Listeria: the inconvenient truth

Christeyns 3/9/25

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DG – Chilled Food Association, Chair - Industry *Listeria* Group, ECFF Rapporteur: www.chilledfood.org/listeria

- *Listeria* and listeriosis
- Outbreaks and how to prevent them
- The law – current, and future and implications
- What Good Looks Like
- The elephant in the kitchen
- What's Next?
- Guidance

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Chilled Food Association

Our Mission

To promote and defend the reputation, sustainability and value of the professional chilled food industry through the development and communication of standards of excellence in the production and distribution of chilled food.

Membership

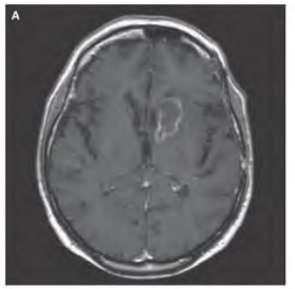
- Chilled food producers
- Compliance with CFA Guidelines
- BRCGS or IFS certification
- Non-compliances + close-outs
- Resumé/CV of person responsible for food safety
- Reference from existing member

Listeria monocytogenes

Major transmission route to humans is through contaminated foodstuffs

- One of 28 *Listeria* species - Lm the only species legislated for: most strains are human pathogens
- Widespread in soil, water, animal faeces, vegetation
- Carried by up to 10% of people
- Long incubation period: ≤90* days before symptoms appear
- Grows at refrigerator temperatures (-2°C: EU Lm Ref Lab, -4.4°C US FDA/USDA)
- Survives freezing (-18°C)
- Relatively heat resistant (70°C for 2 mins - 75°C target)
- Highly salt tolerant (survives at a_W <0.90, i.e. >15% salt solution, grows even in cured foods
- Grows in low O_2 environments, e.g. vac packed
- Minimum growth pH 4.0 (dependent on growth medium)

- Forms persistent biofilms on surfaces
  - Resistant to cleaning and disinfection
  - Creates reservoir of contamination
  - Must enforce rigorous hygiene schedules to manage
- Vulnerable groups particularly susceptible (~20% of UK, USA population) = YOPI (Young, Old, Pregnant, Immunocompromised)
- Transmission from infected food, environment, mother to foetus – spontaneous abortion, miscarriage, meningitis
  - Main cause of death from foodborne illness in EU



* 70 days quoted by numerous authorities

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L. monocytogenes Growth and Survival Parameters

Factor	Growth			Survival
	Lower Limit	Optimum	Upper Limit	
Temp (°C)	*-2.0 to 3.0 **-4.4	30-37	45	-18
pH	4.0-4.3	7	9.6	3.3-4.2
a_W	0.92 (0.90 with glycerol)	0.99		<0.90
NaCl (%)			12	>20
Atmosphere	Facultative anaerobic and microaerophilic – able to grow $\pm$ O_2 (e.g. vac pack or MAP)			

* EU Lm Reference Laboratory shelf life guidance for Labs, 4th ed 2021
** https://ask.usda.gov/s/article/Can-Listeria-grow-at-refrigerator-temperatures

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2023 European Top 5 Foodborne Diseases: Morbidity & Mortality

Disease		Hospitalisations				Deaths		Outbreaks			
	No. confirmed cases	No reporting ‡countries	No. hospitalised	% hospitalised	Outcome available (%)	Reported Deaths	Case Fatality (%)	No.	Related Cases	Case rate	Lm Fatality Rate in comparison
Campylobacteriosis	**137,107**	16	10,551	**23.5**	61.6	**34**	0.04	255	1,097	**45.1**	***453***
Salmonellosis	**65,208**	17	11,287	**38.9**	56.5	**81**	0.22	1,014	6,632	**15.3**	***82***
Yersiniosis	**7,919**	17	636	**30.1**	47.5	**0**	0	14	96	**2.2**	
STEC infections	**7,117**	17	1,130	**38.5**	67.8	**28**	0.58	71	408	**2.1**	***31***
Listeriosis	**2,738**	19	1,330	**96.0**	57.6	**286**	18.1	35	296	**0.62**	

Note: invasive. Cases are primarily sporadic, not from outbreaks

Europe 2023 *v.* 2019: case rate up *43%. More than doubled since 2008

***Source:** EU One Health 2024 Zoonoses Report

efsa European Food Safety Authority

ecdc

EXCLUDES UK

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European Listeriosis Rates 2019-23

Data from:
EU One Health Zoonoses Reports

***Sentinel system population coverage:**
Belgium: 2016-22 80%
Spain: 2016-22 no info

Non-EU rates:
South Africa: 1.84 (2017-18)
USA: 0.3 (2022, CDC)
Australia : 0.57 (2021)
NZ: 0.8 (2022)
UK: 0.24 (2018-22)

UK 2020-23 data:
Food Security Reports 2021/24

2019	Cases	Rate
Spain*	505	–
Estonia	21	1.59
Iceland	4	1.12
Sweden	113	1.1
Denmark	61	1.05
Malta	5	1.01
Slovenia	20	0.96
Finland	50	0.91
Belgium*	66	0.72
Germany	570	0.69
NL	103	0.6
France	373	0.56
Portugal	56	0.54
Norway	27	0.51
Lux	3	0.49
EU28+ EFTA	2621	0.46
Austria	38	0.43
Switz	36	0.42
Hungary	39	0.4
Ireland	17	0.35
Italy	202	0.33
Slovakia	18	0.33
Poland	121	0.32
Latvia	6	0.31
Czechia	27	0.25
UK	156	0.23
Lithuania	6	0.21
Bulgaria	13	0.19
Croatia	6	0.15
Cyprus	1	0.11
Greece	10	0.09
Romania	17	0.09

2020	Cases	Rate
Spain*	191	–
Finland	94	1.7
SL	26	1.2
Iceland	4	1.1
Malta	5	0.97
Sweden	88	0.85
DK	44	0.76
Norway	37	0.69
Switz	58	0.67
DE	544	0.65
Lux	4	0.64
Belgium*	54	0.59
NL	90	0.52
France	334	0.5
Austria	41	0.46
Portugal	47	0.46
Latvia	8	0.42
EU27+EFTA	1876	0.42
Hungary	32	0.33
Italy	147	0.25
Cyprus	2	0.23
Estonia	3	0.23
UK	144	0.21
Greece	20	0.19
Poland	62	0.16
Czechia	16	0.15
Slovakia	7	0.13
Croatia	5	0.12
Ireland	6	0.12
Bulgaria	4	0.06
RO	2	0.01
LT	0	0

2021	Cases	Rate
Spain*	224	–
Iceland	5	1.4
Finland	70	1.3
Denmark	62	1.1
Sweden	107	1
Slovenia	19	0.9
Belgium*	65	0.7
France	435	0.64
Germany	560	0.67
Lux	4	0.63
Latvia	10	0.53
NL	86	0.49
EU27	2183	0.49
EU27+EFTA	2268	0.44
Austria	38	0.43
Italy	241	0.41
Estonia	5	0.38
Switz	152	0.38
Norway	20	0.37
Hungary	35	0.36
Poland	120	0.32
Ireland	14	0.28
UK	184	0.27
Lithuania	7	0.25
Slovakia	13	0.24
Czechia	24	0.22
Greece	21	0.2
Croatia	8	0.2
Cyprus	1	0.11
Romania	11	0.06
Bulgaria	3	0.04
Malta	0	0
Liecht	0	0
Portugal	0	0

2022	Cases	Rate
DK	86	1.5
Finland	70	1.3
Sweden	125	1.2
Spain*	437	0.95
SL	20	0.95
Belgium*	87	0.94
Switz	78	0.89
Estonia	11	0.83
DE	548	0.66
France	451	0.66
Hungary	64	0.66
EU 27	2738	0.62
EU27+EFTA	2848	*0.55
Lux	4	0.62
Portugal	63	0.61
Italy	345	0.58
Norway	30	0.55
NL	94	0.53
Iceland	2	0.53
Austria	47	0.52
Czechia	48	0.46
Slovakia	25	0.46
LT	13	0.46
Latvia	8	0.43
Poland	142	0.38
Ireland	17	0.34
UK	200	0.3
Malta	1	0.19
Croatia	5	0.13
Cyprus	1	0.11
Bulgaria	5	0.07
Greece	7	0.07
Romania	14	0.07
Liecht	0	2

2023	Cases	Rate
Finland	92	1.7
Sweden	131	1.2
PT	99	0.95
Spain*	428	0.92
Belgium*	84	0.89
DK	53	0.89
Switz	74	0.84
France	538	0.79
DE	663	0.79
SL	16	0.76
Iceland	3	0.77
Norway	39	0.71
LT	20	0.7
EU27+ EFTA	2952	0.66
Poland	240	0.65
Lux	4	0.61
Latvia	11	0.58
NL	95	0.53
Hungary	46	0.48
Czechia	45	0.42
Austria	37	0.41
Italy	231	0.39
Slovakia	21	0.39
Estonia	5	0.37
Malta	2	0.37
Ireland	18	0.34
Greece	31	0.3
UK	203	0.3
Bulgaria	15	0.23
Croatia	6	0.16
RO	21	0.11
Cyprus	0	0
Liecht	0	0

2019-2023	Cases	Rate
Spain*	1785	3.69
Finland	376	1.38
Denmark	306	1.06
Sweden	564	1.07
Iceland	18	0.98
Slovenia	101	0.95
Belgium*	356	0.77
Germany	2885	0.69
Estonia	45	0.68
CH+Liech	254	0.64
France	2131	0.63
Lux	19	0.60
EU27 (2021-23)	7873	0.59
Norway	153	0.57
NL	468	0.53
Portugal	265	0.51
Malta	13	0.51
EU28 EFTA EEA (2019)	2621	0.46
Latvia	43	0.45
Austria	201	0.45
Hungary	216	0.45
EU27 EFTA (2020-22)	4144	0.43
Italy	1166	0.39
Poland	685	0.37
Lithuania	46	0.32
Czechia	160	0.3
Ireland	72	0.29
UK	887	0.26
Greece	89	0.17
Croatia	30	0.15
Bulgaria	40	0.12
Cyprus	5	0.11
Romania	65	0.07

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What Makes Food Ready to Eat (RTE)?

2073/2005: "food intended by the producer or the manufacturer for direct human consumption without the need for cooking or other processing effective to reduce to an acceptable level or eliminate microorganisms of concern."

Applies to B2B & B2C
UK Supplier QA systems in major chilled FBOs assure supplier compliance

- **Manufacturer's risk assessment & product design, i.e. HACCP plan [assim. Reg 852/2004]**
- **Appropriate (growing &) production controls – validation + monitoring**
  - Minimise potential for contamination by zoonotic organisms
- **Hygienic preparation and packing – validation + monitoring [852/2004, assim. Reg 2073/2005]**
  - Prevent re-/cross-contamination
  - (thermal) Process
- **Limited shelf life - UK chilled prep food shelf lives 30-40% of usual Continental [2073/2005]**
  - Ensure peak quality
  - Minimise opportunity for microbial growth
- **Chilled distribution, sale and storage - *UK: 5°C max to RDCs required commercially [No EU law – set by MSs]**
  - Minimise potential for microbial growth - domestic fridges ~7°C (FSA project B13006) **BUT new surveys…**
- **Appropriate usage instructions [assim. Reg 1169/2011]**
  - e.g. Chilled storage
  - Durability date – 'use by' for chilled, 'best before' otherwise
  - But no further process for RTE to reduce/eliminate hazard microorganisms

* UK temperature legislation: 8°C max in England, Wales, NI, No limit in Scotland

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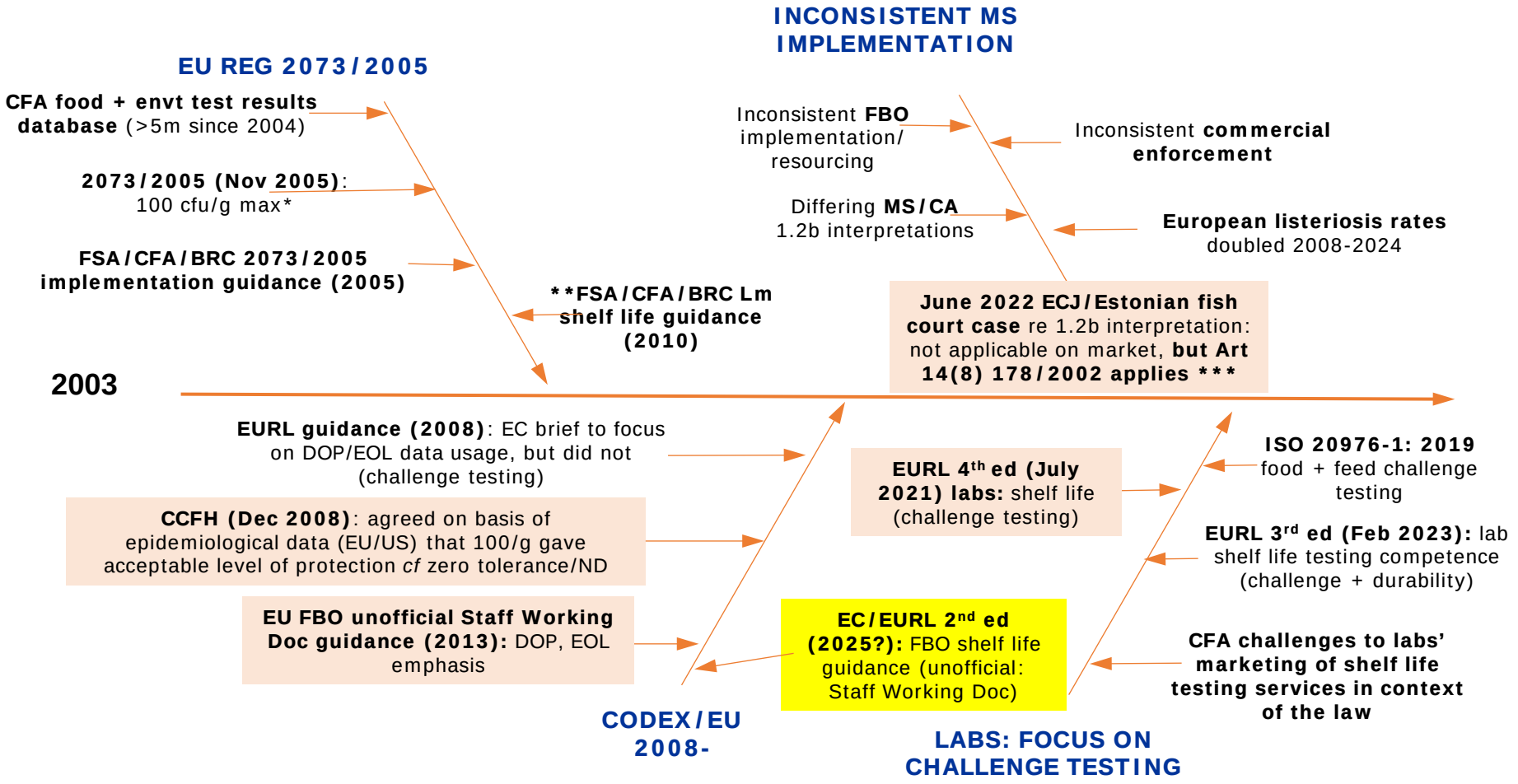
Lm criteria journey milestones & changes

Updated 1/9/25



Sept 2023 proposal to change to 1.2b (i.e. penalty for 1.2a NC): ND throughout life

4 week EC consultation to 8/5/24: 81 responses, 79 with concerns

WTO given until 16/7/24 to comment

EU SCOPAFF agreed 3/7/24: BE voted against, FI abstained, 25 MSs voted for. SCOPAFF agreed again by same qualified majority 11/10/24

Amending Reg 2024/2895 published 20/11/24

Shall apply in EU + other jurisdictions applying EU law from 1 July 2026

- With evidence of RTE food supporting growth compliance throughout shelf life (criterion 1.2a), otherwise CA can specify criterion 1.2b. Resolution by FBO acquiring shelf life substantiation data.

** FSA/CFA/BRC guidance implemented by major industry in the UK, used in enforcement (also in Ireland). **Being refreshed but no change of established approach**

CA can take appropriate measures to impose restrictions on food being placed on market. or require its withdrawal from market where there are reasons to suspect that, despite conformity, it is unsafe.

CCFH = Codex Committee on Food Hygiene CA = Competent Authority DOP = Day of Production EOL = End of Life ND = Not Detected

EU Law: Micro Criteria for Foodstuffs Reg 2073/2005

Food category	Sampling plan N	Sampling plan c	Limits	Stage where the criterion applies
[Criterion 1.2] **Ready-to-eat foods able** to support the growth of *L. monocytogenes,* other than those intended for *infants and for special medical purposes	5	0	**Criterion 1.2a:** 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 (footnote (5)	Products placed on the market during their shelf-life
	5	0	**Criterion 1.2b**: Not detected in 25g: shall apply ~~applies before products have left the immediate control of~~ where the producing FBO has **NOT** been able to demonstrate to the satisfaction of the competent authority that the level of *L. monocytogenes* ~~product~~ will not exceed the limit of 100 cfu/g throughout the shelf life of the food	**Products placed on the market during their shelf-life** ~~Before the food has left the immediate control of the FBO who has produced it~~
[Criterion 1.3} **Ready-to-eat foods unable** to support the growth of *L. monocytogenes,* other than those intended for *infants and for special medical purposes (also see footnotes 4 & 8)	5	0	100 cfu/g	Products placed on the market during their shelf-life

FROM 1/7/26 IN EU + NI

13/8/25 **Amendment shall apply from 1 July 2026 in the EU & jurisdictions applying EU law, i.e. NI.** ***criterion 1.1 applies**

EU Law: Micro Criteria for Foodstuffs Reg 2073/2005
Don't forget the footnotes!

(4) Regular testing against the criterion [1.3] is not required in normal circumstances for the following RTE foods:
— those which have received heat treatment or other processing effective to eliminate *Lm*, when recontamination is not possible after this treatment (for example, products heat treated in their final package),
— fresh, uncut and unprocessed vegetables and fruits
— bread, biscuits and similar products,
— bottled or packed waters, soft drinks, beer, cider, wine, spirits and similar products,
— sugar, honey and confectionery, including cocoa and chocolate products,
— live bivalve molluscs,
— food grade salt.

(5) **This criterion [1.2a] shall apply 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 operator 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.

(8) Products with pH ≤ 4.4 or a_w ≤ 0.92, products with pH ≤ 5.0 and a_w ≤ 0.94, products with a shelf-life of less than five days [*P+≤4 d*] shall be automatically considered to belong to this category [1.3]. Other categories of products can also belong to this category, subject to scientific justification.

Currently applicable in EU & jurisdictions applying EU law, i.e. NI

(Original criterion 1.2b in Reg retained on GB Statutes as it was EU law at 31/12/20. Was assimilated into GB law in 2024)

Shelf Life – no change to EC requirements

UK/IE shelf lives: typically 30-40% those for equivalent foods sold on Continent (FSA project B13006)

- **Annex II of 2073/2005 remains unchanged, i.e.:**
  - **'Studies':**
    - Physico-chemical specs of the food, type of packaging, storage and processing conditions, potential for contamination and the foreseen shelf life, and
    - Scientific literature and research data regarding growth and survival characteristics
  - **Additional studies by the FBO 'when necessary on the basis of those studies', which may include:**
    - Predictive modelling, e.g. www.ComBase.cc (free + failsafe)
    - Tests to assess ability of inoculated microorganisms to grow/survive under reasonably foreseeable storage conditions
    - Studies to evaluate growth/survival during shelf life [storage trials]

Assure 100/g compliance via Supplier QA, environmental hygiene and limit shelf life including by using DOP & EOL data

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Shelf Life – no change to EC requirements: meeting 6 May 2025

UK/IE shelf lives: typically 30-40% those for equivalent foods sold on Continent (FSA project B13006)

1. 2073/2005 emphasis remains on FBOs having shelf life studies to demonstrate that 100/g won't be exceeded. Nothing is changing in that respect. Issue lies primarily with SMEs' compliance with the law.
2. Historical shelf life data & collaborative trials combined with data from consultation of available scientific literature remain valid approaches. Not EC's intention to put new rules in place on shelf life studies etc. "*Challenge testing is not the alpha and/or omega of shelf life studies... and is not always the optimal solution*". Regs' Annex II sets out other approaches.
3. EU Lm Ref Lab updating **EC's 2013 FBO shelf life guidance** by end 2025 => clarity also to CAs on why, how and when to do shelf life testing. EC view: won't remove but may reduce differences in MSs' approaches.
   Note: legally traded food within one MS must be accepted under Single Market rules by another.
4. Re: how a CA on looking at a product can tell whether its shelf life basis is valid, EC commented that there is rapid transfer of info between MSs through EU networks (e.g. RASFF, AAC) so this should not be an issue. Industry response: This still leaves open potential for stoppage of product as there is no visible means of knowing whether there is a sound basis for shelf life. This is particularly an issue for short shelf life foods.
5. EC highlighted that industry guidance (e.g. ECFF's shelf life and EMP docs) can be turned into European Guides under Reg 852/2004, having more robust status.

Assure 100/g compliance via Supplier QA, environmental hygiene and limit shelf life including by using DOP & EOL data

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Shelf Life – no change to EU requirements

UK/IE shelf lives: typically 30-40% those for equivalent foods sold on Continent (FSA project B13006)

- **EC is leaving any specifics of shelf life establishment approach to Member States, e.g.**
  - **Ireland (FSAI)**
    - Will not require challenge testing
    - If using ComBase:
      - Initial load if FBO's data as a rule shows <LOD: 0 log Lm (1 cfu/g)
      - Ignore lag time (although this is important in reality - stressed organisms) – ComBase default lag being removed?
      - Temperature: use <5°C (FBO) for 1/3 shelf life, 7°C for 1/3 (sale), 10°C (home) for final 1/3
    - FSAI sampling on the market using 11290-2 enumeration method
  - **BE/NL**
    - Challenge testing of 'worst case' product in FBOs' range – has resulted in shelf-life reduction by FBOs (**Note**: much longer standard shelf lives than those in the UK/IE for equivalent foods)

Assure 100/g compliance via Supplier QA, environmental hygiene and limit shelf life including by using DOP & EOL data

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Challenge testing: irrelevant to ND, unnecessary, unrepresentative, narrowly applicable, potentially misleading and costly

- **Only demonstrates (e.g. thermal) process efficacy** – no relevance to presence/absence
- **Only covers an individual formulation (recipe)**
- **Ignores prerequisite of assuring & monitoring production area hygiene** & continuous routine product monitoring
- **Uses rapid-growing strains in log phase and typically higher loads than normally detected**
- **Storage trials are proven be effective in setting shelf life - does not take historical (real) data into account**
- **Cannot replicate factory conditions, nor replace volume of data, professional knowledge**
- **Safe food, whether or not challenge-tested to set shelf life, cannot be made in unhygienic conditions**
- **Does not reflect actual production/supply chain control**, which results in low levels (primarily ND) and low prevalence
- **Durability testing is required rarely** - can set shelf life using info on e.g. product characteristics, historical data etc.
- **Shelf life would be set by 3rd party** without knowledge of raw materials, manufacturing areas or processes - **Food safety is FBO's legal responsibility**
- **Spending money on real controls e.g. hygiene, temperature control and Supplier Quality Assurance, is the priority**
- **Highly costly (EUR 10-15k per recipe)**
- **Insufficient lab capacity**

NOT REQUIRED BY LAW

Instead use proven effective controls: Supplier QA, environmental hygiene and limit shelf life inc using DOP & EOL data

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Implications of the changed penalty (Criterion 1.2b to apply throughout shelf life)

- **FBOs not using best practice or even legally compliant likely to continue to not do so until enforcement action is taken**

Example foods affected: 5+ day shelf life salads, sandwiches + fillings, wraps, meat products, fish products, dairy products, prepared (cut) produce, dips, dressings, deli products, pies, flans, quiches, desserts

- **Assured compliance with 1.2b would require:**
  - Reformulation to kill Lm (e.g. pH<3.3), or
  - Shorten shelf life to P+4 max (criterion 1.3 would apply = 100/g max) **BUT P+4 max does not assure safety**, or
  - Validated in-pack thermal process/HPP/irradiation (criterion 1.3 would apply)
  - Another intervention/hurdles, e.g. GAP+GHP+GMP + Lm **bacteriophage**? Phage on its own does not ensure absence (↓ load by 1-2 logs, activity ceasing after ~24h of application). Cannot clean up food, not legal on POAO in EU/UK, costly
  - **Data substantiating shelf life & hygiene: DOP + EOL + Envt (food contact, non-FC, during production + post hygiene) => criterion 1.2a applicable**
- **Potential consequences of 1.2b:**
  - **Application in spot checks on the market - hazard- (detection), not risk-based (quantification):**
    - Loss of foods from market, increased food waste, reduced food security
- **Need:**
  - **Compliance with requirement for shelf life evidence – has been law since 2005 and is not changed**
  - **Continued recognition of efficacy of current approach: data from DOP, EOL+ env controls + Supplier QA**
  - **Much more emphasis on environmental controls + active management + enforcement: CFA EMP guidance**

Shelf Life

UK/IE shelf lives: typically 30-40% those for equivalent foods sold on Continent (FSA project B13006)

EC STATED (6/5/25) NO CHANGE TO LEGAL REQUIREMENTS

MUST RETAIN and expand application and enforcement of:

- **Basis of UK industry effective approach (*viz.* UK epidemiological data) set out in:**
  - **CFA/BRC/FSA (+ other assns.) guidance on 2073/2005 implementation (2005)**
  - **CFA/BRC/FSA shelf life guidance (2010 – being refreshed):**
    - **Referred to in:**
      - **FSA (2025): https://fsalink.food.gov.uk/official/guidance/raw-ready-eat-fishery-products**
      - **FSS (2025): https://www.foodstandards.gov.scot/publications-and-research/publications/shelf-life-guidance-2025**
      - **FSAI (2014): https://www.fsai.ie/publications/guidance-note-18-validation-of-product-shelf-life**
  - **European Chilled Food Federation 2025 shelf life guidance (with ref to BE, NL specifics) [Basis = CFA guidance]**
  - **Environmental best practice management & monitoring (2023, CFA/ECFF/Industry *Listeria* Group)**

- **EHOs require support inc FSA-sponsored training (food micro/legislation) and swabbing/sampling resources**

Supplier QA, environmental hygiene and limit shelf life including by using DOP & EOL data

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What Good Looks Like - Best Practice Data
CFA Members' Lm *Database Jan 2013-Dec 2024

*>5 million datapoints
(food from 2004, production environment from 2006)

RTE **food prevalence (1,116,199 samples):

At any point during shelf life ~0.01% present at quantifiable levels, i.e. >20 cfu/g LOD

DOP: 99 quantifiable out of 866,930 samples

EOL: 50 quantifiable out of 249,269 samples

***Production environment prevalence (2,219,339 samples):

Food contact surfaces: ~0.3% Lm (1,106,023 samples)

Non-Food contact: ~2.7% Lm (1,113,316 samples)

DOP: Day of Production EOL: End of Life
** Further split into raw/cooked/mixed components

***Data also split into During Production, Post Hygiene

All detections are investigated and addressed

UK Implementation?

- **Northern Ireland**
  - EU law applies directly = terms of Windsor Framework (Brexit)
  - FSA NI preparing to deliver training to EHOs
  - Enforcement approach as now for 1.2a-compliant FBOs – but what about non-compliant ones?
  - Implications for traders with NI = have a sound basis for shelf life, as has been required by law since 2005

- **GB**
  - UK consistently lower listeriosis rates performance than EU + UKG confidence in established (DOP/EOL etc) approach
  - UKG's 19/5/25 announcement of agreement to negotiate an SPS Agreement with the EU
    - UKG approach includes dynamic alignment with EU law (hygiene, labelling, composition) i.e. adoption of new EU legislation as a matter of course, and that applicable since 31/12/20.
    - Formal negotiations start this autumn? End date and outcome = ?

- **Approach needed**:
  - Compliance with requirement for shelf life evidence – has been law since 2005
  - Recognition of efficacy of storage trials + DOP, EOL+ env controls + data + current approach to be retained by UK
  - Much more emphasis on environmental controls, active management + enforcement: CFA/ECFF EMP guidance – WHY?

Examples of Major Fatal Listeriosis Outbreaks & Root Causes

Country (year)	Outcomes and Root Causes
UK (1987-9)	>17 dead, 200+ cases. Pâté imported from Belgium. **Post-process contamination**
France (1992)	92 dead, 272 cases. Jellied pork tongue. **Post-process contamination**
USA (1998-9)	17 dead, 4 miscarriages/stillbirths, 101 cases. Cooked meat. **Air filtration maintenance contamination**
Canada (2008)	22 dead, 57 cases. CA $27m. Cooked sliced meat. Dirty slicer. **Post-process contamination**
USA (2010-15)	3 dead, 10 cases. Only in ice cream made into milkshake by hospital. **Post-process contamination**
USA (2011)	33 dead, 147 cases. Cantaloupes. **Contaminated production. Washing process validated?**
Denmark (2014)	17 dead, 41 cases. Cooked meat (rullepølse). **Post-process contamination**
USA (2014)	7 dead, 35 cases. Caramel apples. **Contaminated production. Washing process validated?**
Europe (2015-18)	6 dead, 32 cases. **Frozen sweetcorn eaten raw (non-RTE) but not High Care grown or handled**
South Africa (2017-18)	216 dead, 455 miscarriages, 1060 cases. Cooked RTE meat products. **Post-process contamination**
Netherlands, Belgium (2017-19)	3 dead, 21 cases. Cooked meat product. **Post-process contamination**
Australia (2018)	6 dead, 19 cases. Cantaloupes. **Field contamination, processing contamination**
Germany (2019)	7 dead, 1 miscarriage, 112 cases. Cooked meat product. **Post-process contamination**
Spain (2019)	3 dead, 38 miscarriages, 222 cases. Cooked meat product. **Post-process contamination**
USA (2023)	10 dead, 60 cases. Cooked meat product. **Post-process contamination**
USA (2018-25)	11 dead, 37 cases. Frozen supplement shakes.

See: Table A2 in *Listeria monocytogenes* in ready-to-eat foods: attribution, characterization and monitoring. FAO (2022). www.fao.org/3/cc2400en/cc2400en.pdf.

79/88 listeriosis outbreaks where a root cause was identified were found to be due to post-process contamination, i.e. environmental hygiene control is critical

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Examples of UK Listeriosis Cases/Clusters (1999-2019)

Year	Region	Cases	Vehicle
1999	NE England	4	Hospital sandwiches
2003	NE England	17	Butter
2003	NE England	18	None identified
2003	S Wales	2	Hospital sandwiches
2003	SW England	5	Hospital sandwiches
2004	E Mids	6	None identified
2004	SE England	2	Hospital sandwiches
2005	NW England	1	Sliced meat
2006	London	1	Sliced meat
2007	London	1	Hospital sandwiches
2008	NW England	3	Hospital sandwiches
2010-13	NE England	9	Hospital sandwiches
2011	Staffordshire	3	Hospital sandwiches
2012	Northern Ireland	3	Hospital sandwiches
2013-14	NW and NE England	4	Hospital sandwiches
2014	SE England	4	Hospital sandwiches
2019	UK (North West source)	9 (6 deaths)	*Hospital sandwiches

* 1000 cfu/g in cooked diced chicken supplied to sandwich producer

→ **FSA 2016 guidance for healthcare settings**

ACM 847a (ACMSF) 2007, Eurosurveillance 16 (20) May 2011 https//doi.org.10.1017/50950268820000473 + supplementary information

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Effective Risk Management?

Lm management in place?		UK hospital sandwiches 2019	UK/EU frozen maize 2015-18
Manufacturing hygiene managed to prevent (re)contamination		☒	☒
Product does not support growth		☒	☒ (once thawed)
Product does not support survival		☒	☒
Not a chilled product		☒	☑
Short shelf life (e.g. <5d, i.e. P+4 max):	Components	☒	☒
	End product	☑	☒
Cold chain integrity assured:	Commercial	☒	☑
	Domestic/end user	☒	☒
Consumers:	Not eaten by vulnerable groups	☒	?
	Usage instructions complied with	☒	☒
Total (☑ =+1, ☒ =-1, N/A or ?=0) out of +10 max		**-9**	**-7**

Enforcement

- Enforcers are not sufficiently supported (resourced or trained) to ensure compliance by all FBOs visited, or are not using available powers to seek compliance
- NOTE: 2073/2005 demands
  - Production area:
    - Sampled for Lm, and
    - Trending of data carried out, and
    - Adverse trends acted on without undue delay, and
  - Shelf life: sound basis - CFA/BRC/FSA shelf life guidance (2010):

- Enforcer briefing note developed (CFA/EHO) setting out these requirements and EHO powers

- FBO briefing note drafted (CFA) setting out compliance requirements and signposting to CFA resources

Supplier QA, environmental hygiene and limit shelf life including by using DOP & EOL data

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Impact of *L spp.* detection on Raw RTE component

Measures to minimise risk	
Wash Validation	2-3 week validation over multiple shifts. Focus primarily on proven TVC/enteros reduction with *L spp* as secondary target (lower prevalence)
Barrier Management	LRA and HCA risk management measures + environmental sampling. Verification of controls efficacy.
Testing Incoming	Routine surveillance inc *L spp* of all RTE salad items (e.g. 20-30 different items/site) min 2 x pcm
WIP/Final Product Testing	In-process testing
Action on finding *L spp* positive: Estimate 10-20 people involved for several hours per person	
Enhanced sampling	2 samples taken over next 3-5 deliveries of affected material. If further *L spp* +ves carry out further sampling. LRA and HCA risk management enhanced – additional hygiene, sanitisation of floors, envt samples
Review on-site controls	Audit hygiene controls, production controls, traceability. Strip equipment and swab as anything in contact with the affected material could have become contaminated. Equipment sanitisation and hygiene verification.
Follow-up with supplier	Engagement over e.g. a month
Retail customer	Engagement. Time + cost + reputational damage. Relationship mgmt. Often ramping up testing, e.g. weekly. QA sampling & production records review. Additional audits. Lm meetings at middle management level.

Total time estimated for action to address a single *L spp* detection: 1 person-month

All detections are investigated and addressed

CFA 2021 analysis

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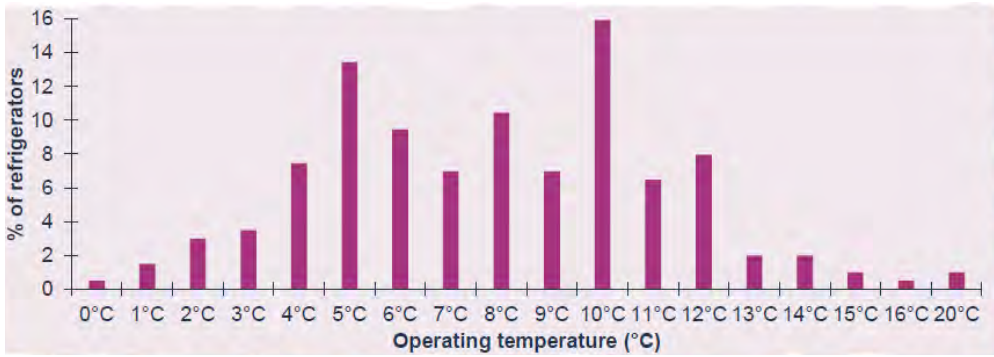
Domestic Fridges – the Missing Link

Where most chilled foods spend most of their time

- **Industry *Listeria* Group-Proposed design, performance and usage project funded by at FSRN: ongoing**
- **Recent surveys**
  - **Cardiff Met University:**
    - Spring/summer 2023 self-reported survey: 201 fridges
    - Respondents' ages: 22% 18-24, 23% 25-34, 9% 65-74, none 75+
    - Fast-reacting thermometer placed in fridge door (warmest fridge part)
    - Recorded temperatures: 0°C to 20°C (see figure)
    - **29% fridges reported at ≤5°C, 71% >5°C, 37% ≥10°C**



  - **Netherlands:**
    - Mean temperatures of 534 fridges: bottom shelf 5.7°C, upper shelf 7.7°C
    - Growth rates (µmax) of pâté and cooked ham modelled using the square root model
    - **Domestic storage for either <7 days or <7°C reduced listeriosis cases by >80 %**
    - **Elderly (65+) people's fridges on average 0.6°C higher than those of people ≤35**
    - Reduction of listeriosis cases may be achieved by targeted communication especially to the elderly

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What's Next?

- Are your HACCP plans, hygiene & their monitoring systems consistently effective - do you have data to prove it?
- Have you documented shelf life basis of your Lm-risk products, irrespective of criteria applicable and verified ongoing (e.g. DOP/EOL data)?
- Are your product usage instructions labelled correctly?

- Will UK Government reach an SPS Agreement with the EU with full dynamic alignment on hygiene etc?
- What training and support will EHOs have?
- Is legislation a barrier to novel hurdle approaches, e.g. bacteriophage?

- How can domestic fridge design, performance and usage and use by date compliance be improved?

- Why are previous lessons from incidents not being cascaded more effectively?
  - Within industry – trade associations/professional bodies, particularly to non-members
  - By and to customers (e.g. manufacturers, retailers, Government to NHS/hospital trusts)
  - By and to enforcers

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Listeria-related guidance available

Author	Year	Title	Web link
ANSES, EURL	2023	Lm Technical guidance document on sampling food processing area. Version 4	https://zenodo.org/records/8406616
BRCGS	2022	Global Standard - Food Safety. Issue 9.	https://www.brcgs.com/store/global-standard-food-safety-(issue-9)/p-12187
CFA	2008	Listeria Management Guidance	
	2016	Micro Testing & Interpretation (2nd ed)	http://tinyurl.com/CFAMTIGv2
	2023	Principles of an Environmental Monitoring Program for Management of Lm	https://bit.ly/3PBIu5p
	2023	Action on detection &/or enumeration of Lm or L. spp in food inc at <LOQ	http://tinyurl.com/LmDetectionAction
CFA, BRC, FSA	2010	Shelf life of RTE food in relation to Lm - Guidance for FBOs	https://www.chilledfood.org/wp-content/uploads/2015/08/Shelf-life-of-RTE-foods-in-relation-to-Lm-FINAL-v1.1.1-23-3-10-with-worked-examples.pdf
CFA/BRC, (FSA)	2006	Guidance on the Practical Implementation of the EC Reg on Micro Criteria for Foodstuffs (ed 1.2)	https://www.chilledfood.org/wp-content/uploads/2015/07/BRC_CFA_Micro_Criteria_Guidance_Ed_1.2.pdf
CODEX Alimentarius Commission	2009	Guidelines on the Application of General Principles of Food Hygiene to the Control of Lm in Foods CAC/GL 61 – 2007 (Under review 2024)	http://www.fao.org/input/download/standards/10740/CXG_061e.pdf
European Chilled Food Federation	2006	Recommendations for the Production of Prepackaged Chilled Food. 2nd ed	https://www.ecff.net/wp-content/uploads/2018/10/ECFF_Recommendations_2nd_ed_18_12_06.pdf
	2023	Principles of an Environmental Monitoring Program for the Management of Lm (CFA doc)	https://www.ecff.eu/wp-content/uploads/2023/10/Principles-of-an-environmental-monitoring-program-for-L-monocytogenes-v1-10-7-23.pdf
	2025	Shelf life of RTE food in relation to Lm - Guidance for FBOs	https://www.ecff.eu/wp-content/uploads/2025/03/ECFF-Shelf-life-of-RTE-foods-in-relation-to-Lm-v3.0.pdf
EC	2013	Guidance document on Lm shelf-life studies for RTE foods, under Reg (EC) No. 2073/2005 of 15/11/05 on micro criteria for foodstuffs. (for FBOs)	https://ec.europa.eu/food/document/download/44257174-bf8c-4214-a60d-6790a7ca4109_en (POOL/G4/2013/11510/11510-EN.doc)
Food & Biocides Industry Group	2016	Biocides in Cleaning and Disinfection	https://www.chilledfood.org/wp-content/uploads/2018/08/Biocides-Cleaning-and-Disinfection-working-document-industry-guidance-18-10-16-with-updated-best-practice-example-FBIG-logo-in-progress.pdf
FSAI	2005	Control & Management of Lm Contamination of Food. ISBN 1-904465-29-3.	https://www.fsai.ie/workarea/downloadasset.aspx?id=1234
FSS	2014	Safe Smoked Fish Tool (2022 revision)	https://safesmokedfish.foodstandards.gov.scot/assessment/3049
Profel	2020	Hygiene guidelines for control of Lm in production of quick-frozen vegetables	https://profel-europe.eu/_library/_files/PROFEL_Listeria_mono_guidelines_November2020.pdf

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