS2F	3.11E+04	5.7	27.52 27.46	5.20E+03 5.48E+03	5.34E+03	5.28	-0.42	38.01
4ECS2F	3.11E+04	5.7	26.95 26.97	8.44E+03 8.29E+03	8.37E+03	5.48	-0.22	60.3
5ECS2F	3.06E+03	5.69	26.54 26.45	1.09E+04 1.18E+04	1.14E+04	5.61	-0.08	83.2
6ECS2F	3.06E+03	5.69	26.92 26.95	7.91E+03 7.67E+03	7.79E+03	5.45	-0.24	57.5
7ECS2F	3.21E+03	5.71	27.15 27.13	6.46E+03 6.58E+03	6.52E+03	5.37	-0.34	45.7
8ECS2F	3.21E+03	5.71	26.69 26.62	9.65E+03 1.02E+04	9.93E+03	5.55	-0.16	69.2
9ECS2F	4.33E+03	5.84	27.17 27.15	1.09E+04 1.10E+04	1.10E+04	5.6	-0.24	57.5
10ECS2F	4.33E+03	5.84	27.36 27.33	9.36E+03 9.56E+03	9.46E+03	5.53	-0.31	49

Rendement moyen pour le niveau 100 000 UG/L	-0.22	62.4
Rendement moyen Eau chaude sanitaire FDRS Short Protocol	-0.26	56.9

Robustesse Eau minérale

Echantillon	Valeur de dopage UG/puits	A(log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B(log)	Rendement log	%
			33.12	8.23E+01				
1EMI1	3.92E+01	3.8	33.14	8.13E+01	8.18E+01	3.42	-0.38	41.7
			32.86	1.01E+02				
2EMI1	3.92E+01	3.8	32.83	1.04E+02	1.02E+02	3.51	-0.29	51.3
			32.57	1.22E+02				
3EMI1	6.49E+01	4.02	32.53	1.25E+02	1.23E+02	3.6	-0.42	38
			32.78	1.03E+02				
4EMI1	6.49E+01	4.02	33.07	8.20E+01	9.23E+01	3.47	-0.55	28.2
			32.31	1.07E+02				
5EMI1	3.74E+01	3.78	32.22	1.16E+02	1.12E+02	3.55	-0.23	58.9
			33.28	4.83E+01				
6EMI1	3.74E+01	3.78	33.29	4.78E+01	4.80E+01	3.19	-0.59	25.7
			31.96	1.31E+02				
7EMI1	6.43E+01	4.01	31.89	1.39E+02	1.35E+02	3.64	-0.37	42.7
			32.2	1.08E+02				
8EMI1	6.43E+01	4.01	32.17	1.11E+02	1.10E+02	3.54	-0.47	33.9
			32.65	1.38E+02				
9EMI1	6.22E+01	4	32.5	1.54E+02	1.46E+02	3.67	-0.33	46.8
			32.53	1.51E+02				
10EMI1	6.22E+01	4	32.74	1.28E+02	1.40E+02	3.65	-0.35	44.7
Aquadien Short Protocol			Rendement moyen pour le niveau 1 000 UG/L				-0.40	41.2

Echantillon	Valeur de dopage UG/puits	A(log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B(log)	Rendement log	%
			27.27	7.80E+03				
1EMI2	2.39E+03	5.58	27.34	7.38E+03	7.59E+03	5.38	-0.2	63.1
			27.34	7.42E+03				
2EMI2	2.39E+03	5.58	27.44	6.84E+03	7.13E+03	5.35	-0.22	60.3
			27.35	7.70E+03				
3EMI2	2.65E+03	5.63	27.31	7.97E+03	7.83E+03	5.4	-0.23	58.9
			27.42	7.30E+03				
4EMI2	2.65E+03	5.63	27.39	7.49E+03	7.40E+03	5.38	-0.25	56.2
			27.12	7.75E+03				
5EMI2	3.33E+03	5.73	27.09	7.98E+03	7.86E+03	5.4	-0.33	46.8
			26.95	8.94E+03				
6EMI2	3.33E+03	5.73	27.02	8.45E+03	8.70E+03	5.44	-0.29	51.3
			27.17	6.85E+03				
7EMI2	2.67E+03	5.63	27.07	7.41E+03	7.13E+03	5.36	-0.27	53.7
			27.06	7.50E+03				
8EMI2	2.67E+03	5.63	27.02	7.77E+03	7.63E+03	5.39	-0.24	57.4
			27.56	7.97E+03				
9EMI2	4.33E+03	5.84	27.45	8.66E+03	8.31E+03	5.42	-0.42	38.01
			27.36	9.34E+03				
10EMI2	4.33E+03	5.84	27.28	9.93E+03	9.64E+03	5.49	-0.35	44.7
			Rendement moyen pour le niveau 100 000 UG/L				-0.28	53.0
			Rendement moyen Eau minérale Aquadien Short Protocol				-0.34	47.1

Echantillon	Valeur de dopage UG/puits	A(log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B(log)	Rendement log	%
			33.18	7.89E+01				
1EMI1W	3.92E+01	3.8	33.16	7.99E+01	7.94E+01	3.46	-0.34	45.7
			33.29	7.23E+01				
2EMI1W	3.92E+01	3.8	33.27	7.36E+01	7.30E+01	3.42	-0.38	41.7
			32.82	9.98E+01				
3EMI1W	6.43E+01	4.01	32.91	9.29E+01	9.63E+01	3.54	-0.47	33.9
			32.73	7.00E+01				
4EMI1W	6.43E+01	4.01	32.7	7.13E+01	7.07E+01	3.41	-0.6	25.1
			31.91	1.28E+02				
5EMI1W	4.95E+01	3.9	31.88	1.31E+02	1.29E+02	3.67	-0.23	58.9
			32.54	7.57E+01				
6EMI1W	4.95E+01	3.9	33.66	6.82E+01	7.20E+01	3.41	-0.49	32.4
			32.39	1.01E+02				
7EMI1W	4.48E+01	3.86	32.33	1.07E+02	1.04E+02	3.57	-0.29	51.3
			33.07	5.67E+01				
8EMI1W	4.48E+01	3.86	33.15	5.30E+01	5.48E+01	3.3	-0.56	27.5
			32.43	1.63E+02				
9EMI1W	6.22E+01	4	32.34	1.76E+02	1.70E+02	3.79	-0.21	61.7
			32.38	1.71E+02				
10EMI1W	6.22E+01	4	32.4	1.68E+02	1.69E+02	3.79	-0.21	61.7
W2 Short Protocol			Rendement moyen pour le niveau 1 000 UG/L				-0.38	44.0

Echantillon	Valeur de dopage UG/puits	A(log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B(log)	Rendement log	%
			28.11	4.20E+03				
1EMI2W	2.39E+03	5.58	28.18	3.99E+03	4.09E+03	5.17	-0.41	38.9
			28.6	2.79E+03				
2EMI2W	2.39E+03	5.58	28.72	2.52E+03	2.65E+03	4.98	-0.6	25.1
			28.34	3.51E+03				
3EMI2W	2.65E+03	5.63	28.35	3.50E+03	3.50E+03	5.1	-0.53	29.5
			28.15	4.09E+03				
4EMI2W	2.65E+03	5.63	28.05	4.41E+03	4.25E+03	5.18	-0.35	44.7
			27.69	4.45E+03				
5EMI2W	2.67E+03	5.63	27.48	5.33E+03	4.89E+03	5.25	-0.38	41.7
			27.9	3.77E+03				
6EMI2W	2.67E+03	5.63	27.89	3.79E+03	3.78E+03	5.13	-0.5	31.6
			26.8	9.28E+03				
7EMI2W	2.67E+03	5.63	26.79	9.41E+03	9.34E+03	5.53	-0.1	79.4
			27.12	7.12E+03				
8EMI2W	2.67E+03	5.63	27.05	7.56E+03	7.34E+03	5.42	-0.21	61.7
			27.21	1.05E+04				
9EMI2W	4.33E+03	5.84	27.16	1.09E+04	1.07E+04	5.59	-0.25	56.2
			27.13	1.12E+04				
10EMI2W	4.33E+03	5.84	26.15	1.10E+04	1.11E+04	5.6	-0.24	57.5
			Rendement moyen pour le niveau 100 000 UG/L				-0.36	46.6
			Rendement moyen Eau minérale W2 Short Protocol				-0.37	45.3

Echantillon	Valeur de dopage UG/puits	Valeur de dopage A(log)	Résultat analyse C(t)	Résultat analyse UG/puits	Résultat analyse Moyenne UG/puits	Résultat analyse B(log)	Rendement log	Rendement %
1EMI1F	3.92E+01	3.8	33.48 33.2	6.22E+01 7.76E+01	6.99E+01	3.4	-0.4	39.8
2EMI1F	3.92E+01	3.8	33.51 33.45	6.07E+01 6.39E+01	6.23E+01	3.35	-0.45	35.5
3EMI1F	6.49E+01	4.02	32.56 32.55	1.23E+02 1.24E+02	1.23E+02	3.65	-0.37	42.7
4EMI1F	6.49E+01	4.02	32.72 32.71	1.08E+02 1.09E+02	1.09E+02	3.59	-0.43	37.2
5EMI1F	3.74E+01	3.78	32.83 32.57	7.01E+01 8.65E+01	7.83E+01	3.45	-0.33	46.8
6EMI1F	3.74E+01	3.78	32.59 32.79	8.50E+01 7.25E+01	7.88E+01	3.45	-0.33	46.8
7EMI1F	6.43E+01	4.01	32.04 32.08	1.23E+02 1.20E+02	1.21E+02	3.64	-0.37	42.7
8EMI1F	6.43E+01	4.01	31.91 31.97	1.38E+02 1.31E+02	1.34E+02	3.68	-0.33	46.8
9EMI1F	6.22E+01	4	31.43 31.91	2.66E+02 2.10E+02	2.38E+02	3.93	-0.07	85.1
10EMI1F	6.22E+01	4	32.07 32.08	1.54E+02 1.41E+02	1.48E+02	3.73	-0.27	53.7

FDRS Short Protocol

Rendement moyen pour le niveau 1 000 UG/L: **-0.34** | **47.7**

Echantillon	Valeur de dopage UG/puits	Valeur de dopage A(log)	Résultat analyse C(t)	Résultat analyse UG/puits	Résultat analyse Moyenne UG/puits	Résultat analyse B(log)	Rendement log	Rendement %
1EMI2F	2.39E+03	5.58	28.25 28.2	3.64E+03 3.78E+03	3.71E+03	5.13	-0.45	35.5
2EMI2F	2.39E+03	5.58	28.18 28.2	3.97E+03 3.91E+03	3.94E+03	5.15	-0.43	37.2
3EMI2F	2.65E+03	5.63	27.75 27.71	5.61E+03 5.80E+03	5.71E+03	5.31	-0.32	47.9
4EMI2F	2.65E+03	5.63	27.83 27.86	5.27E+03 5.13E+03	5.20E+03	5.27	-0.36	43.7
5EMI2F	3.33E+03	5.73	27.33 27.28	6.54E+03 6.77E+03	6.66E+03	5.38	-0.35	44.7
6EMI2F	3.33E+03	5.73	27.16 27.2	7.51E+03 7.29E+03	7.40E+03	5.42	-0.31	49
7EMI2F	2.67E+03	5.63	27.16 27.1	6.89E+03 7.24E+03	7.07E+03	5.4	-0.23	58.9
8EMI2F	2.67E+03	5.63	26.79 26.73	9.39E+03 9.87E+03	9.63E+03	5.54	-0.09	81.3
9EMI2F	4.33E+03	5.84	27.33 27.24	9.56E+03 1.03E+04	9.93E+03	5.55	-0.29	51.3
10EMI2F	4.33E+03	5.84	27.19 27.19	1.07E+04 1.07E+04	1.07E+04	5.58	-0.26	55

Rendement moyen pour le niveau 100 000 UG/L: **-0.31** | **50.5**

Rendement moyen Eau minérale FDRS Short Protocol: **-0.32** | **49.1**

Results from iQ-Check™ Quanti L. spp. *– Extension 2020 - achieved by AdGène*

Robustesse Tour aéroréfrigérante

Echantillon	Valeur de dopage UG/puits	Valeur de dopage A(log)	Résultat analyse C(t)	Résultat analyse UG/puits	Résultat analyse Moyenne UG/puits	Résultat analyse B(log)	Rendement log	Rendement %
			33.8	4.87E+01				
1TAR1	3.92E+01	3.8	33.75	5.04E+01	4.95E+01	3.2	-0.6	25.1
			33.14	8.13E+01				
2TAR1	3.92E+01	3.8	33.2	7.78E+01	7.96E+01	3.41	-0.39	40.7
			32.88	9.53E+01				
3TAR1	6.49E+01	4.02	32.77	1.04E+02	9.97E+01	3.5	-0.52	30.2
			32.93	9.15E+01				
4TAR1	6.49E+01	4.02	32.97	8.88E+01	9.02E+01	3.46	-0.56	27.5
			32.09	1.29E+02				
5TAR1	3.74E+01	3.78	31.96	1.43E+02	1.36E+02	3.64	-0.14	72.4
			32.01	1.38E+02				
6TAR1	3.74E+01	3.78	32.1	1.28E+02	1.33E+02	3.63	-0.15	70.8
			31.66	1.68E+02				
7TAR1	6.43E+01	4.01	31.61	1.75E+02	1.72E+02	3.74	-0.27	53.7
			31.9	1.39E+02				
8TAR1	6.43E+01	4.01	31.91	1.38E+02	1.38E+02	3.65	-0.36	43.7
			32.51	1.54E+02				
9TAR1	6.22E+01	4	32.85	1.17E+02	1.36E+02	3.64	-0.36	43.7
			32.58	1.46E+02				
10TAR1	6.22E+01	4	32.62	1.41E+02	1.43E+02	3.66	-0.34	45.7

Aquadien Short Protocol — Rendement moyen pour le niveau 1 000 UG/L: -0.37 | 45.4

Echantillon	Valeur de dopage UG/puits	Valeur de dopage A(log)	Résultat analyse C(t)	Résultat analyse UG/puits	Résultat analyse Moyenne UG/puits	Résultat analyse B(log)	Rendement log	Rendement %
			27.74	5.43E+03				
1TAR2	2.39E+03	5.58	27.71	5.54E+03	5.49E+03	5.25	-0.33	46.8
			28.07	4.20E+03				
2TAR2	2.39E+03	5.58	28.13	4.00E+03	4.10E+03	5.11	-0.46	34.7
			27.16	8.94E+03				
3TAR2	2.65E+03	5.63	27.12	9.25E+03	9.09E+03	5.46	-0.17	67.6
			27.76	5.56E+03				
4TAR2	2.65E+03	5.63	27.85	5.20E+03	5.38E+03	5.24	-0.39	40.7
			26.54	1.26E+04				
5TAR2	3.33E+03	5.73	26.46	1.33E+04	1.29E+04	5.62	-0.11	77.6
			26.7	1.10E+04				
6TAR2	3.33E+03	5.73	26.84	9.80E+03	1.04E+04	5.52	-0.21	61.7
			26.96	8.16E+03				
7TAR2	2.67E+03	5.63	26.97	8.10E+03	8.13E+03	5.41	-0.22	60.3
			26.7	1.01E+04				
8TAR2	2.67E+03	5.63	26.75	9.69E+03	9.88E+03	5.5	-0.13	74.1
			27.46	8.62E+03				
9TAR2	4.33E+03	5.84	27.38	9.18E+03	8.90E+03	5.45	-0.39	40.7
			27.45	8.70E+03				
10TAR2	4.33E+03	5.84	27.37	9.27E+03	8.98E+03	5.46	-0.38	41.7

Rendement moyen pour le niveau 100 000 UG/L: -0.28 | 54.6

Rendement moyen Tour aéroréfrigérante Aquadien Short Protocol: -0.32 | 50.0

Echantillon	Valeur de dopage UG/puits	Valeur de dopage A(log)	Résultat analyse C(t)	Résultat analyse UG/puits	Résultat analyse Moyenne UG/puits	Résultat analyse B(log)	Rendement log	Rendement %
			33.63	5.56E+01				
1TAR1W	3.92E+01	3.8	33.61	5.61E+01	5.59E+01	3.3	-0.5	31.6
			33.51	6.08E+01				
2TAR1W	3.92E+01	3.8	33.55	5.91E+01	6.00E+01	3.33	-0.47	33.9
			32.14	1.05E+02				
3TAR1W	4.95E+01	3.9	32.01	1.18E+02	1.12E+02	3.6	-0.3	50.1
			32.31	9.16E+01				
4TAR1W	4.95E+01	3.9	32.31	9.18E+01	9.17E+01	3.52	-0.38	41.7
			32.28	1.11E+02				
5TAR1W	4.48E+01	3.86	32.45	9.63E+01	1.04E+02	3.57	-0.29	51.3
			32.61	8.40E+01				
6TAR1W	4.48E+01	3.86	32.64	8.16E+01	8.28E+01	3.47	-0.39	40.7
			32	1.12E+02				
7TAR1W	4.89E+01	3.89	31.83	1.30E+02	1.21E+02	3.64	-0.25	56.2
			32.42	7.83E+01				
8TAR1W	4.89E+01	3.89	32.5	7.32E+01	7.58E+01	3.44	-0.45	35.5
			32.62	1.41E+02				
9TAR1W	6.22E+01	4	32.55	1.48E+02	1.45E+02	3.72	-0.28	52.5
			32.82	1.20E+02				
10TAR1W	6.22E+01	4	33.03	1.02E+02	1.11E+02	3.6	-0.4	39.8

W2 Short Protocol — Rendement moyen pour le niveau 1 000 UG/L: -0.37 | 43.3

Echantillon	Valeur de dopage UG/puits	Valeur de dopage A(log)	Résultat analyse C(t)	Résultat analyse UG/puits	Résultat analyse Moyenne UG/puits	Résultat analyse B(log)	Rendement log	Rendement %
			28.13	4.12E+03				
1TAR2W	2.39E+03	5.58	28.17	4.00E+03	4.06E+03	5.17	-0.41	38.9
			28.28	3.58E+03				
2TAR2W	2.39E+03	5.58	38.3	3.50E+03	3.54E+03	5.11	-0.47	33.9
			28.33	3.53E+03				
3TAR2W	2.65E+03	5.63	28.21	3.89E+03	3.71E+03	5.12	-0.51	30.9
			28.15	4.08E+03				
4TAR2W	2.65E+03	5.63	28.2	3.93E+03	4.01E+03	5.16	-0.47	33.9
			27.21	6.57E+03				
5TAR2W	2.67E+03	5.63	27.18	6.75E+03	6.66E+03	5.38	-0.25	56.2
			26.79	9.38E+03				
6TAR2W	2.67E+03	5.63	26.95	8.19E+03	8.78E+03	5.5	-0.13	74.1
			27.42	7.14E+03				
7TAR2W	3.43E+03	5.74	27.26	8.14E+03	7.64E+03	5.44	-0.3	50.1
			27.37	7.40E+03				
8TAR2W	3.43E+03	5.74	27.24	8.32E+03	7.86E+03	5.45	-0.29	51.3
			27.59	7.78E+03				
9TAR2W	4.33E+03	5.84	27.58	7.82E+03	7.80E+03	5.45	-0.39	40.7
			27.19	1.07E+04				
10TAR2W	4.33E+03	5.84	27.06	1.19E+04	1.13E+04	5.61	-0.23	58.9

Rendement moyen pour le niveau 100 000 UG/L: -0.35 | 46.9

Rendement moyen Tour aéroréfrigérante W2 Short Protocol: -0.36 | 45.1

Echantillon	Valeur de dopage UG/puits	A(log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B(log)	Rendement log	%
			33.56	5.88E+01				
1TAR1F	3.92E+01	3.8	33.59	5.71E+01	5.79E+01	3.32	-0.48	33.1
			33.16	7.99E+01				
2TAR1F	3.92E+01	3.8	33.16	8.01E+01	8.00E+01	3.46	-0.34	45.7
			32.6	1.18E+02				
3TAR1F	6.49E+01	4.02	32.66	1.13E+02	1.16E+02	3.62	-0.4	39.8
			32.54	1.25E+02				
4TAR1F	6.49E+01	4.02	32.47	1.31E+02	1.28E+02	3.66	-0.36	43.7
			32.29	1.09E+02				
5TAR1F	3.74E+01	3.78	32.35	1.04E+02	1.07E+02	3.58	-0.2	63.1
			32.74	7.51E+01				
6TAR1F	3.74E+01	3.78	32.72	7.65E+01	7.58E+01	3.44	-0.34	45.7
			32.56	8.05E+01				
7TAR1F	6.43E+01	4.01	32.19	1.09E+02	9.49E+01	3.53	-0.48	33.1
			31.82	1.48E+02				
8TAR1F	6.43E+01	4.01	32.12	1.15E+02	1.32E+02	3.68	-0.33	46.8
			32.47	1.58E+02				
9TAR1F	6.22E+01	4	32.44	1.62E+02	1.60E+02	3.76	-0.24	57.5
			32.67	1.35E+02				
10TAR1F	6.22E+01	4	32.65	1.38E+02	1.37E+02	3.69	-0.31	49

FDRS Short Protocol — Rendement moyen pour le niveau 1 000 UG/L: **-0.35** | **45.8**

Echantillon	Valeur de dopage UG/puits	A(log)	Résultat analyse C(t)	UG/puits	Moyenne UG/puits	B(log)	Rendement log	%
			27.84	5.00E+03				
1TAR2F	2.39E+03	5.58	27.85	4.99E+03	4.99E+03	5.25	-0.33	47.8
			28.39	3.27E+03				
2TAR2F	2.39E+03	5.58	28.51	2.99E+03	3.13E+03	5.05	-0.53	29.5
			28.33	3.55E+03				
3TAR2F	2.65E+03	5.63	28.34	3.52E+03	3.53E+03	5.1	-0.53	29.5
			27.75	5.62E+03				
4TAR2F	2.65E+03	5.63	27.85	5.19E+03	5.40E+03	5.3	-0.33	46.8
			27.02	8.42E+03				
5TAR2F	3.33E+03	5.73	27	8.53E+03	8.48E+03	5.48	-0.25	56.2
			27.03	8.36E+03				
6TAR2F	3.33E+03	5.73	27.03	8.38E+03	8.37E+03	5.48	-0.25	56.2
			27.32	6.06E+03				
7TAR2F	2.67E+03	5.63	27.29	6.22E+03	6.14E+03	5.34	-0.29	51.3
			27.11	7.21E+03				
8TAR2F	2.67E+03	5.63	27.03	7.71E+03	7.46E+03	5.43	-0.2	63.1
			27.81	6.50E+03				
9TAR2F	4.33E+03	5.84	27.65	7.39E+03	6.95E+03	5.4	-0.44	36.3
			27.52	8.18E+03				
10TAR2F	4.33E+03	5.84	27.31	9.74E+03	8.96E+03	5.51	-0.33	46.8

Rendement moyen pour le niveau 100 000 UG/L: **-0.35** | **46.4**

Rendement moyen Tour aéroréfrigérante FDRS Short Protocol: **-0.35** | **46.1**

Appendix 6: Selectivity

Results from iQ-Check™ Quanti L. spp – Extension 2011 - v01 achieved by IPL santé, environnement durables Nord

Sélectivité

Souches cibles : *Legionella* spp.

	Souche	Origine	Taux cible inoculum (Eq UG/puits)	Ct (moy)	IQ Check Legionella spp UG/puits	IQ Check Legionella spp Détection *Legionella*
1	*L. pneumophila ser 1*	CIP 103854T	1,00E+03	33,21	105	Détecté
2	*L. pneumophila ser 2*	CHUL LG 1007 3002	1,00E+03	33,00	122	Détecté
3	*L. pneumophila ser 3*	CHUL LG 1016 2014	1,00E+03	33,19	109	Détecté
4	*L. pneumophila ser 4*	CHUL LG 1006 3010	1,00E+03	33,03	119	Détecté
5	*L. pneumophila ser 5*	CHUL LG 1008 5013	1,00E+03	33,19	106	Détecté
6	*L. pneumophila ser 6*	ATCC 33215	1,00E+03	32,98	101	Détecté
7	*L. pneumophila ser 7*	CHUL LG 1022 1105	1,00E+03	32,93	129	Détecté
8	*L. pneumophila ser 8*	CHUL LG 1009 3009	1,00E+03	33,00	123	Détecté
9	*L. pneumophila ser 9*	CHUL LG 0925 4012	1,00E+03	32,92	130	Détecté
10	*L. pneumophila ser 10*	CHUL LG 1009 2018	1,00E+03	32,63	162	Détecté
11	*L. pneumophila ser 11*	CHUL LG 0841 3021	1,00E+03	32,58	168	Détecté
12	*L. pneumophila ser 12*	CHUL LG 1009 3041	1,00E+03	32,54	174	Détecté
13	*L. pneumophila ser 13*	CHUL LG 1022 1006	1,00E+03	32,88	133	Détecté
14	*L. pneumophila ser 14*	CHUL LG 0916 4027	1,00E+03	32,57	168	Détecté
15	*L. pneumophila ser 15*	CHUL LG 0312 4049	1,00E+03	32,61	163	Détecté
16	*Legionella anisa*	CIP 103870	1,00E+03	32,21	177	Détecté
17	*Legionella birminghamsis*	CHUL HL 06284037	1,00E+03	32,21	177	Détecté
18	*Legionella bozemanii*	CIP 103872 (eq ATCC 33217)[a]	1,00E+03	32,66	127	Détecté
19	*Legionella cherrii*	CHUL HL 05214024	1,00E+03	32,30	166	Détecté
20	*Legionella cincinnatiensis*	CIP 103875	1,00E+03	32,09	193	Détecté
21	*Legionella dunmofii*	CIP 103876 (éq ATCC 33279)[b]	1,00E+03	32,26	170	Détecté
22	*Legionella erythra*	CHUL LG0713012	1,00E+03	32,67	126	Détecté
23	*Legionella feeleii*	CHUL LG07503022	1,00E+03	32,28	169	Détecté
24	*Legionella gormanii*	CHUL LG 10232007	1,00E+03	32,63	133	Détecté
25	*Legionella hackeliae*	CIP103844	1,00E+03	32,50	143	Détecté
26	*Legionella jordanis*	CHUL LG 09455020	1,00E+03	32,25	172	Détecté
27	*Legionella lansingensis*	ATCC 43751	1,00E+03	32,15	185	Détecté
28	*Legionella longbeachae*	CHUL HL 06383034	1,00E+03	32,56	137	Détecté
29	*Legionella maceachernii*	CHUL LG 09221009	1,00E+03	32,21	177	Détecté
30	*Legionella micdadei*	CIP 103882 (éq ATCC 33218)[c]	1,00E+03	32,31	165	Détecté
31	*Legionella oakridgensis*	CHUL LG 07122004	1,00E+03	32,60	133	Détecté
32	*Legionella parisiensis*	CHUL LG 08513015	1,00E+03	32,19	180	Détecté
33	*Legionella sainthelensi*	CHUL HL 06353004	1,00E+03	32,20	179	Détecté
34	*Legionella tucsonensis*	CHUL LG 08495014	1,00E+03	32,37	158	Détecté
35	*Legionella wadsworthii*	CIP 103886	1,00E+03	32,09	193	Détecté

[a]Fluoribacter bozemanae
[b]Fluoribacter dumofii
[c]Tatlockia micdadei

Sélectivité

Exclusivité

	Souche	Origine	Taux cible inoculum (Eq UG/puits)	IQ Check Legionella spp		
				Ct (moy)	**UG/puits**	**Détection**
1	*Aeromonas hydrophila*	Environnement	1,00E+04	N/A	-	Non détecté
2	*Alcaligenes faecalis*	CIP 60.80	1,00E+04	N/A	-	Non détecté
3	*Bacillus subtilis*	CCM 1999	1,00E+04	N/A	-	Non détecté
4	*Burkholderia cepacia*	Eau de douche, La chapelle St Mesnin	1,00E+04	N/A	-	Non détecté
5	*Clostridium*	Eau de puits, Boghni	1,00E+04	N/A	-	Non détecté
6	*Enterobacter aerogenes*	Environnement	1,00E+04	49	5,17E-04	Non détecté
7	*Escherichia coli*	Eau d'alimentation, Liencourt	1,00E+04	N/A	-	Non détecté
8	*Flavobacterium algicola*	Environnement	1,00E+04	N/A	-	Non détecté
9	*Klebsiella oxytoca*	ATCC 49473	1,00E+04	45,42	7,56E-03	Non détecté
10	*Listeria monocytogenes*	CCM 5576	1,00E+04	N/A	-	Non détecté
11	*Proteus vulgaris*	Environnement	1,00E+04	43,55	3,09E-02	Non détecté
12	*Pseudomonas aeruginosa*	Eau d'alimentation, Lille	1,00E+04	42,7	5,83E-02	Non détecté
13	*Pseudomonas fluorescens*	Environnement	1,00E+04	N/A	-	Non détecté
14	*Pseudomonas putida*	Environnement	1,00E+04	N/A	-	Non détecté
15	*Serratia marcescens*	Environnement	1,00E+04	43,13	4,21E-02	Non détecté
16	*Stenotrophomonas maltophila*	Canal de la Deûle, Lille	1,00E+04	N/A	-	Non détecté