



Incidence of food associated pathogens in Iceland-overview

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Background

Salmonella

Campylobacter

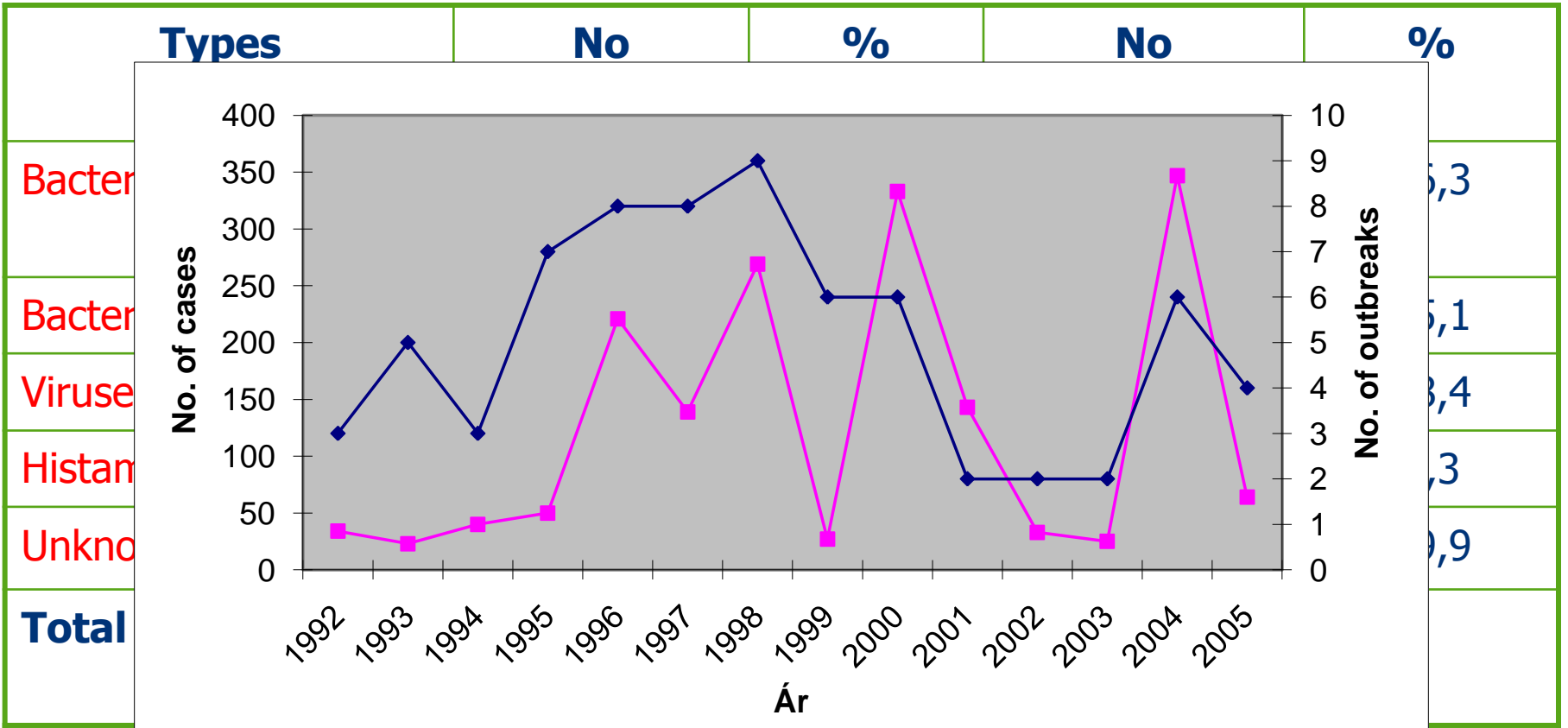
Listeria monocytogenes

Viruses

Rapid detection

Conclusion

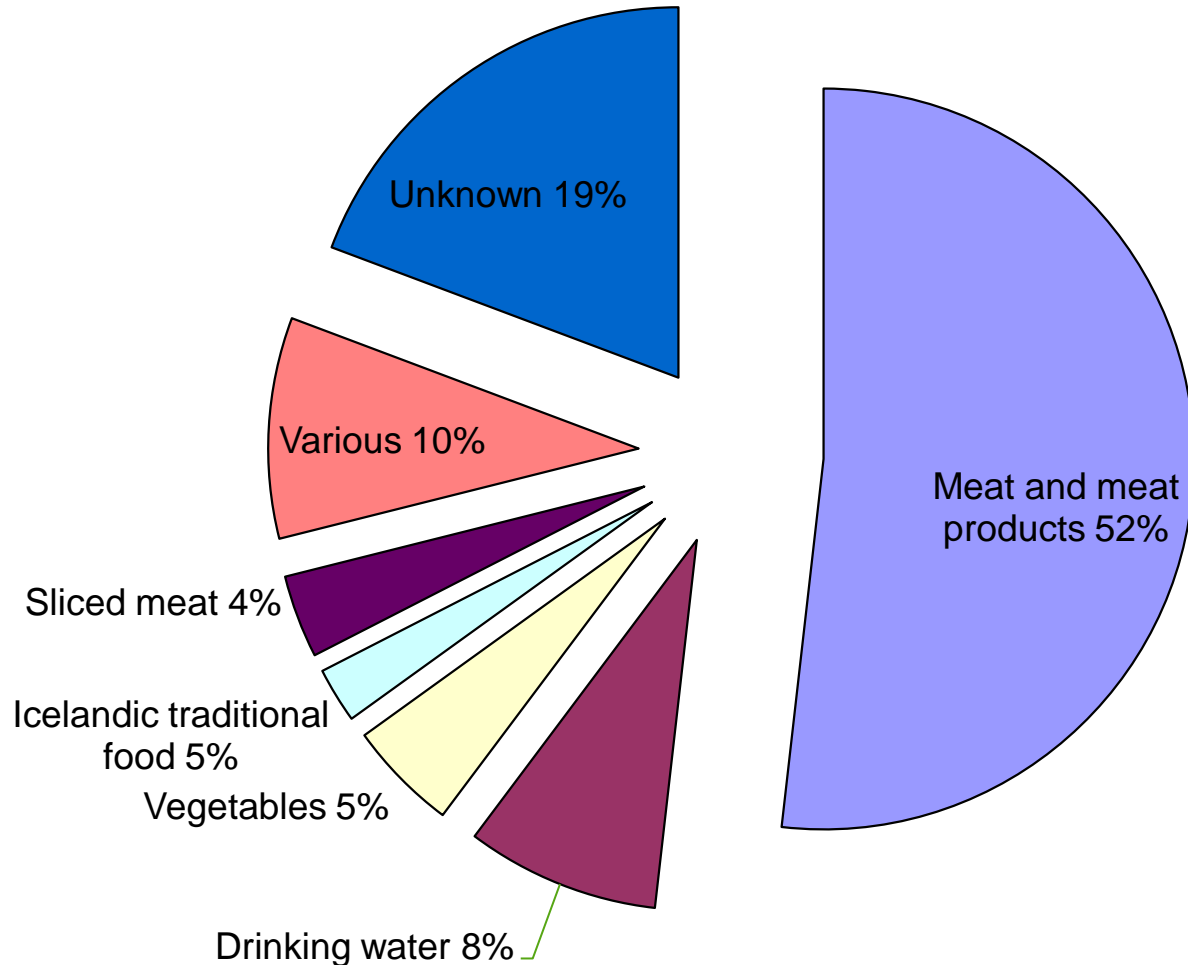
Outbreaks and cases in Iceland 1997 - 2007



Food involved in confirmed food-borne illnesses in Iceland 1985 – 2007.



83 outbreaks

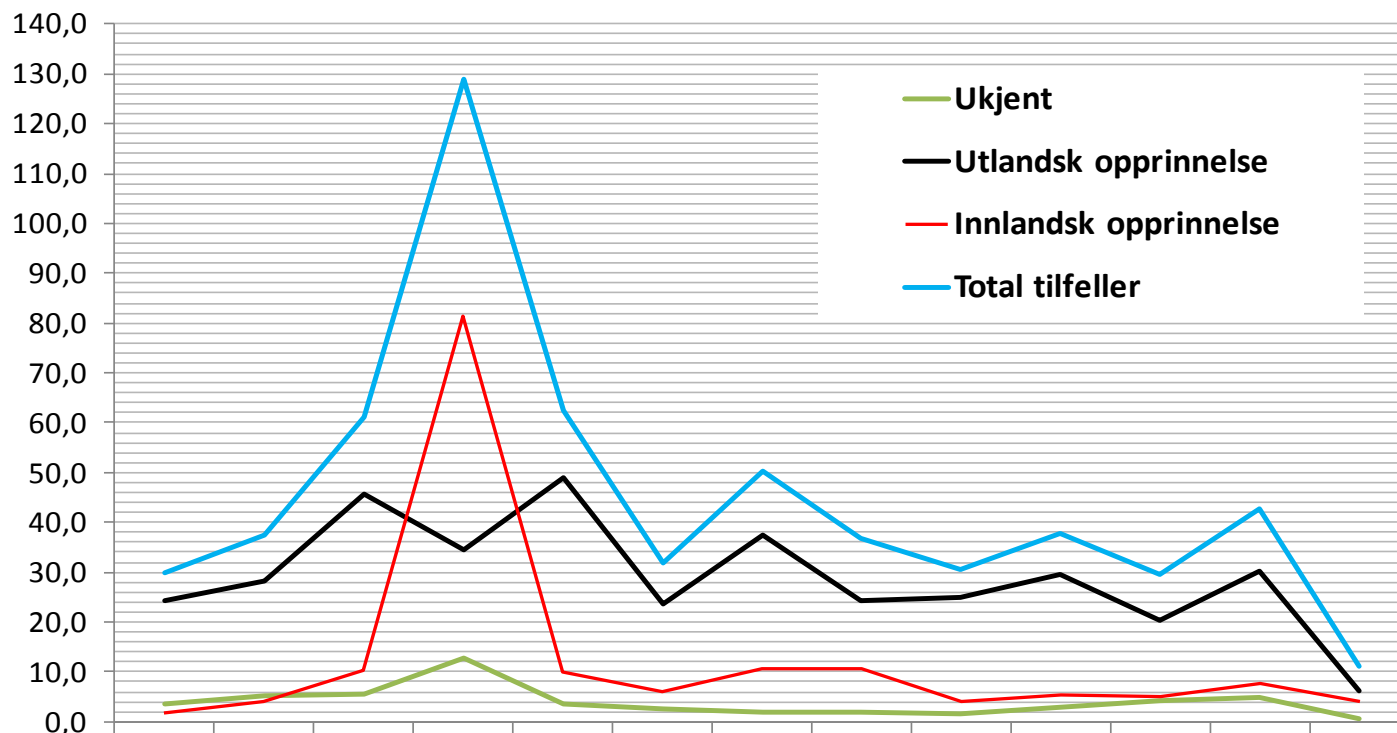


Human Salmonella cases

(University Hospital Clinical Laboratories)

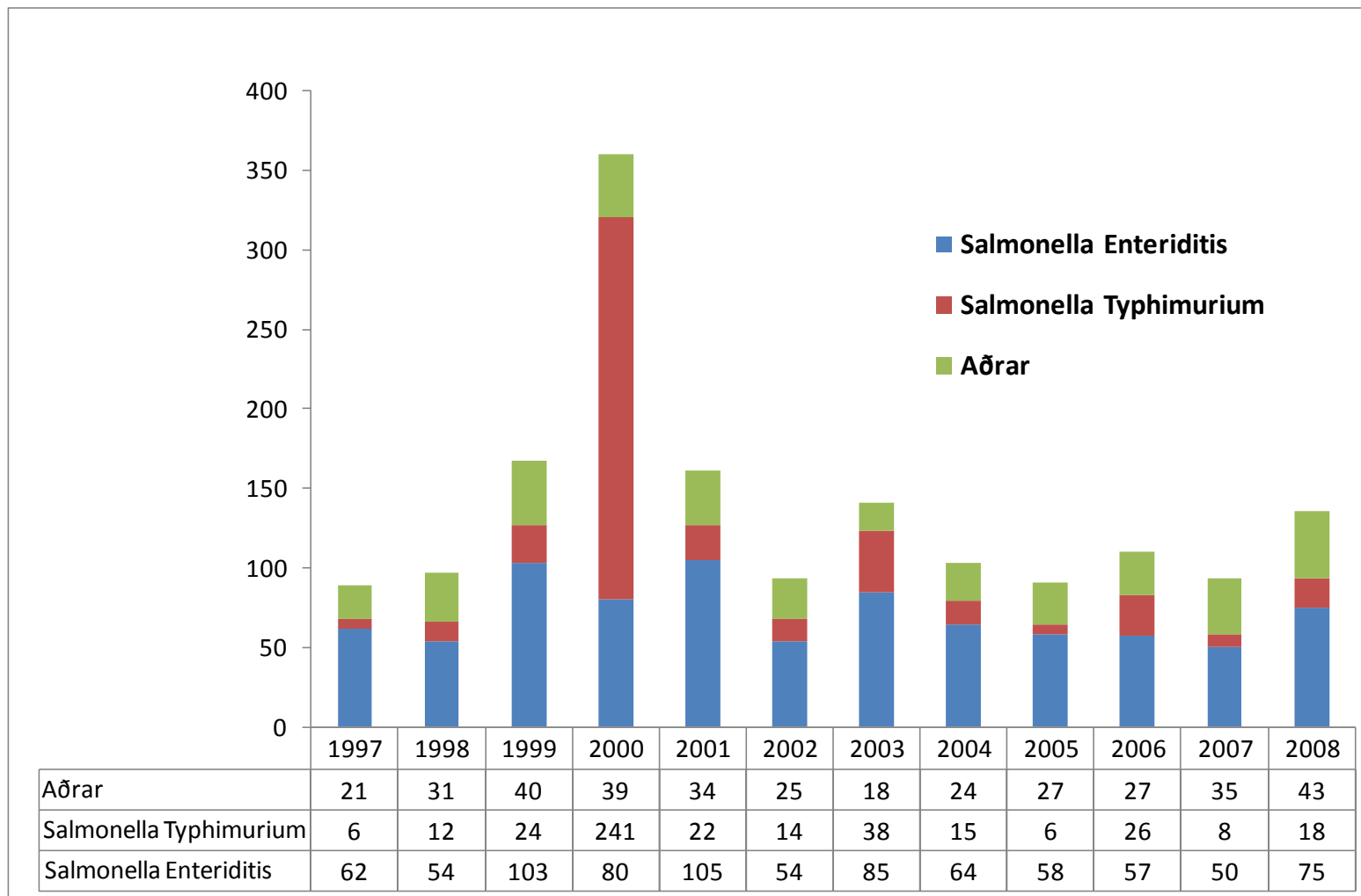


Antall tilfeller av Salmonella hos mennesker pr. 100.000 innbyggere.



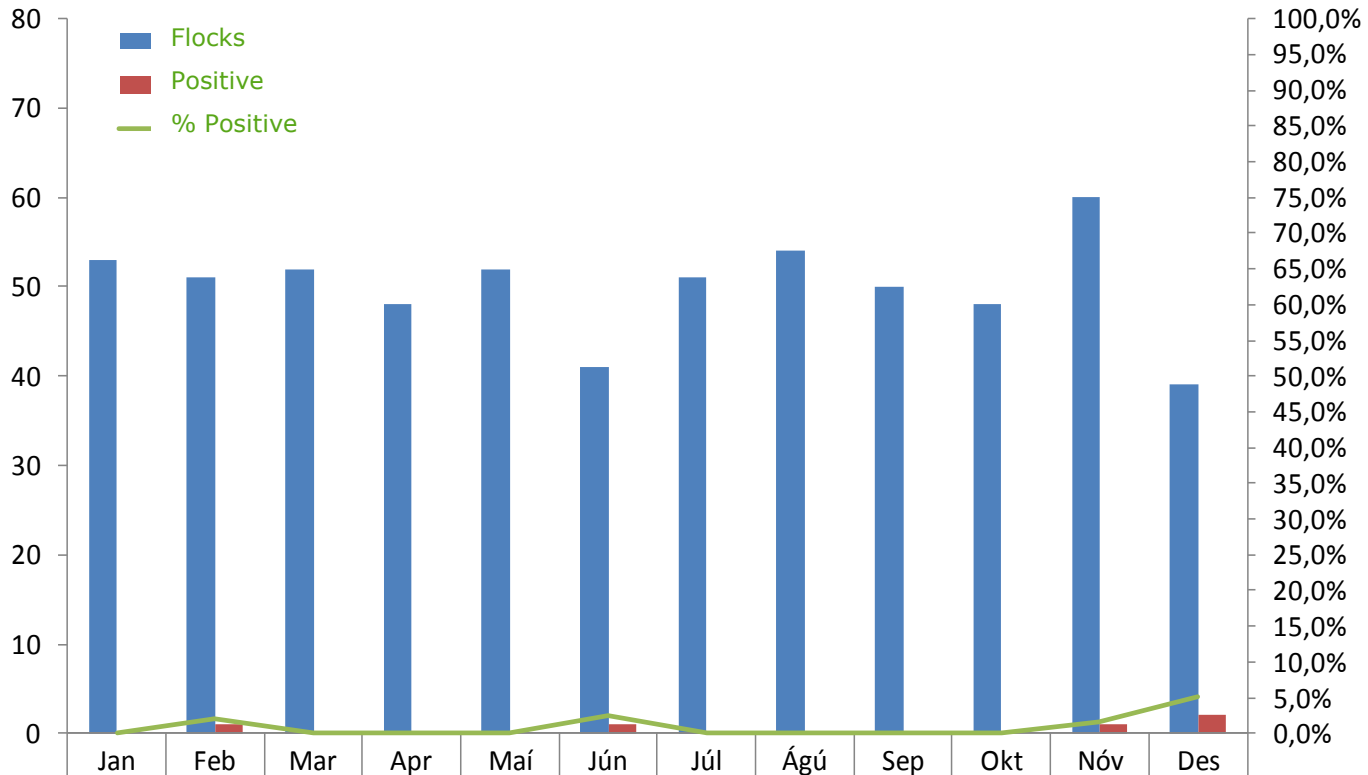
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Ukjent	3,7	5,1	5,4	12,7	3,5	2,4	2,1	2,0	1,7	2,9	4,1	5,0	0,6
Utlandsk opprinnelse	24,2	28,3	45,5	34,6	48,9	23,6	37,5	24,2	25,0	29,6	20,3	30,1	6,3
Innlandsk opprinnelse	1,8	4,0	10,4	81,5	10,1	5,9	10,7	10,6	4,0	5,2	5,1	7,5	4,1
Total tilfeller	29,7	37,4	61,3	128,8	62,5	31,9	50,2	36,8	30,7	37,7	29,5	42,6	11,0

Human Salmonella cases - Serotypes



Salmonella in broiler flocks 2009

(Icelandic Veterinary and Food Authority)

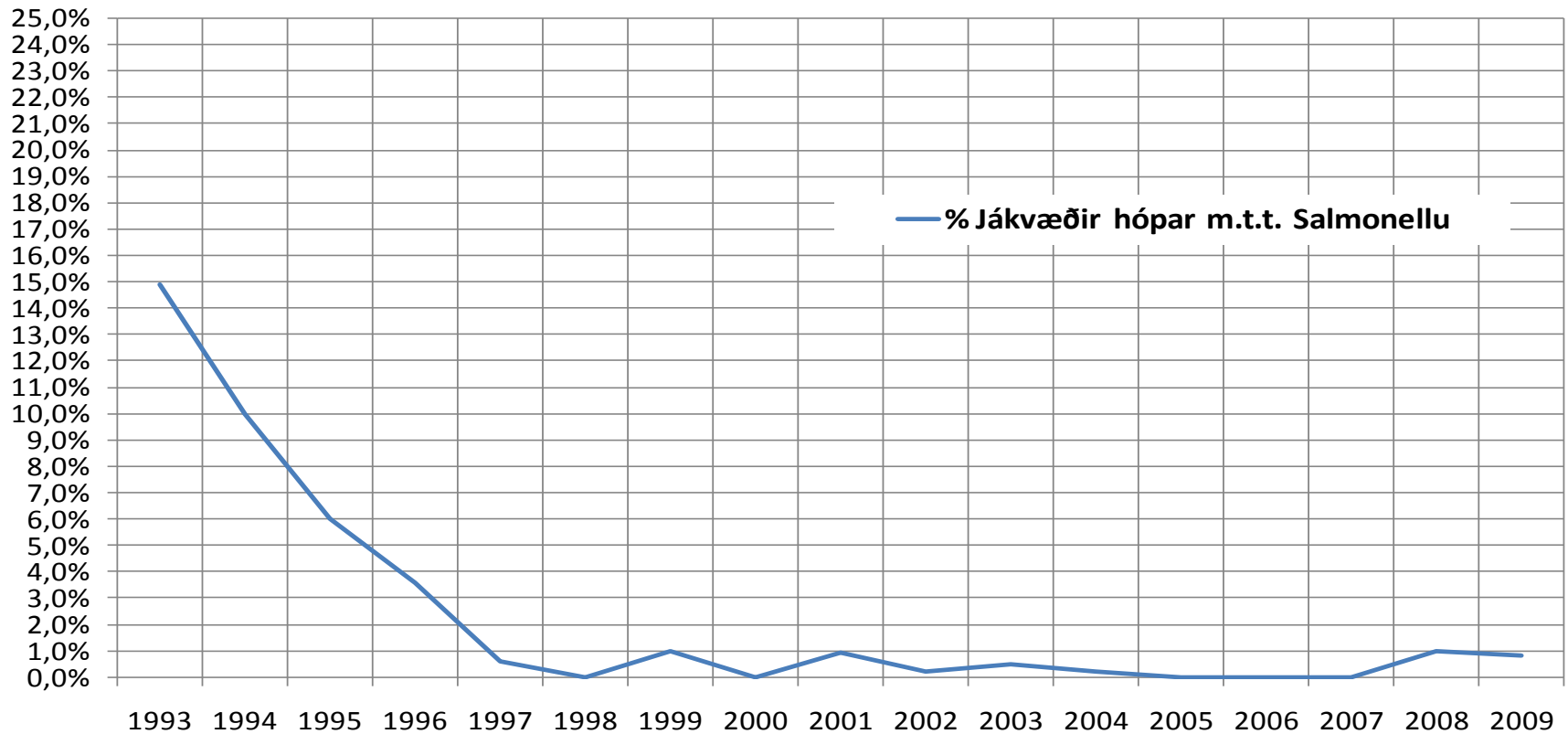


2010
Jan-May:

265 samples
3 pos (1,1%)

	Jan	Feb	Mar	Apr	Maí	Jún	Júl	Ágú	Sep	Okt	Nóv	Des
Hópar	53	51	52	48	52	41	51	54	50	48	60	39
Jákvæðir	0	1	0	0	0	1	0	0	0	0	1	2
% Jákvæðir	0,0%	2,0%	0,0%	0,0%	0,0%	2,4%	0,0%	0,0%	0,0%	0,0%	1,7%	5,1%

Ratio of Salmonella positive broiler flocks 1993-2009



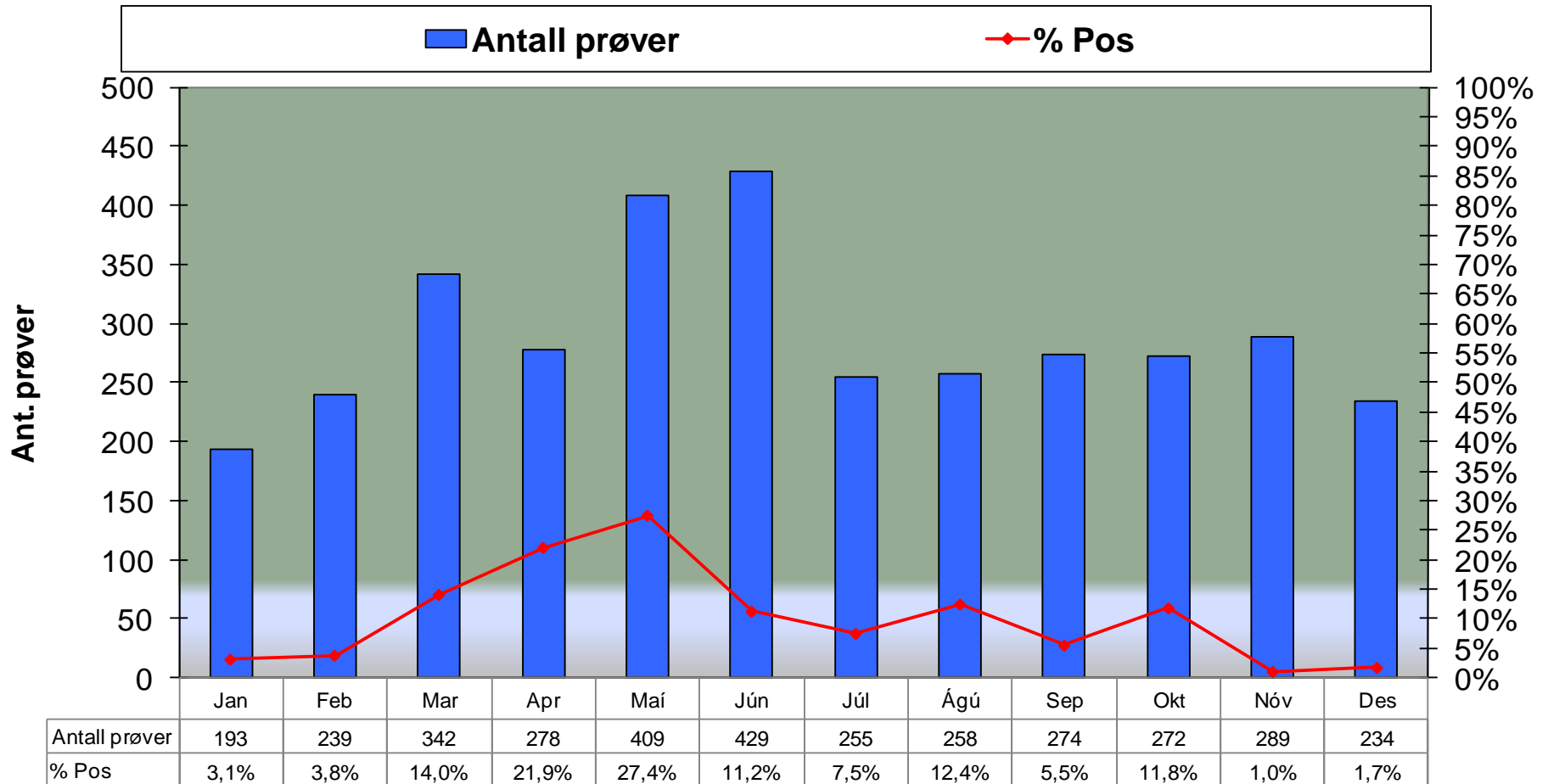
Cultivation on feces samples from swine 2009

(Icelandic Food and Veterinary Authority)

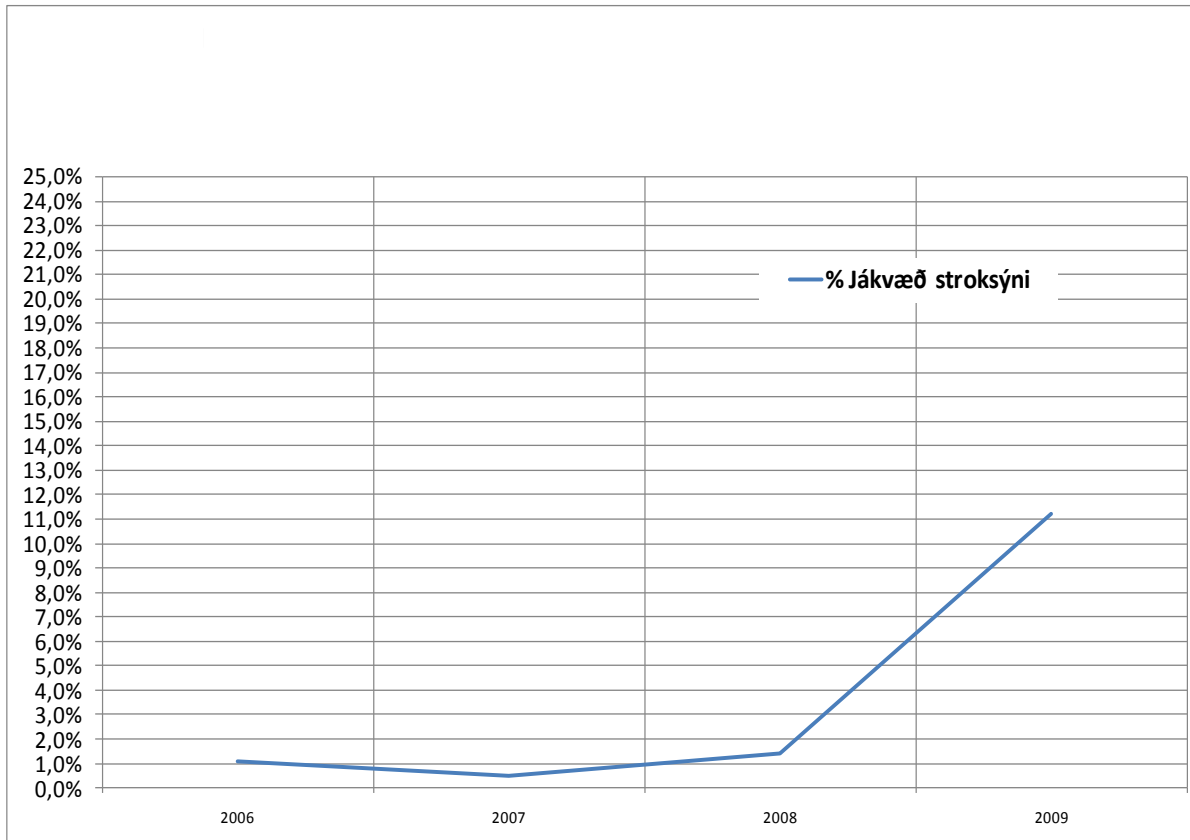
Fecespr	Prøver	Neg	Pos	% Pos	Salmonella
Jan	25	20	5	20,0%	S. Kedougou+, S. Brandenburg, S. Worthington+
Feb	74	73	1	1,4%	S. Worthington
Mar	5	5	0	0,0%	
Apr	2	2	0	0,0%	
Maí	12	12	0	0,0%	
Jún	14	14	0	0,0%	
Júl	0	0	0	-	
Ágú	0	0	0	-	
Sep	0	0	0	-	
Okt	7	7	0	0,0%	
Nóv	8	8	0	0,0%	
Des	116	115	1	0,9%	S. Duisburg
	263	256	7	2,7%	

Swab samples from swine 2009

(Icelandic Food and Veterinary Authority)



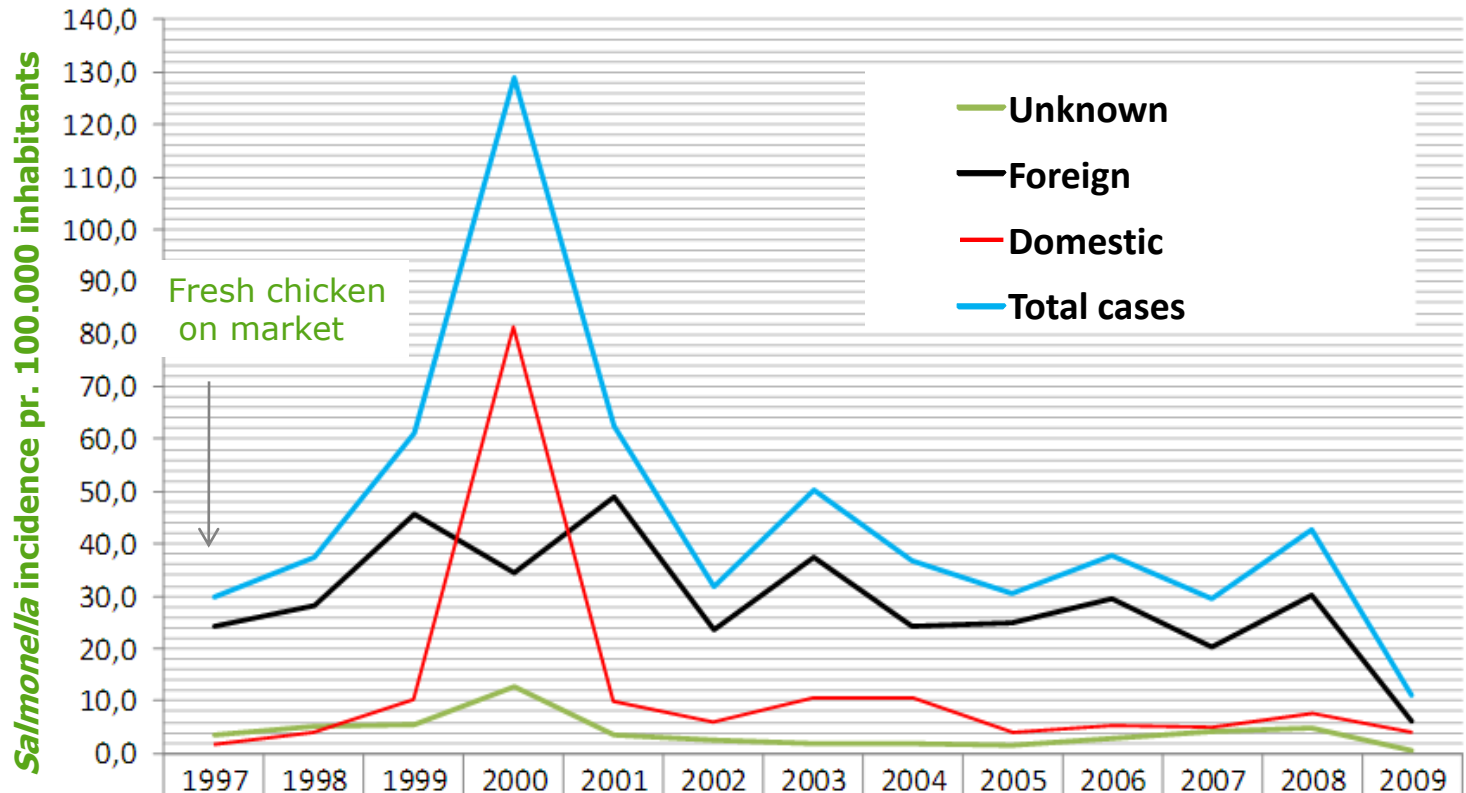
Swab samples from pork carcasses positive for Salmonella 2006-2009



2010 Jan-May
1260 samples
3,6 % positive

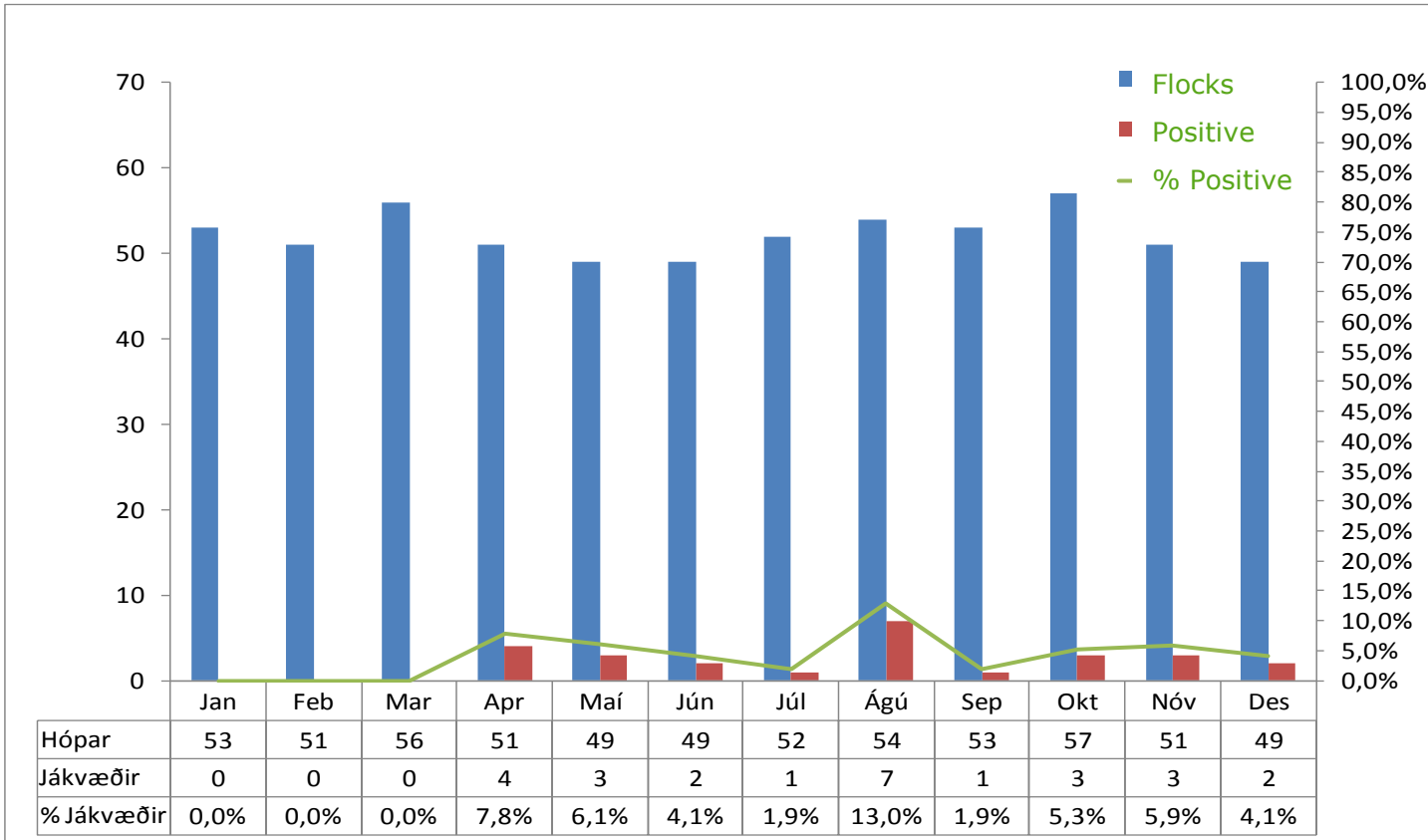
Cases of Campylobacter in humans per 100.000 inhabitants

(University Hospital Clinical Laboratories)



	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Ekki vitað	7,0	8,7	9,7	8,1	4,2	3,1	1,7	2,0	2,0	3,3	1,6	2,5	0,6
Tilfelli af erlendum uppruna	13,6	19,2	29,4	45,9	31,1	19,1	12,0	22,1	20,7	24,4	14,9	16,9	9,1
Tilfelli af innlendum uppruna	14,0	51,9	116,8	32,5	42,6	26,0	17,6	33,0	22,3	10,4	13,0	11,3	13,8
Alls tilfelli	34,5	79,8	155,9	86,5	77,8	48,2	31,3	57,2	45,0	38,0	29,5	30,7	23,5

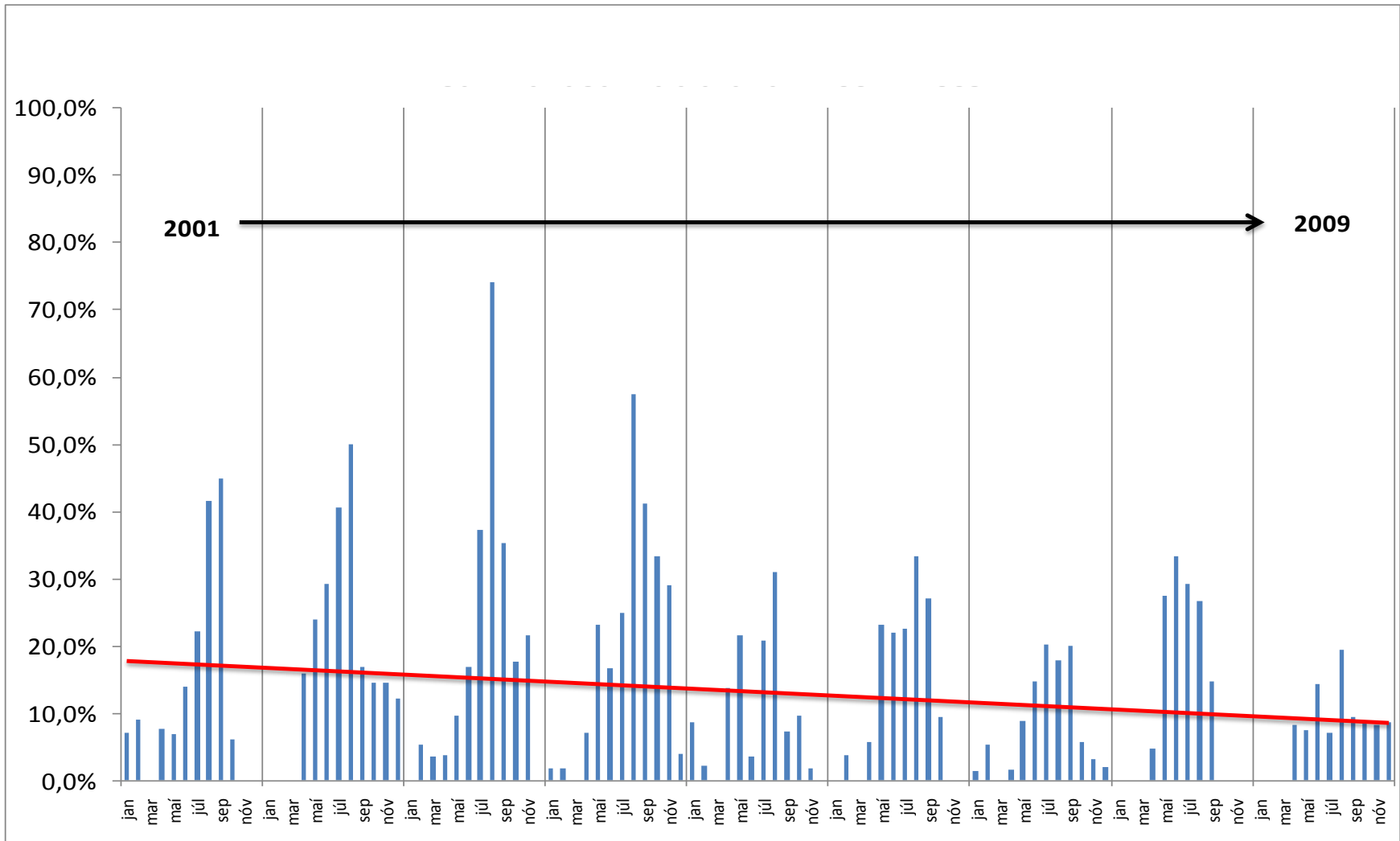
Campylobacter in broiler flocks 3-4 days prior to slaughter 2009



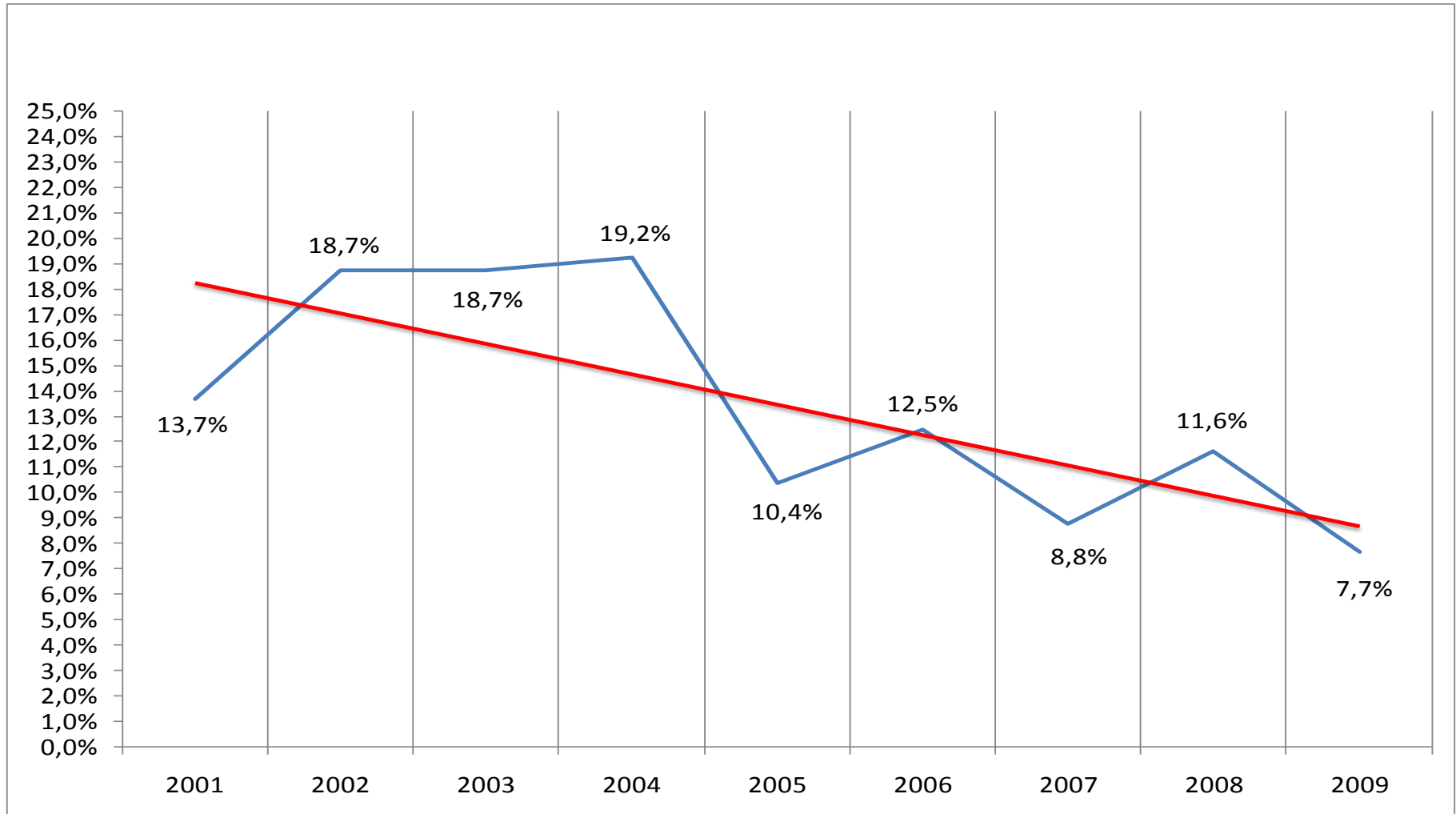
2010
Jan-May

260 samples
11 pos (4,2%)

Campylobacter in broiler slaughter flocks in slaughtering 2001-2009



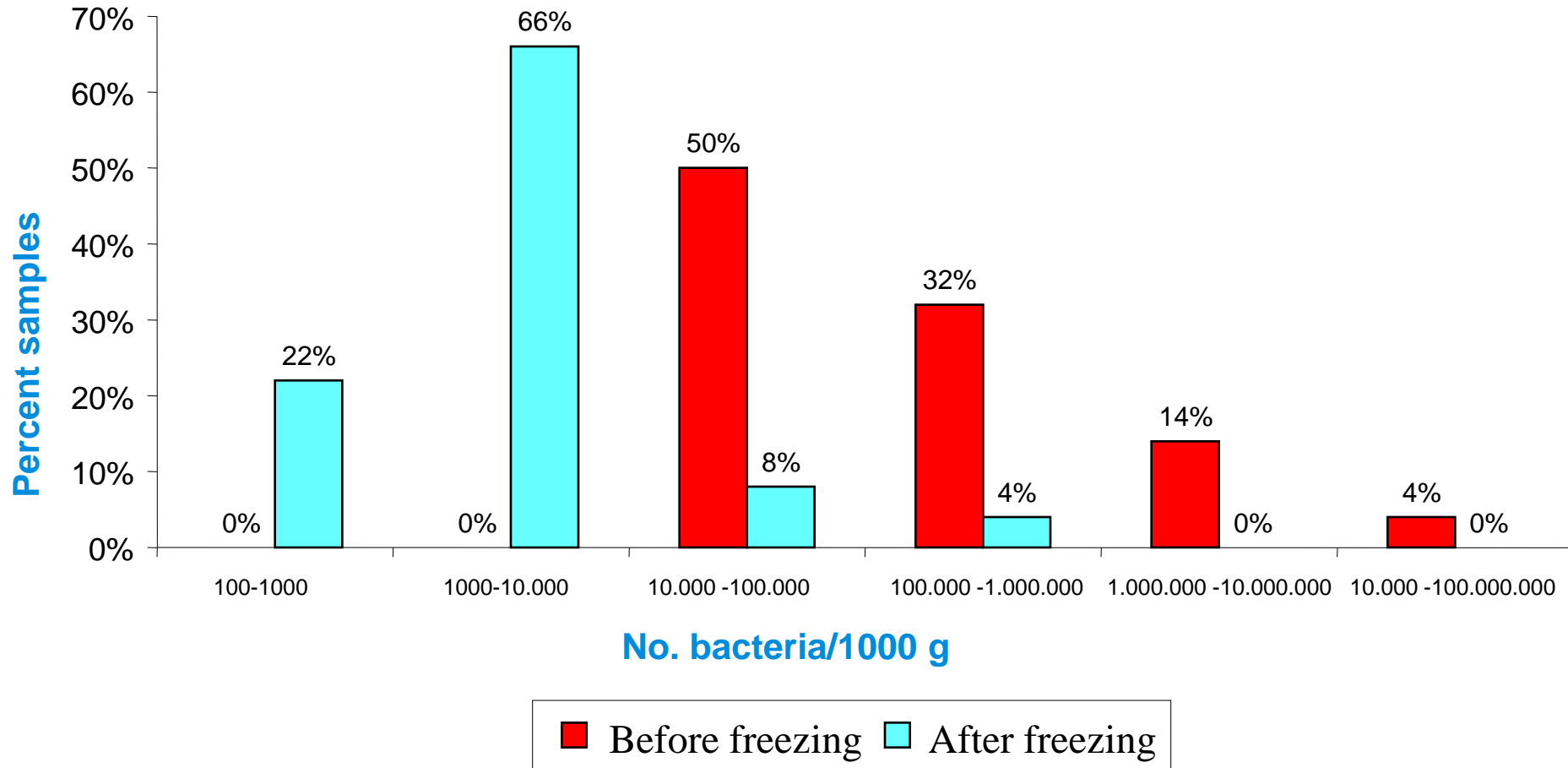
Campylobacter in broiler flocks at slaughter in slaughtering 2001-2009



Freezing effect of *Campylobacter* in chicken



(n = 50/50)



Public awareness campaign in 2000 against *Campylobacter*



Það iðar allt af lífi í eldhúsum landsins

Hundrubir Íslendinga smitubúst af bakteríunni *Campylobacter* í síðasta mánuði. Hátt í hundrað manns veiktust svo að þeir þurftu að leita læknis og sumir voru lagðir inn á spítala vegna syklingarinnar.

- ▲ Gættu að hreinlæti í eldhúsinu. Notið hreina áhöld, þvoð hafa og skurðborotti þegar skipt er úr einni gerð braefna yfir í aðra.
- ▲ Gægnið allt kjöt til að drepa bakteríuna. Merki þess að kjöt sé nægilega matreitt eru að safnin sem dryppar af kjötinu er tær og engir rauðir blættir í fuglakjöt.
- ▲ Þvoð hendur oft og metið eftir vinnu með bratt kjöt og þurrkið blóðvatni frá kjöti og kjöklingum upp með eldhúsgöggli.
- ▲ Geymið kjöt vel afskiðlið frá öðrum mat því hratt kjöt smitar aðra matvöru, t.a.m. ósoðið grænmeti. Kælið mat hratt og þrugglega og geymið hann vel kælda.

Athugið að þó *Campylobacter* sé að finna í hráu kjöti, einkum kjöklingum, er ekki ástæða að óttast kjötneytu því bakterían dreypst við hátt hitastig og því er vel hitað kjöt öruggt.

Bakteríur í matvælum gera ekki upp á milli fólks - fegurðardrottningar kúka líka



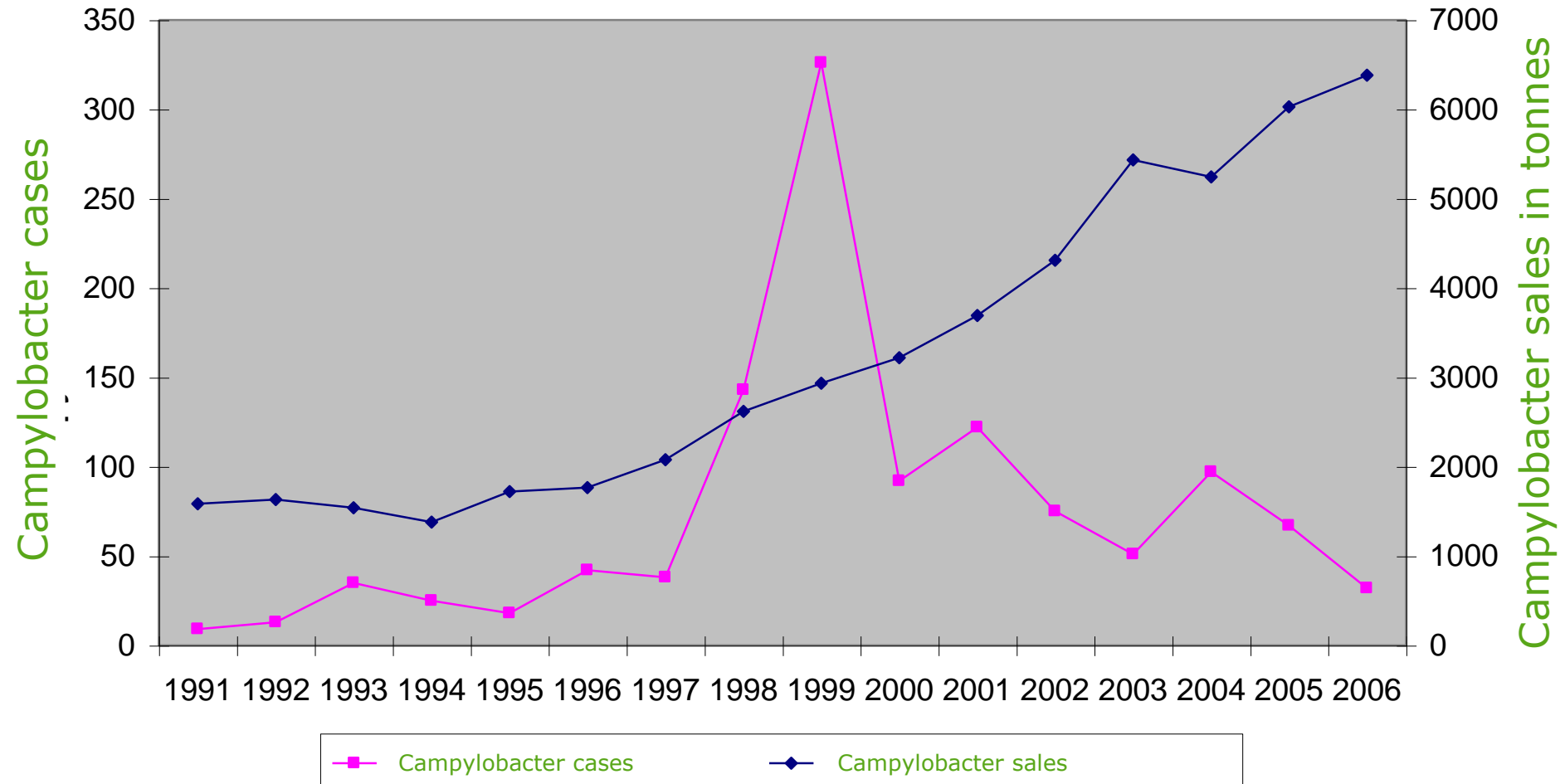
Bakteríur og sjúklar í matvælum gera engan greinarmun á Jóni og séra Jóni. En Jónar og allir aðrir geta hins vegar komið í vegg fyrir matarsjúklingar með því að gæta hreinlætis og meðhöndla matvælin rétt.

Núgöngu var boðlingjarninn „Vænni gægn matarsjúklingum og matareitrusum“ sendur á BÍL heimili í Landúna. Við hvetjum þig til að kynna og tilfærsla þér efni hans - svo að þér verði ekki til setunnar boðið!

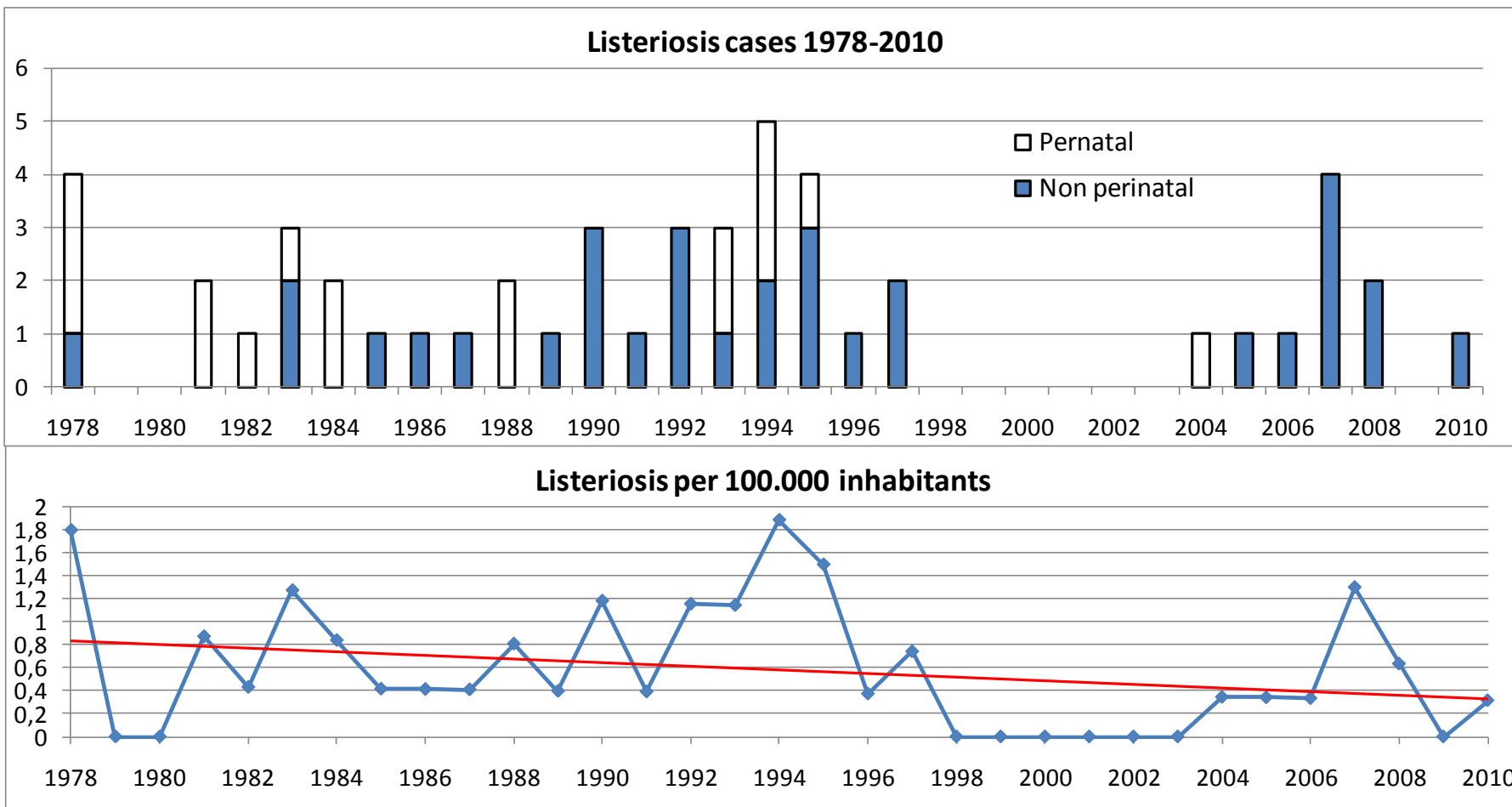


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SÍTTELINGARSTOFU
www.landlaeknir.is

Campylobacter cases vs chicken sales



Listeriosis in Iceland 1978-2010



EU average 0.3 per 100.000 inhabitants

Research projects (1993-2008) in Iceland

- *Listeria* surveys in the food industry
- Biofilm studies
- PFGE and virulence studies
- Biopreservation of fishery products
- High Pressure treatment of cold-smoked salmon
- PCR detection of Lm

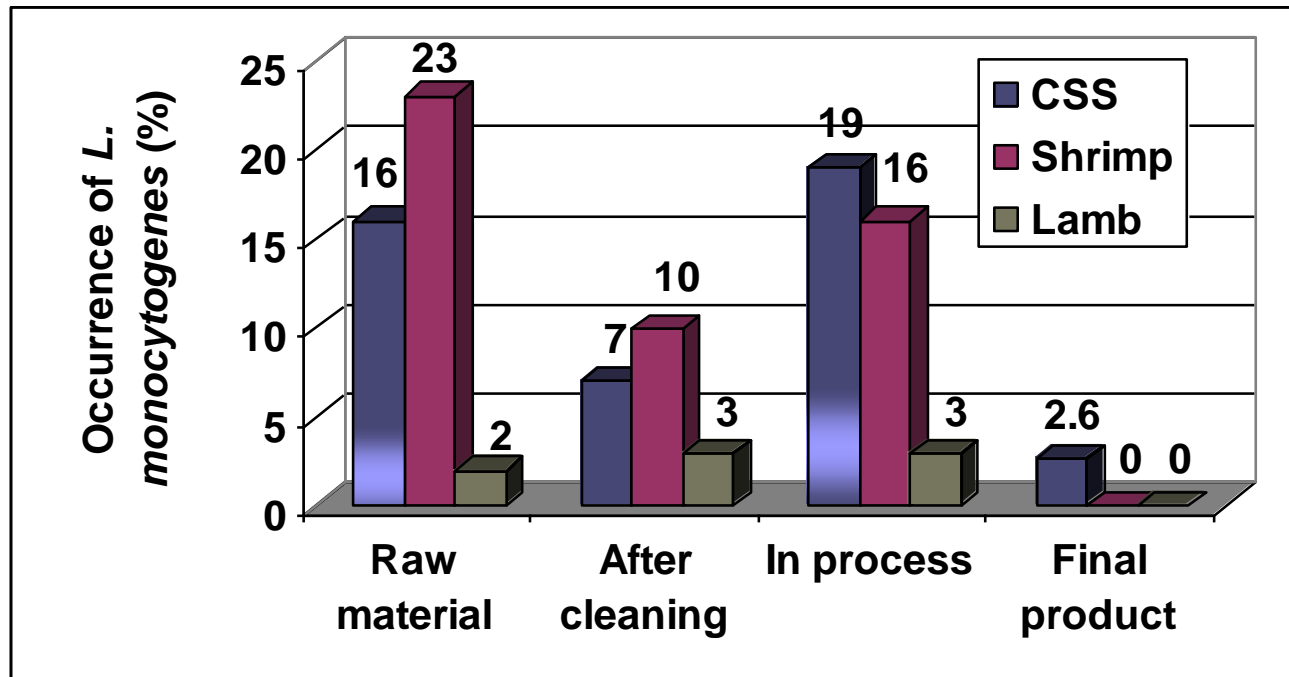
Prevalence data through routine analysis

Growth modeling in seafood products

Listeria surveys in the food industry



- Food processing plants visited (1996-2001)
 - n=1532 (24 surveys)
- Overall incidence: *Listeria spp.* 12.6%; Lm 9.9%
 - ✓ raw material: 15.4% (Lm = 12.7%)
 - ✓ in process: 13.1% (Lm = 10.7%)
 - ✓ final products: 5.7% (Lm = 0.2%)



Prevalence of *Listeria* in Icelandic foods

Sample type (1997-2003)	No. samples	Positive <i>Listeria</i> (%)	Positive Lm (%)
Raw milk	169	10.1	10.1
Vegetables	26	0	0
Vegetable cuts	70	1.1	1.1
Meat-cold cuts	145	3.5	1.4
Processed meat products	3	0	0
Raw meat	15	6.6	6.6
Raw seafood	1	0	0
Cold-smoked/gravad fish	20	15	?
Buffet meals	4	0	0
"Thorramatur" (trad. Icel. food)	5	0	0
Sour "thorramatur"	9	0	0
Offal	3	0	0
Herring	103	67	26.2

Prevalence of *Listeria* in Icelandic seafoods

Fish species	No samples	<i>Listeria</i> spp.	
	1999-2006	No. pos	%
shrimp	1833	1	0.1
cod	178	44	24.7
haddock	15	0	0.0
saithe/pollock	4	0	0.0
Ocean perch/ redfish	3	0	0.0
herring	344	158	45.9
capelin	166	78	47.0

Sampling site in cod processing plant	% <i>Listeria</i> positive plants (n=15)
Raw material - skin	0
Raw material - flesh	0
Fish after filleting	14
Fish after skinning	35
Fish in trimming	56
Fish before packaging	56
Fish in block	60
Fish after IQF	56
Minced fish	35

Sampling site in cod processing plant	% Positive plants (n=15)	
	<i>Listeria</i> post cleaning	<i>Listeria</i> in process
Reception		
Floor	0	7
Tubs- raw material	0	0
Machine hall		
Washing tub	0	7
Decrading belt	7	14
Beheading	7	7
Filleting - knives	0	7
Skinning machine	0	0
Floor	0	14
Trimming hall		
Trimming line	0	14
Trimming board	7	7
Packaging	7	35
Floor	7	21
Belt to IQF	0	7
Collection belt	0	14
Knives	0	7
Weighing tray	7	28
Gloves	7	7
Apron	0	7

- **Importance of Lm among *Listeria* spp. detected**

Fish	90%
Cooked Shrimp	90%
Raw meat	40%
Processed meat	24%
Chicken	61%

- **Main contamination sites**

Fish: processing equipment and environment

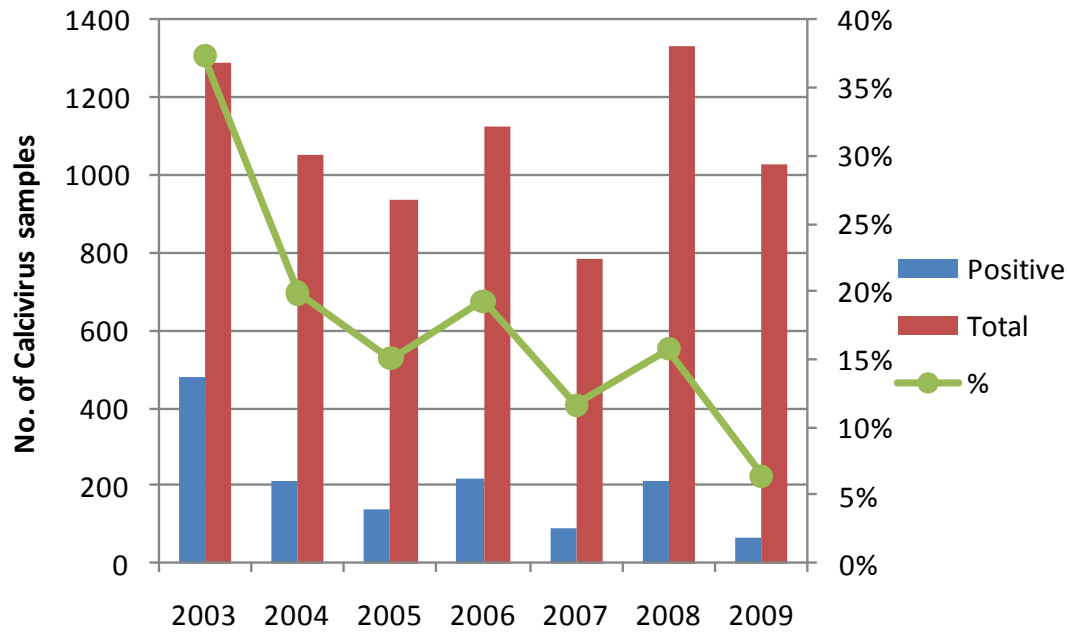
Shrimp: raw material, equipment, environm.

Raw meat: drains

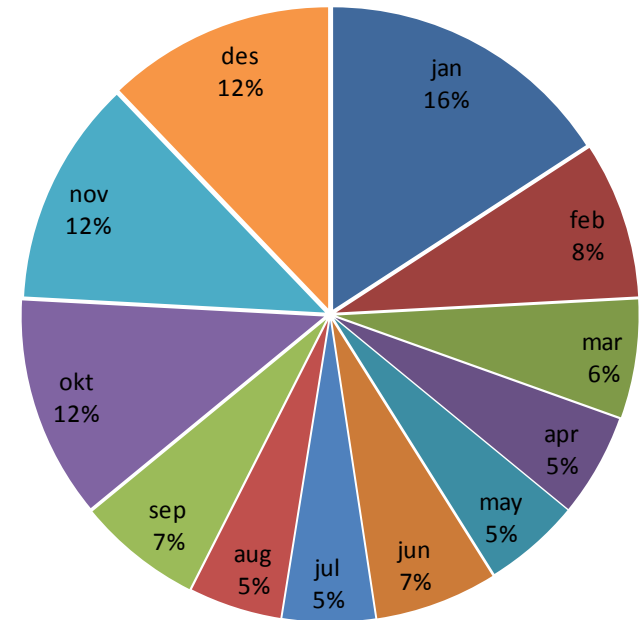
Cold cuts: raw material

Chicken: brine and drains

Calicivirus/NoV positive human stool samples



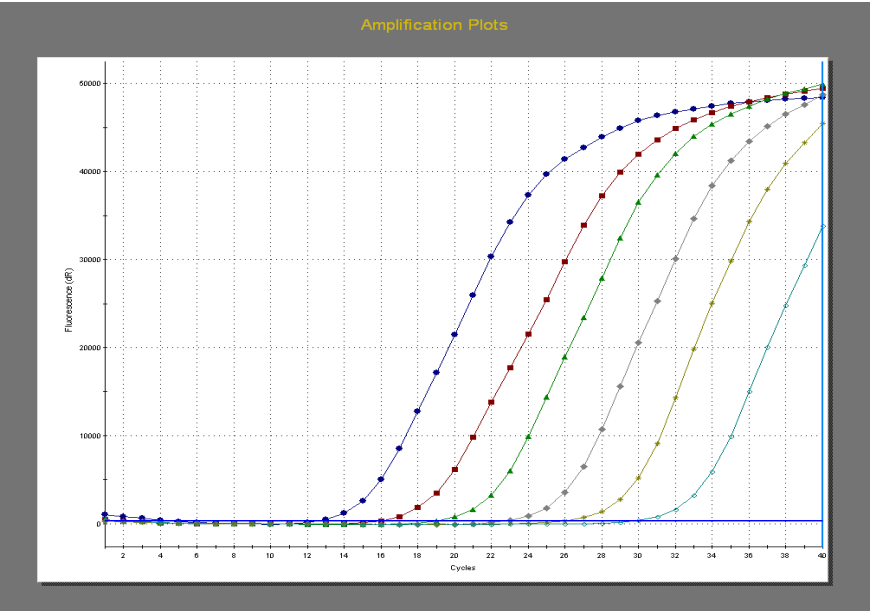
2003-2009 average



Data obtained from state hospitals, most often patients in clinical care

Real-time PCR detection

Real-time PCR

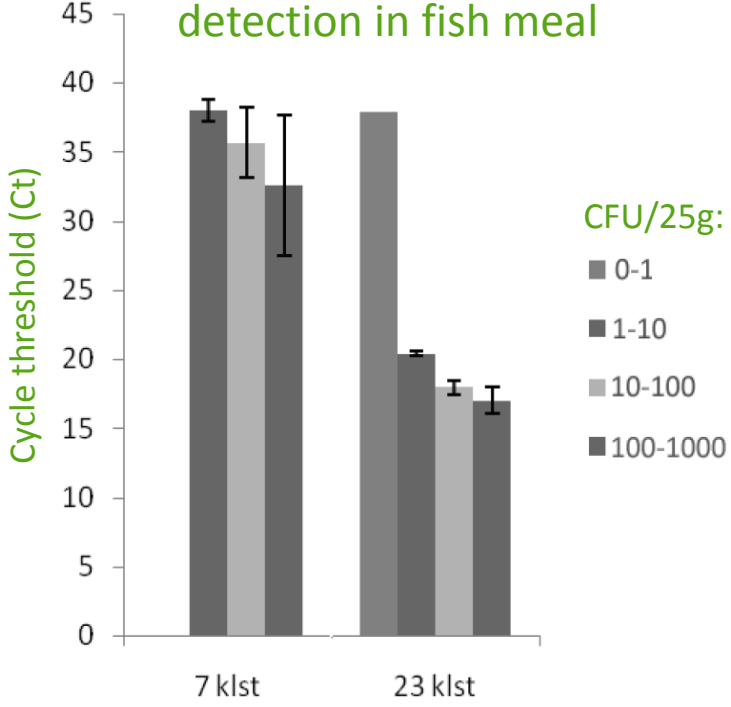


Development of *Listeria monocytogenes* detection method following enrichment

Listeria monocytogenes detection in food and feed

Hours preenrichment	12		24	
Spiking concentration (CFU/25g)	1-10	10-100	1-10	10-100
Shrimps	x	x	x	x
Fishmeal	x	x	x	x
Raw milk	NE	x	NE	x

Listeria monocytogenes detection in fish meal



Salmonella spiked in chicken feces

<i>Salmonella</i> CFU/g feces	NMKL no.71 5 ed. 1999	qPCR Ct values
10 ⁵ -10 ⁶	pos	20,6
10 ⁴ -10 ⁵	pos	23,5
10 ³ -10 ⁴	pos	25,7
10 ² -10 ³	pos	29,7
10 ¹ -10 ²	pos	31,6
10 ⁰ -10 ¹	neg	neg
0-10 ⁰	neg	neg

99 chicken and chicken feces samples analyzed

9 pos and 90 neg with both methods

Other methods developed/installed at Matís:

- *Campylobacter*
- *Vibrio parahaemolyticus* / *Vibrio spp.*
- *Pseudomonas* spp. (food spoilage bacteria)
- *P. phosphoreum* (fish spoilage bacteria)
- Norovirus
- Hepatitis A

Food safety and Matis

- **Quality- and safety analysis for food inspectors, food producers and others.**
- **Accredited service laboratory**
- **Research (monitoring) on undesirable microbes and substances in food, feed and environment**
- **Risk assessment and risk assessment research**
- **Databases on safety and nutritional ingredients of food**
- **Courses, information and consultancy to consumers, companies and authorities**

Conclusion

- **Current status of food associated pathogens**
- **Iceland has reached a good state in general regarding public food safety. Clinical cases and incidences of contaminated foods are in most cases below EU average.**
- **This success has been achieved for number of reasons:**
 - Small and manageable market size**
 - Good collaboration between scientists, public bodies and producers**
- **Access to high quality water sources and beneficial climate.**
- **Implementation of rapid detection methods in the future can aid increased food safety**
- **Outbreaks will occur again but effective food surveillance system can certainly reduce the risks.**

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