Lessons Learned from European and South African Listeriosis Outbreaks

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- Context - UK chilled food sector
- Key terms and principles
- Why is *Listeria monocytogenes* important?
- EU regulatory requirements
- Listeriosis rates internationally
- Recent fatal outbreaks – timelines and impacts
  - South Africa 2017-18 RTE cooked meat product
  - European 2015-18 RTC frozen corn
- Conclusions

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UK, 1989

Health fears hit chilled food sales at MandS

Labour plans new attack on Thatcher over food hygiene

CALL FOR FREEZE ON COOK-CHILL

- **'Listeria hysteria': fatal pâté outbreak, contaminated cooked chicken**
- **Department of Health demanded code of practice on 'cook-chill'**
- **CFA launched May, developed HACCP-based industry guidelines, launched December together with accreditation scheme**

Trade association at last for chilled food manufacturers

The Chilled Foods Association has been formed at the right moment, in the best place, for essential reasons. Its progress should be followed. □

Food body plans safety initiatives

Join CFA, urges Minister

Chilled food firms launch far-reaching code to guarantee safety

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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 manufacturers
- Compliance with CFA Guidelines
- BRC or IFS certification
- Non-compliances + close-outs
- Resumé of person responsible for food safety
- Reference from existing member

Chilled Food

A prepared food that
for reasons of safety and/or quality
is designed to be stored
at refrigeration temperatures
(at or below *8°C)
throughout its entire life

Ready to Eat	**(RTE)**
Ready to Reheat	**(RTRH)**
Ready to Cook	**(RTC)**

* Legal max in England, Wales, Northern Ireland. Chilled sector operates to 5°C max on delivery to RDC

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Key Terms: RTE, RTRH, RTC

- **Ready to Eat (RTE)**

  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. (cold-eating) [from EU Regulation 2073/2005]

  Manufactured in a High Care or High Risk Area

- **Ready to Reheat (RTRH)**

  Designed to be reheated by the final consumer.

  Manufactured in a High Care or High Risk Area

  Standard practice among UK major multiples to provide validated cooking instructions

- **Ready to Cook (RTC)**

  Designed to be given a heat process delivering a 6-log kill with respect to vegetative pathogens (a minimum process equivalent to 70°C/2 mins) throughout all components.

  Manufactured in a Low Risk/GMP Area

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What Makes Food RTE?

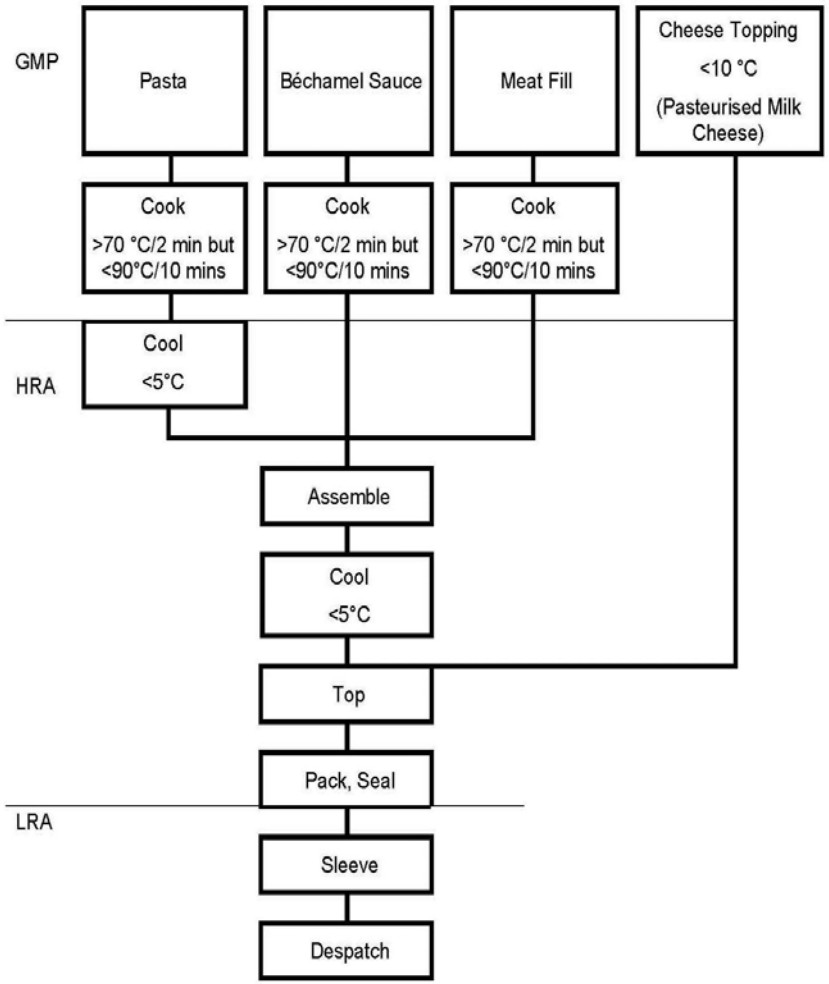
- Manufacturer's risk assessment & product design, i.e. HACCP plan:
- Appropriate (growing &) production controls
  - Minimise potential for contamination by zoonotic organisms
- Hygienic preparation and packing
  - Prevent re-/cross-contamination
  - (thermal) Process
- Limited shelf life
  - Ensure peak quality
  - Minimise opportunity for microbial growth
- Chilled distribution, sale and storage
  - Minimise potential for microbial growth
- Appropriate usage instructions
  - E.g. Chilled storage
  - Durability date – 'use by' for chilled, 'best before' otherwise
  - No further process to reduce/eliminate hazard microrganisms

Raw RTE – Materials Assurance

- Specified suppliers
- Apply Good Agricultural Practice standards
- Agronomists on-site
- Crop protocols
  - Growing site selection
  - Organic waste use in agriculture
    - Human-derived (sewage sludge) – no use on RTE
    - Animal-derived (farmyard manures, abattoir waste) – long intervals even after composting. Not used in practice on UK retail prepared RTE
  - Irrigation water quality
  - Control animal access
  - Assure human hygiene
- Grower/processor contracts
- Grower/processor/retailer audits

Segregation

- **GMP/Low Risk Area**
  - Raw material intake / Ready to cook foods / Packaged food
- **High Care Area**
  - RTE and ready to reheat food production
  - Includes non-thermally processed ('raw') ingredients having been through a decontamination process
  - Separate equipment, utensils, staff and changing areas
  - Positive pressure, filtered air
- **High Risk Area**
  - RTE and ready to reheat food production
  - Only thermally processed foods (minimum 70°C/2 mins)
  - Separate equipment, utensils, staff and changing areas
  - Positive pressure, filtered air



Listeria monocytogenes (Lm)

- One of 18 *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 O_2 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

Listeria monocytogenes: Parameters

Factor	Growth			Survival
	Lower Limit	Optimum	Upper Limit	
Temperature (°C)	-1.5 to 3.0	30-37	45	-18
pH	4.2-4.3	7	9.4-9.5	3.3-4.2
A_W	0.90-0.93	0.99	>0.99	<0.90
NaCl (%)	<0.5	0.7	12-16	>20
Atmosphere	Facultative anaerobe – survives in presence or absence of oxygen			

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Vulnerable Groups

- **People with weakened immune systems are particularly susceptible to listeriosis, and likely to suffer more severe symptoms**

- **Vulnerable groups include:**
  - **immunosuppressed people**
  - **patients undergoing immunosuppressive or cytotoxic treatment**
  - **cancer patients**
  - **unborn and newly delivered infants**
  - **pregnant women**
  - **people with diabetes**
  - **alcoholics (including those with alcoholic liver disease)**
  - **the elderly**
  - **people using gastric acid inhibitors***

- **Proportion of population in a vulnerable group?**
  - **USA** and UK *** ~ 20%**

* Risk factors for sporadic listeriosis in the Netherlands, 2008 to 2013. Euro Surveill. 2015;20(31):pii=21199
** Sensitive populations: who is at greatest risk? Int J Food Microbiol 1996;30:113–123.
*** The Occurrence and Prevention of Foodborne Disease in Vulnerable People. Foodborne Paths & Disease. 2011; 8 (9), 961-973

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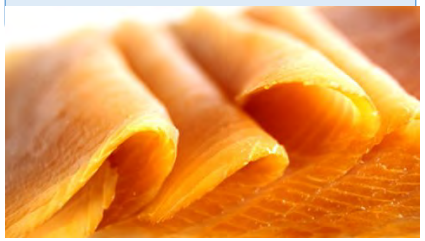
Foods of Particular Risk to Vulnerable Groups

Fish

- Smoked fish
- Cooked shellfish
- Pâté



Meat

- Cooked (sliced) meats/poultry
- Pâté
- Cured meats

Pasteurised/ unpasteurised cheeses

- Soft blue veined
- Mould ripened soft

Prepared foods

- Pre-packed sandwiches
- Prepared salad veg
- Some cut fruits e.g. melon

Generally high risk:

- **Chilled, and**
- **Able to support the growth of Lm, and**
- **Ready to eat**

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EU General Food Law 178/2002

- **Art 14.1:** Food shall not be placed on the market if it is unsafe
- **Art 14.2:** Food shall be deemed to be unsafe if it is considered to be:
  (a) injurious to health;
  (b) unfit for human consumption.
- **Art 14.5:** In determining whether any food is unfit for human consumption, regard shall be had to whether the food is unacceptable for human consumption **according to its intended use**…
- **Art 14.8:** Conformity of a food with specific provisions applicable to that food **shall not bar the competent authorities from taking appropriate measures to impose restrictions on it being placed on the market or to require its withdrawal from the market where there are reasons to suspect that, despite such conformity, the food is unsafe**.

https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32002R0178

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EU General Food Hygiene Law 852/2004

- **Art 1.1:**

  (a) primary responsibility for food safety rests with the food business operator (FBO)

  (b) it is necessary to ensure food safety throughout the food chain,

  (c) it is important, for food that cannot be stored safely at ambient temperatures, particularly frozen food, to maintain the cold chain;

  (d) general implementation of procedures based on the HACCP principles, together with the application of good hygiene practice, should reinforce FBOs' responsibility

- **Chapter V, 1:** All articles, fittings and equipment with which food comes into contact are to:

  (a) be effectively cleaned &, where necessary, disinfected. Cleaning and disinfection are to take place at a frequency sufficient to avoid any risk of contamination…

https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:139:0001:0054:en:PDF

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EU Food Information to Consumers Law 1169/2011

- **Chapter IV, Section 1, Art 9.1 1:** In accordance with Articles 10 to 35 and subject to the exceptions contained in this Chapter, indication of the following particulars shall be mandatory....

  (j) instructions for use where it would be difficult to make appropriate use of the food in the absence of such instructions;

- **Art 27.1:** The instructions for use of a food shall be indicated in such a way as to **enable appropriate use to be made of the food**.

https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32011R1169

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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 *L. monocytogenes,* 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
		5	0	Absence in 25 g applies before food has left the immediate control of the initial FBO if the manufacturer is **NOT** able to demonstrate that growth will not exceed 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 *L. monocytogenes,* 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

** 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

https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32005R2073

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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.**

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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.**

EU Regulation 2073/2005
Annex II - Shelf Life Studies

- **The studies shall include:**
  - specifications for physico-chemical characteristics of the product, such as pH, a_w, salt content, concentration of preservatives and the type of packaging system, **taking into account the storage** and processing conditions, the possibilities for contamination and **the foreseen shelf-life….**

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Expected Storage Temperature: Domestic Fridges

Temperature reported (°C)	Number of fridges at specified temperature	% fridges at specified temperature	Cumulative %
<4°C	143	4	4
4.0-4.9°C	1,255	34.8	38.8
5.0-5.9°C	120	3.3	42.1
6.0-6.9°C	24	0.7	42.8
7.0-7.9°C	1,356	37.6	80.4
8.0-8.9°C	68	1.9	82.3
9.0-9.9°C	633	17.5	99.8
≥10°C	8	0.2	100

Of 3,607 domestic refrigerators (consolidated surveys) worldwide 39% were <5°C, 80% were <8°C. Mean European and UK temperature 6.6°C

Source: *Cl botulinum* in vacuum and modified atmosphere packed (MAP) chilled foods (FSA Project **B13006**)

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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

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What Good Control Looks Like:
UK Chilled Food Industry Lm Data (2006-2017)

- **RTE food prevalence (835624 samples):**
  - **<1% Lm at any point during shelf life, of which**
  - **0.04% present at quantifiable levels, i.e. >20 cfu/g LOQ**
- **Production environment prevalence (1356031 samples):**
  - **Food contact surfaces <0.5% Lm (~663k samples)**
  - **Non-Food contact surfaces ~2% Lm (~693k samples)**

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*Fatal Listeriosis Outbreaks – Why the Repeats?

Canada (1981)	18 dead, 41 cases. Coleslaw. Field contamination of cabbage (sheep).
USA (1985)	48 dead, 142 cases. Queso fresco (raw milk cheese).
UK (1987-9)	>17 dead, 200+ cases. Pâté imported from Belgium.
France (1992)	92 dead, 272 cases. Jellied pork tongue.
Italy (1997)*	0 dead, 1556 cases. Corn and tuna salad.
USA (1998-9)	17 dead, 4 miscarriages/stillbirths, 101 cases. Cooked meat. Contaminated air filtration unit.
UK (2007)	1 dead. Catered sandwiches.
Canada (2008)	22 dead, 57 cases. CAD 27m. Cooked sliced meat. Retirement homes & hospitals. Dirty slicer.
Australia (2009)	3 dead, 36 cases. Chicken wrap.
USA (2010-15)	3 dead, 10 cases. Ice cream (served to patients as milkshake). [WGS]
USA (2011)	33 dead, 147 cases. USD 50m. Cantaloupes. Equipment & water.
UK (N. Ireland) (2012)	3 dead. Hospital-catered sandwiches.
USA (2013-16)	3 dead, 9 cases. Frozen vegetables.
Denmark (2014)	17 dead, 41 cases. Cooked meat (rullepølse). [WGS]
Canada & USA (2015-16)	4 dead, 33 cases. Leafy salad.
EU (AT, DK, FI, SE, UK) (2015-18)	6 dead, 32 cases. Frozen corn [WGS]
South Africa (2017-18)	216 dead, 1060 cases. Cooked RTE meat products.
Australia (2018)	7 dead, 19 cases. Cantaloupes.

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European Listeriosis Rates

***2017 EFSA/ECDC Data**

Disease		Hospitalisations				Deaths				
	No. confirmed human cases	Status available (%)	Number of reporting ‡countries	Reported hospitalised cases	Proportion hospitalised (%)	Outcome available (%)	No. reporting Member States	Reported Deaths	Case Fatality (%)	Fatality Rate cf Lm
Campylobacteriosis	246,158	27.6	17	20,810	30.5	72.8	16	45	0.04	345
Salmonellosis	91,662	43.1	14	16,796	42.5	67.8	17	156	0.25	56
Yersiniosis	6,823	27.1	14	616	33.4	65.5	15	3	0.07	20
STEC infections	6,073	41.0	18	933	37.5	66.1	21	20	0.50	28
Listeriosis	2,480	40.4	16	988	98.6	65.8	18	225	13.8	

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

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

‡ Not all countries observed cases for all diseases

* 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, 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

** *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

Comparing Countries' Listeriosis Rates (per 100k people)

2014-2017

(Spain: 2017 sentinel system covers ?% population)

USA rate: 0.3
Australia rate: 0.3*
New Zealand rate: 0.6

2017-18 SA outbreak: 1.84
* incomplete data

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 Republic	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 Republic	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

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efsa European Food Safety Authority

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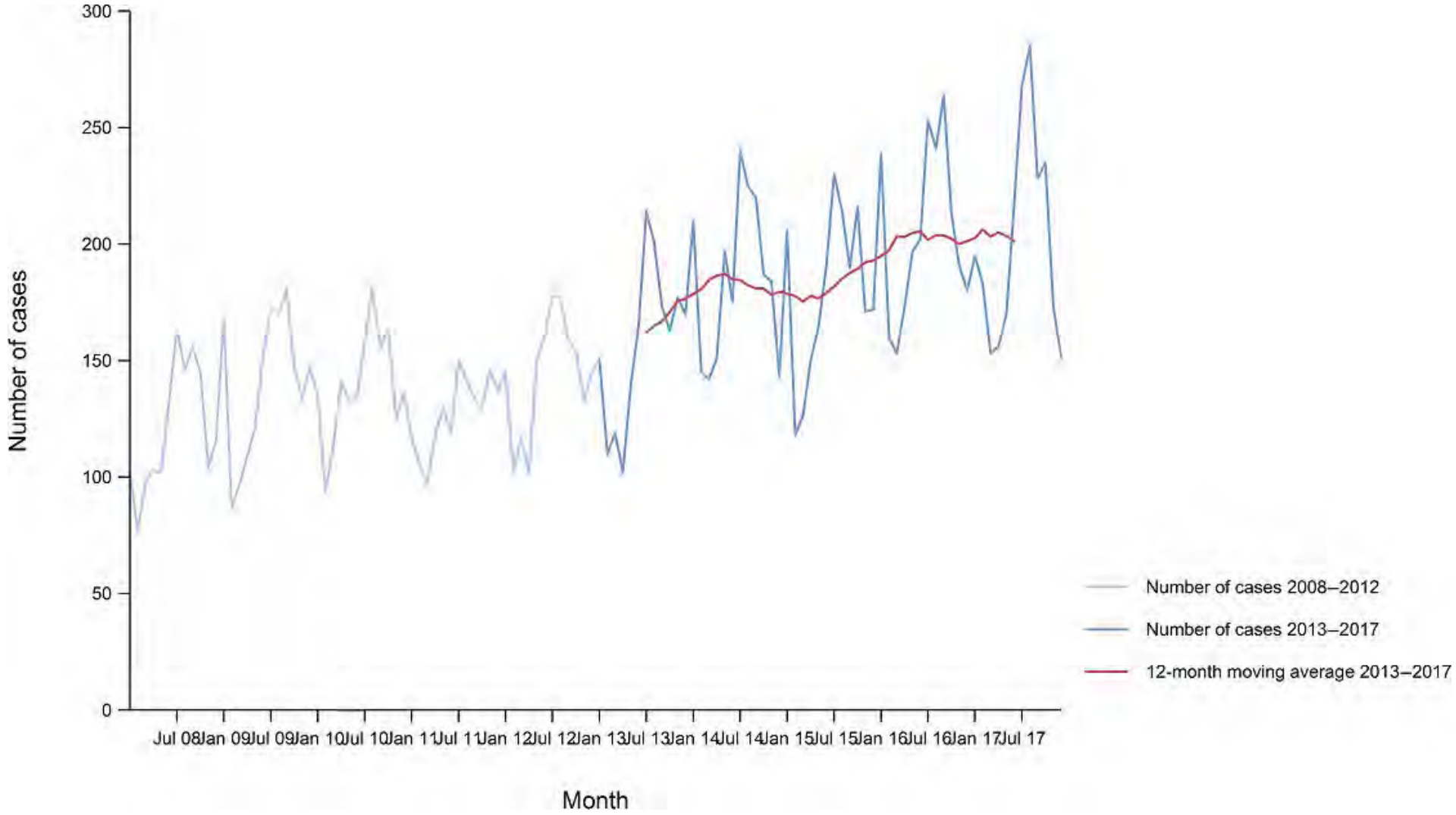
European Listeriosis Trends 2008-2017



EFSA, ECDC, 2018. The European Union 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

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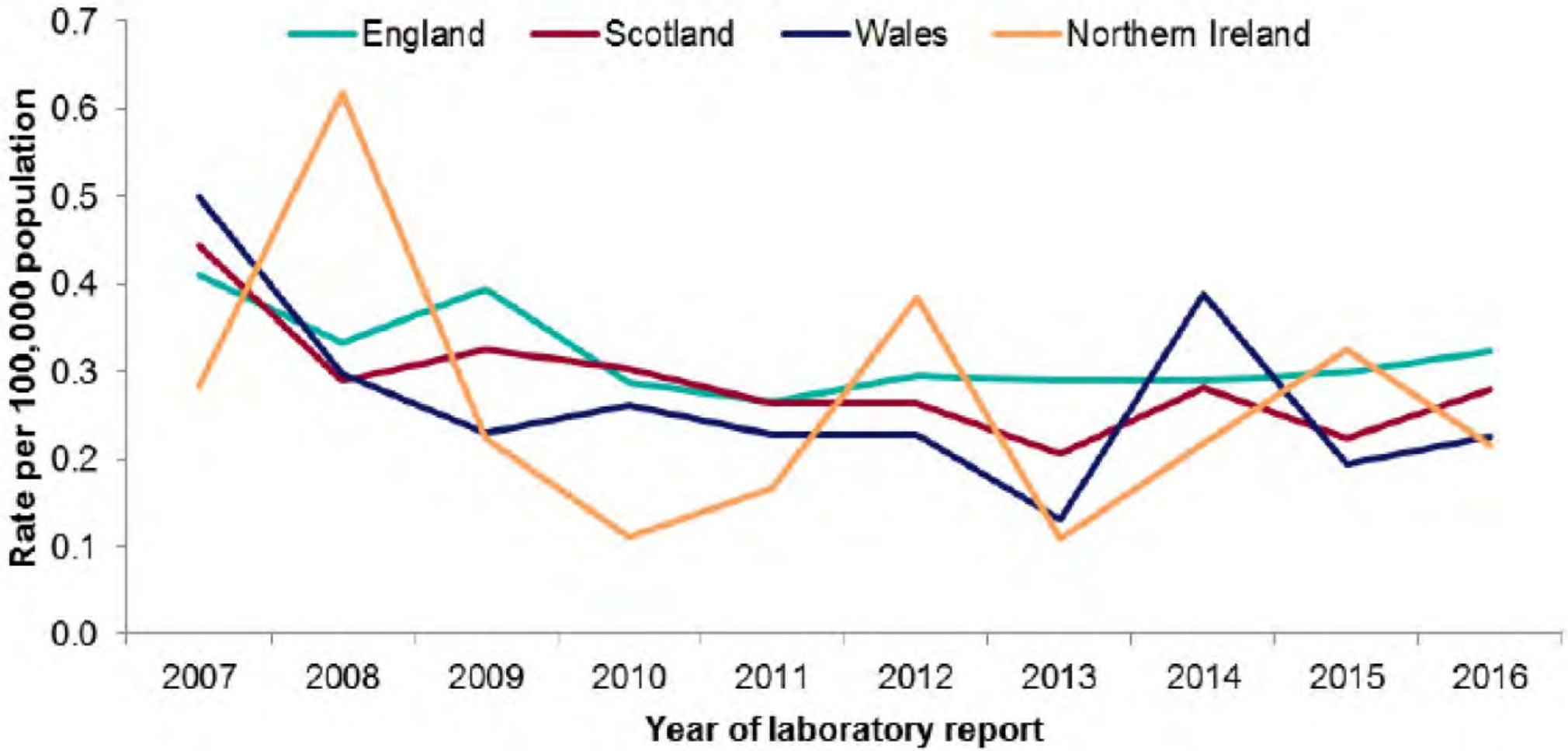
UK Listeriosis Trends 2007-2016



Source: ACMSF, ACM/1258 January 2018

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Listeriosis Risk Factors (UK study 2001-2008)

- **More likely to report consumption of:**
  - Cooked meats (beef and ham/pork, not poultry)
  - Cooked fish, i.e. (cold?) smoked salmon) & shellfish (prawns)
  - Dairy products (i.e. milk but also certain cheeses)
  - 'Mixed salads' (including protein)

- **More likely to be bought from:**
  - Convenience stores & local shops (bakers, butchers, fishmongers and greengrocers)

- **Incidence higher in most deprived areas**
  - Observed in patients aged 60+
  - More marked for pregnancy-associated cases

- **Pregnancy-associated cases increasingly 'ethnic'**
  - 16.7% to 57.9% from 2001-8, most marked 2006-8
  - 12.7% from 2008-2013

https://www.eurosurveillance.org/content/10.2807/ese.15.27.19610-en

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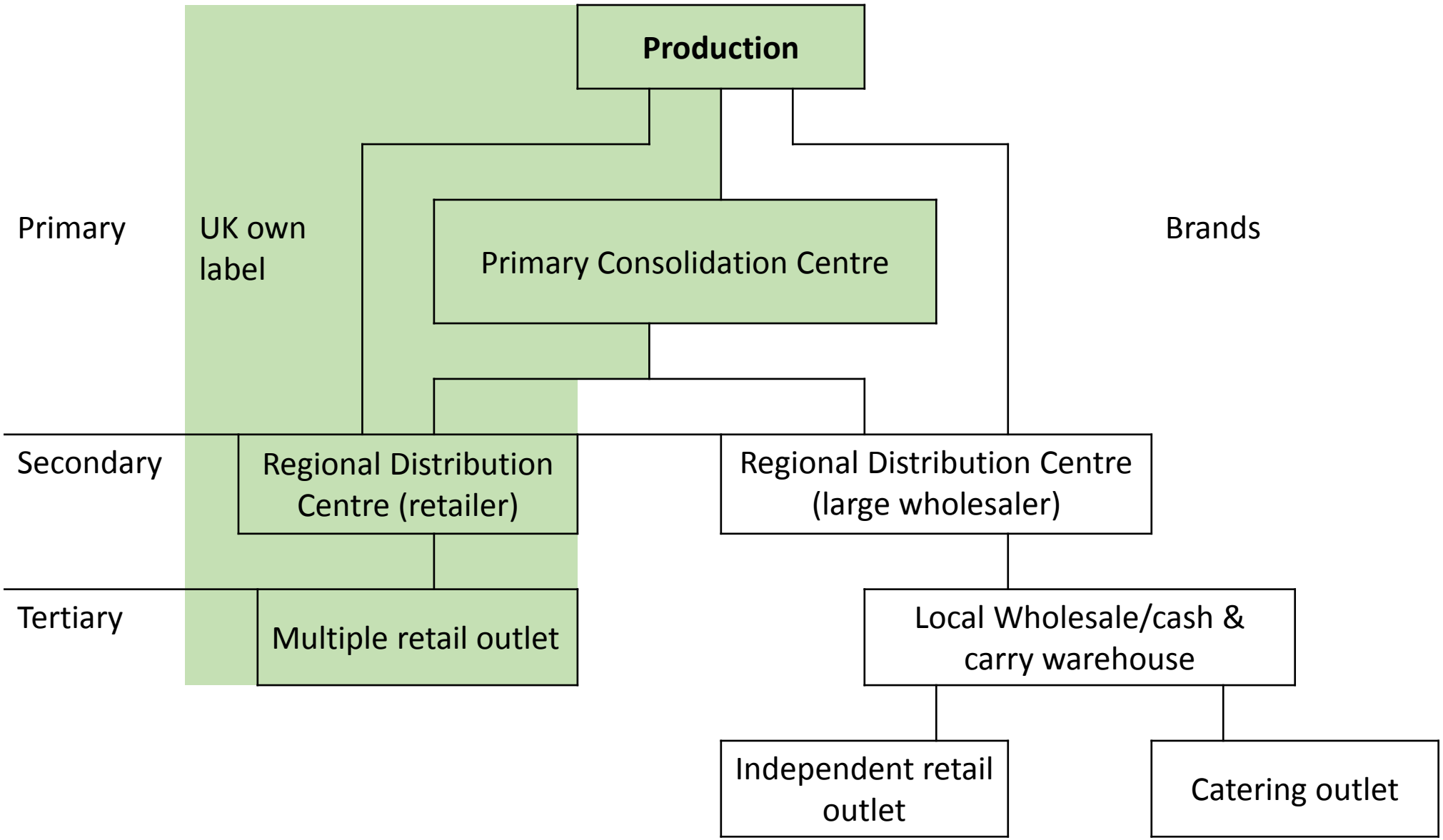
Example structure of food distribution channels



South African RTE Cooked Meat
and
EU RTC Frozen Maize

Lessons learned from European and South African listeriosis outbreaks

AFFI Food Safety Conference
February 2019, San Diego

Phil Voysey, Roy Betts
Campden BRI, Chipping Campden, UK
Andras Sebok
Campden BRI, Budapest, Hungary

Talk content

- South African ‘polony’ outbreak 2017-8
- Actions following European ‘quick-frozen vegetable’ outbreak 2018

Campden BRI
food and drink innovation

Talk content

- South African ‘polony’ outbreak 2017-8
- Actions following European ‘quick-frozen vegetable’ outbreak 2018

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The South African Listeriosis Outbreak

- The largest outbreak of Listeriosis ever recorded
- Up until Sept 2018
  - 1060 laboratory confirmed cases
  - 216 dead
  - Note: these are only the recorded cases
- Before 2017: Number of cases per year in South Africa
  - 60 to 80

Outbreak Profile

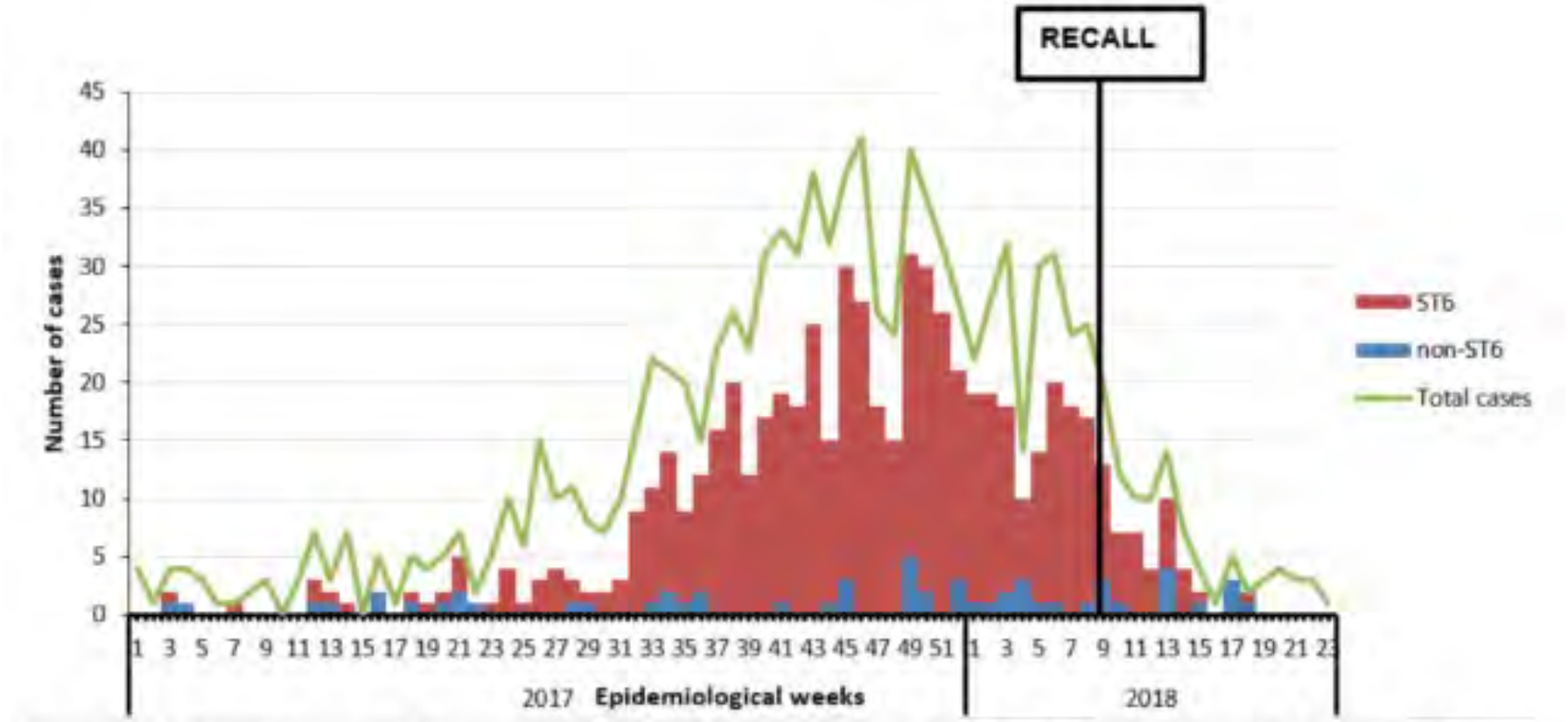

Figure 1: Epidemic curve of laboratory-confirmed listeriosis cases by date of clinical specimen collection (n=1 052) and sequence type (ST) (n=597), South Africa, 01 January 2017 to 20 June 2018 (n=1053)

NB, cases started beginning of 2017, no recall until early 2018

Campden BRI 100 years with industry for industry

Campden BRI food and drink innovation

Some Background of Listeriosis in South Africa

- Low numbers of reported cases per year – approx. 1 per week
- But not a notifiable illness
  - No understanding of real numbers

Outbreak timeline (1)

- 7th Nov 2017 (week 45) - Letter from the National Institute for Communicable Diseases (NICD)
- To the S.A. Association for Food Science & Technology
- Requesting assistance because of a 10 fold increase in Listeria meningitis cases
- Noting vast majority of isolates are genetically identical

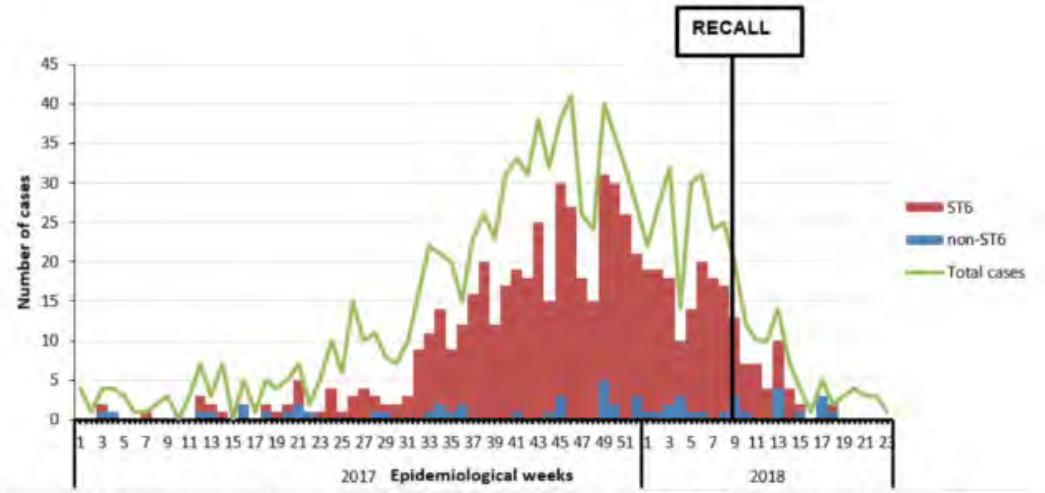

Figure 1: Epidemic curve of laboratory-confirmed listeriosis cases by date of clinical specimen collection (n=1 052) and sequence type (ST) (n=597), South Africa, 01 January 2017 to 20 June 2018 (n=1053)

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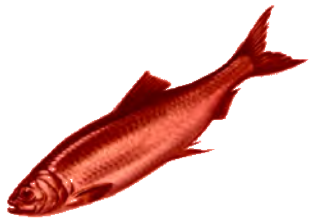
Outbreak Timeline (2)

- 4th December- NICD-situation report
  - 557 cases since Jan 1st 2017

- 5th December- ministerial announcement
  - Health minister- noted outbreak publicly
  - 557 cases reported, 36 dead

- 15th December
  - Listeriosis made a notifiable disease under the National Health Act (2003)

Outbreak Timeline 3



- **30th December**
  - News report- an poultry abattoir prohibited from selling meat (Sovereign foods)
  - Positive Listeria tests in factory
- **31st December**
  - News Report
  - Sovereign said move by Department of Health “premature and unfounded.”
  - Claimed they sent 14 food samples to the Department for tests and that the Department found 8 of these to contain *Listeria monocytogenes*.
  - it says it also sent a duplicate set of samples for independent analysis - no *Listeria* were found.
- **9th Jan (Sunday Times)**
  - Sovereign Foods’ poultry abattoir in Hartbeespoort back in operation following closure on December 22 by the government.
  - Sovereign media release quoting Health Minister Aaron Motsoaledi saying: "*At this juncture, we cannot conclude that the abattoir is the source of the present outbreak*.“
  - The ST6 strain was not found at Sovereign.

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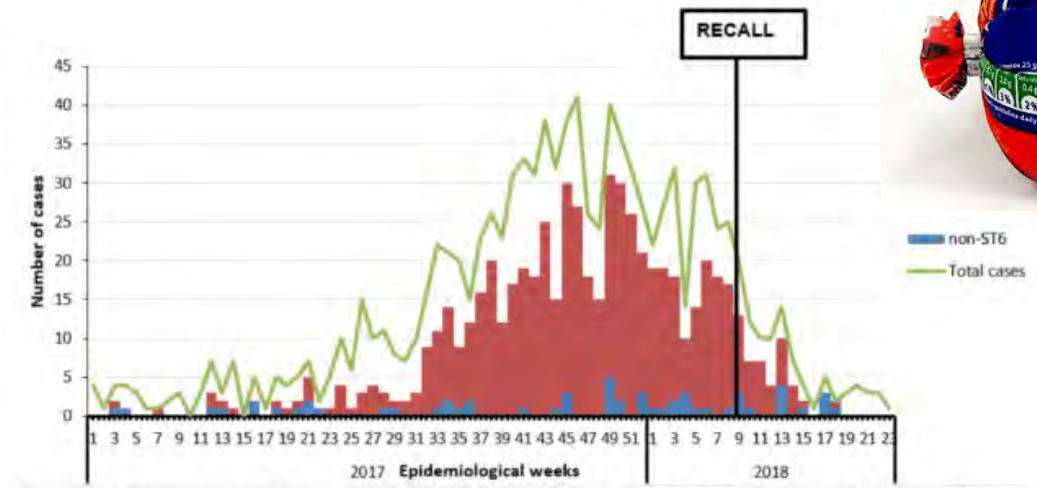
Update on Numbers

- 31st December
  - NICD 704 cases
  - Source of Listeriosis not confirmed

Outbreak Timeline (4)

- 4th March- Health Minister makes statement
  - Source declared as Polony (Enterprise Foods)



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4th March Statement by Minister for Health

- The Minister also said:

- "*We advise members of the public to avoid <u>all processed meat products</u> that are sold as ready-to-eat. While we know that polony is definitely implicated, there is a risk of cross-contamination of other ready-to-eat processed meat products, either at production, distribution or retail.*"

How was the source found?

- 12th January, nine children under the age of 5 yr. from one creche went to hospital with febrile gastro-enteritis.
- Listeriosis suspected as a possible cause.
- Environmental Health visited the crèche, obtained samples from two unrelated polony brands (manufactured by *Enterprise* and Rainbow Chicken Limited (RCL) respectively) and submitted these to the laboratory for testing.
- *Listeria monocytogenes* was isolated from stool collected from one of the ill children, and both of the polony specimens collected from the crèche.
- Isolates sent to the NICD and were whole genome sequenced.
- The ST6 type confirmed on all three isolates on 27th January.
- As 91% were of outbreak illness due to ST6. They concluded that this was outbreak source

What about the Rainbow Chicken?

- **18/3/18**- Health Ministry confirmed Rainbow Chicken Limited's Wolwehoek plant found to be contaminated with *Listeria*, in line with the announcement made earlier this month.
- Rainbow said tests at a lab in France, show plant is clear of the *Listeria* strain.
- **29/3/18** Health Department confirmed Rainbow Chicken polony factory not the ST6 strain that caused 91% of cases.
- "*This corroborates the results reported by RCL Foods at a French laboratory*," a health ministry statement noted.

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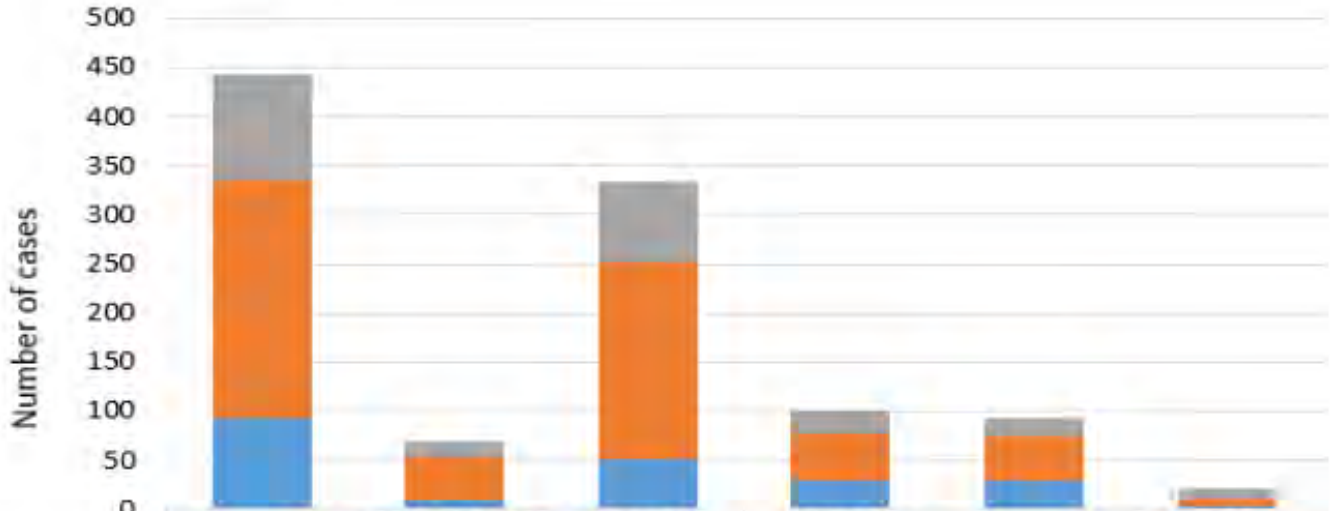
Outbreak Timeline (5)

- 3rd September 18 - Health minister announces:
  - *Listeria* outbreak over
  - Polony can be eaten again

The Strain

- In January 18
  - 72% of all isolates were noted as strain ST6
  - The others were other types of
    L. monocytogenes

Age Distribution Profile



	≤28 days	1Month - 14 years	15 - 49 years	50 - 64 years	≥65 years	Age unknown
OUTCOME PENDING	108	16	81	23	16	10
DISCHARGED	242	44	201	48	47	8
DIED	93	9	52	30	29	3

Figure 2: Age distribution and outcome* of laboratory-confirmed listeriosis cases, South Africa, 01 January 2017 to 10 July 2018 (N = 1 060) 'Outcome pending' includes patients whose outcome is unknown (e.g. they may still be hospitalised) and those whose medical records could not be found).

- Note the unusual age profile at the 15-49 age group
- It's been noted that people with AIDS are 500 time more likely to contract Listeriosis

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Outcomes (1)

- 1060 ill, 216 dead
  - These are only the reported figures
  - Keep in mind Listeriosis was not reportable until 15th December
  - Also the rural nature of parts of the country could make reporting more difficult
  - It has been noted that there was probably massive under-reporting
- Meat industry hit badly before outbreak source finalised
- Enterprise Foods (Tiger Brands) recall virtually all product
- Cost:

Tiger Brands said the potential losses, which it estimated at R28-33 million, were for March.

In addition, the food producer said it was taking a R337-377 million rand pre-tax hit due to the costs of a product recall and suspension of production at its Polokwane, Germiston, Pretoria and Clayville sites.

  - Recall: £1.8 million ($2.35 million)
  - Pre tax –£ 21.1 million ($27.55 million)
  - Just for recall, & suspension of sales

Outcomes (2)

- The producer shipped product to 15 different regional countries
  - Angola, Botswana, Democratic Republic of the Congo, Ghana, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Nigeria, Swaziland, Uganda, Zambia, and Zimbabwe.

- All recalled the product
  - WHO concerns that there may be outbreaks in these other countries

End Points

- SA now have a “zero tolerance” policy on *Listeria*
- Its reportable in South Africa
- There was confusion in risk communication
  - Good risk communication with correct information is critical, and almost never achieved in outbreaks
- Large losses to many companies
- Good tracking is essential to both limit illness and minimise economic effects

Talk content

- South African ‘polony’ outbreak 2017-8
- Actions following European ‘quick-frozen vegetable’ outbreak 2018

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Multinational outbreak of listeriosis linked to frozen vegetables

- Nov 2017 Finland reported in Epidemic Intelligence Information System (EPIS) a national cluster of cases of listeriosis since 2016, caused by same type of *L. monocytogenes* by whole genome sequencing (WGS).

- WGS data shared with other countries to compare it with those in own databases – member states used different comparison methods and all shared their data with each other via ECDC

Situation in Nov 2017

- EU Teleconference held to discuss responses from EU MS
- Total of 29 cases with same WGS type in Austria (2), Denmark (2), Finland (14), Sweden (6) and UK (5)
- 2 isolates from France with same WGS type from environmental sample from FBO processing frozen foods - flat-leaved parsley, soft corn grains, potato cubes, green peas




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Food consumption data

- 23 cases with food consumption data:
- 9 reported consumption of sweetcorn and 1 reported possible consumption
- 6 reported consumption of frozen sweetcorn and 4 non-frozen sweetcorn products (3/4 canned sweetcorn)
- 3 reported consumption of mixed vegetables; 2 stating frozen vegetables and one non frozen
- Sweetcorn consumption not part of food questionnaire for all MS — UK cases re-interviewed 4 cases, 3 report sweetcorn consumption

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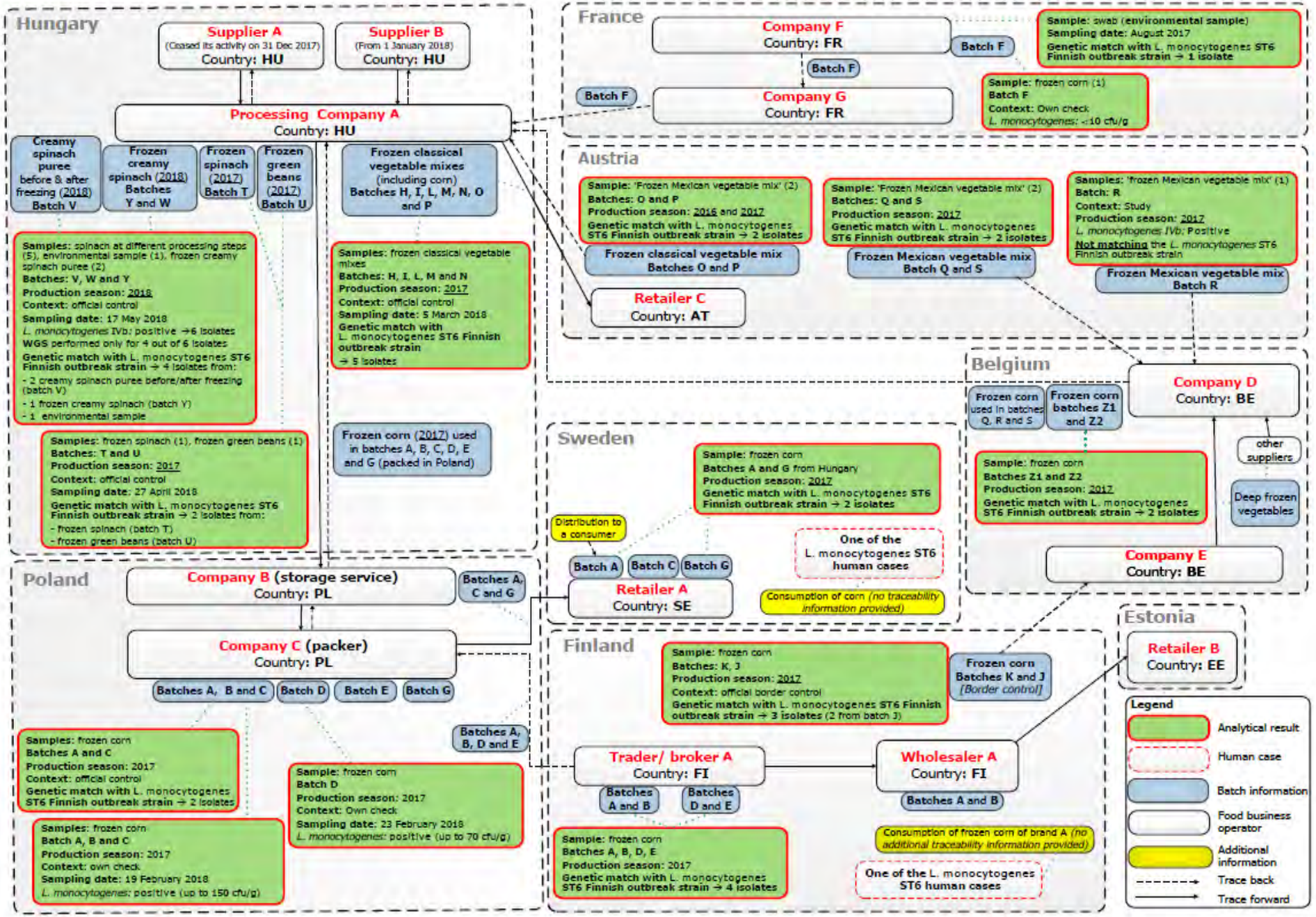
Jan and Feb 2018

- *L. monoctogenes* detected in batches of frozen sweetcorn from Finnish trader (50-140 cfu/g) - same WGS as outbreak strain
  - Sweetcorn produced in Hungary and packed in Poland
  - Recent Finnish case reported eating frozen mixed veg containing sweetcorn of same brand as above
- Swedish case reports eating frozen sweetcorn - brand unknown
- Isolate with outbreak WGS profile detected at unacceptable levels in frozen sweetcorn from home of a consumer in
- Sweden – trace back shows packed in Poland and produced in Hungary
- Austria reports isolates from 2 different types of frozen mixed vegetables including sweetcorn that originates same company in Hungary

Frozen sweetcorn investigations

- Large company supplying frozen sweetcorn as well as fresh and frozen vegetables + other products to major retailers, food service companies and industry across Europe and elsewhere
- Finland and Sweden: outbreak isolates from frozen corn that was produced and frozen in Hungary and packed in Poland
- Complex production and distribution network
- 10 production sites in EU

Figure 3. Graphical representation of traceability and testing information available in RASFF or provided to EFSA by Member States, as of 29 June 2018



Note: cfu/g: colony-forming unit per gram. AT: Austria, BE: Belgium, EE: Estonia, FI: Finland, FR: France; HU: Hungary, PL: Poland, SE: Sweden

Country	*Listeria monocytogenes* isolates from frozen sweetcorn	Match outbreak strain by WGS
Austria	2 isolates from different frozen vegetables: Mexican mixed veg containing corn from 2016 and 2017	Yes
Finland	7 isolates from batches of frozen corn from Hungry, and frozen corn from Belgium	Yes
Sweden	3 isolates from 2 batches of frozen corn produced in Hungary packed in Poland in 2017	Yes
Belgium	4 isolates from frozen corn originating from Hungarian company	Yes
France	Isolate from batch frozen corn that came from Hungarian company	Yes
Poland	Isolates from 10 batches at packing company <10-150cfu/g	Yes
Hungary	11 isolates from frozen corn, frozen mixed vegetables, frozen spinach, frozen green beans, frozen creamy spinach – production 2017 and 2018	Yes

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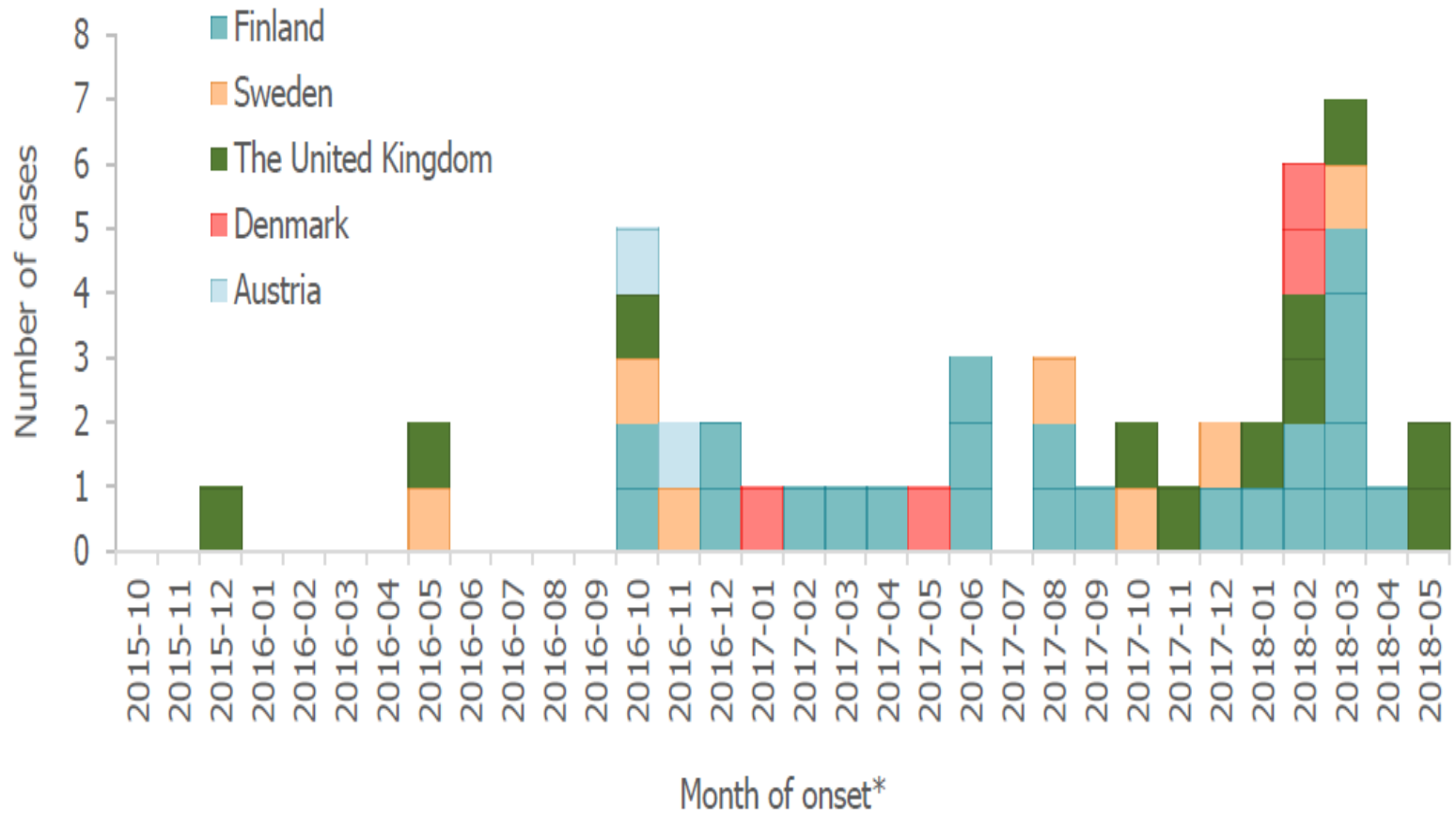
Control measures

- Implicated frozen sweetcorn products originating in Hungary and supplied via Polish packers were withdrawn and recalled in Estonia, Finland, Poland and Sweden have withdrawn and recalled.
- Identified that frozen sweetcorn was being thawed and consumed without further cooking
- Advice to cook frozen sweetcorn before eating or adding to salads
- Need to establish the root source of contamination and implement control measures
- New cases could occur due to the long incubation period (1–70 days), long shelf-life of frozen sweetcorn products and potential consumption of frozen corn bought by the customers before the recalls and eaten without being cooked.

Figure 1. ***Listeria monocytogenes*** **PCR serogroup IVb, ST6 confirmed outbreak cases by month of symptom onset*, European Union 2015–2018 (n=47)**



** If month of onset missing: month of sampling or month of receipt at reference laboratory*

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Number of listeriosis cases July 2018

Country	Number of cases (No deaths)				Total number of cases	Total number of deaths
	2015	2016	2017	2018		
Austria	0	2 (1)	0	0	2	1
Denmark	0	0	2	2 (1)	4	1
Finland	0	4	10 (2)	10	24	2
Sweden	0	3 (1)	3	1	7	2
The United Kingdom	1	2	2 (2)	7	12	2
Total	1	11 (2)	17 (3)	19 (1)	**49**	8

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Summary of listeriosis outbreak

- First multicounty outbreak of listeriosis identified by WGS
- WGS provides unequivocal evidence that isolates are related and are from a common source and have been present in food chain since at least 2015
- Isolates from frozen sweetcorn originating in Hungary from along the food chain have same WGS profile as isolates from cases
- Need to implement effective control measures to prevent more cases – worldwide recall of contaminated products July 2018 – >100 countries, including 43 products recalled in UK – no more cases
- Improve communication on preventing consumption of uncooked frozen sweetcorn

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Response by the Hungarian frozen vegetable and fruit manufacturers (1)

- After reviewing the situation and consultations with the national food control authorities the members of the Hungarian Freezing and Canning Industry Association (MHKSZ) have taken a systematic approach to assess the level of control of L. monocytogenes at their sites to identify the necessary measures to reduce the risk of contamination of their products.

- An agreement on improving the standard of the L. monocytogenes control of Hungarian IQF sweet corn and other frozen vegetable and fruit products.

- Hosting a targeted audit on L. monocytogenes to assess the standard of the controls at the participating sites in the sweet corn processing season in 2018.

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Response by the Hungarian frozen vegetable and fruit manufacturers (2)

- Development of a voluntary product certification scheme on Listeria monocytogenes control in IQF vegetables and fruits with particular focus to IQF sweet corn.

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Position of the Campden BRI Hungary proposed to the Hungarian frozen food manufacturers (1)

3 parallel actions are necessary and possible to strengthen food safety and to serve the needs of those consumers who prefer to consume (frozen) vegetables and fruits without further cooking:

1. Informing the consumers clearly, effectively and repeatedly that the currently available frozen vegetable products are not ready to eat, they must be cooked before the consumption as it is described in the cooking instruction.

This communication shall be unambiguous and consistent!

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Position of the Campden BRI Hungary proposed to the Hungarian frozen food manufacturers (2)

2.

Implementing preventive actions to reduce the level of risk of *Listeria monocytogenes* significantly in frozen vegetables processed and packed with the conventional technology without meeting high risk/high care requirements to improve the protection of the consumer (this activity has been started).

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Position of the Campden BRI Hungary proposed to the Hungarian frozen food manufacturers (3)

Potential establishment of an additional new ready- to- eat frozen vegetable (sweet corn) product category – for this building of new or redesigning and rebuilding of some of the existing factories is necessary to meet high risk requirements – high costs of construction and operation – reflected in the price of the product.

It is a complementary alternative only, - should not be applied as a mandatory requirement for all existing factories.

These ready- to- eat products shall be clearly differentiated, with easily distinguishable labelling from the current ready- to- cook products.

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Control measures (1)

A systematic review and redesign to improve:

- the HACCP system;
- the factory layout, flow of processes, zone segregation, movement of personnel;
- the measures to prevent cross-contamination of the products after blanching;
- hygienic design of machinery and construction of production areas, smoothness and cleanability of surfaces;
- hygiene, cleaning and disinfection;
- maintenance procedures and practices and their efficiency;
- water and air supply and quality;
- personal hygiene practices.

Control measures (2)

- Strengthening the control of : - blanching;
  - condensation.

- Identification of potential locations of biofilm formation and mitigation of the biofilm formation.

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Expected outcomes

- A significant reduction of the risk of L. monocytogenes in ready to cook frozen vegetables processed and packed in low risk factory environment

  - consumers will be exposed to a significantly lower risk even if they do not follow the cooking instruction.

- Systematic elimination of potential sources of L. monocytogenes contamination in the factory environment before it reaches the finished product – continuous improvement of the controls at the site.

- Regular review of the results and exchange the experiences at national level including consultations with the food control authorities – continuous extension of the knowledge.

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South African RTE Meat Products: End Points

- **Contaminated high risk long shelf life chilled food eaten as a staple in a country with a 20% HIV positive adult population – and exported**

- **All 157 processed meat factories inspected**
  - **By WHO and environmental health inspectors**
- **900 health inspectors retrained**
  - **In taking samples from food factories**
- **New SA legislation (R638) brought in 14 June 2018**
  - **Requires HACCP/FSMS for meat and poultry products**
  - **Lm absence requirement**
  - **Implementation by 14 March 2019**

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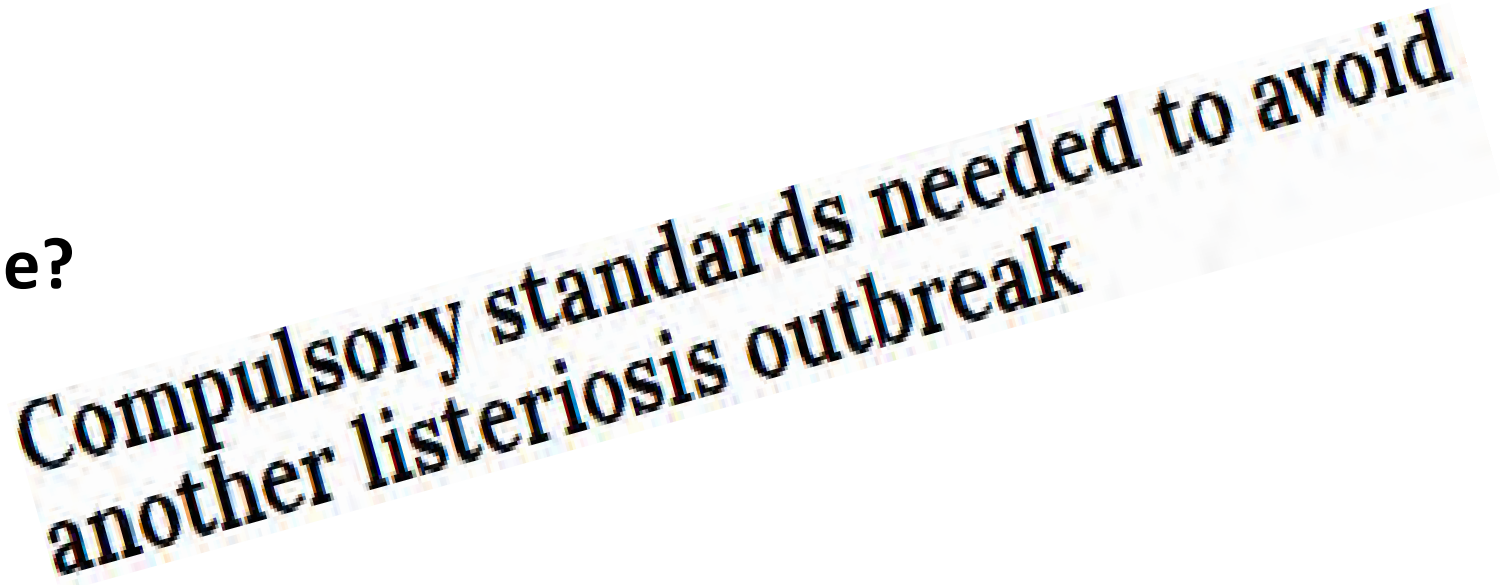
South African RTE Meat Products: End Points

- **Tiger Brands relaunched polony Jan 2019**
  - **Increased price**
  - **Safety seal and stamp implies each polony has “passed” a “7 step quality check process” that provides “improved food safety”:**
    - **Sourced right**
    - **Quality at the gate**
    - **Food safe environment**
    - **Trained and safety skilled staff**
    - **Quality production**
    - **Delivered safely**
    - **Fully traceable**

South African RTE Meat Products: End Points

- Industry and national infrastructure (including training and chill chain) sufficient to support consistent food safety assurance for high risk food?
- Ongoing programme of verification in place?
  - Industry?
  - Enforcers?
- CODEX/WTO role?



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EU RTC Frozen Maize: Key Points

- **Frozen maize**
  - **High sugar, cut surface**
  - **Blanching typically 90°C/90 secs – deals with surface contamination – core?**
  - **Post-process recontamination potential**
  - **…But not RTE, so 'low risk', and no Lm criteria apply by (EU) law**

- ***EFSA risk management recommendation:**

"consumers should consider adequately heat treating frozen vegetable products that are not 'RTE products' before consumption'

* www.efsa.europa.eu/publications EFSA Supporting publication 2018:EN-1402

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EU RTC Frozen Maize: End Points

- **Company applying <10 cfu/g criterion on imports into UK**
- **Hygiene and sampling**
  - Equipment (freezer tunnel) decommissioned/replaced (conveyors, flooring) - capex
  - Systems reviewed and improved - capex
    - New zoning approaches implemented: Separation between pre- and post-blanch areas
    - Sanitation improved with new monitoring
  - Post-hygiene environment for Lm now routine
  - In-process and final product sampling for Lm now routine (previously *E. coli*)
  - Product sampling dependent on customer requirements
    - e.g. 1-5 samples end product tested/batch
  - European industry organisation suggesting <10 cfu/g on RTC frozen??
  - Methods: EN ISO11290 -1 (detection) and -2 (enumeration) *cf* 2073/2005

* www.efsa.europa.eu/publications EFSA Supporting publication 2018:EN-1402

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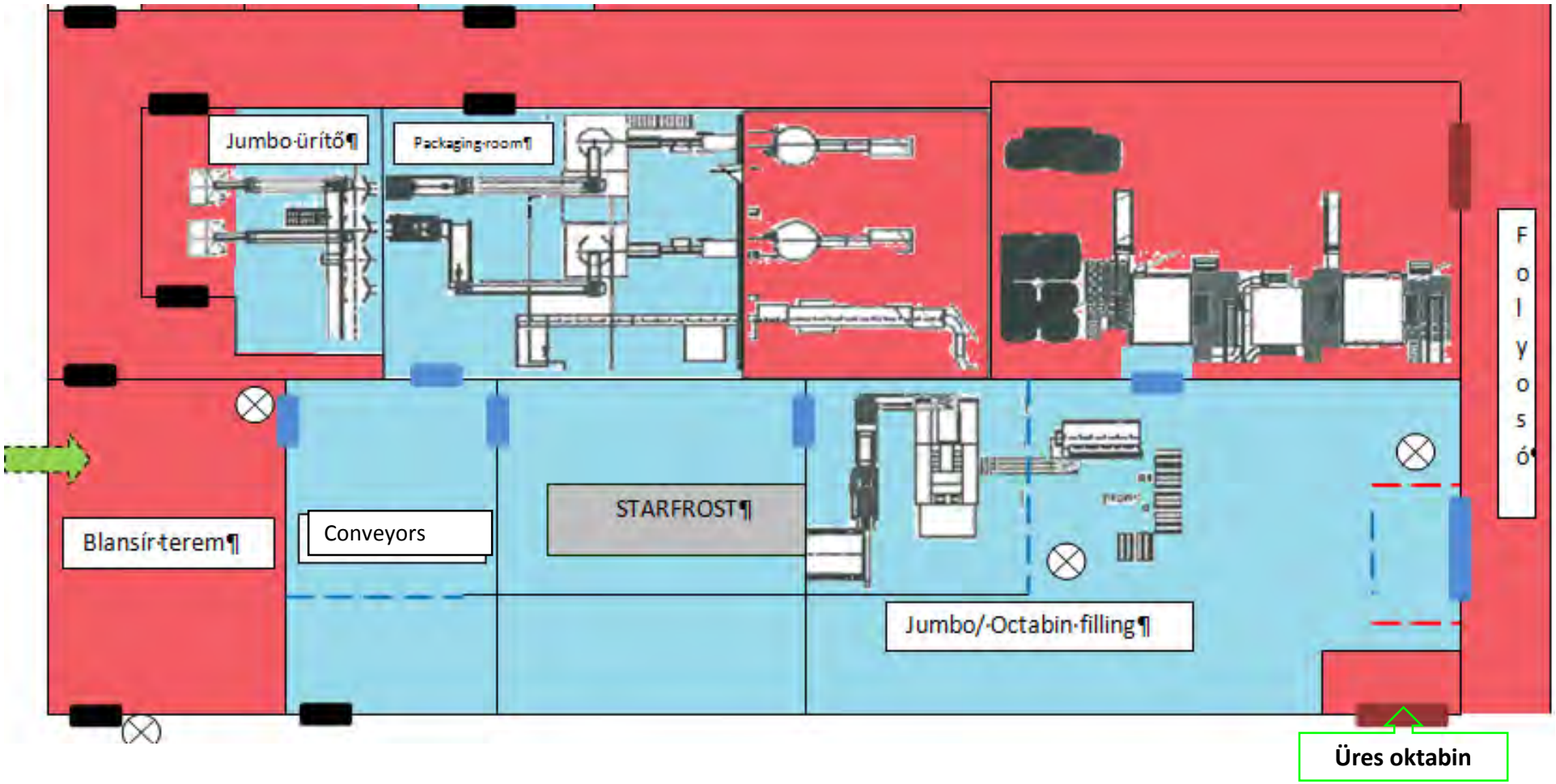
Zones: red lower risk, blue higher Care



Improved cleaning programmes where belts are removed every time the kit is cleaned

New epoxy resin floor in higher care area

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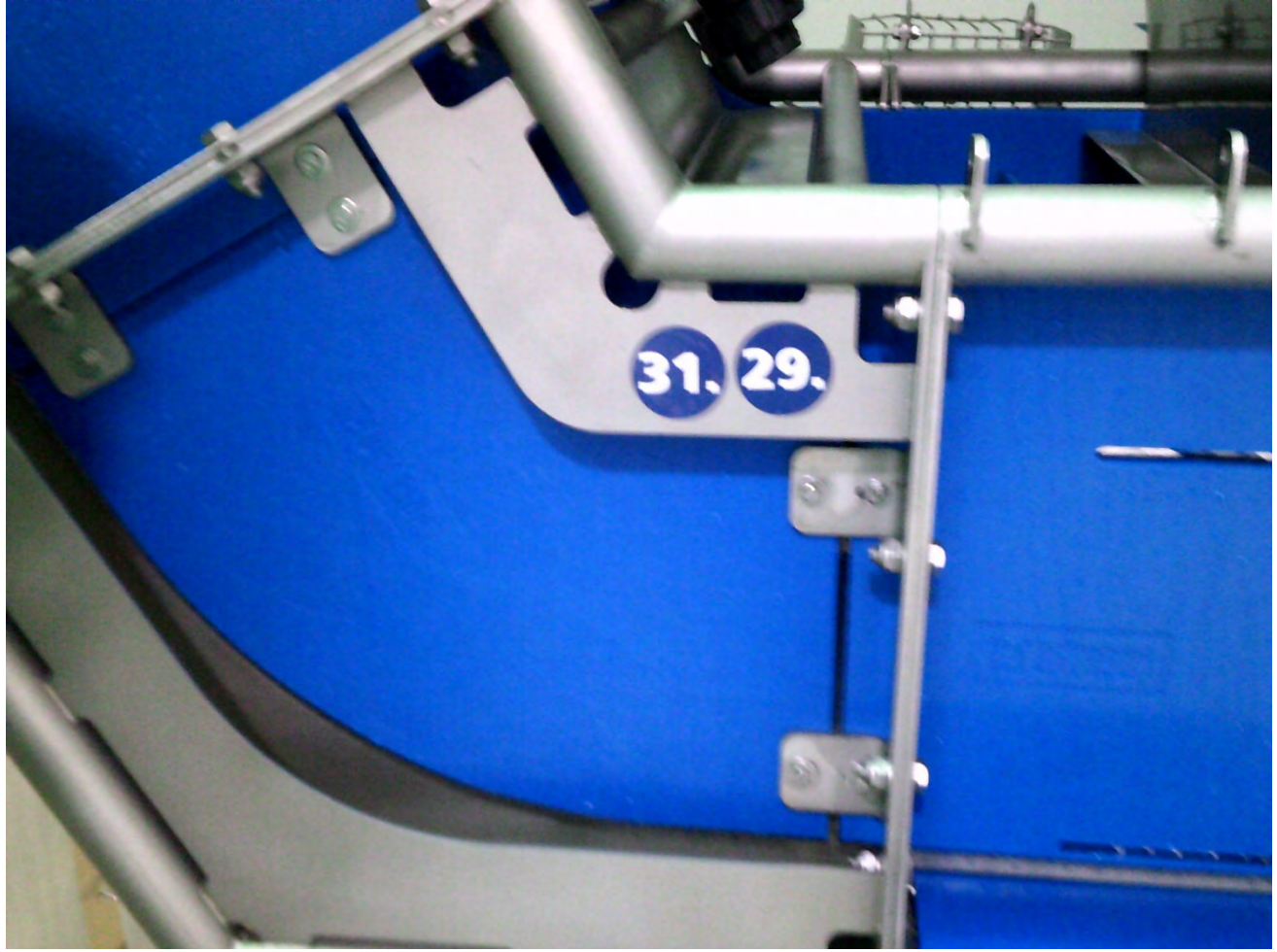

New conveyor with identified swabbing locations

Hand over area between higher care and lower care area. Fork lift 1 drives bin in to square and second takes out and off to storage

Scrubber drier dries floors of excess water

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New boot wash and hand sanitiser station on entrance to zoned area

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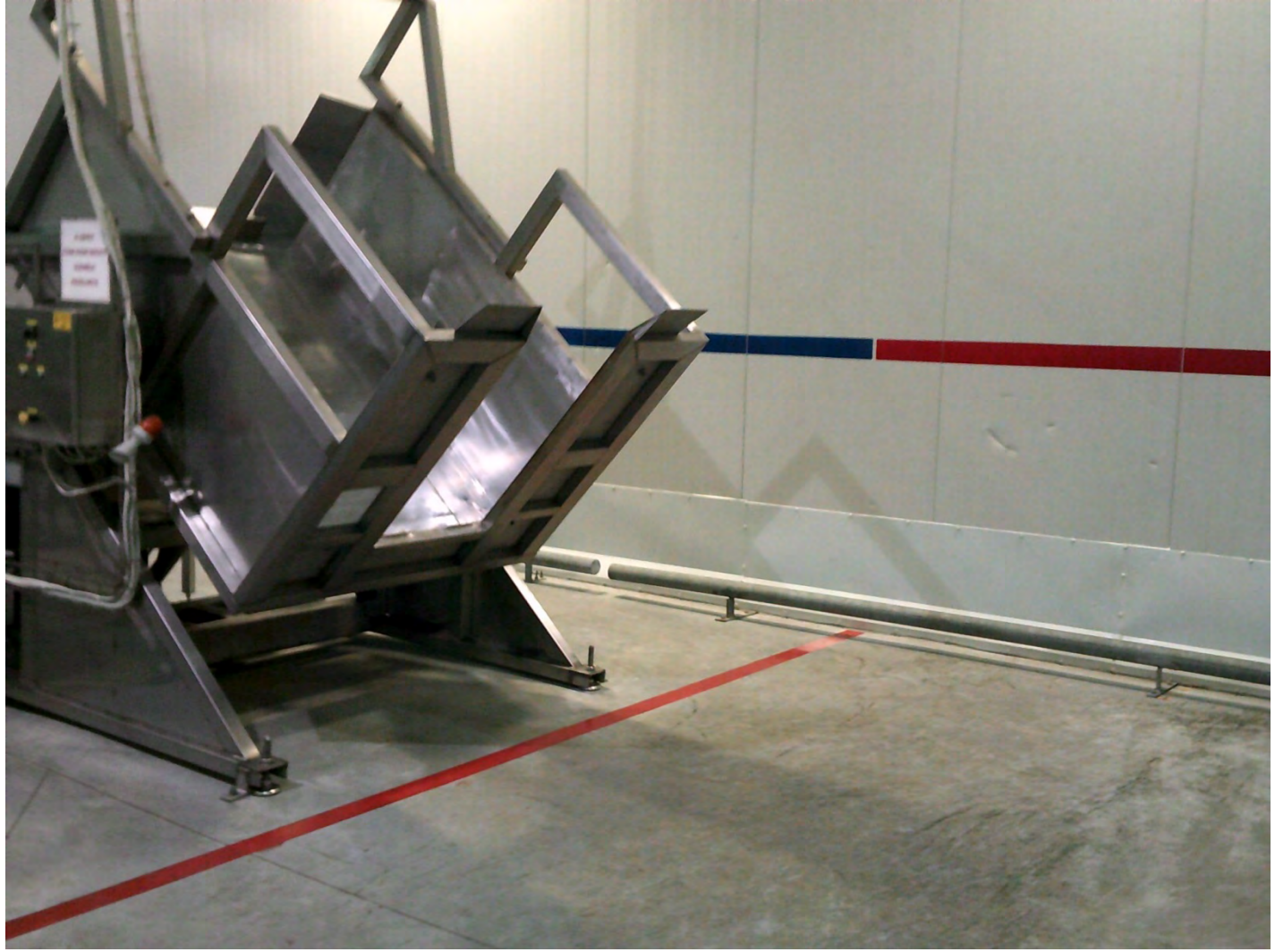

Marked segregation between red low risk and blue higher care.
In this case bulk hoppers crossing to a packing area

EU RTC Frozen Maize: End Points

- **User instructions**
  - **Specifications for professional users state must be cooked before use**
    - But what is compliance particularly in RTE products?
  - **Cooking statement/instructions previously often absent in Continental EU market, although required by law – industry activity to address this**
  - **Cooking instructions validated to achieve 70°C/2mins (UK)**
  - **Changed labelling to enhance the messaging that requires cooking prior to consumption**

* www.efsa.europa.eu/publications EFSA Supporting publication 2018:EN-1402

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EU RTC Frozen Maize: UK Consumer Instructions

Microwave from frozen but can also be cooked on the hob.

Before cooking: Remove all packaging.
Place 2 portions of mixed special vegetables (1 portion = 80g) into a non-metallic dish. Add 1 teaspoon of cold water. Cover.

During cooking: Stir halfway through.
Re-cover and continue cooking.

After cooking: Drain. Check food is piping hot.
Allow to stand for 1 minute.

All cooking appliances vary. This is a guide only.

Microwave on full power
Cat D 750w 6 mins | Cat E 850w 5 mins

To cook on the hob from frozen.

Boil water.

Add mixed special vegetables carefully.
Return to the boil.

To cook on the hob
Moderate heat
3–4 mins

Drain. Check food is piping hot.
All cooking appliances vary. This is a guide only

COOK FROM FROZEN

BOIL Add product to boiling water. Return to boil, cover and simmer. **2-3 min**

MICROWAVE Empty 250g of contents into a microwaveable container. Add a small amount of water. Cover with a microwaveable plate.

750w **5 min** 850w **4 min**

Do not remove from microwave until after **1 min** stand time.
Larger quantities of product will require longer cooking.

Drain well. Season to taste.

Do not reheat.

IMPORTANT This product is raw and must be cooked according to instructions.

capex

WARNING: Do not eat raw.

DIRECTIONS FOR USE: Cook from frozen.

	Oven Wattage	Total Cooking Time
MICROWAVE	C/750W	2½ minutes, stir and re-cover, 2½ minutes
	D/850W	2½ minutes, stir and re-cover, 2 minutes
	E/1000W	2 minutes, stir and re-cover, 1½ minutes

Place the required amount of frozen sweetcorn into a non-metallic microwaveable container and add 2 tablespoons of water. Cover with a microwaveable film or saucer. Cook on full power for the time specified above, stir and re-cover as directed. Stand for 1 minute and drain before serving. **Caution:** Beware of escaping steam when removing film or saucer. Handle carefully to avoid scalding.

BOIL	4 - 5 minutes

Place the required quantity of frozen sweetcorn into a saucepan with sufficient boiling water to cover. Bring back to the boil and simmer for 4 - 5 minutes. Drain and serve.

Ensure product is thoroughly cooked and piping hot throughout. Do not reheat.

COOKING INSTRUCTIONS

4-5 mins Hob

For best results boil from frozen:
Remove all packaging.
Place in boiling water and bring back to the boil.
Cover and simmer for 4-5 minutes.
Drain well before serving.

5/4½ mins Microwave

800W / 900W
Place in a microwavable bowl and add 2-3 tablespoons (30-45ml) water.
Cover and heat on full power for 2 minutes 30 seconds (800W) / 2 minutes 30 seconds (900W).
Stir, re-cover and heat on full power for a further 2 minutes 30 seconds (800W) / 2 minutes (900W).
Leave to stand for 1 minute after cooking.
Drain well before serving.

Check food is piping hot throughout before serving.
All appliances vary these are guidelines only.

Caution
Do not eat raw.

COOKING GUIDELINES FROM FROZEN:
This is a raw product. Cook thoroughly until piping hot throughout.

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The truth is rarely pure, and never simple

Oscar Wilde, The Importance of Being Earnest

Effective Risk Management?

Lm management demonstrably in place?	SA RTE cooked meat products	EU frozen maize
Manufacturing hygiene managed to prevent (re)contamination	N	N
Product does not support growth	N	Y
Product does not support survival	N	N
Not a chilled product	N	Y
Short shelf life (<5 days)	N	N
Chill chain integrity assured		
- Commercial	?	Y
- Domestic	?	Y
Consumer population/behaviour		
- Not eaten by vulnerable groups	N	?
- Usage instructions complied with	?	N
Total (Y =+1, N =-1, ?=0) out of +9 max	**-6**	**0**

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General Issues

- Are HACCP plans, sanitation and their monitoring systems consistently effective?
- Is legislation a barrier to effective monitoring?
- Laboratories
  - What methods are stipulated by law?
    - Methods must appropriate not only to the microorganism but also the food matrix
  - What lab accreditations/other measures are required to assure good practice?
- Is enforcement effective consistently?
  - Commercial
  - National
- Are product usage instructions labelled correctly?
- What does effective consumer/end product user education look like?
- Why are previous lessons not being cascaded more effectively?
  - Within industry – trade associations/professional bodies?
  - By and to customers (e.g. manufacturers, retailers)

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