



Listeria, the Law and What Good Control Looks Like

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Listeria monocytogenes (Lm)



- One of 20 *Listeria* species
- **Lm is the only species legislated for - pathogenic**
- Widespread in environment: soil, water, animal faeces, vegetation
- Carried by ~10% of people
- Long incubation period: up to 90 days before symptoms appear
- Grows at refrigerator temperatures (-1.4°C)
- **Survives freezing (-18°C)**
- Relatively heat resistant (70°C/2 mins for 6-log reduction)
- Grows in low O₂ environments, e.g. vacuum packed foods
- Highly salt tolerant (A_w 0.92): survives and grows even in cured foods
- Min pH for growth 4.2-4.3
- Forms persistent biofilms on surfaces
 - Resistant to cleaning and disinfection
 - Creates reservoir of contamination
 - **Must enforce rigorous hygiene schedules to manage**
- Vulnerable groups are particularly susceptible
- Transmission from infected food, the environment, mother to foetus
- **Main cause of death from foodborne illness in the EU**

Major transmission route
into humans is through
contaminated foodstuffs

2018 European Top 5 Foodborne Diseases

Morbidity & Mortality



Disease	No. confirmed human cases	Hospitalisations				Deaths				Fatality Rate cf Lm
		Status available (%)	Number of reporting ‡countries	Reported hospitalised cases	Proportion hospitalised (%)	Outcome available (%)	No. reporting MS	Reported Deaths	Case Fatality (%)	
Campylobacteriosis	246,571	27.7	18	20,848	30.6	72.7	16	60	0.03	520
Salmonellosis	91,857	43.2	15	16,556	41.7	67.0	17	119	0.19	82
STEC infections	8,161	37.3	18	1,151	37.8	60.4	20	11	0.22	71
Yersiniosis	6,699	26.4	14	519	29.3	56.8	15	3	0.08	195
Listeriosis	2,549	42.4	17	1,049	97.0	57.6	19	229	15.6	

* 2017: Listeriosis date rate 345x Campylobacteriosis, 28x STEC

** 2016: Listeriosis death rate 540x Campylobacteriosis, 60x STEC

***2015: Listeriosis death rate 590x Campylobacteriosis, 74x STEC

EFSA/ECDC, 2019. EU One Health Zoonoses Report 2018. <https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2019.5926>

* EFSA, ECDC, 2018. EU summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2017.

<http://ecdc.europa.eu/sites/portal/files/documents/zoonoses-%20food-borne-outbreaks-surveillance-2017.pdf>

**EFSA, ECDC, 2017. EU summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2016.

EFSA Journal 2017. 10.2903/j.efsa.2017.5077

*** EFSA, ECDC, 2016. EU summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2015.

EFSA Journal 2016. 10.2903/j.efsa.2016.4634



L. monocytogenes EU Legislation

EU Microbiological Criteria for Foodstuffs 2073/2005

Criterion number	Food category	Sampling plan		Limits	Analytical reference method	Stage where the criterion applies
		n	c			
1.2 (a and b)	Ready-to-eat foods <u>able</u> to support the growth of <i>L. monocytogenes</i> , other than those intended for *infants and for special medical purposes	5	0	100 cfu/g: applies if the manufacturer is able to demonstrate, to the satisfaction of the competent authority, that the product will not exceed the limit 100 cfu/g throughout the shelf-life. The FBO may fix intermediate limits during the process that must be low enough to guarantee that the limit of 100 cfu/g is not exceeded at the end of shelf-life	EN/ISO 11290-2	Products placed on the market during their shelf-life
		5	0	Not detected in 25g: applies before products have left the immediate control of the producing FBO <u>when</u> he is NOT able to demonstrate to the satisfaction of the competent authority that the product will not exceed the limit of 100cfu/g throughout the shelf life	EN/ISO 11290-1	Before the food has left the immediate control of the food business operator, who has produced it
1.3	Ready-to-eat foods * <u>unable</u> to support the growth of <i>L. monocytogenes</i> , other than those intended for **infants and for special medical purposes	5	0	100 cfu/g	EN/ISO 11290-2	Products placed on the market during their shelf-life

* Shelf life <5 days (P+4): food 'automatically considered' not to support growth. NB: P=0 (EU Lm Ref Lab Shelf Life Guidance)

** EU Reg 609/2013 on Food for Specific Groups (FSG), i.e. food for infants and young children (infant formula, follow-on formula and weaning foods), food for specific medical purposes, and total diet replacement for weight control. Limit of 0 cfu/g in 25g sample, n=10, c=0

[Consolidated Reg https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02005R2073-20200308](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02005R2073-20200308)

EU Regulation 2073/2005 Environmental Sampling

- **Art 3.2 of 2073/2005:**
- Samples shall be taken from processing areas and equipment used in food production, when such sampling is necessary for ensuring that the criteria are met. In that sampling the ISO standard 18593 shall be used as a reference method. **Food business operators manufacturing ready-to-eat foods, which may pose a *Listeria monocytogenes* risk for public health, shall sample the processing areas and equipment for *Listeria monocytogenes* as part of their sampling scheme.**

Trending Sampling Results

- **Recital 25 of 2073/2005 – generally applicable:**
- **Trends in test results should be analysed, as they are able to reveal unwanted developments in the manufacturing process enabling the FBO to take corrective actions before the process is out of control.**

What Good Control Looks Like (UK Chill): Validation & Monitoring

- **Regular environmental swabbing and food sampling**
 - Target environmental sampling: try to find Lm, address with hygiene
 - Trend results (EU Reg 2073/2005) and act on adverse trends (hygiene)
- **Environmental swabbing (presence/absence)**
 - Validate cleaning method efficacy
 - Verify ongoing efficacy
- **Food sampling**

• Day of Production (DOP)	hygiene indicator
• End of Life (EOL)	shelf life appropriateness

What Good Control Looks Like: UK Chilled Food Industry Lm Data (2008-2019)

- RTE food prevalence (909054 samples):
 - ~0.7% Lm at any point during shelf life, of which
 - 0.0002% present at quantifiable levels, i.e. >20 cfu/g LOQ
- Production environment prevalence (1592459 samples):

• Food contact surfaces	<0.4% Lm	(~774k samples)
• Non-Food contact surfaces	~2% Lm	(~818k samples)

Comparing European Countries' Listeriosis Rates 2014-18

All rates per 100k population

Sentinel systems:

Belgium: 2015-18 covers 80% population

Spain: 2015-17 no coverage info

Non-EU rates:

South Africa: 1.84 (2017-18)

USA: 0.3

Australia : 0.3*

NZ: 0.6

* incomplete data

US rate data:

<https://www.cdc.gov/listeria/technical.html>

Australia:

<https://www2.health.vic.gov.au/public-health/infectious-diseases/disease-information-advice/listeriosis>

NZ:

<https://www.foodstandards.gov.au/publications/Documents/Listeria%20monocytogenes.pdf>

2014	Cases	Rate
Italy	52	-
Portugal	-	-
Denmark	92	1.64
Sweden	125	1.30
Iceland	4	1.23
Switzerland + Liechtenstein	98	1.20
Finland	65	1.19
Spain	161	1.15
Luxembourg	5	0.91
Slovenia	18	0.87
Belgium	84	0.75
Germany	597	0.74
Austria	49	0.58
France	374	0.57
Norway	29	0.57
Netherlands	90	0.54
Slovakia	29	0.54
EU	2,161	0.52
Hungary	39	0.40
Czech Rep	38	0.36
Ireland	15	0.33
UK	201	0.31
Lithuania	7	0.24
Malta	1	0.24
Poland	86	0.23
Latvia	3	0.15
Bulgaria	10	0.14
Greece	10	0.09
Croatia	4	0.09
Estonia	1	0.08
Romania	5	0.03
Cyprus	0	0.00

2015	Cases	Rate
Spain	206	0.99
Malta	4	0.93
Sweden	88	0.90
Finland	46	0.84
Estonia	11	0.84
Denmark	44	0.78
Belgium	83	0.74
Germany	580	0.71
Switzerland + Liechtenstein	54	0.65
Slovenia	13	0.63
France	412	0.62
EU	2,206	0.46
Austria	38	0.44
Netherlands	71	0.42
Ireland	19	0.41
Latvia	8	0.40
Hungary	37	0.38
Norway	18	0.35
Czech Rep	36	0.34
Slovakia	18	0.33
UK	186	0.29
Greece	31	0.29
Portugal	28	0.27
Italy	153	0.25
Poland	70	0.18
Lithuania	5	0.17
Bulgaria	5	0.07
Romania	12	0.06
Croatia	2	0.05
Cyprus	0	0
Luxembourg	0	0
Iceland	0	0

2016	Cases	Rate
Spain	362	-
Finland	67	1.22
Belgium	104	0.92
Germany	697	0.85
Slovenia	15	0.73
Denmark	40	0.7
Sweden	68	0.69
Estonia	9	0.68
Switzerland + Liechtenstein	50	0.6
France	375	0.56
Austria	46	0.53
Netherlands	89	0.52
EU	2,536	0.47
Czech Rep	47	0.45
Norway	19	0.37
Lithuania	10	0.35
Luxembourg	2	0.35
UK	201	0.31
Italy	179	0.3
Latvia	6	0.3
Portugal	31	0.3
Ireland	13	0.28
Poland	101	0.27
Hungary	25	0.25
Malta	1	0.23
Greece	20	0.19
Slovakia	10	0.18
Croatia	4	0.1
Bulgaria	5	0.07
Romania	9	0.05
Cyprus	0	0
Iceland	0	0

2017	Cases	Rate
Spain	284	-
Iceland	6	1.77
Finland	89	1.62
Denmark	58	1.01
Germany	726	0.88
Luxembourg	5	0.85
Sweden	81	0.81
Belgium	73	0.80
Netherlands	108	0.63
Slovenia	13	0.63
France	370	0.55
Switzerland	45	0.53
EU Total	2,480	0.48
Portugal	42	0.41
Hungary	36	0.37
Austria	32	0.36
Lithuania	9	0.32
Poland	116	0.31
Estonia	4	0.30
Norway	16	0.30
Ireland	14	0.29
Czech Rep	30	0.28
Italy	164	0.27
UK	160	0.24
Slovakia	12	0.22
Croatia	8	0.19
Greece	20	0.19
Bulgaria	13	0.18
Latvia	3	0.15
Romania	10	0.05
Cyprus	0	0.00
Malta	0	0.00

2018	Cases	Rate
Estonia	27	2.05
Finland	80	1.45
Spain	370	0.89
Sweden	89	0.88
Denmark	49	0.85
Luxembourg	5	0.83
Germany	683	0.82
Belgium	74	0.81
Latvia	15	0.78
Lithuania	20	0.71
Portugal	64	0.62
Switzerland	52	0.61
Iceland	2	0.57
France	338	0.51
Slovenia	10	0.48
EU Total	2,549	0.47
Norway	24	0.45
Ireland	21	0.43
Netherlands	69	0.40
Poland	128	0.34
Austria	27	0.31
Slovakia	17	0.31
Czech Republic	31	0.29
Italy	178	0.29
Hungary	24	0.25
UK	168	0.25
Malta	1	0.21
Greece	19	0.18
Romania	28	0.14
Bulgaria	9	0.13
Cyprus	1	0.12
Croatia	4	0.10

Conclusions

- **100 cfu/g as the legal limit, when enforced commercially, drives compliance with best practice and achievement of high standards, as evidenced by epidemiology**
- **High Care/Risk Area regimes are a demonstrably effective control strategy, i.e. application of GMP + HACCP**
- **DOP and EOL trending and analysis works as a means of demonstrating control and shelf life appropriateness**
- **Current UK industry and EU hygiene, shelf life and microbiological rules are effective when implemented and enforced commercially**