

ICELAND

The Report referred to in Article 9 of Directive 2003/99/EC

TRENDS AND SOURCES OF ZOONOSSES AND ZOOTIC AGENTS IN HUMANS, FOODSTUFFS, ANIMALS AND FEEDSTUFFS

including information on foodborne outbreaks,
antimicrobial resistance in zoonotic agents and some
pathogenic microbiological agents.

IN 2013

INFORMATION ON THE REPORTING AND MONITORING SYSTEM

Country: Iceland

Reporting Year: 2013

Laboratory name	Description	Contribution
Institute for Experimental Pathology, Keldur	Institute for Experimental Pathology, Keldur conducts research and supplies research based advisory support to the Icelandic authorities concerning animal health. They provide diagnostic and analytical services and cover all disciplines relating to infectious diseases: Pathology, bacteriology, virology, parasitology, immunology vaccinology and serology. Keldur serves as a national reference laboratory for Campylobacter, Tricinellosis and TSE.	Data
Icelandic Food and Veterinary Authority, MAST	<p>The Icelandic Food and Veterinary Authority (MAST) is the competent authority for the purpose of Directive 2003/99/EC of the European Parliament and of the Council.</p> <p>MAST carries out administration, surveillance, training and services to fisheries, agriculture, businesses and consumers in order to promote animal health and welfare, plant health and safety of food.</p>	Data and text. The reporting officer is employed at MAST.
Matis Ltd., Matís ehf	Matis is an independent research institute on food and Biotechnology. Matis serves as a testing laboratory for food and feed. Matís serves as a national reference laboratory for Salmonella and viral and bacterial contamination of mussels.	Data

INFORMATION ON THE REPORTING AND MONITORING SYSTEM

Laboratory name	Description	Contribution
Syni Laboratory service, Sýni ehf	Syni Laboratory Service Ltd. is a privately owned company with a testing laboratory for food and feed.	Data
ProMat, Rannsóknþjónustan ProMat ehf	ProMat Laboratory service Ltd is a privately owned testing laboratory for food and feed.	Data

PREFACE

This report is submitted to the European Commission in accordance with Article 9 of Council Directive 2003/99/ EC*. The information has also been forwarded to the European Food Safety Authority (EFSA).

The report contains information on trends and sources of zoonoses and zoonotic agents in Iceland during the year 2013 .

The information covers the occurrence of these diseases and agents in humans, animals, foodstuffs and in some cases also in feedingstuffs. In addition the report includes data on antimicrobial resistance in some zoonotic agents and commensal bacteria as well as information on epidemiological investigations of foodborne outbreaks. Complementary data on susceptible animal populations in the country is also given. The information given covers both zoonoses that are important for the public health in the whole European Community as well as zoonoses, which are relevant on the basis of the national epidemiological situation.

The report describes the monitoring systems in place and the prevention and control strategies applied in the country. For some zoonoses this monitoring is based on legal requirements laid down by the Community Legislation, while for the other zoonoses national approaches are applied.

The report presents the results of the examinations carried out in the reporting year. A national evaluation of the epidemiological situation, with special reference to trends and sources of zoonotic infections, is given. Whenever possible, the relevance of findings in foodstuffs and animals to zoonoses cases in humans is evaluated.

The information covered by this report is used in the annual Community Summary Report on zoonoses that is published each year by EFSA.

* Directive 2003/ 99/ EC of the European Parliament and of the Council of 12 December 2003 on the monitoring of zoonoses and zoonotic agents, amending Decision 90/ 424/ EEC and repealing Council Directive 92/ 117/ EEC, OJ L 325, 17.11.2003, p. 31

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1. ANIMAL POPULATIONS

The relevance of the findings on zoonoses and zoonotic agents has to be related to the size and nature of the animal population in the country.

A. Information on susceptible animal population

Sources of information

Information is estimated from the livestock database BUSTOFN where all animals and animal owners are registered. The Icelandic Food and Veterinary Authority (MAST) is responsible for the database.

Information regarding slaughtered animals comes from the register of slaughtered animals which is hosted at the Farmers Association. Information for number of poultry for meat production comes from the Veterinary Officer for Poultry diseases.

Dates the figures relate to and the content of the figures

The figures for livestock and herds relate to the year 2013 (31.12.2013). As not all the animal groups mentioned exist in Iceland there are no figures on some animal groups in the report. For Poultry the number of flocks is cumulative for the year 2013.

Definitions used for different types of animals, herds, flocks and holdings as well as the types covered by the information

Herd means an animal or group of animals kept on a holding as an epidemiological unit. In Iceland, there is generally only one herd of the same animal species except for poultry.

National evaluation of the numbers of susceptible population and trends in these figures

When evaluating the number of susceptible populations the figures are relatively accurate, considering that these figures have been confirmed during annual on the spot controls last years for all herds. Livestock officers are responsible for confirming the accuracy of the figures for each animal owner. There has been a change from a general downward trend in the figures for dairy cows toward a increased number of dairy cows, there are fewer holdings but at the same time each holding is getting bigger. Population numbers for sheep and horses have been stable for the past decade.

Geographical distribution and size distribution of the herds, flocks and holdings

All existing animal groups in Iceland are relatively evenly spread around the agricultural lowland areas. There are no herds or holdings in the highlands, which cover over 80 % of the island. In the summer, from June to September, the flocks of sheep and herds of horses are grazing in the highlands.

Table Susceptible animal populations

* Only if different than current reporting year

Animal species	Category of animals	Number of herds or flocks		Number of slaughtered animals		Livestock numbers (live animals)		Number of holdings	
		Data	Year*	Data	Year*	Data	Year*	Data	Year*
Cattle (bovine animals)	meat production animals	180				7050		180	
	dairy cows and heifers	690				65000		690	
	calves (under 1 year)	25				300		25	
	mixed herds	40				5000		40	
	- in total	935		21383		77350		95	
Deer	farmed - in total	0				0		0	
Ducks	meat production flocks	0				0		0	
Gallus gallus (fowl)	breeding flocks for egg production line - in total	5				3800		3	
	breeding flocks for meat production line - in total	35				61000		4	
	laying hens	46				191000		12	
	broilers	657				737000		28	
	- in total ¹⁾	743		4957270		992800		47	
Goats	- in total	90				860		90	

Table Susceptible animal populations

Animal species	Category of animals	Number of herds or flocks		Number of slaughtered animals		Livestock numbers (live animals)		Number of holdings	
		Data	Year*	Data	Year*	Data	Year*	Data	Year*
Pigs	breeding animals	4		1590		1451		4	
	fattening pigs	15				24600		15	
	- in total	19		76687		26051		19	
Sheep	animals under 1 year (lambs)	2646				476300		2646	
	- in total	2646		590657		476300		2646	
Solipeds, domestic	horses - in total	2550		9758		78000		2550	
Turkeys	meat production flocks	28				1200		4	
	parent breeding flocks	2				800		1	
	- in total ²⁾	30				2000		5	

Comments:

- ¹⁾ Number of slaughtered animals is a total for all poultry, including turkeys
- ²⁾ For number of slaughtered animals, see Gallus gallus

2. INFORMATION ON SPECIFIC ZOO NOSES AND ZOONOTIC AGENTS

Zoonoses are diseases or infections, which are naturally transmissible directly or indirectly between animals and humans. Foodstuffs serve often as vehicles of zoonotic infections. Zoonotic agents cover viruses, bacteria, fungi, parasites or other biological entities that are likely to cause zoonoses.

2.1 SALMONELLOSIS

2.1.1 General evaluation of the national situation

A. General evaluation

History of the disease and/or infection in the country

Salmonella is endemic in the pig production but prevalence of Salmonella on pig carcasses has been low since 2007 (0,5 – 2,7%) except for the year 2009 where the prevalence rose to 11,2%.

The situation regarding Salmonella in the poultry meat production has been very good, with prevalence under 1% in poultry flocks for many years and 0% prevalence for three consecutive years (2005 – 2007). In 2009 – 2013, however, an increase in positive poultry flocks was seen. Salmonella in breeding flocks (*Gallus gallus*) has never been confirmed in the last decade.

Salmonella infections in sheep holdings have not been investigated but clinical outbreaks have sporadically occurred.

A study in 2010 on Salmonella in bovine animals revealed very low prevalence (<0,5%) with no samples positive.

As for sheep, sporadic clinical cases and outbreaks of Salmonella have occurred in horses.

The situation regarding Salmonella in pork and poultry products is considered good.

Spread of Salmonella into the pig production has likely occurred by raw feed materials. PFGE investigations indicate that some Salmonella serotypes have spread into poultry production with compound feed but the mechanism of spread is not known.

National evaluation of the recent situation, the trends and sources of infection

Since 2009 total cases of human salmonellosis have been relatively few. Numbers of cases acquired abroad have gone down. The number of domestic cases was relatively stable in this same period.

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases (as a source of infection)

Because of very strict control programmes for reducing salmonella in the pig and poultry production and low numbers of human cases of salmonellosis, domestic food products of animal origin are considered to represent a small risk to the consumer in regard to Salmonella. This assumption is supported by the experience in 2009 and 2010 where the prevalence of Salmonella in pig and poultry meat production rose significantly but where the prevalence of human cases of salmonellosis did not alter in the same direction. Instead the opposite development was observed.

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Because of changes (see recent actions) in the feed production in 2010 spread of Salmonella seems not to be as important as before. Instead, permanent local infections in some premises seem to be the main cause for maintaining the prevalence in the poultry flocks at approximately 1 – 2%.

Recent actions taken to control the zoonoses

Heat treatment of raw soya material (2010) before shipment to pig holdings and replacing an old feed mill (2010) with a new one with excellent bio security are two major factors that have contributed to less spread of Salmonella by feed.

2.1.2 Salmonellosis in humans

A. Salmonellosis in humans

Reporting system in place for the human cases

Yes it is a reportable disease

Case definition

Yes the EU case definition

Notification system in place

Yes

Relevance as zoonotic disease

High

Table Salmonella in humans - Species/serotype distribution

Species/serotype Distribution	Cases	Cases Inc.	Autochthon cases	Autochthon Inc.	Imported cases	Imported Inc.	Unknown status
Salmonella	26	8.1	6	1.8	19	5.9	1
S. Enteritidis	21	6.6	2	0.6	18	5.6	1
S. Typhimurium	5	1.5	4	1.2	1	0.3	0

Table Salmonella in humans - Age distribution

Age distribution	S. Enteritidis			S. Typhimurium			Salmonella spp.		
	All	M	F	All	M	F	All	M	F
<1 year	0	0	0	0	0	0	1	0	1
1 to 4 years	0	0	0	0	0	0	2	0	2
5 to 14 years	0	0	0	1	1	0	2	0	1
15 to 24 years	2	2	0	0	0		6	0	5
25 to 44 years	3	3	0	3	2	1	5	3	1
45 to 64 years	12	9	3	1	1	0	4	2	1
65 years and older	4	3	1	0	0	0	3	0	3
Age unknown	0	0	0	0	0	0	0	0	0
Total :	21	17	4	5	4	1	23	5	14

Footnote:

Gender is missing for four cases

Table Salmonella in humans - Seasonal distribution

Seasonal Distribution Months	S. Enteritidis	S. Typhimuri um	Salmonell a spp.
	Cases	Cases	Cases
January	1	0	2
February	0	0	3
March	2	0	3
April	1	1	1
May	2	0	2
June	1	0	2
July	2	4	1
August	4	0	3
September	1	0	3
October	6	0	0
November	1	0	2
December	0	0	1
not known	0	0	0
Total :	21	5	23

2.1.3 Salmonella in foodstuffs

A. Salmonella spp. in broiler meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

The FBOs are sampling each slaughter batch

At meat processing plant

No official sampling

Sampling according to 2073/2005 by FBO is verified under the regular official control of the FBO.

At retail

The local competent authorities (LCA) are responsible for sampling at retail.

For Matis survey: Fully packed products were shipped to the lab at the same time as distribution to retail was being done. Samples were stored at 4°C for few days until analysis was performed.

Frequency of the sampling

At slaughterhouse and cutting plant

Each broiler slaughter batch is sampled

At meat processing plant

The frequency of sampling of minced meat and meat preparation by the FBO is according to the production capacity per week. More than 3 tons / week; 5 samples per week. 1 - 3 tons per week; 5 samples every second week. 500 kg - 1 ton; 5 samples 4 times per year. Frequency can be reduced when results have been negative for 30 weeks. Processing plants producing less the 500 kg / week does not need to take samples if they can demonstrate good hygiene practices.

At retail

Depend on the survey

For Matis survey: Samples were collected once every month at random dates and from random producer but with consideration of market share (three main producers in Iceland).

Type of specimen taken

At slaughterhouse and cutting plant

Neck skin

At meat processing plant

Minced meat and meat preparation

At retail

Packed broiler meat and products thereof

For Matis survey: Three types of samples: Neck skin, whole skinned loin, wing cuts with skin

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

From each slaughter batch, 50 neck skin samples, each sample consisting of 2-3g, are pooled into one sample. At the laboratory, a subsample of 25g is taken for further culturing.

At meat processing plant

Each sample is 25 g of minced meat or meat preparations.

At retail

Packed products

For Matis survey: For each type of sample type; 15 packs were received and pool sample prepared from 3 packs resulting in 5 measurements of each sample type. This was done every month for 4 months (Jan-Apr)

Definition of positive finding

At slaughterhouse and cutting plant

A sample positive for *Salmonella* spp.

At meat processing plant

Sample is considered to be positive when *salmonella* spp. is detected.

At retail

Sample is considered to be positive when *salmonella* spp. is detected.

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

Bacteriological method: NMKL No 71:1999, 5th edition

At meat processing plant

NMKL 71, 5th ed., 1999

At retail

NMKL 71, 5th ed., 1999 ISO 6579:2002 Wellcolex- serogroup identification

Preventive measures in place

All broiler flocks are sampled before slaughter and *salmonella* positive flocks are destroyed since it is prohibited to slaughter *salmonella* positive flocks. Haccp activities are verified during official control of FBO. According to national legislation there is a warning note on each package containing raw poultry meat. This note recommends the consumer to prevent cross contamination when handling raw poultry meat.

Control program/mechanisms

The control program/strategies in place

As described before

Measures in case of the positive findings or single cases

When *salmonella* is detected in a slaughter batch or in a product, the batch is withdrawn from the market.

Notification system in place

The FBO and the laboratory have to report a detection of *salmonella* spp. immediately to MAST.

Results of the investigation

For Matis Survey: All 60 samples (15 from every month; 5 from each sample type) were found negative in relation to *Salmonella* spp.

National evaluation of the recent situation, the trends and sources of infection

There are no changes in prevalence of *salmonella* in slaughter batches.

B. Salmonella spp. in pig meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

The information needed is whether carcasses are contaminated with Salmonella or not. Therefore all slaughter batches from all holdings tested for Salmonella. The sampling is a part of permanent control programme and is objective, official and performed by the CA (MAST).

Samples are taken from carcasses after cooling where the number of samples depend on the size of the slaughter batch.

At meat processing plant

Depending on the survey: Official samples of minced pig meat.

Sampling according to 2073/2005 by FBO is verified under the regular official control of the FBO.

At retail

Samples of minced pig meat.

The local health authorities (LHA) are responsible for sampling at retail.

Frequency of the sampling

At slaughterhouse and cutting plant

Every herd is sampled at each slaughter. From every herd ten randomly chosen carcasses from the slaughter batch are swabbed if 40 or fewer pigs are slaughtered, twenty carcasses are swabbed if 41 - 120 pigs are slaughtered and thirty carcasses are swabbed if more than 120 pigs are slaughtered. By this number of samples it can be declared by 95% confidence level that at least one positive sample will be detected in the batch if the prevalence in the batch is 10 – 15% or higher.

At meat processing plant

31 official samples from 7 batches of minced pig meat.

The frequency of sampling of minced meat and meat preparation by the FBO is according to the production capacity per week. More than 3 tons / week; 5 samples per week. 1 - 3 tons per week; 5 samples every second week. 500 kg - 1 ton; 5 samples 4 times per year. Frequency can be reduced when results have been negative for 30 weeks. Processing plants producing less the 500 kg / week does not need to take samples if they can demonstrate good hygiene practices.

At retail

8 official samples from 5 batches of minced pig meat.

Type of specimen taken

At slaughterhouse and cutting plant

Surface of carcasses

At meat processing plant

Official samples; minced meat.

Minced meat and meat preparation

At retail

Minced meat.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

At slaughtering, the pig carcasses are split into two parts along the vertebrate. After cooling both carcass parts are swabbed in three designated areas. One cotton swab is used for both carcass parts. Two of the three areas on each part cover approx. 10 x 10 cm. The third area covers approx. 100 cm². The three different areas on each side of the carcass cover the following sites:

Area I: Anus region, inside of the thigh and the pelvis region

Area II: The cut surface of the breast and abdomen, underbelly

Area III: Inside the cranial part of thorax and the adjacent transected bones/ribs

Swabs from 10 carcasses are pooled together in one sample.

At meat processing plant

5 X 200 g of minced meat. Each sample is 25 g of minced meat or meat preparations. Samples can be pooled into one samples (225g).

At retail

2 x 200 g of minced meat. Each sample is 25 g of minced meat

Definition of positive finding

At slaughterhouse and cutting plant

The swabs tests are Tecra Rapid tests (antibody/antigen test). In the middle of the year the RapidChek Select test was taken into use instead of the Tecra Rapid test. A positive test according to the protocol for the test and before confirmation by culturing, is regarded as positive for Salmonella. Confirmation by culturing is not needed, but at least one swab from each slaughter batch is serotyped and tested for antimicrobial resistance. If a positive Tecra/RapidChek test is negative by bacteriological culturing, the result has no influence on actions already taken regarding next slaughter from the respective herd.

At meat processing plant

Sample is considered to be positive when salmonella spp. is detected.

At retail

Sample is considered to be positive when salmonella spp. is detected.

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

Salmonella Tecra Unique Rapid Test. (Enrichment immunocapture immunoenrichment and detection steps)

RapidChek Select Salmonella.

Bacteriological method: NMKL 187:2007

Bacteriological method: NMKL 71:1999

At meat processing plant

Bacteriological method: NMKL 71:1999

At retail

Bacteriological method: NMKL 71:1999

Preventive measures in place

Sanitary slaughtering is performed when slaughtering from herds that are categorised as level 3 herds.

Organs from pigs originating from level 2 or 3 herds are considered not fit for processing or consumption.

For further information about categorizing into levels see chapter Salmonella spp. in pigs (meat juice

index)

Haccp activities are verified under official control of FBO.

Control program/mechanisms

The control program/strategies in place

The mandatory national control programme for Salmonella in pigs is approved by the Competent Authority, MAST. The aim of the programme is to prevent salmonella in pork and thereby mitigate the risk of human salmonellosis.

The surveillance programme is constructed to monitor salmonella infections at farm level by measuring antibodies against Salmonella in meat juice test, to survey salmonella contamination on pig carcasses at slaughtering and to monitor Salmonella serotypes in faecal and swab samples. Salmonella serotypes are also tested for antimicrobial resistance.

Measures in case of the positive findings or single cases

Finding one positive sample from a level 1 herd initiates reactions. In case of a positive sample all carcasses from the respective herd must be swabbed at next slaughter and quarantined whilst waiting for the results from the swab test. All positive carcasses must be heat treated before entering the market.

All carcasses from level 2 and 3 herds are swabbed (and swabs from 5 carcasses are pooled together in one sample) and quarantined at the slaughterhouse and cannot enter the market unless swabs are negative. Carcasses positive for Salmonella must be heat treated.

When salmonella is detected in a product, the product is withdrawn from the market.

Notification system in place

Salmonella is a notifiable disease, according to national legislation on animal diseases No. 25/1993 and according to the national Food Law No. 93/1995. The Competent Authority, MAST, receives all results from the respective laboratories regarding Salmonella testing (including serotyping and antimicrobial resistance) on samples from pig production, slaughtering and from FBO own checks in slaughterhouses, cutting plants and processing plants.

Results of the investigation

Swabs taken at the slaughterhouses were 0,9% positive for Salmonella. In swab samples Salmonella Worthington, Salmonella Brandenburg, Salmonella Infantis and Salmonella Unnamed I Rough : i: - were found.

Results from the FBOs own checks according to 2073/2005 are not available.

National evaluation of the recent situation, the trends and sources of infection

The prevalence for Salmonella positive swab samples was 1,1%, 0,5%, 1,4% in 2006, 2007 and 2008. The prevalence rose to 11,2% in 2009 but declined in the two consecutive years i.e. in 2011, 2012 and 2013 to 1,3%, 0,3% and 0,9% respectively. Despite of the increase in Salmonella in the pig production and on pig carcasses salmonellosis in humans in the same period did not alter in the same direction. On the contrary domestic cases of salmonellosis in humans were fewer in 2009 and 2010 compared to domestic cases in the previous years.

Salmonella in minced meat and meat preparation (pig meat) was not detected in 2013.

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a

source of infection)

Salmonella on pig carcasses seems not to be a major source for human infections.

C. Salmonella spp. in bovine meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

No official sampling.

Sampling according to 2073/2005 by FBO is verified under the regular official control of the FBO.

At meat processing plant

No official sampling.

Sampling according to 2073/2005 by FBO is verified under the regular official control of the FBO.

At retail

No official sampling.

Frequency of the sampling

At slaughterhouse and cutting plant

The frequency of sampling by FBO is proportional to the slaughterhouse's throughput.

Slaughtering of beef and horses. >10.000 carcasses / year; 5 samples every second week. 2000- 10000 carcasses; /year 5 samples per month. 500-2000 carcasses / month 5 samples 4 times a year. < 500 carcasses no sampling if GHP can be demonstrated.

Slaughtering of lamb / sheep. > 100.000 carcasses / slaughtering periode of 6- 8 weeks; 5 samples 5 times during the periode. 50.000- 100.000 carcasses / slaughtering periode of 6- 8 weeks; 5 samples 4 times during the periode. 10.000- 50.000 carcasses / slaughtering periode of 6- 8 weeks; 5 samples 2 times during the periode. < 10.000 no sampling if GHP can be demonstrated.

At meat processing plant

The frequency of sampling of minced meat and meat preparation by the FBO is according to the production capacity per week. More than 3 tons / week; 5 samples per week. 1 - 3 tons per week; 5 samples every second week. 500 kg - 1 ton; 5 samples 4 times per year. Frequency can be reduced when results have been negative for 30 weeks. Processing plants producing less the 500 kg / week does not need to take samples if they can demonstrate good hygiene practices (GHP).

At retail

The local health authorities (LHA) are responsible for sampling at retail

No official sampling 2012.

Type of specimen taken

At slaughterhouse and cutting plant

Surface of carcass

At meat processing plant

Each sample is 25 g of minced meat or meat preparations.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

According to MAST guidance the slaughterhouses should swab the carcass before chilling in four designated areas with a sponge. Each area 10 x 10 cm; total 400 cm². Swabs of 5 carcasses can be

pooled to one sample.

At meat processing plant

Each sample is 25 g of minced meat or meat preparations. Samples can be pooled into one sample (225 g)

Definition of positive finding

At slaughterhouse and cutting plant

Sample is considered to be positive when salmonella spp. is detected.

At meat processing plant

Sample is considered to be positive when salmonella spp. is detected.

At retail

Sample is considered to be positive when salmonella spp. is detected.

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

NMKL No 71:1999, 5th edition

At meat processing plant

NMKL No 71:1999, 5th edition

At retail

NMKL No 71:1999, 5th edition

Preventive measures in place

HACCP activities are verified under official control of FBO.

Measures in case of the positive findings or single cases

Meat should be withdrawn from the market.

Notification system in place

Laboratories as well as the FBO analysing salmonella should notify any detection of Salmonella to MAST. Salmonella is a notifiable disease, according to national legislation on animal diseases No. 25/1993 and according to the national Food Law No. 93/1995. The Competent Authority, MAST, receives all positive results from the respective laboratories regarding Salmonella testing (including serotyping and antimicrobial resistance) on samples from FBO own checks in slaughterhouses, cutting plants and processing plants.

Results of the investigation

The results from the FBO own checks are not available. There is no indication that Salmonella is a problem in bovine meat production

Salmonella has not been notified by FBO to MAST the competent authority.

National evaluation of the recent situation, the trends and sources of infection

Detection of salmonella in minced meat and meat preparation (bovine meat) was not notified to MAST 2013

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Salmonella on bovine carcasses seems not to be a major source for human infections.

D. Salmonella spp. in turkey meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

The FBOs are sampling each slaughter batch.

Sampling at cutting plant according to 2073/2005 by FBO is verified under the regular official control of the FBO.

At meat processing plant

No official sampling

Sampling according to 2073/2005 by FBO is verified under the regular official control of the FBO.

At retail

No official sampling

Frequency of the sampling

At slaughterhouse and cutting plant

Each turkey slaughter batch is sampled

At meat processing plant

The frequency of sampling of minced meat and meat preparation by the FBO is according to the production capacity per week. More than 3 tons / week; 5 samples per week. 1 - 3 tons per week; 5 samples every second week. 500 kg - 1 ton; 5 samples 4 times per year. Frequency can be reduced when results have been negative for 30 weeks. Processing plants producing less than 500 kg / week does not need to take samples if they can demonstrate good hygiene practices.

Type of specimen taken

At slaughterhouse and cutting plant

Neck skin

At meat processing plant

Minced meat and meat preparation

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

From each slaughter batch, 50 neck skin samples, each sample consisting of 2-3g, are pooled into one sample. At the laboratory, a subsample of 25g is taken for further culturing.

At meat processing plant

Each sample is 25 g of minced meat or meat preparations.

Definition of positive finding

At slaughterhouse and cutting plant

A sample positive for Salmonella spp.

At meat processing plant

Sample is considered to be positive when salmonella spp. is detected.

At retail

Sample is considered to be positive when salmonella spp. is detected.

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

Bacteriological method: NMKL No 71:1999, 5th edition

At meat processing plant

NMKL No 71:1999, 5th edition

At retail

NMKL No 71:1999, 5th edition

Preventive measures in place

All flocks are sampled before slaughter and salmonella positive flocks are destroyed since it is prohibited to slaughter salmonella positive flocks. Haccp activities are verified during official control of FBO.

Measures in case of the positive findings or single cases

When salmonella is detected in a slaughter batch or in a product, the batch is withdrawn from the market.

Notification system in place

The FBO and the laboratory have to report a detection of salmonella spp. immediately to MAST.

Results of the investigation

Results from the FBOs own checks according to 2073/2005 are not available.

National evaluation of the recent situation, the trends and sources of infection

The FBOs should take samples according to a guidance on 2073/2005 issued by MAST in april 2012.

Detection of salmonella in minced meat and meat preparation was not notified to MAST 2013

E. Salmonella spp. in eggs and egg products

Monitoring system

Sampling strategy

Flocks of laying hens are monitored see under salmonella spp. in flocks of laying hens

No official sampling

Frequency of the sampling

Eggs at egg packing centres (foodstuff based approach)

No official sampling

Eggs at retail

No official sampling

Raw material for egg products (at production plant)

No official sampling

Egg products (at production plant and at retail)

No official sampling

Table Salmonella in poultry meat and products thereof

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium
Meat from broilers (Gallus gallus) - carcase - Slaughterhouse - Surveillance	Keldur	Census	Industry sampling	food sample > neck skin	Domestic	Batch	25 g	716	2		
Meat from broilers (Gallus gallus) - meat preparation - intended to be eaten cooked - Retail - Surveillance	Matis	Suspect sampling	Official sampling	food sample > meat	Domestic	Single	25 g	4	0		
Meat from spent hens (Gallus gallus) - fresh - breeding flocks - Retail - Surveillance	Keldur	Census	Industry sampling	food sample > neck skin	Domestic	Batch	25 g	18	0		
Meat from spent hens (turkey) - fresh - breeding flocks - Retail - Surveillance	Keldur	Census	Industry sampling	food sample > neck skin	Domestic	Batch	25 g	4	0		
Meat from turkey - carcase - Slaughterhouse - Surveillance	Keldur	Census	Industry sampling	food sample > neck skin	Domestic	Batch	25 g	60	0		

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Meat from broilers (Gallus gallus) - carcase - Slaughterhouse - Surveillance		2
Meat from broilers (Gallus gallus) - meat preparation - intended to be eaten cooked - Retail - Surveillance		
Meat from spent hens (Gallus gallus) - fresh - breeding flocks - Retail - Surveillance		
Meat from spent hens (turkey) - fresh - breeding flocks - Retail - Surveillance		

Table Salmonella in poultry meat and products thereof

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Meat from turkey - carcass - Slaughterhouse - Surveillance		

Table Salmonella in red meat and products thereof

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium
Meat from pig - carcase - Slaughterhouse - Surveillance	Keldur, Promat	Objective sampling	Official sampling	food sample > carcase swabs	Domestic	Batch	600 cm2	2878	26		
Meat from pig - minced meat - intended to be eaten cooked - Processing plant - Surveillance	Matis	Convenience sampling	Official sampling	food sample	Domestic	Single	25 g	31	0		
Meat from pig - minced meat - intended to be eaten cooked - Retail - Surveillance	Matis	Convenience sampling	Official sampling	food sample	Domestic	Single	25 g	8	0		

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified	S. Brandenburg	S. Infantis	S. Worthington	Salmonella spp.
Meat from pig - carcase - Slaughterhouse - Surveillance		16	6	1	2	1
Meat from pig - minced meat - intended to be eaten cooked - Processing plant - Surveillance						
Meat from pig - minced meat - intended to be eaten cooked - Retail - Surveillance						

2.1.4 Salmonella in animals

A. Salmonella spp. in Gallus Gallus - breeding flocks

Monitoring system

Sampling strategy

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

The monitoring of salmonella in breeding flocks of Gallus gallus is applied to the whole country.

Every breeding flock consisting of 250 animals or more is sampled. During primary production samples are both taken by the food business operator (FBO) and by the competent authority (CA) in accordance with the national control programme.

In 2013, all samples from breeding flocks are taken at farm level. When a breeder flock is slaughtered samples are taken from each slaughter batch at the time of slaughter, after evisceration but before chilling. The sampling strategy is according to national requirements that were implemented in 2001 and 2002 and according to the national control programme in accordance with reg. (EC) no. 2130/2003 and in accordance with the Annex of the Commission Regulation (EU) No 200/2010.

In Iceland there are only parent flocks.

Frequency of the sampling

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

Every flock is sampled.

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

At the age of 4 weeks and again 2 weeks before moving to the laying phase.

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

Every 2 weeks.

If eggs from a breeding flocks are not incubated monthly or more often, then samples have to be taken each time before eggs are sent for incubation, and the result must be available before eggs are shipped to the hatchery.

Type of specimen taken

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

Hatched eggs

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

Socks/ boot swabs

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

Socks / boots wabs, or boot swabs/dust sample, or fecal sample

Methods of sampling (description of sampling techniques)

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

From each breeding flock (paternal and maternal line separately) one sample is taken during hatching.

The pooled sample consists of 10 g of broken eggshells taken from a total of 25 separate hatcher baskets,

which in total is at least 250g of broken eggshells.

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

From each breeding flock two pairs of boot swabs are collected and pooled into one sample, both at the age of 4 weeks and two weeks before moving to the laying phase.

Breeding flocks: Production period

Industry samples: On their choice, there are either taken 5 pairs of bootswabs (2 pooled samples) or one pair of bootswab and one dustsample, the dust sample is cultured separately. In case it is not possible to take bootswab samples, 2 pooled samples of in total 300 individual fecal samples are taken.

The official samples are taken in the same way as the industry samples: two pooled samples with either 5 pairs of bootswabs or one pair of bootswabs and one dust sample, or 300 fecal samples. The samples are taken at the beginning and the end of the laying phase and once in between.

Case definition

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

A sample positive for salmonella spp. In cases where the CA has suspicion of a false positive result, the CA can confirm a first positive finding, and if it is not possible to confirm, the flock will be calculated as negative.

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

A sample positive for salmonella spp. In cases where the CA has suspicion of a false positive result, the CA can confirm a first positive finding, and if it is not possible to confirm, the flock will be calculated as negative.

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

A sample positive for salmonella spp., always confirmed by the CA. If it is not possible to confirm a first positive finding in two consecutive samples taken by the CA, the flock will be calculated as negative.

Diagnostic/analytical methods used

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

Bacteriological method: NMKL 187

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

Bacteriological method: NMKL 187

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

Bacteriological method: NMKL 187

Vaccination policy

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

Vaccination of poultry flocks against salmonella is not allowed according to the national control program.

Other preventive measures than vaccination in place

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

Preventive measures include specific requirements regarding biosecurity in accordance with national legislation.

Control program/mechanisms

The control program/strategies in place

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

A national control programme was published by the Competent Authority on 1.11.2008 and reviewed in february 2012 and december 2013 for the control of salmonella in poultry. The control programme was developed according to reg. (EC) nr. 2130/2003 and reg. (EC) no. 213/2009.

The industry bears all the cost of the sampling. They also bear the cost of official sampling.

According to reg. (IS) no. 688/2002 and according to instructions published by the CA for the implementation of reg. (EC) nr. 2073/2005, samples are taken by the FBO from each slaughter batch by taking one pooled sample consisting of 50 neck skins.

According to Icelandic legal act no. 25/1993 on animal diseases an protection of it is prohibited to import poultry to Iceland. Exception is given for import of hatching eggs or day old chicks for parent stock, requiring that no salmonella spp. is detected in the grand parent stock.

Measures in case of the positive findings or single cases

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

Birds from a flock that has been tested positive may not be moved from the farm. It is not allowed to hatch eggs from a positive parent flock. A positive flock cannot be sent to the slaughterhouse and is therefore culled at the farm.

Notification system in place

Salmonella is a notifiable disease according to Icelandic legal act nr. 25/1993.

The laboratory sends an immediate notification to the CA when there is a positive salmonella finding.

Results of the investigation

No Salmonella spp. was found in breeding flocks of Gallus gallus.

National evaluation of the recent situation, the trends and sources of infection

No Salmonella spp. was found in breeding flocks of Gallus gallus.

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

No salmonella spp. was found in breeding flocks of Gallus gallus and they are not considered as a source of infection in boilers, other animals, foodstuffs or humans.

B. Salmonella spp. in Gallus Gallus - broiler flocks

Monitoring system

Sampling strategy

Broiler flocks

The sampling strategy is according to a control programme that was implemented in 2008 in and it applies to all of Iceland.

The monitoring of salmonella in broilers is applied to the whole country and is in accordance with reg. (EC) no. 646/2007.

Every broiler flock is sampled by the food business operator (FBO). On 10% of the farms, one flock per year is sampled by the competent authority (CA) in accordance with the national control programme and in accordance with the Annex of the Commission Regulation (EU) No 200/2012.

At slaughter samples are also taken from each slaughter batch after evisceration but before chilling. The sampling strategy is according to national requirements that were implemented in 2001 and 2002 and according to the national control programme.

Frequency of the sampling

Broiler flocks: Before slaughter at farm

3 weeks prior to slaughter

Type of specimen taken

Broiler flocks: Before slaughter at farm

Boot/sock swabs. According to the National Control Program it is also allowed to take one sock sample and one dust sample but it is only practiced during the official sampling.

Methods of sampling (description of sampling techniques)

Broiler flocks: Before slaughter at farm

From each broiler flock two pairs of boot swabs are collected and pooled into one sample. In case one sock sample and one dust sample are taken, the two samples are pooled into one sample.

The official sample consists of one sock sample and one dust sample, and the samples are cultured separately.

Case definition

Broiler flocks: Before slaughter at farm

A flock is considered positive when Salmonella spp. is found in a sample. According to the national control programme, no confirming samples have to be taken. But as a part of the FBO's own controls, usually a confirmatory sample is taken. When salmonella is not found in two subsequent samples and not in a third sample taken by the CA, the flock is considered to be negative for salmonella.

Diagnostic/analytical methods used

Broiler flocks: Before slaughter at farm

Bacteriological method: NMKL 187

Vaccination policy

Broiler flocks

Vaccination of poultry flocks against salmonella is not practiced in Iceland and not allowed according to

the National Control Program.

Other preventive measures than vaccination in place

Broiler flocks

Preventive measures include specific requirements regarding biosecurity in accordance with national legislation.

Control program/mechanisms

The control program/strategies in place

Broiler flocks

A national control programme was published by the Competent Authority on 1.11.2008 and reviewed in february 2012 and december 2013 for the control of salmonella in poultry. The control programme was developed according to reg. (EC) no. 2130/2003. It describes sampling of each broiler flock at the farm three weeks prior to slaughter.

According to reg. (IS) no. 688/2002 and according to instructions published by the CA for the implementation of reg. (EC) nr. 2073/2005, samples are taken by the FBO from each slaughter batch by taking one pooled sample consisting of 50 neck skins.

The industry bears the cost of all sampling, also of sampling by the CA.

According to Icelandic legal act no. 25/1993 on animal diseases an protection of it is prohibited to import poultry to Iceland. Exception is given for import of hatching eggs or day old chicks for parent stock, requiring that no salmonella spp. is detected in the grand parent stock. No broilers and no broiler hatching eggs are imported to Iceland.

Measures in case of the positive findings or single cases

Broiler flocks: Before slaughter at farm

Birds from a flock that has been tested positive may not be moved from the farm. A positive flock cannot be sent to the slaughterhouse and is therefore culled at the farm.

Notification system in place

Salmonella is a notifiable disease according to Icelandic legal act no. 25/1993.

The laboratory sends an immediate notification to the CA when there is a positive salmonella finding.

Results of the investigation

In 2013, Salmonella Worthington was both found in a feedmill and in broilers on different farms receiving feed from the same feedmill, and all isolated showed the same PFGE pattern, suggesting contamination of broiler flocks through contaminated feed. Other cases of salmonella in broilers were all in houses where salmonella had been previously detected.

National evaluation of the recent situation, the trends and sources of infection

Since 1997 salmonella prevalence in broiler flocks at the farm level has been below 1%. After 2008 however, the prevalence of salmonella in broiler flocks rose and reached a peak in 2010. In 2013, reinfection of broiler flocks in previously contaminated houses was a major source of infection, as well as infection through contaminated feed.

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

In Iceland it is not allowed to slaughter salmonella positive poultry flocks. Therefore, the main sources of contaminated poultry meat are flocks with a negative pre-slaughter sample but a positive sample at the time of slaughter. Cross contamination between negative and positive flocks at the slaughterhouse is also a source. Salmonella prevalence in slaughter flocks has been far below 1% since sampling started in 1998 and until 2010 (except for 2001 when prevalence was 1,8%). After 2010 prevalence in slaughter flocks rose above 1%. However, neither *S. enteritidis* nor *S. typhimurium* were found in broilers during this time and there have been no reports or indications of human infections from infected broiler products in the past years.

C. Salmonella spp. in Gallus Gallus - flocks of laying hens

Monitoring system

Sampling strategy

Laying hens flocks

The sampling strategy is according to a control programme that was implemented in 2008 in and it applies to all of Iceland. All flocks of laying hens where eggs are distributed from are under surveillance.

At primary production the samples are taken by the Food Business Operator (FBO). Official samples are also taken by the Competent Authority (CA) once a year from one flock from each farm with more than 1000 hens.

If a flock of laying hens is slaughtered, samples are taken by the FBO from each slaughter batch after evisceration but before chilling. The sampling strategy is according to national requirements that were implemented in 2001 and 2002 and according to the national control programme in accordance with the Annex of the Commission Regulation (EU) No 517/2011.

Frequency of the sampling

Laying hens: Day-old chicks

Every flock is sampled

Laying hens: Rearing period

At the age of 2-4 weeks, and at the age of 12 - 15 weeks.

Laying hens: Production period

Every 15 weeks.

Laying hens: Before slaughter at farm

3 weeks prior to slaughter.

Laying hens: At slaughter

Every flock is sampled

Type of specimen taken

Laying hens: Day-old chicks

Internal linings of delivery boxes or fabric swabs

Laying hens: Rearing period

Faeces or sock samples

Laying hens: Production period

Faeces or sock samples.

Official samples consist of one dust sample in addition to the fecal or sock samples.

Laying hens: Before slaughter at farm

Faeces or sock samples, or faeces/sock sample and one dust sample

Laying hens: At slaughter

Neck skin

Methods of sampling (description of sampling techniques)

Laying hens: Day-old chicks

One pooled sample of internal linings from 5 delivery boxes.

Laying hens: Rearing period

One pooled sample consisting of 2x150g fecal samples. Or one pooled sample with two pairs of sock samples.

Laying hens: Production period

One pooled sample consisting of 2x150g fecal samples or of two pairs of sock samples.

Official samples: one pooled sample consisting of 2x150 g of fecal samples, or two pairs of sock samples and 1 x 100g of dust sample.

Laying hens: Before slaughter at farm

One pooled sample consisting of 2x150g fecal samples or of two pairs of sock samples.

Laying hens: At slaughter

One pooled sample consisting of 50 neck skin samples, each neck skin sample weighting between 3-5 g.

Case definition

Laying hens: Day-old chicks

A sample positive for Salmonella spp.

Laying hens: Rearing period

A sample positive for Salmonella spp.

Laying hens: Production period

Fecal and/or dust sample positive for Salmonella spp. If confirmation samples are taken according to reg. nr. (EC) 2160/2003, and no salmonella is found in the additional samples, the flock is considered to be negative.

Laying hens: Before slaughter at farm

A sample positive for Salmonella spp.

Laying hens: At slaughter

A sample positive for Salmonella spp.

Diagnostic/analytical methods used

Laying hens: Rearing period

Bacteriological method: NMKL 187

Laying hens: Production period

Bacteriological method: NMKL 187

Laying hens: Before slaughter at farm

Bacteriological method: NMKL 187

Laying hens: At slaughter

Bacteriological method: NMKL No 71:1999, 5th edition

Vaccination policy

Laying hens flocks

Vaccination of poultry flocks against salmonella is not practiced and not allowed according to the NCP.

Other preventive measures than vaccination in place

Laying hens flocks

Preventive measures include specific requirements regarding biosecurity in accordance with national legislation.

Control program/mechanisms

The control program/strategies in place

Laying hens flocks

A national control programme was published by the Competent Authority on 1.11.2008 and reviewed in february 2012 and december 2013 for the control of salmonella in poultry. The control programme was developed according to reg. (EC) nr. 2130/2003.

According to reg. (IS) no. 688/2002 and according to instructions published by the CA for the implementation of reg. (EC) nr. 2073/2005, samples are taken by the FBO from each slaughter batch by taking one pooled sample consisting of 50 neck skins.

The industry bears the cost of all sampling, They also bear the cost of official sampling.

According to Icelandic legal act no. 25/1993 on animal diseases an protection of it is prohibited to import poultry to Iceland. Exception is given for import of hatching eggs or day old chicks for parent stock, requiring that no salmonella spp. is detected in the grand parent stock. No laying hens are imported.

Measures in case of the positive findings or single cases

Laying hens flocks

Birds from a salmonella positive flock may not be moved from the farm and it is not allowed to distribute eggs from a salmonella infected flock. It is not allowed to send a salmonella positive flock to the slaughterhouse. Therefore a positive flock will be culled at the farm.

Notification system in place

Salmonella is a notifiable disease according to Icelandic legal act no. 25/1993. The laboratory sends an immediate notification to the CA when there is a positive salmonella finding.

Results of the investigation

No salmonella spp. has been found in flocks of laying hens in 2013.

National evaluation of the recent situation, the trends and sources of infection

After the implementation of the national control programme in 2008, salmonella has only been detected twice, once in an official dust sample on a commercial laying hen farm in 2010 and once in fecal samples taken by an FBO in a backyard flock in 2011. Official samples taken for confirmation were however in both cases all negative. The source of the infection in both cases remains unclear. Salmonella had never been detected in flocks of laying hens before 2008.

There has never been any evidence that consupcion of eggs or egg products caused human infections.

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

There is no indication that salmonella in Icelandic table eggs or egg products is a major source of

infections in humans. Salmonella Enteritidis has never been found in laying hens and is not frequently found in humans. Table eggs have never been suspected as the source of foodborne outbreaks in humans after 2002.

D. Salmonella spp. in bovine animals

Monitoring system

Sampling strategy

Bulk milk from 70 farms. Random. Salmonella Dublin antibody examination in milk by ELISA

Methods of sampling (description of sampling techniques)

Animals at farm

Bulk milk taken at farms and collected in the dairies. Salmonella Dublin antibody examination in milk by ELISA

E. Salmonella spp. in pigs

Monitoring system

Sampling strategy

Breeding herds

There are neither breeding herds nor multiplying herds as such in Iceland which produce purebred pigs (f.exs. Landrace , Yorkshire) or hybrid pigs (f.exs. LY, HD) for sale. Breeding or improvement of the stock is done by import of frozen semen from Norway. Therefore all pig herds produce their own purebreds (sows and boars) and hybrid pigs (sows and boars) mostly by insemination.

All pig holdings produce pigs for slaughtering, but some holdings can have separate herds with purebred/hybrid production, sow herds with piglet production or herds with fattening pigs.

All sow herds with piglet production and all herds with purebred/hybrid production shall be faecal sampled once pr. year.

The official sampling is a part of a permanent surveillance programme and performed by the CA (MAST).

Multiplying herds

See breeding herds.

Fattening herds

See also breeding herds.

Surveillance of all slaughter pig herds is carried out at the slaughterhouses by continuous serologic testing of meat juice from all herds. The sampling is objective and random meat samples are collected from carcasses after cooling. Number of samples and frequency of sampling depend on herd size.

Sixty, seventy five or one hundred samples shall be taken from herds slaughtering for less than 2000 pigs pr. year, 2001 – 5000 pigs pr. year and over 5001 pigs pr. year respectively.

A Salmonella index is calculated for each herd based on the weighted average of positive meat juice samples from the previous thirteen weeks, where results from the current period (last five weeks) weigh three times as much as the two previous ones (2 periods each consisting of 4 weeks).

Once or twice a month finisher herds are classified into levels; level one, two or three, according to their Salmonella index. Herds having indexes lower than 39 are categorised into level one, into level two having indexes between 40 and 69 and into level three having indexes higher than 70.

The surveillance programme for detection of Salmonella infection in pig herds was implemented 1st of October 2006.

All herds shall be faecal sampled once pr. year and more often if needed. The official sampling is a part of the surveillance programme and is performed by the CA (MAST).

Frequency of the sampling

Breeding herds

Once a year

Fattening herds at farm

Other: Once a year and when needed

Fattening herds at slaughterhouse (herd based approach)

Other: Depends on herd size

Type of specimen taken

Breeding herds

Faeces

Fattening herds at farm

Faeces

Fattening herds at slaughterhouse (herd based approach)

Meat juice

Methods of sampling (description of sampling techniques)

Breeding herds

The number of faecal samples depends on the herd size. Herds with > 400 animals collect 20 samples and herds with 100 – 400 animals collect 4 – 16 samples.

Fattening herds at farm

The number of faecal samples depends on the herd size. Herds with > 400 animals collect 20 samples and herds with 100 – 400 animals collect 4 – 16 samples.

Fattening herds at slaughterhouse (herd based approach)

Meat samples are collected from carcasses after cooling. The meat samples are collected in special meat juice containers. Number of samples and frequency of sampling depend on herd size, ex. 75 samples/year from herds that slaughter between 2000 and 5000 pigs/year.

All herds are sorted into three levels, depending on the results. Level 1 for those who are salmonella free or very low prevalence and level 2 and 3 as the prevalence is higher. Prevalence is calculated approximately every two to four weeks.

Case definition

Breeding herds

A herd is considered positive when Salmonella has been isolated from faecal samples.

Fattening herds at farm

A herd is considered positive when Salmonella has been isolated from faecal samples.

Fattening herds at slaughterhouse (herd based approach)

An individual sample is considered seropositive if OD% > 10

Diagnostic/analytical methods used

Breeding herds

Bacteriological method: NMKL No 187:2007

Fattening herds at farm

Bacteriological method: NMKL No 187:2007

Fattening herds at slaughterhouse (herd based approach)

Serological method: SALMOTYPE Pig Screen LDL ELISA

Vaccination policy

Breeding herds

No salmonella vaccination occur

Fattening herds

No salmonella vaccination occur

Other preventive measures than vaccination in place

Breeding herds

In national regulation regarding pigs there are provisions on bio security demanding special facilities for entering the herd, isolation of and delivering pigs.

Multiplying herds

See breeding pigs.

Fattening herds

See breeding pigs.

Separate transport of pigs to slaughterhouse and separate slaughtering of pigs in level three herds.

In national regulation regarding pigs there are provisions on bio security demanding special facilities for entering the herd, isolation of and delivering pigs.

Control program/mechanisms

The control program/strategies in place

Fattening herds

The surveillance programme is constructed to monitor salmonella infections at farm level by measuring antibodies against Salmonella in meat juice test, to survey salmonella contamination on pig carcasses at slaughtering and to monitor Salmonella serotypes in faecal and swab samples. Salmonella serotypes are also tested for antimicrobial resistance.

The mandatory national control programme for Salmonella in pigs is approved by the Competent Authority, MAST. The aim of the programme is to prevent salmonella in pork and thereby mitigate the risk of human salmonellosis.

In order to control Salmonella infections at farm, the national regulation on pig health and housing No. 353/2011 stipulates preventive measures to be implemented.

Recent actions taken to control the zoonoses

The ongoing national control programme for Salmonella in pigs was implemented 1st of October 2006. Because of the nature of the pig production in Iceland especially the feeding system where pig producers bought unheated raw materials from feed mills for feed production the pig production as a whole was considered as a risk for human salmonellosis. When an increase in positive meat juice samples were clearly noted in the years 2009 and 2010 the then national regulation for pig health and housing was amended and entered into force 6th of April 2011 in order to control Salmonella infections at farm level. The control program was reevaluated in October 2013.

Measures in case of the positive findings or single cases

Measures are taken (described in Salmonella spp in pig meat and products thereof) when herds are moved between levels or categories i.e. when a herd is downgraded from level 1 to level 2 or 3. Sanitary slaughtering is performed when herds are categorised as level 3 herds.

Level 2 and 3 herds are obliged to be faecal sampled within fifteen days after being scaled down from the above level.

Notification system in place

Salmonella is a notifiable disease, according to national legislation on animal diseases No. 25/1993. The Competent Authority, MAST, receives all results from the respective laboratories regarding Salmonella testing (including serotyping and antimicrobial resistance) on samples from pig production and slaughtering.

Results of the investigation

Salmonella is endemic in the pig production. Of all meat juice samples 27,9% were positive for Salmonella. At farm Salmonella Brandenburg, Salmonella Kedougou, Salmonella Infantis, Salmonella Worthington and Salmonella Typhimurium were found.

National evaluation of the recent situation, the trends and sources of infection

Meat juice samples have been taken since 2004 even though this test method was first used as an official method for Salmonella monitoring after 1st of October 2006. A fluctuation was seen in positive meat juice samples from the year 2004 to the year 2008 but within the limits of 1 - 5%.

In the next consecutive years i.e. in 2009 and 2010 the prevalence ascended significantly (12,7% and 23,4%). In 2011 the prevalence descended again and was in 2012 14,8%. This year it has ascended significantly and is the highest up to date or 27,9%

Despite of the increase in Salmonella in the pig production salmonellosis in humans in the same period did not alter equally. On the contrary domestic cases of salmonellosis in humans were fewer in 2009 and 2010 compared to domestic cases in the previous years.

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Salmonella in pig production seems not to be a major source for human infections.

F. Salmonella spp. in ducks - breeding flocks and meat production flocks

Control program/mechanisms

The control program/strategies in place

Meat production flocks

There was no duck production in Iceland in 2013. The last duck flocks were slaughtered in 2012, then national production ceased.

G. Salmonella spp. in geese - breeding flocks and meat production flocks

Notification system in place

There is no commercial geese meat production ongoing in Iceland. However, there are a few backyard flocks used for private consumption.

In case samples would be taken and salmonella would be detected, movement of all birds in the flock will be restricted according to Icelandic laws.

H. Salmonella spp. in turkey - breeding flocks and meat production flocks

Monitoring system

Sampling strategy

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

The monitoring of salmonella in turkey breeding flocks is applied to the whole country.

Every breeding flock consisting of 250 animals or more is sampled. During primary production samples are both taken by the food business operator (FBO) and by the competent authority (CA) in accordance with the national control programme.

In 2013, all samples from breeding flocks are taken at farm level. When a breeder flock is slaughtered samples are taken from each slaughter batch at the time of slaughter, after evisceration but before chilling. The sampling strategy is according to national requirements that were implemented in 2001 and 2002 and according to the national control programme in accordance with reg. (EC) no. 2130/2003 and in accordance with the Annex of the Commission Regulation (EU) No 584/2008.

In Iceland there are only parent flocks.

Meat production flocks

The sampling strategy is according to a control programme that was implemented in 2008 in accordance with reg. (EC) no. 2160/2003 and it applies to all of Iceland.

Every turkey flock is sampled by the food business operator (FBO). At slaughter samples are also taken from each slaughter batch after evisceration but before chilling. The sampling strategy is according to national requirements that were implemented in 2001 and 2002 and according to the national control programme in accordance with reg. (EC) no. 2130/2003.

Official samples are taken by the competent authority from one flock on one farm once a year (from 10% of all farms with over 500 fattening turkeys).

Frequency of the sampling

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

Every flock is sampled.

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

At the age of 4 weeks and two weeks before moving to the laying house.

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

Every 3 weeks.

Meat production flocks: Before slaughter at farm

3 weeks prior to slaughter.

Meat production flocks: At slaughter (flock based approach)

Every batch is sampled.

Type of specimen taken

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

Hatched eggs

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

Socks/ boot swabs

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

Socks / boots wabs, or boot swabs/dust sample

Meat production flocks: Before slaughter at farm

Boot/sock swabs. According to the National Control Program it is also allowed to take one sock sample and one dust sample but it is only practiced during the official sampling.

Meat production flocks: At slaughter (flock based approach)

Neck skin

Methods of sampling (description of sampling techniques)

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

From each breeding flock (paternal line and maternal line separately) one sample is taken during hatching. The pooled sample consists of 10 g of broken eggshells taken from a total of 25 separate hatcher baskets, which in total is at least 250g of broken eggshells.

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

From each breeding flock two pairs of boot swabs are collected and pooled into one sample, both at the age of 4 weeks and two weeks before moving to the laying phase.

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

Industry samples: On their choice, there are either taken 5 pairs of bootswabs (2 pooled samples) or one pair of bootswab and one dustsample, the dust sample is cultured separately.

The official samples are taken in the same way as the industry samples: two pooled samples with either 5 pairs of bootswabs or one pair of bootswabs and one dust sample. The samples are taken once a year from 10% of all flocks.

Meat production flocks: Before slaughter at farm

From each flock two pairs of boot swabs are collected and pooled into one sample. In case one sock sample and one dust sample are taken, the two samples are pooled into one sample.

The official sample consists of one sock sample and one dust sample, and the samples are cultured separately.

Meat production flocks: At slaughter (flock based approach)

From each slaughter flock one pooled sample consisting of 50 neck skin samples is taken, with each neck skin sample weighting between 3 - 5 g.

Case definition

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

A sample positive for salmonella spp. In cases where the CA has suspicion of a false positive result, the CA can confirm a first positive finding, and if it is not possible to confirm, the flock will be calculated as negative.

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

A sample positive for salmonella spp., always confirmed by the CA. If it is not possible to confirm a first positive finding in two consecutive samples taken by the CA, the flock will be calculated as negative.

Meat production flocks: Before slaughter at farm

A flock is considered positive when *Salmonella* spp. is found in a sample. According to the NCP, no confirming samples have to be taken. But as a part of the FBO's own controls, usually a confirmatory sample is taken. When salmonella is not found in two subsequent samples and not in a third sample taken by the CA, the flock is considered to be negative for salmonella.

Meat production flocks: At slaughter (flock based approach)

A sample positive for *Salmonella* spp.

Diagnostic/analytical methods used

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

Bacteriological method: NMKL 187

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

Bacteriological method: NMKL 187

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

Bacteriological method: NMKL 187

Meat production flocks: Before slaughter at farm

Bacteriological method: NMKL 187

Meat production flocks: At slaughter (flock based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

Vaccination of poultry flocks against salmonella is not allowed according to the national control program.

Meat production flocks

Vaccination of poultry flocks against salmonella is not allowed according to the national control program.

Other preventive measures than vaccination in place

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

Preventive measures include specific requirements regarding biosecurity in accordance with national legislation.

Meat production flocks

Preventive measures include specific requirements regarding biosecurity in accordance with national legislation.

Control program/mechanisms

The control program/strategies in place

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

A national control programme was published by the Competent Authority on 1.11.2008 and reviewed in february 2012 and december 2013 for the control of salmonella in poultry. The control programme was developed according to reg. (EC) nr. 2130/2003 and reg. (EC) no. 213/2009.

The industry bears all the cost of the sampling. They also bear the cost of official sampling.

According to reg. (IS) no. 688/2002 and according to instructions published by the CA for the implementation of reg. (EC) nr. 2073/2005, samples are taken by the FBO from each slaughter batch by

taking one pooled sample consisting of 50 neck skins.

According to Icelandic legal act no. 25/1993 on animal diseases an protection of it is prohibited to import poultry to Iceland. Exception is given for import of hatching eggs or day old chicks for parent stock, requiring that no salmonella spp. is detected in the grand parent stock.

Meat production flocks

A national control programme was published by the Competent Authority on 1.11.2008 and reviewed in february 2012 and december 2013 for the control of salmonella in poultry. The control programme was developed according to reg. (EC) no. 2130/2003. It describes sampling of each turkey flock at the farm three weeks prior to slaughter.

According to reg. (IS) no. 688/2002 and according to instructions published by the CA for the implementation of reg. (EC) nr. 2073/2005, samples are taken by the FBO from each slaughter batch by taking one pooled sample consisting of 50 neck skins.

The industry bears the cost of all sampling, also of sampling by the CA.

According to Icelandic legal act no. 25/1993 on animal diseases an protection of it is prohibited to import poultry to Iceland. Exception is given for import of hatching eggs or day old chicks for parent stock, requiring that no salmonella spp. is detected in the grand parent stock. No turkeys or hatching eggs for fattening turkeys are imported to Iceland.

Measures in case of the positive findings or single cases

Birds from a flock that has been tested positive may not be moved from the farm. It is not allowed to hatch eggs from a positive parent flock. A positive flock cannot be sent to the slaughterhouse and is therefore culled at the farm.

All raw meat from a positive flock at slaughter that has already been distributed is withdrawn from the market. All meat from a positive slaughter flock has to be destroyed or heat treated before distribution.

Notification system in place

Salmonella is a notifiable disease according to Icelandic legal act no. 25/1993.

The laboratory sends an immediate notification to the CA when there is a positive salmonella finding.

Results of the investigation

In 2013, Salmonella spp. was not found in turkey parent flocks. However Salmonella Worthington was found in flocks of fattening turkeys, and contamination through contaminated feed is suggested, see text form on salmonella spp. in broiler flocks. The PFGE pattern of isolates from turkey flocks was the same as the PFGE pattern from broiler flocks and from the isolates from the feedmill.

National evaluation of the recent situation, the trends and sources of infection

Salmonella had never been detected in turkey breeder flocks.

However, salmonella was found again in fattening flocks in 2013, but not in 2011 and 2012.

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

No salmonella spp. has been found in turkey breeding flocks and they are not considered as a source of infection in flocks of fattening turkeys, other animals, foodstuffs or humans.

In Iceland it is not allowed to slaughter salmonella positive poultry flocks. Therefore, the main sources of contaminated poultry meat are flocks with a negative pre-slaughter sample but a positive sample at the

time of slaughter, which has not been the case for turkey flocks. In recent years there have been no indications of any human infections from infected icelandic turkey meat.

Table Salmonella in breeding flocks of Gallus gallus

	No of flocks under control programme	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Target Verification	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis
Gallus gallus (fowl) - breeding flocks for broiler production line - adult - Farm - Control and eradication programmes (Boot swabs and dust samples. From some flocks, only boot swab samples were taken.)	36	Keldur and Matis	Census	Official and industry sampling	environmental sample > boot swabs and dust	Domestic	yes	Flock	36	1	
Gallus gallus (fowl) - breeding flocks for broiler production line - day-old chicks - Hatchery - Control and eradication programmes	8	Keldur	Census	Industry sampling	animal sample > eggshells	Domestic	yes	Flock	8	0	
Gallus gallus (fowl) - breeding flocks for broiler production line - during rearing period - Farm - Control and eradication programmes	11	Keldur and Matis	Census	Industry sampling	environmental sample > boot swabs	Domestic	yes	Flock	11	0	
Gallus gallus (fowl) - breeding flocks for egg production line - adult - Farm - Control and eradication programmes (Boot swabs and dust samples. From some flocks, only boot swab samples were taken.)	6	Keldur	Census	Official and industry sampling	environmental sample > boot swabs and dust	Domestic	yes	Flock	6	0	
Gallus gallus (fowl) - breeding flocks for egg production line - day-old chicks - Hatchery - Control and eradication programmes	3	Keldur	Census	Industry sampling	animal sample > eggshells	Domestic	yes	Flock	3	0	
Gallus gallus (fowl) - breeding flocks for egg production line - during rearing period - Farm - Control and eradication programmes	2	Keldur	Census	Industry sampling	environmental sample > boot swabs	Domestic	yes	Flock	2	0	

Table Salmonella in breeding flocks of Gallus gallus

	S. Hadar	S. Infantis	S. Typhimurium	S. Virchow	S. 1,4,[5],12:i:-	Salmonella spp., unspecified	S. Agona
Gallus gallus (fowl) - breeding flocks for broiler production line - adult - Farm - Control and eradication programmes (Boot swabs and dust samples. From some flocks, only boot swab samples were taken.)							1
Gallus gallus (fowl) - breeding flocks for broiler production line - day-old chicks - Hatchery - Control and eradication programmes							
Gallus gallus (fowl) - breeding flocks for broiler production line - during rearing period - Farm - Control and eradication programmes							
Gallus gallus (fowl) - breeding flocks for egg production line - adult - Farm - Control and eradication programmes (Boot swabs and dust samples. From some flocks, only boot swab samples were taken.)							
Gallus gallus (fowl) - breeding flocks for egg production line - day-old chicks - Hatchery - Control and eradication programmes							
Gallus gallus (fowl) - breeding flocks for egg production line - during rearing period - Farm - Control and eradication programmes							

Table Salmonella in other animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	S. 1,4,[5],12:i:-
Cattle (bovine animals) - adult cattle over 2 years - Farm - Monitoring	Keldur	Unspecified	Industry sampling	animal sample > milk	Domestic	Herd	70	0			
Pigs - fattening pigs - Farm - Monitoring ¹⁾	Keldur	Census	Official sampling	animal sample > faeces	Domestic	Herd	9	6		1	
Pigs - fattening pigs - Slaughterhouse - Monitoring	Keldur	Objective sampling	Official sampling	animal sample > meat juice	Domestic	Animal	1255	350			

	Salmonella spp., unspecified	S. Brandenburg	S. Infantis	S. Kedougou	S. Worthington
Cattle (bovine animals) - adult cattle over 2 years - Farm - Monitoring					
Pigs - fattening pigs - Farm - Monitoring ¹⁾		2	1	1	1
Pigs - fattening pigs - Slaughterhouse - Monitoring	350				

Comments:

¹⁾ Only part of the sampling unit were tested - not all units as planned

Table Salmonella in other poultry

	No of flocks under control programme	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Target Verification	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis
Gallus gallus (fowl) - laying hens - day-old chicks - Control and eradication programmes	73	Keldur	Census	Industry sampling	animal sample > eggshells	Domestic	yes	Flock	37	0	
Gallus gallus (fowl) - laying hens - during rearing period - Control and eradication programmes	25	Keldur	Census	Industry sampling	animal sample > faeces	Domestic	yes	Flock	12	0	
Gallus gallus (fowl) - laying hens - adult - Farm - Control and eradication programmes ¹⁾	41	Keldur	Census	Official and industry sampling	animal sample > faeces	Domestic	yes	Flock	30	0	
Gallus gallus (fowl) - broilers - before slaughter - Farm - Control and eradication programmes ²⁾	641	Keldur and Matis	Census	Official and industry sampling	environmental sample > boot swabs	Domestic	yes	Flock	640	15	
Turkeys - breeding flocks, unspecified - day-old chicks - Farm - Control and eradication programmes	2	Keldur	Census	Industry sampling	animal sample > eggshells	Domestic	yes	Flock	2	0	
Turkeys - breeding flocks, unspecified - during rearing period - Farm - Control and eradication programmes	2	Keldur	Convenience sampling	Industry sampling	environmental sample > boot swabs	Domestic	yes	Flock	2	0	
Turkeys - breeding flocks, unspecified - adult - Farm - Control and eradication programmes	4	Keldur	Census	Official and industry sampling	environmental sample > boot swabs and dust	Domestic	yes	Flock	4	0	
Turkeys - fattening flocks - before slaughter - Farm - Control and eradication programmes	29	Keldur	Census	Official and industry sampling	environmental sample > boot swabs	Domestic	yes	Flock	29	2	

Table Salmonella in other poultry

	S. Typhimurium	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Gallus gallus (fowl) - laying hens - day-old chicks - Control and eradication programmes			
Gallus gallus (fowl) - laying hens - during rearing period - Control and eradication programmes			
Gallus gallus (fowl) - laying hens - adult - Farm - Control and eradication programmes ¹⁾			
Gallus gallus (fowl) - broilers - before slaughter - Farm - Control and eradication programmes ²⁾			15
Turkeys - breeding flocks, unspecified - day-old chicks - Farm - Control and eradication programmes			
Turkeys - breeding flocks, unspecified - during rearing period - Farm - Control and eradication programmes			
Turkeys - breeding flocks, unspecified - adult - Farm - Control and eradication programmes			
Turkeys - fattening flocks - before slaughter - Farm - Control and eradication programmes			2

Comments:

¹⁾ From some flocks, bootswab samples were taken. For official sampling, dust samples were taken in addition

²⁾ Official samples: bootswabs and dust sample

2.1.5 Salmonella in feedingstuffs

Table Salmonella in compound feedingstuffs

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium
Compound feedingstuffs for cattle - final product - Feed mill - Surveillance	Syni	Selective sampling	Official sampling	feed sample	Domestic	Batch	25 g	1	0		
Compound feedingstuffs for pigs - final product - Feed mill - Surveillance	Syni	Selective sampling	Official sampling	feed sample	Domestic	Batch	25 g	3	0		
Compound feedingstuffs for poultry (non specified) - process control - Feed mill - Surveillance ¹⁾	Syni	Selective sampling	Official sampling	environmental sample > dust	Domestic	Batch	25 g	18	1		
Compound feedingstuffs for poultry - breeders - final product - Feed mill - Surveillance	Syni	Selective sampling	Official sampling	feed sample	Domestic	Batch	25 g	9	0		

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified	S. Worthington
Compound feedingstuffs for cattle - final product - Feed mill - Surveillance			
Compound feedingstuffs for pigs - final product - Feed mill - Surveillance			
Compound feedingstuffs for poultry (non specified) - process control - Feed mill - Surveillance ¹⁾			1
Compound feedingstuffs for poultry - breeders - final product - Feed mill - Surveillance			

Table Salmonella in compound feedingstuffs

Comments:

¹⁾ Environmental samples in feed mills

Table Salmonella in feed material of animal origin

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium
Feed material of land animal origin - dairy products - Feed mill - Surveillance ¹⁾											
Feed material of land animal origin - meat meal - Feed mill - Surveillance ²⁾											
Feed material of land animal origin - meat and bone meal - Feed mill - Surveillance ³⁾											
Feed material of land animal origin - bone meal - Feed mill - Surveillance ⁴⁾											
Feed material of land animal origin - greaves - Feed mill - Surveillance ⁵⁾											
Feed material of land animal origin - poultry offal meal - Feed mill - Surveillance ⁶⁾											
Feed material of land animal origin - feather meal - Feed mill - Surveillance ⁷⁾											
Feed material of land animal origin - blood meal - Feed mill - Surveillance ⁸⁾											
	S. 1,4,[5],12:i:-	Salmonella spp., unspecified									
Feed material of land animal origin - dairy products - Feed mill - Surveillance ¹⁾											
Feed material of land animal origin - meat meal - Feed mill - Surveillance ²⁾											

Table Salmonella in feed material of animal origin

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Feed material of land animal origin - meat and bone meal - Feed mill - Surveillance ³⁾		
Feed material of land animal origin - bone meal - Feed mill - Surveillance ⁴⁾		
Feed material of land animal origin - greaves - Feed mill - Surveillance ⁵⁾		
Feed material of land animal origin - poultry offal meal - Feed mill - Surveillance ⁶⁾		
Feed material of land animal origin - feather meal - Feed mill - Surveillance ⁷⁾		
Feed material of land animal origin - blood meal - Feed mill - Surveillance ⁸⁾		

Comments:

- ¹⁾ no production and no official sampling
- ²⁾ no production and no official sampling
- ³⁾ no production and no official sampling
- ⁴⁾ no production and no official sampling
- ⁵⁾ no production and no official sampling
- ⁶⁾ no production and no official sampling
- ⁷⁾ no production and no official sampling
- ⁸⁾ no production and no official sampling

Table Salmonella in feed material of animal origin

Table Salmonella in other feed matter

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium
Feed material of cereal grain origin - maize derived - Feed mill - Surveillance	Syni	Convenience sampling	Official sampling	feed sample	Unknown	Batch	25 g	2	0		
Feed material of oil seed or fruit origin - soya (bean) derived - Feed mill - Surveillance	Syni	Selective sampling	Official sampling	feed sample	Unknown	Batch	25 g	2	0		
	S. 1,4,[5],12:i:-	Salmonella spp., unspecified									
Feed material of cereal grain origin - maize derived - Feed mill - Surveillance											
Feed material of oil seed or fruit origin - soya (bean) derived - Feed mill - Surveillance											

2.1.6 Antimicrobial resistance in Salmonella isolates

A. Antimicrobial resistance in Salmonella in cattle

Sampling strategy used in monitoring

Frequency of the sampling

No samples taken

B. Antimicrobial resistance in Salmonella in pigs

Sampling strategy used in monitoring

Frequency of the sampling

Salmonella found in pig herds in the Icelandic Salmonella Monitoring Programme is included in the resistance monitoring (at least one isolate per herd). All herds are to be sampled once pr. year.

Type of specimen taken

Salmonella isolates from faecal samples are susceptibility tested. Isolates from all herds are tested, i.e. breeding herds, piglet production herds and herds with fattening pigs.

Methods of sampling (description of sampling techniques)

For description of the Icelandic Salmonella Control programme, see the parts describing Salmonella in pigs. Other sampling methods vary depending on the situation.

Procedures for the selection of isolates for antimicrobial testing

At least one isolate per herd is selected for antimicrobial testing. Salmonella is isolated at various laboratories and sent to the National Hospital in Reykjavík for testing of antimicrobial susceptibility.

Methods used for collecting data

The laboratories send regularly data to MAST or as soon as results are obtained.

Laboratory methodology used for identification of the microbial isolates

NMKL No 187, 2007

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Ampicillin, Ceftriaxone, Chloramphenicol, TMP/Sulfa, Ciprofloxacin.

Cut-off values used in testing

The values used are clinical cut-off values.

Ampicillin: R ≤ 13

Ceftriaxone: R ≤ 19

Chloramphenicol: R ≤ 12

TMP/Sulfa: R ≤ 10

Ciprofloxacin: R ≤ 20

Preventive measures in place

If multiresistant Salmonella Typhimurium is found in a herd the pigs from that the herd are slaughtered with extra sanitary measures taken into action.

Control program/mechanisms

The control program/strategies in place

The Salmonella isolates from pigs originate from the Icelandic Salmonella surveillance programme. The results of a serosurveillance at the slaughterhouses appoint risk herds to be further examined by analyzing pen-faecal samples from finisher herds at level 2 and level 3 farms.

Recent actions taken to control the zoonoses

See Salmonella in pigs.

Measures in case of the positive findings or single cases

According to the national control programme no specific actions are taken regarding antimicrobial resistance unless multiresistant Salmonella Typhimurium is detected at farm. If multiresistant Salmonella

Typhimurium is found all carcasses from the respective herd are sampled at the slaughterhouse and all positive carcasses are heat treated.

Notification system in place

See Salmonella in pigs.

Results of the investigation

Resistance to Ampicillin and TMP/Sulfa was found in 3 isolates from 3 epidemiological units that were serotyped as Salmonella Brandenburg (2 isolates) and Salmonella Kedougou (1 isolates).

National evaluation of the recent situation, the trends and sources of infection

Prevalence of serotypes with some resistance is high, however, no multiresistant isolates were found.

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

S. Typhimurium isolates from humans from a foodborne outbreak were compared with the S. Typhimurium isolate from pigs with PFGE, and no correlation was found.

C. Antimicrobial resistance in Salmonella in poultry

Sampling strategy used in monitoring

Frequency of the sampling

Salmonella found in poultry in samples taken according to the Icelandic Salmonella Control Programme is included in the resistance monitoring. At least one positive samples from each flock is serotyped and tested for antimicrobial sensitivity.

Type of specimen taken

See Chapter Salmonella spp. in Gallus Gallus - breeding flocks, broiler flocks and flocks of leaying hens and Chapter Salmonella spp. in ducks and turkey - breeding flocks and meat production flocks.

Methods of sampling (description of sampling techniques)

See Chapter Salmonella spp. in Gallus Gallus - breeding flocks, broiler flocks and flocks of leaying hens and Chapter Salmonella spp. in ducks and turkey - breeding flocks and meat production flocks.

Procedures for the selection of isolates for antimicrobial testing

At least one isolate per positive flock is submitted for antimicrobial testing.

Methods used for collecting data

The laboratories send regularly data to MAST or as soon as results are obtained.

Laboratory methodology used for identification of the microbial isolates

NMKL No 187

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Ampicillin, Ceftriaxone, Chloramphenicol, TMP/Sulfa, Ciprofloxacin.

Cut-off values used in testing

The values used are clinical cut-off values.

Ampicillin: R \leq 13

Ceftriaxone: R \leq 19

Chloramphenicol: R \leq 12

TMP/Sulfa: R \leq 10

Ciprofloxacin: R \leq 20

Preventive measures in place

See Chapter Salmonella spp. in Gallus Gallus - breeding flocks, broiler flocks and flocks of leaying hens and Chapter Salmonella spp. in ducks and turkey - breeding flocks and meat production flocks.

Control program/mechanisms

The control program/strategies in place

See Chapter Salmonella spp. in Gallus Gallus - breeding flocks, broiler flocks and flocks of leaying hens and Chapter Salmonella spp. in ducks and turkey - breeding flocks and meat production flocks.

Recent actions taken to control the zoonoses

See Chapter Salmonella spp. in Gallus Gallus - breeding flocks, broiler flocks and flocks of leaying hens and Chapter Salmonella spp. in ducks and turkey - breeding flocks and meat production flocks.

Measures in case of the positive findings or single cases

All poultry flocks positive for Salmonella spp. are killed on the farm since it is not allowed to slaughter positive flocks or use a flock for production of food. No additional actions are taken for flocks with salmonella isolates resistant to one or more antibiotics.

Notification system in place

See Chapter Salmonella spp. in Gallus Gallus - breeding flocks, broiler flocks and flocks of laying hens and Chapter Salmonella spp. in ducks and turkey - breeding flocks and meat production flocks.

Results of the investigation

No resistance was found in the isolates to the tested antimicrobials.

National evaluation of the recent situation, the trends and sources of infection

Antimicrobial resistance is very rarely found in poultry isolates and is not increasing.

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

See Chapter Salmonella spp. in Gallus Gallus - breeding flocks, broiler flocks and flocks of laying hens and Chapter Salmonella spp. in ducks and turkey - breeding flocks and meat production flocks.

D. Antimicrobial resistance in Salmonella in foodstuff derived from pigs

Sampling strategy used in monitoring

Frequency of the sampling

Salmonella found on pig carcasses in the Icelandic Salmonella Control Programme is included in the resistance monitoring. All herds are always objective sampled but in a case of a positive sample the herd is census sampled. At least one serotype is tested for antimicrobial sensitivity.

Type of specimen taken

The carcasses are swabbed with cotton swabs. Isolates from positive swabs are tested.

Methods of sampling (description of sampling techniques)

See Salmonella spp. in pig meat and products thereof.

Procedures for the selection of isolates for antimicrobial testing

Salmonella is isolated at various laboratories and sent to the National Hospital in Reykjavík for testing of antimicrobial susceptibility.

Methods used for collecting data

The laboratories send regularly data to MAST or as soon as results are obtained.

Laboratory methodology used for identification of the microbial isolates

The Salmonella Tecra Unique Rapid Test is used for detection of Salmonella (Enrichment immunocapture immunoenrichment and detection steps). In the middle of the year the RapidChek Select test was taken into use instead of the Tecra Rapid test. When Salmonella is detected in the Tecra/RapidChek test, the Bacteriological method used is: NMKL 187:2007

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Ampicillin, Ceftriaxone, Chloramphenicol, TMP/Sulfa, Ciprofloxacin.

Cut-off values used in testing

The values used are clinical cut-off values.

Ampicillin: R ≤ 13

Ceftriaxone: R ≤ 19

Chloramphenicol: R ≤ 12

TMP/Sulfa: R ≤ 10

Ciprofloxacin: R ≤ 20

Preventive measures in place

See Salmonella in pigs.

Control program/mechanisms

The control program/strategies in place

See Salmonella spp. in pig meat and products thereof.

Recent actions taken to control the zoonoses

See Salmonella in pigs.

Measures in case of the positive findings or single cases

According to the national control programme no specific actions are taken regarding antimicrobial resistance unless multiresistant Salmonella Typhimurium is detected at farm. If multiresistant Salmonella

Typhimurium is found at farm the pigs from the respective herd are sanitary slaughtered.

Notification system in place

See Salmonella spp. in pig meat and products thereof.

Results of the investigation

Resistance was found in one isolate from one epidemiological unit to Ampicillin, serotype S. unnamed, I
rough : i : -.

National evaluation of the recent situation, the trends and sources of infection

See Salmonella spp. in pig meat and products thereof.

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

See Salmonella spp. in pig meat and products thereof.

E. Antimicrobial resistance in Salmonella in foodstuff derived from poultry

Sampling strategy used in monitoring

Frequency of the sampling

Salmonella found on poultry carcasses in samples taken according to the Icelandic Salmonella Control Programme is included in the resistance monitoring. All positive samples are serotyped and tested for antimicrobial sensitivity.

Type of specimen taken

See chapter Salmonella spp. in broiler meat and products thereof and chapter Salmonella spp. in ducks and turkey - breeding flocks and meat production flocks.

Methods of sampling (description of sampling techniques)

See chapter Salmonella spp. in broiler meat and products thereof and chapter Salmonella spp. in ducks and turkey - breeding flocks and meat production flocks.

Procedures for the selection of isolates for antimicrobial testing

Salmonella is isolated at various laboratories and sent to the laboratory at the National Hospital in Reykjavik for testing of antimicrobial susceptibility.

Methods used for collecting data

The laboratories send regularly data to MAST or as soon as results are obtained.

Laboratory methodology used for identification of the microbial isolates

NMKL No 71:1999

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Ampicillin, Ceftriaxone, Chloramphenicol, TMP/Sulfa, Ciprofloxacin.

Cut-off values used in testing

The values used are clinical cut-off values.

Ampicillin: R ≤ 13

Ceftriaxone: R ≤ 19

Chloramphenicol: R ≤ 12

TMP/Sulfa: R ≤ 10

Ciprofloxacin: R ≤ 20

Preventive measures in place

See chapter Salmonella spp. in broiler meat and products thereof and chapter Salmonella spp. in ducks and turkey - breeding flocks and meat production flocks.

Control program/mechanisms

The control program/strategies in place

See chapter Salmonella spp. in broiler meat and products thereof and chapter Salmonella spp. in ducks and turkey - breeding flocks and meat production flocks.

Recent actions taken to control the zoonoses

See chapter Salmonella spp. in broiler meat and products thereof and chapter Salmonella spp. in ducks and turkey - breeding flocks and meat production flocks.

Measures in case of the positive findings or single cases

According to the Icelandic animal health legislation MAST (CA) can take any measures that are needed if multiresistant isolates are found.

Notification system in place

See Chapter Salmonella spp. in broiler meat and products thereof and chapter Salmonella spp. in ducks and turkey - breeding flocks and meat production flocks.

Results of the investigation

No resistance was found in the isolates to the tested antimicrobials.

National evaluation of the recent situation, the trends and sources of infection

See chapter Salmonella spp. in broiler meat and products thereof and chapter Salmonella spp. in ducks and turkey - breeding flocks and meat production flocks.

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

See chapter Salmonella spp. in broiler meat and products thereof and chapter Salmonella spp. in ducks and turkey - breeding flocks and meat production flocks.

Table Antimicrobial susceptibility testing of Salmonella in Pigs

Salmonella	S. Typhimurium		S. 1,4,[5],12:i:-		S. Derby		S. Agona		Salmonella spp.		S. Brandenburg		S. Infantis		S. Kedougou		S. Worthington	
	yes										yes		yes		yes		yes	
	1										11		1		1		2	
Antimicrobials:	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n
Amphenicols - Chloramphenicol	1	0									6	0	1	0	1	0	2	0
Cephalosporins - 3rd generation cephalosporins	1	0									6	0	1	0	1	0	2	0
Fluoroquinolones - Ciprofloxacin	1	0									6	0	1	0	1	0	2	0
Penicillins - Ampicillin	1	0									6	2	1	0	1	1	2	0
Sulfonamides	1	0									6	2	1	0	1	1	2	0
Trimethoprim	1	0									6	2	1	0	1	1	2	0
Fully sensitive	1	0									6	4	1	1	1	0	2	0
Resistant to 3 antimicrobials											6	3			1	1		

Table Antimicrobial susceptibility testing of Salmonella in meat from pig

Salmonella	S. Typhimurium		S. 1,4,[5],12:i:-		S. Derby		S. Agona		Salmonella spp.		S. Brandenburg		S. Worthington	
Isolates out of a monitoring program (yes/no)									yes		yes		yes	
Number of isolates available in the laboratory									1		6		2	
Antimicrobials:	N	n	N	n	N	n	N	n	N	n	N	n	N	n
Amphenicols - Chloramphenicol									1	0	6	0	1	0
Cephalosporins - 3rd generation cephalosporins									1	0	6	0	1	0
Fluoroquinolones - Ciprofloxacin									1	0	6	0	1	0
Penicillins - Ampicillin									1	1	6	0	1	0
Sulfonamides									1	0	6	0	1	0
Trimethoprim									1	0	6	0	1	0
Fully sensitive									1	0	6	6	1	1
Resistant to 1 antimicrobial									1	1				

Table Antimicrobial susceptibility testing of Salmonella in Compound feedingstuffs for poultry (non specified)

Salmonella	S. Enteritidis		S. Typhimurium		S. 1,4,[5],12:i:-		Salmonella spp.		S. Worthington	
	Isolates out of a monitoring program (yes/no)								no	
	Number of isolates available in the laboratory								1	
Antimicrobials:	N	n	N	n	N	n	N	n	N	n
Amphenicols - Chloramphenicol									1	0
Cephalosporins - 3rd generation cephalosporins									1	0
Fluoroquinolones - Ciprofloxacin									1	0
Penicillins - Ampicillin									1	0
Sulfonamides									1	0
Trimethoprim									1	0

Table Antimicrobial susceptibility testing of Salmonella in meat from broilers (Gallus gallus)

Salmonella	S. Enteritidis		S. Typhimurium		S. 1,4,[5],12:i:-		S. Java		S. Agona		S. Virchow		S. Hadar		S. Kentucky		S. Infantis		Salmonella spp.	
Isolates out of a monitoring program (yes/no)									yes											
Number of isolates available in the laboratory									2											
Antimicrobials:	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n
Amphenicols - Chloramphenicol									2	0										
Cephalosporins - 3rd generation cephalosporins									2	0										
Fluoroquinolones - Ciprofloxacin									2	0										
Penicillins - Ampicillin									2	0										
Sulfonamides									2	0										
Trimethoprim									2	0										
Fully sensitive									2	0										

Table Antimicrobial susceptibility testing of Salmonella in Turkey

Salmonella	S. Enteritidis		S. Typhimurium		S. 1,4,[5],12:i:-		S. Agona		S. Kentucky		S. Newport		S. Saintpaul		Salmonella spp.		S. Worthington	
Isolates out of a monitoring program (yes/no)																	yes	
Number of isolates available in the laboratory																	3	
Antimicrobials:	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n
Amphenicols - Chloramphenicol																	3	0
Cephalosporins - 3rd generation cephalosporins																	3	0
Fluoroquinolones - Ciprofloxacin																	3	0
Penicillins - Ampicillin																	3	0
Sulfonamides																	3	0
Trimethoprim																	3	0
Fully sensitive																	3	3

Table Antimicrobial susceptibility testing of Salmonella in Gallus gallus (fowl) - broilers

Salmonella	S. Enteritidis		S. Typhimurium		S. 1,4,[5],12:i:-		S. Java		S. Agona		S. Virchow		S. Hadar		S. Kentucky		S. Infantis		Salmonella spp.		S. Corvallis		S. Worthington	
	Isolates out of a monitoring program (yes/no)								yes								yes				yes		yes	
	Number of isolates available in the laboratory								6								5				1		5	
Antimicrobials:	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n
Amphenicols - Chloramphenicol									6	0							5	0			1	0	5	0
Cephalosporins - 3rd generation cephalosporins									6	0							5	0			1	0	5	0
Fluoroquinolones - Ciprofloxacin									6	0							5	0			1	0	5	0
Penicillins - Ampicillin									6	0							5	0			1	0	5	0
Sulfonamides									6	0							5	0			1	0	5	0
Trimethoprim									6	0							5	0			1	0	5	0
Fully sensitive									6	6							5	5			1	1	5	5

Table Antimicrobial susceptibility testing of Salmonella in Gallus gallus (fowl) - breeding flocks, unspecified

Salmonella	S. Enteritidis		S. Typhimurium		S. 1,4,[5],12:i:-		S. Agona		S. Virchow		S. Hadar		S. Kentucky		S. Infantis		Salmonella spp.	
	Isolates out of a monitoring program (yes/no)						yes											
	Number of isolates available in the laboratory						1											
	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n
Amphenicols - Chloramphenicol							1	0										
Cephalosporins - 3rd generation cephalosporins							1	0										
Fluoroquinolones - Ciprofloxacin							1	0										
Penicillins - Ampicillin							1	0										
Sulfonamides							1	0										
Trimethoprim							1	0										

Table Cut-off values for antibiotic resistance testing of Salmonella in Animals

Test Method Used		Standard methods used for testing		
Disc diffusion		EUCAST		

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin	NON-EFSA		
	Streptomycin	NON-EFSA		
Amphenicols	Chloramphenicol	NON-EFSA		17
Cephalosporins	3rd generation cephalosporins			20
	Cefotaxime	NON-EFSA		
	Ceftazidime	NON-EFSA		
Fluoroquinolones	Ciprofloxacin	NON-EFSA		19
Penicillins	Ampicillin	NON-EFSA		14
Quinolones	Nalidixic acid	NON-EFSA		
Sulfonamides	Sulfonamides	NON-EFSA		13
Tetracyclines	Tetracycline	NON-EFSA		
Trimethoprim	Trimethoprim	NON-EFSA		13

Table Cut-off values for antibiotic resistance testing of Salmonella in Animals

Table Cut-off values for antibiotic resistance testing of Salmonella in Feed

Test Method Used	Standard methods used for testing
Disc diffusion	NCCLS/CLSI

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin	EFSA	2	
	Streptomycin	EFSA	32	
Amphenicols	Chloramphenicol	EFSA	16	12
Cephalosporins	3rd generation cephalosporins			19
	Cefotaxime	EFSA	0.5	
	Ceftazidime	EFSA	2	
Fluoroquinolones	Ciprofloxacin	EFSA	0.064	20
Penicillins	Ampicillin	EFSA	8	13
Quinolones	Nalidixic acid	EFSA	16	
Sulfonamides	Sulfonamides	EFSA	256	10
Tetracyclines	Tetracycline	EFSA	8	
Trimethoprim	Trimethoprim	EFSA	2	10

Table Cut-off values for antibiotic resistance testing of Salmonella in Feed

Table Cut-off values for antibiotic resistance testing of Salmonella in Food

Test Method Used		Standard methods used for testing		
Disc diffusion		NCCLS/CLSI		

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin	EFSA	2	
	Streptomycin	EFSA	32	
Amphenicols	Chloramphenicol	EFSA	16	12
Cephalosporins	3rd generation cephalosporins			19
	Cefotaxime	EFSA	0.5	
	Ceftazidime	EFSA	2	
Fluoroquinolones	Ciprofloxacin	EFSA	0.064	20
Penicillins	Ampicillin	EFSA	8	13
Quinolones	Nalidixic acid	EFSA	16	
Sulfonamides	Sulfonamides	EFSA	256	10
Tetracyclines	Tetracycline	EFSA	8	
Trimethoprim	Trimethoprim	EFSA	2	10

Table Cut-off values for antibiotic resistance testing of Salmonella in Food

Table Cut-off values for antibiotic resistance testing of Salmonella in Humans

Test Method Used	Standard methods used for testing
Disc diffusion	EUCAST

		Concentration (microg/ml)	Zone diameter (mm)
		Resistant >	Resistant <=
Amphenicols	Chloramphenicol	8	17
Cephalosporins	3rd generation cephalosporins	2	20
Fluoroquinolones	Ciprofloxacin	1	19
Penicillins	Ampicillin	8	14

Footnote:

Trimethoprim/sulfamethoxazole MIC > 4 microg/ml and zone diameter <= 14 is Resistant

2.2 CAMPYLOBACTERIOSIS

2.2.1 General evaluation of the national situation

A. Thermophilic Campylobacter general evaluation

History of the disease and/or infection in the country

Icelandic studies have shown that many species of wild birds, farmed animals and pets are frequent carriers of a thermophilic *Campylobacter* spp. A pilot study done in 1999 (July-Oct) showed that 25% of broiler flocks in Iceland were infected and that the prevalence in broiler meat on the market in Iceland was 45%.

In 1998 the incidence of campylobacteriosis in humans began to increase, from 34,5 in 1997 to 79,8 in 1998. In 1999 the incidence was 155,9, where 116,8 were identified as being of domestic origin. In 1996 it was authorized for the first time to sell and distribute chilled broiler meat, where in the decades before only frozen broiler meat had been available and no poultry meat was imported to Iceland. Following the marketing of chilled broiler meat the yearly consumption increased from 6 kg pr. Inhabitant in 1996 to 11 kg pr. Inhabitant in 1999. Icelandic veterinary and human health authorities came to the conclusion that the major increase of human campylobacteriosis in Iceland in 1999 was linked to the consumption and handling of chilled broiler meat.

In cooperation with the poultry industry in Iceland the authorities implemented a national surveillance programme for *Campylobacter* in poultry. It began as a voluntary programme in May 2000, but by late 2001 and early 2002 it was implemented into national legislation. The objective of the programme is to prevent the distribution of chilled poultry carcasses or poultry meat that is known to be *Campylobacter* positive.

Therefore all positive poultry flocks and all positive slaughter batches are either frozen or heat treated before distribution, however as the results from the slaughter samples are not available until two days after slaughter, campylobacter positive carcasses or chilled meat can occasionally be distributed. Only carcasses from poultry flocks that are negative prior to slaughter can be distributed from the slaughterhouses as chilled meat.

The Icelandic consumer prefers chilled poultry meat to frozen and is willing to pay more for it. In Iceland there are three poultry companies and each company owns all the establishments throughout the processing chain (i.e. the hatchery, farm, slaughterhouse, cutting plant and processing plants for meat and ready-to-eat products).

With regard to the surveillance programme the poultry companies have to produce *Campylobacter* negative broilers if they want to sell and distribute chilled broiler meat, as all *Campylobacter* positive broilers must be frozen or heat-treated before distribution and marketing. This is why the Icelandic surveillance programme is the driving force for all on farm efforts to eradicate *Campylobacter*; see chapter on *Campylobacter* in *Gallus gallus*.

National evaluation of the recent situation, the trends and sources of infection

After the implementation of the national surveillance programme in 2000 the prevalence in broiler flocks, slaughter groups and the incidence in humans decreased dramatically. The *Campylobacter* trend in the last decade has been that it is decreasing in all three stages (i.e. in broilers, slaughter batches and humans).

Before the implementation of the surveillance programme the prevalence in broiler flocks was about 25%. However, in recent years it has been very low.

Before the implementation of the surveillance programme the prevalence in broiler meat on the market was about 45%. However, in recent years the prevalence in broiler slaughter batches has been also been very low.

It is assumed that the implementation of the surveillance programme has decreased the human incidence of campylobacteriosis. These results have been achieved despite the fact that annual consumption of broiler meat has increased from 6 kg pr. inhabitant in 1996 to 24 kg pr. inhabitant in 2009 and that probably over 90% of all broiler meat on the market is sold chilled. No unfrozen or unheattreated poultry meat is imported, but the import of frozen broiler meat is increasing.

Since its implementation, through the Icelandic national surveillance programme it was possible to prevent large quantities of *Campylobacter* positive broiler meat from entering the market as chilled meat. The programme is assumed to be very effective to reduce *Campylobacter* contamination in broiler meat and campylobacteriosis in humans, by preventing as much as possible consumers from handling contaminated chilled poultry meat.

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases (as a source of infection)

Consumption and handling of poultry and poultry products is not believed to be the primary source of human campylobacteriosis in Iceland any longer. Other sources might be a more important source of human campylobacteriosis in Iceland.

Recent actions taken to control the zoonoses

The implementation of the Icelandic surveillance programme for *Campylobacter* in poultry was a direct response from the food and veterinary authority and the poultry industry to the major increase in human campylobacteriosis in 1999. The programme is almost the same as it was when implemented in 2000 and only minor changes have been made.

2.2.2 Campylobacteriosis in humans

A. Thermophilic Campylobacter in humans

Reporting system in place for the human cases

Yes it is a notifiable disease

Case definition

EU case definition

Diagnostic/analytical methods used

Culture

Notification system in place

Yes

Relevance as zoonotic disease

High

Table Campylobacter in humans - Species/serotype distribution

Species/serotype Distribution	Cases	Cases Inc.	Autochthon cases	Autochthon Inc.	Imported cases	Imported Inc.	Unknown status
Campylobacter	100	31.2	50	15.6	42	13.1	8
C. coli	0	0	0	0	0	0	0
C. jejuni	100	31.2	50	15.6	42	13.1	8
C. upsaliensis	0	0	0	0	0	0	0

Table Campylobacter in humans - Age distribution

Age distribution	C. coli			C. jejuni			Campylobacter spp., unspecified		
	All	M	F	All	M	F	All	M	F
<1 year	0	0	0	0	0	0	0	0	0
1 to 4 years	0	0	0	1	1	0	0	0	0
5 to 14 years	0	0	0	6	4	2	0	0	0
15 to 24 years	0	0	0	17	7	10	0	0	0
25 to 44 years	0	0	0	31	21	10	0	0	0
45 to 64 years	0	0	0	36	21	15	0	0	0
65 years and older	0	0	0	9	6	3	0	0	0
Age unknown	0	0	0	0	0	0	0	0	0
Total :	0	0	0	100	60	40	0	0	0

Table Campylobacter in humans - Seasonal distribution

Seasonal Distribution Months	C. coli	C. jejuni	C. upsaliensi s	Campylobacter spp., unspecified
	Cases	Cases	Cases	Cases
January	0	2	0	0
February	0	3	0	0
March	0	2	0	0
April	0	7	0	0
May	0	8	0	0
June	0	11	0	0
July	0	25	0	0
August	0	15	0	0
September	0	10	0	0
October	0	11	0	0
November	0	5	0	0
December	0	1	0	0
not known	0	0	0	0
Total :	0	100	0	0

2.2.3 Campylobacter in foodstuffs

A. Thermophilic Campylobacter in Broiler meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

See text form on thermophilic campylobacter in Gallus gallus

At retail

For Matis survey: Fully packed products were shipped to the lab at the same time as distribution to retail was being done. Samples were stored at 4°C for few days until analysis was performed.

Frequency of the sampling

At retail

For Matis survey: Samples were collected once every month at random dates and from random producer but with consideration of market share (three main producers in Iceland).

Type of specimen taken

At retail

For Matis survey: Three types of samples: Neck skin, whole skinned loin, wing cuts with skin

Methods of sampling (description of sampling techniques)

At retail

Packed products

For Matis survey: For each type of sample type; 15 packs were received and pool sample prepared from 3 packs resulting in 5 measurements of each sample type. This was done every month for 4 months (Jan-Apr)

Definition of positive finding

At retail

Sample is considered to be positive when Campylobacter spp. is detected.

Diagnostic/analytical methods used

At retail

For Matis survey: direct plating without preenrichment

Preventive measures in place

Meat from positive broiler flocks is frozen for at least 14 days or heat treated before it is placed on the market.

Control program/mechanisms

The control program/strategies in place

See text form on thermophilic campylobacter in Gallus gallus

Results of the investigation

For Matis Survey: All 60 samples (15 from every month; 5 from each sample type) were found negative in relation to Campylobacter spp.

2.2.4 Campylobacter in animals

A. Thermophilic Campylobacter in Gallus gallus

Monitoring system

Sampling strategy

According to the Icelandic Campylobacter National Surveillance Programme every poultry flock is sampled at the farm 2 to 5 days prior to slaughter, if it is intended to distribute meat from the flock unfrozen and unheattreated (fresh). Samples are taken by the food business operator (FBO).

Samples are also taken from each poultry flock at slaughter from april 1 to october 31 every year, if the meat from the flock is distributed unfrozen and unheattreated (fresh).

Frequency of the sampling

Before slaughter at farm

Every flock from which the meat is intended to be distributed unfrozen and unheattreated is sampled by the FBO, 2-5 days before slaughter.

At slaughter

Annually, from march 1 to october 31, every batch is sampled by the FBO, if the meat from the flock is intended to be distributed unheattreated and unfrozen.

If at slaughter no pre-slaughter sample is available, but it is intended to distribute meat from the batch unheattreated and unfrozen, samples are taken at slaughter and it is not allowed to distribute meat from the batch until results from slaughter samples are available and negative.

Type of specimen taken

Before slaughter at farm

Faeces

At slaughter

Caecas

Methods of sampling (description of sampling techniques)

Before slaughter at farm

10 individual fresh faecal droppings are taken by the FBO 2 to 5 days before slaughter. They are sent as one pooled sample to the laboratory.

At slaughter

Caecas from 10 broiler carcasses are taken at the slaughter line by the FBO, pooled into one sample.

Case definition

Before slaughter at farm

A flock is considered positive when Campylobacter spp. is detected.

At slaughter

A slaughter batch is considered positive when Campylobacter spp. is detected.

Diagnostic/analytical methods used

Before slaughter at farm

Bacteriological method: Campy-Cefex direct plate Method

At slaughter

Bacteriological method: Campy-Cefex direct plate Method

Vaccination policy

There is no vaccination against *Campylobacter* in Iceland.

Other preventive measures than vaccination in place

Generally the freezing policy (meat from contaminated flocks has to be frozen) is the driving force for all preventive measures at farm level. As only flocks that test negative for *Campylobacter* prior to slaughter can be processed as fresh chilled products the farmers aim to produce negative flocks, as the fresh chilled products have the highest market value.

The most important interventions done at the farm level is maintaining a very high biosecurity all year round. Preferably flocks are not thinned. In 2005 many farmers began to slaughter the broilers at a younger age (approx. 32 days) during the summer period (June-September) as younger broilers have lower *campylobacter* prevalence. The rest of the year broilers are slaughtered at the age of approx. 36 days. The latest preventative measure (since 2008) is to use fly nets on the broiler house inlets during the summer period on high risk farms (i.e. where "all in - all out" method cannot be implemented at farm level).

All preventative measures at the farm level are voluntary interventions.

Control program/mechanisms

The control program/strategies in place

The Icelandic *Campylobacter* surveillance programme is build on the freezing policy which means that all poultry flocks positive in the pre-slaughter sample are submitted to freezing or are heat treated before distribution. If *campylobacter* is detected in a slaughter batch, no further meat will be distributed from the slaughter house unless frozen or heat treated, but meat already distributed is not withdrawn from the market. Only carcasses from poultry flocks that are negative prior to slaughter can be processed as chilled meat from the slaughterhouses. The objective of the programme is to prevent distribution of poultry carcasses or poultry meat that is known to be *Campylobacter* positive as chilled products.

The surveillance programme started in the year 2000 as a voluntary programme in collaboration with the poultry industry. In 2002 it was implemented into national legislation (reg. no. 260/1980 (amended by reg. no 688/2002) and reg. no. 251/1995 (amended by reg. no 904/2001)).

Recent actions taken to control the zoonoses

Fly nettings on air inlets on high risk houses (after 2008)

Measures in case of the positive findings or single cases

Carcasses from flocks that test positive for thermophilic *Campylobacter* sp. based upon the pre-slaughter sampling are either subjected to heat-treatment or freezing.

Notification system in place

All results from samples taken from broiler flocks are as a part of the surveillance programme reported directly to the authorities from the laboratories, both negative and positive results.

Results of the investigation

The prevalence of *Campylobacter* sp. in broiler flocks in 2013 before slaughter was only 1,4%, and such a low prevalence has not been found before. Probably, a quite cold summer contributed to the exceptionally low prevalence, together with increased experience of farmers in maintaining a high level biosecurity. In 2013, from april to the end of october, 1,9% of batches distributed unfrozen and unheattreated were positive for campylobacter.

National evaluation of the recent situation, the trends and sources of infection

The trend in the last decade has been that the *Campylobacter* prevalence in broiler flocks is decreasing.

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Human campylobacteriosis has not been decreasing in the past years, but there is a clear decrease of prevalence of campylobacter in broiler flocks. In 2013, in a study performed in Canada, broiler isolates from 2011 and isolates from domestically aquired human cases were compared with a so called CGF40 fingerprinting method. Unfortunately it was not possible to revitalize all broiler isolates, from which meat was distributed fresh and known to be contaminated on the market. However, few clusters were found with both isolates from humans and broilers. Most human isolates (17 out of 44) belonged to the same cluster, with no broiler isolate matching.

It is suggested that for the cases for 2011, other sources than domestically produced broiler meat should be considered as a possible source.

Table Campylobacter in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Units tested	Total units positive for Campylobacter	C. coli	C. jejuni	C. lari
Gallus gallus (fowl) - broilers - Farm - Monitoring	Keldur and Matís	Census	Industry sampling	animal sample > faeces	Domestic	Flock	637	9		8	
Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring	Keldur and Matís	Census	Industry sampling	animal sample > caecum	Domestic	Slaughter batch	429	8		8	
Turkeys - Farm - Monitoring	Keldur	Census	Industry sampling	animal sample > faeces	Domestic	Flock	34	3			
Turkeys - Slaughterhouse - Monitoring	Keldur	Census	Industry sampling	animal sample > caecum	Domestic	Slaughter batch	2	0			

	C. upsaliensis	Thermophilic Campylobacter spp., unspecified
Gallus gallus (fowl) - broilers - Farm - Monitoring		1
Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring		
Turkeys - Farm - Monitoring		3
Turkeys - Slaughterhouse - Monitoring		

2.2.5 Antimicrobial resistance in Campylobacter isolates

A. Antimicrobial resistance in Campylobacter jejuni and coli in cattle

Sampling strategy used in monitoring

Frequency of the sampling

No samples taken

B. Antimicrobial resistance in Campylobacter jejuni and coli in poultry

Sampling strategy used in monitoring

Frequency of the sampling

Every broiler flock is sampled.

From april til end of october, every slaughter batch is sampled if it is intended to distribute its meat to the market unheattreated and unfrozen.

Type of specimen taken

Fecal samples from flocks at farm before slaughter, cecal samples at slaughter

Methods of sampling (description of sampling techniques)

At farm: 10 fecal samples pooled into one sample

At slaughter: 10 cecal samples pooled into one sample

Procedures for the selection of isolates for antimicrobial testing

All isolates are tested.

Laboratory methodology used for identification of the microbial isolates

Campy-Cefex direct plate Method for both types of samples.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Erythromycin, Ciprofloxacin, Tetracyclin, Streptomycin, Gentamicin, Nalidixin acid.

Cut-off values used in testing

Erythromycin: 4 (mg/l)

Ciprofloxacin: 0.5

Tetracyclin: 1

Streptomycin: 4

Gentamicin: 2

Nalidixic acid: 16

Control program/mechanisms

The control program/strategies in place

All isolates are tested.

Measures in case of the positive findings or single cases

No special measures are taken at the moment.

Notification system in place

The CA is informed about all results since the isolates are tested at the request of the CA.

Results of the investigation

One isolate out of 16 was found to be resistant to Tetracyclin. All other isolates were susceptible to all tested antimicrobials.

National evaluation of the recent situation, the trends and sources of infection

This is the first year where campylobacter isolates are tested for their antimicrobial resistance, so no conclusions can be drawn on trends of AMR in Campylobacter jejuni et coli.

Table Antimicrobial susceptibility testing of Campylobacter in Gallus gallus (fowl)

Campylobacter	C. coli		C. jejuni		Campylobacter spp., unspecified	
	Isolates out of a monitoring program (yes/no)		yes			
	Number of isolates available in the laboratory		16			
Antimicrobials:	N	n	N	n	N	n
Aminoglycosides - Gentamicin			16	0		
Fluoroquinolones - Ciprofloxacin			16	0		
Macrolides - Erythromycin			16	0		
Quinolones - Nalidixic acid			16	0		
Tetracyclines - Tetracycline			16	1		
Fully sensitive			16	15		
Resistant to 1 antimicrobial			16	1		
Aminoglycosides - Streptomycin			16	0		

Table Antimicrobial susceptibility testing of *C. jejuni* - *C. jejuni* subsp. *jejuni* in *Gallus gallus* (fowl) - broilers - before slaughter - Farm - Domestic - Control and eradication programmes - Census - Industry sampling - animal sample - faeces - quantitative data [Dilution method]

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

C. jejuni subsp. jejuni Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory Antimicrobials:	Gallus gallus (fowl) - broilers - before slaughter - Farm - Control and eradication programmes																											
	yes																											
	3																											
	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>4096		
Aminoglycosides - Gentamicin	2	3	0							1	2																	
Aminoglycosides - Streptomycin	4	3	0									3																
Fluoroquinolones - Ciprofloxacin	0.5	3	0						1	2																		
Quinolones - Nalidixic acid	16	3	0										1	1		1												
Tetracyclines - Tetracycline	1	3	0							1	2																	
Macrolides - Erythromycin	4	3	0									3																

C. jejuni subsp. jejuni Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory	Gallus gallus (fowl) - broilers - before slaughter - Farm - Control and eradication programmes	
	yes	
	3	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin		
Aminoglycosides - Streptomycin		
Fluoroquinolones - Ciprofloxacin		
Quinolones - Nalidixic acid		

Table Antimicrobial susceptibility testing of *C. jejuni* - *C. jejuni* subsp. *jejuni* in *Gallus gallus* (fowl) - broilers - before slaughter - Farm - Domestic - Control and eradication programmes - Census - Industry sampling - animal sample - faeces - quantitative data [Dilution method]

<i>C. jejuni</i> subsp. <i>jejuni</i>	Gallus gallus (fowl) - broilers - before slaughter - Farm - Control and eradication programmes	
Isolates out of a monitoring program (yes/no)	yes	
Number of isolates available in the laboratory	3	
Antimicrobials:	lowest	highest
Tetracyclines - Tetracycline		
Macrolides - Erythromycin		

Footnote:

For Streptomycin and Erythromycin, all three isolates were with less than 0,5 (ug/ml), reported as equal to 0,5 ug/ml

Table Antimicrobial susceptibility testing of C. jejuni - C. jejuni subsp. jejuni in Gallus gallus (fowl) - broilers - unspecified - Slaughterhouse - Domestic - Control and eradication programmes - Census - Industry sampling - animal sample - caecum - quantitative data [Dilution method]

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

C. jejuni subsp. jejuni Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory			Gallus gallus (fowl) - broilers - unspecified - Slaughterhouse - Control and eradication programmes																											
			yes																											
			13																											
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>4096				
Aminoglycosides - Gentamicin	2	13	0								3	7	3																	
Aminoglycosides - Streptomycin	4	13	0										7	5	1															
Fluoroquinolones - Ciprofloxacin	0.5	13	0							4	7	2																		
Quinolones - Nalidixic acid	16	13	0											2	1	7	2	1												
Tetracyclines - Tetracycline	1	13	1								1	6	4	1					1											
Macrolides - Erythromycin	4	13	0										11	2																

C. jejuni subsp. jejuni	Gallus gallus (fowl) - broilers - unspecified - Slaughterhouse - Control and eradication programmes	
	yes	
	13	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin		
Aminoglycosides - Streptomycin		
Fluoroquinolones - Ciprofloxacin		
Quinolones - Nalidixic acid		

Table Antimicrobial susceptibility testing of C. jejuni - C. jejuni subsp. jejuni in Gallus gallus (fowl) - broilers - unspecified - Slaughterhouse - Domestic - Control and eradication programmes - Census - Industry sampling - animal sample - caecum - quantitative data [Dilution method]

C. jejuni subsp. jejuni	Gallus gallus (fowl) - broilers - unspecified - Slaughterhouse - Control and eradication programmes	
Isolates out of a monitoring program (yes/no)	yes	
Number of isolates available in the laboratory	13	
Antimicrobials:	lowest	highest
Tetracyclines - Tetracycline		
Macrolides - Erythromycin		

Table Cut-off values used for antimicrobial susceptibility testing of Campylobacter in Animals

Test Method Used	Standard methods used for testing
Broth dilution	NCCLS/CLSI

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		4	
Fluoroquinolones	Ciprofloxacin		0.5	
Macrolides	Erythromycin		4	
Quinolones	Nalidixic acid		16	
Tetracyclines	Tetracycline		1	

Table Cut-off values used for antimicrobial susceptibility testing of Campylobacter in Food

Test Method Used	Standard methods used for testing
Broth dilution	NCCLS/CLSI

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		4	
Fluoroquinolones	Ciprofloxacin		0.5	
Macrolides	Erythromycin		4	
Quinolones	Nalidixic acid		16	
Tetracyclines	Tetracycline		1	

Table Cut-off values used for antimicrobial susceptibility testing of Campylobacter in Humans

Test Method Used		Standard methods used for testing		
Disc diffusion		EUCAST		

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Fluoroquinolones	Ciprofloxacin		0.5	26
Macrolides	Erythromycin		4	20
Tetracyclines	Tetracycline		2	30

Table Cut-off values used for antimicrobial susceptibility testing of C. coli in Animals

Test Method Used		Standard methods used for testing		

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		4	
Fluoroquinolones	Ciprofloxacin		0.5	
Macrolides	Erythromycin		8	
Quinolones	Nalidixic acid		16	
Tetracyclines	Tetracycline		2	

Table Cut-off values used for antimicrobial susceptibility testing of C. coli in Feed

Test Method Used		Standard methods used for testing		

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		4	
Fluoroquinolones	Ciprofloxacin		0.5	
Macrolides	Erythromycin		8	
Quinolones	Nalidixic acid		16	
Tetracyclines	Tetracycline		2	

Table Cut-off values used for antimicrobial susceptibility testing of C. coli in Food

Test Method Used		Standard methods used for testing		

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		4	
Fluoroquinolones	Ciprofloxacin		0.5	
Macrolides	Erythromycin		8	
Quinolones	Nalidixic acid		16	
Tetracyclines	Tetracycline		2	

Table Cut-off values used for antimicrobial susceptibility testing of C. coli in Humans

Test Method Used		Standard methods used for testing		
Disc diffusion		EUCAST		

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Fluoroquinolones	Ciprofloxacin		0.5	26
Macrolides	Erythromycin		8	24
Tetracyclines	Tetracycline		2	30

Table Cut-off values used for antimicrobial susceptibility testing of C. jejuni in Animals

Test Method Used		Standard methods used for testing		

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		4	
Fluoroquinolones	Ciprofloxacin		0.5	
Macrolides	Erythromycin		4	
Quinolones	Nalidixic acid		16	
Tetracyclines	Tetracycline		1	

Table Cut-off values used for antimicrobial susceptibility testing of *C. jejuni* in Feed

Test Method Used		Standard methods used for testing		
			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		4	
Fluoroquinolones	Ciprofloxacin		0.5	
Macrolides	Erythromycin		4	
Quinolones	Nalidixic acid		16	
Tetracyclines	Tetracycline		1	

Table Cut-off values used for antimicrobial susceptibility testing of C. jejuni in Food

Test Method Used		Standard methods used for testing		
			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		4	
Fluoroquinolones	Ciprofloxacin		0.5	
Macrolides	Erythromycin		4	
Quinolones	Nalidixic acid		16	
Tetracyclines	Tetracycline		1	

Table Cut-off values used for antimicrobial susceptibility testing of *C. jejuni* in Humans

Test Method Used		Standard methods used for testing		
Disc diffusion		EUCAST		
			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Fluoroquinolones	Ciprofloxacin		0.5	26
Macrolides	Erythromycin		4	20
Tetracyclines	Tetracycline		2	30

2.3 LISTERIOSIS

2.3.1 General evaluation of the national situation

A. Listeriosis general evaluation

History of the disease and/or infection in the country

The prevalence of *Listeria monocytogenes* in smoked and gravad fish was determined in a survey 2011. The results were: The probability (95%) to find *Listeria monocytogenes* in smoked and gravad fish on the market is 3.83% – 7.16% and there is 95% probability that cfu/g is >100 in 1.99% – 4.6% of smoked and gravad fish.

No official sampling 2013.

Recent actions taken to control the zoonoses

The requirements of the Regulation (EC) No 2073/2005 apply, i.e., monitoring of the production process, shelf-life studies when deemed appropriate, withdrawal from the market when unsatisfactory results and taking measures to prevent the recurrence of the contamination, such as reviewing the production routines and shelf life of the product. Dietary advice is given to pregnant women.

2.3.2 Listeriosis in humans

A. Listeriosis in humans

Reporting system in place for the human cases

Yes it is a reportable disease

Case definition

The EU case definition

Diagnostic/analytical methods used

Culture

Notification system in place

Yes

History of the disease and/or infection in the country

Yearly number of cases in humans has been one to four cases during the last years. Mostly sporadic cases

Table Listeria in humans - Species/serotype distribution

Species/serotype Distribution	Cases	Cases Inc.
Listeria	0	0
Listeria spp., unspecified	0	0
Congenital cases	0	0
Number of deaths	0	0

Table Listeria in humans - Age distribution

Age distribution	L. monocytogenes			Listeria spp., unspecified		
	All	M	F	All	M	F
<1 year	0	0	0	0	0	0
1 to 4 years	0	0	0	0	0	0
5 to 14 years	0	0	0	0	0	0
15 to 24 years	0	0	0	0	0	0
25 to 44 years	0	0	0	0	0	0
45 to 64 years	0	0	0	0	0	0
65 years and older	0	1	0	0	0	0
Age unknown	0	0	0	0	0	0
Total :	0	1	0	0	0	0

2.3.3 Listeria in foodstuffs

A. Listeria in Food

Monitoring system

Sampling strategy

No continuous monitoring of foodstuffs takes place. Surveys are occasionally performed. Last survey was in 2011 on LM in smoked and gravad fish. The FBO should follow the EU requirements regarding testing for *L. monocytogenes* in ready-to-eat foods (Regulation (EC) NO 2073/2005). Samples are taken as part of internal control programmes in the food producing industry and sampling is verified in regular official control.

Frequency of the sampling

At the production plant

Not known. It is the FBO that should decide the frequency.

Type of specimen taken

At the production plant

Ready to eat products.

Definition of positive finding

At the production plant

Samples positive for *Listeria monocytogenes* are considered positive.

Preventive measures in place

HACCP activities are verified under official control. Dietary advice is given to pregnant women.

Notification system in place

The laboratories and the FBO operators should notify to MAST if they detect *Listeria monocytogenes* in ready to eat food.

Results of the investigation

2013: *Listeria monocytogenes* in ready to eat food has not been notified to MAST.

2.3.4 Listeria in animals

A. Listeria in Animals

Monitoring system

Sampling strategy

There is no active surveillance in animals regarding *L. monocytogenes*.

Notification system in place

Listeriosis in animals is a notifiable disease.

National evaluation of the recent situation, the trends and sources of infection

Based on notifications little changes are seen in the prevalence of listeriosis in animals.

Table Listeria in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Units tested	Total units positive for Listeria	L. monocytogenes	Listeria spp., unspecified
Cattle (bovine animals) - Farm - Monitoring ¹⁾							0			
Cattle (bovine animals) - dairy cows - Farm - Monitoring ²⁾							0			
Sheep - Farm - Monitoring ³⁾							0			
Goats - Farm - Monitoring ⁴⁾							0			
Pigs - Farm - Monitoring ⁵⁾							0			
Gallus gallus (fowl) - Farm - Monitoring ⁶⁾							0			
Turkeys - Farm - Monitoring ⁷⁾							0			

Comments:

- ¹⁾ No sampling
²⁾ No sampling
³⁾ No sampling
⁴⁾ No sampling
⁵⁾ No sampling
⁶⁾ No sampling
⁷⁾ No sampling

2.4 E. COLI INFECTIONS

2.4.1 General evaluation of the national situation

2.4.2 E. coli infections in humans

A. Verotoxigenic Escherichia coli infections in humans

Reporting system in place for the human cases

Yes it is a reportable disease

Case definition

Yes the EU case definition

Diagnostic/analytical methods used

Culture and PCR

Notification system in place

Yes

History of the disease and/or infection in the country

Yearly number of cases is very low, from 1 - 7 cases, mostly sporadic cases.

Table Escherichia coli, pathogenic in humans - Species/serotype distribution

Species/serotype Distribution	Cases	Cases Inc.	Autochthon cases	Autochthon Inc.	Imported cases	Imported Inc.
Escherichia coli, pathogenic						
HUS	0	0	0	0	0	0
- clinical cases	0	0	0	0	0	0
- lab. confirmed cases	0	0	0	0	0	0
- caused by O157 (VT+)	0	0	0	0	0	0
- caused by other VTEC	0	0	0	0	0	0
E.coli infect. (except HUS)	3	1	3	1	0	0
- clinical cases	3	1	3	1	0	0
- laboratory confirmed	3	1	3	1	0	0
- caused by O157 (VT+)	3	1	3	1	0	0
- caused by other VTEC	0	0	0	0	0	0

Table Escherichia coli, pathogenic in humans - Age distribution

Age distribution	Verotoxigenic E. coli (VTEC)			Verotoxigenic E. coli (VTEC) - VTEC O157:H7			Verotoxigenic E. coli (VTEC) - VTEC non-O157		
	All	M	F	All	M	F	All	F	M
<1 year	0	0	0	0	0	0	0	0	0
1 to 4 years	0	0	0	0	0	0	0	0	0
5 to 14 years	0	0	0	0	0	0	0	0	0
15 to 24 years	0	0	2	0	0	0	0	0	0
25 to 44 years	0	0	0	0	0	0	0	0	0
45 to 64 years	0	0	0	0	0	0	0	0	0
65 years and older	0	0	1	0	0	0	0	0	0
Age unknown	0	0	0	0	0	0	0	0	0
Total :	0	0	3	0	0	0	0	0	0

2.4.3 Escherichia coli, pathogenic in animals

A. Verotoxigenic Escherichia coli in cattle (bovine animals)

Monitoring system

Sampling strategy

No samples taken

2.5 TUBERCULOSIS, MYCOBACTERIAL DISEASES

2.5.1 General evaluation of the national situation

A. Tuberculosis general evaluation

History of the disease and/or infection in the country

No regular monitoring but sporadic monitoring from 1923 until 1971 was negative and there are no positive findings in slaughterhouses. *Mycobacterium bovis* is almost unknown in Iceland. The only clinical sample in cattle was in 1922

2.5.2 Tuberculosis, mycobacterial diseases in humans

A. Tuberculosis due to *Mycobacterium bovis* in humans

Reporting system in place for the human cases

Yes

Case definition

The EU case definition

Diagnostic/analytical methods used

Culture PCR

Notification system in place

Yes

History of the disease and/or infection in the country

No cases during the last decade

Table Mycobacterium in humans - Age distribution

Age distribution	M. bovis		
	All	M	F
<1 year	0	0	0
1 to 4 years	0	0	0
5 to 14 years	0	0	0
15 to 24 years	0	0	0
25 to 44 years	0	0	0
45 to 64 years	0	0	0
65 years and older	0	0	0
Age unknown	0	0	0
Total :	0	0	0

2.5.3 Mycobacterium in animals

A. Mycobacterium bovis in bovine animals

Status as officially free of bovine tuberculosis during the reporting year

The entire country free

The entire country is free.

Monitoring system

Sampling strategy

B. Mycobacterium bovis in farmed deer

Monitoring system

Sampling strategy

No deer in the country

Table Tuberculosis in other animals

		Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Analytical Method	Sampling unit	Units tested	Total units positive for Mycobacterium	M. bovis	M. tuberculosis
Sheep	1)								0			
Goats	2)								0			
Pigs	3)								0			
Badgers	4)								0			

		Mycobacterium spp., unspecified
Sheep	1)	
Goats	2)	
Pigs	3)	
Badgers	4)	

Comments:

- 1) No sampling
 2) No sampling
 3) No sampling
 4) No sampling

Table Tuberculosis in other animals

2.6 BRUCELLOSIS

2.6.1 General evaluation of the national situation

A. Brucellosis general evaluation

History of the disease and/or infection in the country

Brucella abortus has never been found in Iceland

2.6.2 Brucellosis in humans

A. Brucellosis in humans

Reporting system in place for the human cases

Yes, it is a reportable disease

Case definition

Yes, EU case definition

Notification system in place

Yes

History of the disease and/or infection in the country

No cases during last the decades in Iceland

Table Brucella in humans - Species/serotype distribution

Species/serotype Distribution	Cases	Cases Inc.	Autochthon cases	Autochthon Inc.	Imported cases	Imported Inc.
Brucella	0	0	0	0	0	0
B. abortus	0	0	0	0	0	0
B. melitensis	0	0	0	0	0	0
B. suis	0	0	0	0	0	0
Occupational cases	0	0	0	0	0	0

Table Brucella in humans - Age distribution

Age distribution	B. abortus			B. melitensis			Brucella spp., unspecified		
	All	M	F	All	M	F	All	M	F
<1 year	0	0	0	0	0	0	0	0	0
1 to 4 years	0	0	0	0	0	0	0	0	0
5 to 14 years	0	0	0	0	0	0	0	0	0
15 to 24 years	0	0	0	0	0	0	0	0	0
25 to 44 years	0	0	0	0	0	0	0	0	0
45 to 64 years	0	0	0	0	0	0	0	0	0
65 years and older	0	0	0	0	0	0	0	0	0
Age unknown	0	0	0	0	0	0	0	0	0
Total :	0	0	0	0	0	0	0	0	0

2.6.3 Brucella in animals

A. Brucella abortus in bovine animals

Status as officially free of bovine brucellosis during the reporting year

The entire country free
yes

Monitoring system

Sampling strategy
Blood samples from 5 cows in 16 herds

Frequency of the sampling
Every year

Type of specimen taken
Serum

Diagnostic/analytical methods used
Brucella abortus (agg) antibody examination by agglutination

Control program/mechanisms

The control program/strategies in place
Annual serological surveillance of dairy cow herds, and annually are taken 80 samples.
Randomly selection of 16 herds, from each herd 5 blood samples are taken.

Measures in case of the positive findings or single cases

Stamping out

Notification system in place

Brucellosis in animals is notifiable

Results of the investigation

No positive samples were found.

National evaluation of the recent situation, the trends and sources of infection

Neither Brucella abortus nor other Brucella spp. has never been detected in Iceland.

B. Brucella melitensis in goats

Status as officially free of caprine brucellosis during the reporting year

The entire country free

Yes

C. Brucella melitensis in sheep

Status as officially free of ovine brucellosis during the reporting year

The entire country free

Yes

Monitoring system

Sampling strategy

Blood samples taken from rams in a semen station, from whom semen is exported to the USA.

Frequency of the sampling

Annually.

Type of specimen taken

Blood samples.

Case definition

A sample positive in serology for Brucella melitensis.

Diagnostic/analytical methods used

Brucella melitensis antibody examination by agglutination

Measures in case of the positive findings or single cases

Stamping out

Notification system in place

Brucella melitensis in animals is a notifiable disease.

Results of the investigation

No positive samples were found.

Table Bovine brucellosis in countries and regions that do not receive Community co-financing for eradication programme

If present, the row "Total -1" refers to analogous data of the previous year.

	Total number of existing bovine		Officially free herds		Infected herds		Surveillance						Investigations of suspect cases								
							Serological tests			Examination of bulk milk			Information about			Epidemiological investigation					
	Herds	Animals	Number of herds	%	Number of herds	%	Number of bovine herds tested	Number of animals tested	Number of infected herds	Number of bovine herds tested	Number of animals or pools tested	Number of infected herds	Number of notified abortions whatever cause	Number of isolations of Brucella infection	Number of abortions due to Brucella abortus	Number of animals tested with serological blood tests	Number of suspended herds	Number of positive animals		Number of animals examined microbio logically	Number of animals positive microbio logically
Region																		Sero logically	BST		
Ísland	755	70300	755	100	0	0	7	36	0												
Total : ¹⁾	755	70300	755	100	0	0	7	36	0	0	0	0	0	0	0	0	0	0	0	0	0

Comments:

¹⁾ N.A.

2.7 YERSINIOSIS

2.7.1 General evaluation of the national situation

2.7.2 Yersiniosis in humans

A. Yersiniosis in humans

Reporting system in place for the human cases

Yes it is a reportable disease

Case definition

The EU case definition

Notification system in place

Yes

History of the disease and/or infection in the country

A very rare disease in Iceland, only sporadic cases with many years between cases

Table Yersinia in humans - Species/serotype distribution

Species/serotype Distribution	Cases	Cases Inc.	Autochthon cases	Autochthon Inc.	Imported cases	Imported Inc.
Yersinia	0	0	0	0	0	0
Y. enterocolitica	0	0	0	0	0	0
Y. enterocolitica - O:3	0	0	0	0	0	0
Y. enterocolitica - O:9	0	0	0	0	0	0

Table Yersinia in humans - Age distribution

Age distribution	Y. enterocolitica			Yersinia spp., unspecified		
	All	M	F	All	M	F
<1 year	0	0	0	0	0	0
1 to 4 years	0	0	0	0	0	0
5 to 14 years	0	0	0	0	0	0
15 to 24 years	0	0	0	0	0	0
25 to 44 years	0	0	0	0	0	0
45 to 64 years	0	0	0	0	0	0
65 years and older	0	0	0	0	0	0
Age unknown	0	0	0	0	0	0
Total :	0	0	0	0	0	0

Table Yersinia in humans - Seasonal distribution

Seasonal Distribution Months	Y. enterocoliti ca	Yersinia spp., unspecifie d
	Cases	Cases
January	0	0
February	0	0
March	0	0
April	0	0
May	0	0
June	0	0
July	0	0
August	0	0
September	0	0
October	0	0
November	0	0
December	0	0
not known	0	0
Total :	0	0

2.8 TRICHINELLOSIS

2.8.1 General evaluation of the national situation

A. Trichinellosis general evaluation

History of the disease and/or infection in the country

Regular, systematic surveillance of *Trichinella* sp. had not been done so far in Iceland, but as of January 1st 2012 samples are taken from all slaughtered pigs and horses according to Commission Regulation (EC) No 2075/2005.

When particularly looked for *Trichinella* has neither been found in live stock nor in domestic wild animals (foxes, minks) in Iceland. Three cases of *Trichinella* sp. in stray polar bears are known from the years 1963, 2008 and 2010. In 1963 *Trichinella* sp. was found in a stray polar bear which came ashore in the north-western part of the country, in 2008 *Trichinella* native was found in another polar bear that came ashore in the northern part of the country and in 2010 *Trichinella* sp. was found in the third animal which was detected in the north-eastern part of Iceland.

When exporting horse meat some purchasers demand *Trichinella* testing at slaughter and prior to export. As a result of these demands approx. 1.600 samples from horses had been investigated up until the year 2008, which were negative with regard to *Trichinella* sp.

Trichinella has never been diagnosed in humans in Iceland.

National evaluation of the recent situation, the trends and sources of infection

The risk of *Trichinella* spp. being introduced into Icelandic wildlife does exist because of occasional stray polar bears coming ashore. The probability of the risk is however very low because polar bears are euthanized and their carcasses removed as soon as they are detected.

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases (as a source of infection)

The probability of contracting trichinellosis from food producing animals of Icelandic origin is close to zero.

Recent actions taken to control the zoonoses

None, other than euthanizing and removing polar bears from the environment and disposing of the carcasses after post-mortem investigations.

2.8.2 Trichinellosis in humans

A. Trichinellosis in humans

Reporting system in place for the human cases

Yes it is a reportable disease

Case definition

Yes, the Eu case definition

Notification system in place

Yes

History of the disease and/or infection in the country

No cases during the last decades

National evaluation of the recent situation, the trends and sources of infection

Zero cases in humans

Table Trichinella in humans - Species/serotype distribution

Species/serotype Distribution	Cases	Cases Inc.	Autochthon cases	Autochthon Inc.	Imported cases	Imported Inc.
Trichinella	0	0	0	0	0	0
Trichinella spp., unspecified	0	0	0	0	0	0

Table Trichinella in humans - Age distribution

Age distribution	Trichinella spp., unspecified		
	All	M	F
<1 year	0	0	0
1 to 4 years	0	0	0
5 to 14 years	0	0	0
15 to 24 years	0	0	0
25 to 44 years	0	0	0
45 to 64 years	0	0	0
65 years and older	0	0	0
Age unknown	0	0	0
Total :	0	0	0

2.8.3 Trichinella in animals

A. Trichinella in horses

Monitoring system

Sampling strategy

Samples were taken from all slaughtered horses intended to be put on the market.

Frequency of the sampling

Samples were taken from all horses.

Type of specimen taken

Tongue or masseter muscle.

Methods of sampling (description of sampling techniques)

Methods used were in accordance with Regulation (EC) No 2075/2005. For analyses, 5 g per animal is included in a pooled sample of maximum 100 g.

Case definition

An animal with a positive test result in the official examination.

Diagnostic/analytical methods used

Commission Regulation (EC) 2075/2005, Car 1, Chap 1 Magnetic stirrer method for pooled sample digestion for the detection of Trichinella in meat

Results of the investigation including the origin of the positive animals

No cases of Trichinellosis were reported among slaughtered horses.

Control program/mechanisms

The control program/strategies in place

Sampling was according to 2075/2005 and is monitored by official vets.

Measures in case of the positive findings or single cases

In case of a positive sample the horse carcasses will be retested individually. Pursuant to the Law on Animal Health No 25/1993, the Minister can issue national regulation on any necessary measures to be taken in order to find the source of the infection, restrict movement of animals, hinder the spread of and eradicate the disease.

Notification system in place

According to the national Law on Animal Health, no. 25/1993, trichinellosis is a list B disease that must be notified.

Monitoring system

Sampling strategy

For categories of holdings officially recognised Trichinella-free

There is no categorization of holdings.

National evaluation of the recent situation, the trends and sources of infection

No cases have been reported in Iceland, neither in humans nor in animals.

B. Trichinella in pigs

Number of officially recognised Trichinella-free holdings

All holdings are considered trichinella - free.

Categories of holdings officially recognised Trichinella-free

No categorization of holdings.

Monitoring system

Sampling strategy

General

Samples were taken from all slaughtered pigs intended to be placed on the market.

Frequency of the sampling

General

Samples were taken from all pigs slaughtered.

For categories of holdings officially recognised Trichinella-free

Type of specimen taken

General

Muscle clip from the pillar of diaphragma.

Methods of sampling (description of sampling techniques)

General

Samples are taken according to 2075/2005 by trained employee of the slaughterhouse under the supervision of the official vet. 1g of muscle clip from the pillar of diaphragma (max 100 pigs per analyse).

Case definition

General

An animal where Trichinella spp. larvae has been detected.

Diagnostic/analytical methods used

General

Artificial digestion method of pooled samples.

Preventive measures in place

Controlled housing condition in pig farms. Regular official control of farms and slaughterhouses.

Control program/mechanisms

The control program/strategies in place

Sampling of all slaughtered pigs.

Summary results of the inspections of Trichinella-free holdings including information on farmer compliance

Not applicable

Recent actions taken to control the zoonoses

None

Measures in case of the positive findings or single cases

In case of a positive sample the pig carcasses will be retested according to the regulation 2075/2005.
Pursuant to the Law on Animal Health No 25/1993, the Minister can issue national regulation on any necessary measures to be taken in order to find the source of the infection, restrict movement of animals, hinder the spread of and eradicate the disease.

The contingency plan in place

Is under preparation but not issued yet.

Notification system in place

According to the national Law on Animal Health, no. 25/1993, trichinellosis is a list B disease that must be notified.

Results of the investigation including description of the positive cases and the verification of the *Trichinella* species

No positive result on trichinella from the samples taken.

National evaluation of the recent situation, the trends and sources of infection

No cases have been reported in Iceland, neither in humans nor in animals.

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

None

Table Trichinella in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Units tested	Total units positive for Trichinella	T. spiralis	Trichinella spp., unspecified
Pigs - fattening pigs ¹⁾	Keldur, Promat	Census	Industry sampling	food sample > meat	Domestic	Animal	77473	0	0	0
Solipeds, domestic - horses - Slaughterhouse - Surveillance	Keldur, Promat	Census	Industry sampling	food sample > meat	Domestic	Animal	9817	0	0	0

Comments:

¹⁾ All slaughtered pigs are sampled

2.9 ECHINOCOCCOSIS

2.9.1 General evaluation of the national situation

A. Echinococcus spp. general evaluation

History of the disease and/or infection in the country

Echinococcus multilocularis has never been diagnosed. *Echinococcus granulosus* used to be quite frequent but has now apparently been eradicated, the last incidence detected in animals was in 1979 and in humans in 1988.

National evaluation of the recent situation, the trends and sources of infection

Emphasis is put on keeping the country free from *Echinococcus*. Annual treatment of dogs with anthelmintics is required and all carcasses at slaughterhouses are checked visually. The risk of introduction of *Echinococcus multilocularis* is considered moderate or low as the main definitive host, the red fox (*Vulpes vulpes*) is not present in the country and not wolves or coyotes neither. The same applies for many common intermediate hosts such as vole, lemming and muskrat. The only fox in Iceland is the arctic fox (*Vulpes lagopus*), which is seldom seen in the vicinity of residential areas.

2.9.2 Echinococcosis in humans

A. Echinococcus spp. in humans

Reporting system in place for the human cases

Yes it is a reportable disease

Case definition

Yes the EU case definition

Notification system in place

Yes

History of the disease and/or infection in the country

Zero cases during the last decades

Table Echinococcus in humans - Species/serotype distribution

Species/serotype Distribution	Cases	Cases Inc.	Autochthon cases	Autochthon Inc.	Imported cases	Imported Inc.
Echinococcus	0	0	0	0	0	0
E. granulosus	0	0	0	0	0	0
E. multilocularis	0	0	0	0	0	0
Echinococcus spp., unspecified	0	0	0	0	0	0

Table Echinococcus in humans - Age distribution

Age distribution	E. granulosus			E. multilocularis			Echinococcus spp., unspecified		
	All	M	F	All	M	F	All	M	F
<1 year	0	0	0	0	0	0	0	0	0
1 to 4 years	0	0	0	0	0	0	0	0	0
5 to 14 years	0	0	0	0	0	0	0	0	0
15 to 24 years	0	0	0	0	0	0	0	0	0
25 to 44 years	0	0	0	0	0	0	0	0	0
45 to 64 years	0	0	0	0	0	0	0	0	0
65 years and older	0	0	0	0	0	0	0	0	0
Age unknown	0	0	0	0	0	0	0	0	0
Total :	0	0	0	0	0	0	0	0	0

2.9.3 Echinococcus in animals

Table Echinococcus in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Region	Units tested	Total units positive for Echinococcus	E. granulosus	E. multilocularis
Cattle (bovine animals) - Slaughterhouse - Surveillance	1)							0			
Sheep - Slaughterhouse - Surveillance	2)							0			
Goats - Slaughterhouse - Surveillance	3)							0			
Pigs - Slaughterhouse - Surveillance	4)							0			
Solipeds, domestic - horses - Slaughterhouse - Surveillance	5)							0			
Reindeers - Slaughterhouse - Surveillance	6)							0			
Raccoon dogs	7)							0			
Dogs	8)							0			

	Echinococcus spp., unspecified
Cattle (bovine animals) - Slaughterhouse - Surveillance	1)
Sheep - Slaughterhouse - Surveillance	2)
Goats - Slaughterhouse - Surveillance	3)

Table Echinococcus in animals

		Echinococcus spp., unspecified
Pigs - Slaughterhouse - Surveillance	4)	
Solipeds, domestic - horses - Slaughterhouse - Surveillance	5)	
Reindeers - Slaughterhouse - Surveillance	6)	
Raccoon dogs	7)	
Dogs	8)	

Comments:

- 1) No sampling
- 2) No sampling
- 3) No sampling
- 4) No sampling
- 5) No sampling
- 6) No sampling
- 7) No sampling
- 8) No sampling

2.10 TOXOPLASMOSIS

2.10.1 General evaluation of the national situation

2.10.2 Toxoplasmosis in humans

A. Toxoplasmosis in humans

Reporting system in place for the human cases

Yes it is a reportable disease

Case definition

Yes the EU case definition

Diagnostic/analytical methods used

Serology - detection of antibodies

Notification system in place

Yes

Table Toxoplasma in humans - Species/serotype distribution

Species/serotype Distribution	Cases	Cases Inc.
Toxoplasma	0	0
Toxoplasma spp., unspecified	0	0
Congenital cases	0	0

Table Toxoplasma in humans - Age distribution

Age distribution	Toxoplasma spp., unspecified		
	All	M	F
<1 year	0	0	0
1 to 4 years	0	0	0
5 to 14 years	0	0	0
15 to 24 years	0	0	0
25 to 44 years	0	0	0
45 to 64 years	0	0	0
65 years and older	0	0	0
Age unknown	0	0	0
Total :	0	0	0

2.11 RABIES

2.11.1 General evaluation of the national situation

2.11.2 Rabies in humans

A. Rabies in humans

Reporting system in place for the human cases

Yes it is a reportable disease

Case definition

Yes the EU case definition

Notification system in place

Yes

History of the disease and/or infection in the country

Zero cases during the last decades

2.12 STAPHYLOCOCCUS INFECTION

2.12.1 General evaluation of the national situation

2.13 Q-FEVER

2.13.1 General evaluation of the national situation

2.14 WEST NILE VIRUS INFECTIONS

2.14.1 General evaluation of the national situation

2.14.2 West Nile Virus Infections in humans

A. West Nile Virus in Humans

Reporting system in place for the human cases

Yes

Case definition

The EU case definition

Notification system in place

Yes

History of the disease and/or infection in the country

Zero cases during the last decade

National evaluation of the recent situation, the trends and sources of infection

The vector for the virus does not exist within the country

Relevance as zoonotic disease

Low

3. INFORMATION ON SPECIFIC INDICATORS OF ANTIMICROBIAL RESISTANCE

3.1 ESCHERICHIA COLI, NON-PATHOGENIC

3.1.1 General evaluation of the national situation

3.1.2 Antimicrobial resistance in Escherichia coli, non-pathogenic

Table Cut-off values used for antimicrobial susceptibility testing of Escherichia coli, non-pathogenic in Animals

Test Method Used	Standard methods used for testing

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		16	
Amphenicols	Chloramphenicol		16	
Cephalosporins	Cefotaxime		0.25	
	Ceftazidime		0.5	
Fluoroquinolones	Ciprofloxacin		0.064	
Penicillins	Ampicillin		8	
Quinolones	Nalidixic acid		16	

Table Cut-off values used for antimicrobial susceptibility testing of *Escherichia coli*, non-pathogenic in Animals

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Sulfonamides	Sulfonamides		256	
	Sulfamethoxazole		64	
Tetracyclines	Tetracycline		8	
Trimethoprim	Trimethoprim		2	

Table Cut-off values used for antimicrobial susceptibility testing of *Escherichia coli*, non-pathogenic in Feed

Test Method Used		Standard methods used for testing		
			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		16	
Amphenicols	Chloramphenicol		16	
Cephalosporins	Cefotaxime		0.25	
	Ceftazidime		0.5	
Fluoroquinolones	Ciprofloxacin		0.064	
Penicillins	Ampicillin		8	
Quinolones	Nalidixic acid		16	
Sulfonamides	Sulfonamides		256	
	Sulfamethoxazole		64	
Tetracyclines	Tetracycline		8	
Trimethoprim	Trimethoprim		2	

Table Cut-off values used for antimicrobial susceptibility testing of Escherichia coli, non-pathogenic in Feed

Table Cut-off values used for antimicrobial susceptibility testing of Escherichia coli, non-pathogenic in Food

Test Method Used	Standard methods used for testing

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		16	
Amphenicols	Chloramphenicol		16	
Cephalosporins	Cefotaxime		0.25	
	Ceftazidime		0.5	
Fluoroquinolones	Ciprofloxacin		0.064	
Penicillins	Ampicillin		8	
Quinolones	Nalidixic acid		16	
Sulfonamides	Sulfonamides		256	
	Sulfamethoxazole		64	
Tetracyclines	Tetracycline		8	
Trimethoprim	Trimethoprim		2	

Table Cut-off values used for antimicrobial susceptibility testing of Escherichia coli, non-pathogenic in Food

3.2 ENTEROCOCCUS, NON-PATHOGENIC

3.2.1 General evaluation of the national situation

3.2.2 Antimicrobial resistance in Enterococcus, non-pathogenic isolates

Table Cut-off values for antibiotic resistance of E. faecalis in Animals

Test Method Used	Standard methods used for testing

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		32	
	Streptomycin		512	
Amphenicols	Chloramphenicol		32	
Fluoroquinolones	Ciprofloxacin		4	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin		4	
Macrolides	Erythromycin		4	
Oxazolidines	Linezolid		4	
Penicillins	Ampicillin		4	

Table Cut-off values for antibiotic resistance of *E. faecalis* in Animals

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Tetracyclines	Tetracycline		4	

Table Cut-off values for antibiotic resistance of E. faecalis in Feed

Test Method Used		Standard methods used for testing		
			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		32	
	Streptomycin		512	
Amphenicols	Chloramphenicol		32	
Fluoroquinolones	Ciprofloxacin		4	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin		4	
Macrolides	Erythromycin		4	
Oxazolidines	Linezolid		4	
Penicillins	Ampicillin		4	
Tetracyclines	Tetracycline		4	

Table Cut-off values for antibiotic resistance of E. faecalis in Food

Test Method Used		Standard methods used for testing		
			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		32	
	Streptomycin		512	
Amphenicols	Chloramphenicol		32	
Fluoroquinolones	Ciprofloxacin		4	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin		4	
Macrolides	Erythromycin		4	
Oxazolidines	Linezolid		4	
Penicillins	Ampicillin		4	
Tetracyclines	Tetracycline		4	

Table Cut-off values for antibiotic resistance of E. faecium in Animals

Test Method Used		Standard methods used for testing		
			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		32	
	Streptomycin		128	
Amphenicols	Chloramphenicol		32	
Fluoroquinolones	Ciprofloxacin		4	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin		4	
Macrolides	Erythromycin		4	
Oxazolidines	Linezolid		4	
Penicillins	Ampicillin		4	
Streptogramins	Quinupristin/Dalfopristin		1	
Tetracyclines	Tetracycline		4	

Table Cut-off values for antibiotic resistance of *E. faecium* in Feed

Test Method Used	Standard methods used for testing

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		32	
	Streptomycin		128	
Amphenicols	Chloramphenicol		32	
Fluoroquinolones	Ciprofloxacin		4	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin		4	
Macrolides	Erythromycin		4	
Oxazolidines	Linezolid		4	
Penicillins	Ampicillin		4	
Streptogramins	Quinupristin/Dalfopristin		1	
Tetracyclines	Tetracycline		4	

Table Cut-off values for antibiotic resistance of E. faecium in Food

Test Method Used		Standard methods used for testing		
			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		32	
	Streptomycin		128	
Amphenicols	Chloramphenicol		32	
Fluoroquinolones	Ciprofloxacin		4	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin		4	
Macrolides	Erythromycin		4	
Oxazolidines	Linezolid		4	
Penicillins	Ampicillin		4	
Streptogramins	Quinupristin/Dalfopristin		1	
Tetracyclines	Tetracycline		4	

4. INFORMATION ON SPECIFIC MICROBIOLOGICAL AGENTS

4.1 CRONOBACTER

4.1.1 General evaluation of the national situation

4.2 HISTAMINE

4.2.1 General evaluation of the national situation

A. Histamine General evaluation

History of the disease and/or infection in the country

No cases reported 2013.

National evaluation of the recent situation, the trends and sources of infection

Scromboid species like herring and mackerel are produced in Iceland. Rapid cooling on board vessel is effective quality and hygiene measures, chilling and the testing is verified under regular official control. assurance system. Surveys are performed occasionally. No survey in 2013. In former surveys the levels of histamine were under the detection limit.

Recent actions taken to control the hazard

Information to the FBO on preventive measures like rapid cooling and sampling for analysing of histamine (2073/2005) has been issued. The results are checked by inspectors in official control.

4.2.2 Histamine in foodstuffs

A. Histamine in foodstuffs

Monitoring system

Sampling strategy

No official sampling.

4.3 STAPHYLOCOCCAL ENTEROTOXINS

4.3.1 General evaluation of the national situation

A. Staphylococcal enterotoxins general evaluation

History of the disease and/or infection in the country

One food borne outbreak due to staphylococcal enterotoxins was reported 2013. The cause of the outbreak was a homemade meal.

4.3.2 Staphylococcal enterotoxins in foodstuffs

A. Staphylococcal enterotoxins in foodstuffs

Monitoring system

Sampling strategy

No official sampling.

5. FOODBORNE

Foodborne outbreaks are incidences of two or more human cases of the same disease or infection where the cases are linked or are probably linked to the same food source. Situation, in which the observed human cases exceed the expected number of cases and where a same food source is suspected, is also indicative of a foodborne outbreak.

A. Foodborne outbreaks

System in place for identification, epidemiological investigations and reporting of foodborne outbreaks

LCAs, the Food and Veterinary authority (MAST) shall inform the chief epidemiologist immediately if they become aware of a risk of infections. Laboratories detecting zoonosis in food should report to MAST. Physicians and laboratories analysing human samples are required, according to article 3 in the Act on Health Security and Communicable Diseases no. 1997/19 to report notifiable diseases and diseases subject to registration to the the Chief epidemiologist. The Chief epidemiologist monitor the data and shall report suspected foodborne outbreaks to MAST and the relevant LCAs. MAST, chief epidemiologist and LCA if relevant work together in investigations of food borne outbreak. The chief epidemiologist is responsible for epidemiological investigation of humans and MAST is responsible investigation of animals, food, FBO and coordination of the relevant LCAs.

Description of the types of outbreaks covered by the reporting:

All suspected foodborne outbreaks are notifiable. The definition of a foodborne outbreak is two or more human cases with the same infection where the cases are linked or are probably linked to the same food source, or when observed number of human cases exceeds the expected number of cases during the same time period and place, and food is a likely vehicle.

National evaluation of the reported outbreaks in the country:

Trends in numbers of outbreaks and numbers of human cases involved

Food borne outbreaks of domestic origin are very few (1-5) each year. The situation has been stable the past 10 years.

Table Foodborne Outbreaks: summarised data

	Weak evidence or no vehicle outbreaks				Strong evidence Number of Outbreaks	Total number of outbreaks
	Number of outbreaks	Human cases	Hospitalized	Deaths		
Salmonella - S. Typhimurium	1	3	0	0	0	1
Salmonella - S. Enteritidis	0	unknown	unknown	unknown	0	0
Salmonella - Other serovars	0	unknown	unknown	unknown	0	0
Campylobacter	0	unknown	unknown	unknown	0	0
Listeria - Listeria monocytogenes	0	unknown	unknown	unknown	0	0
Listeria - Other Listeria	0	unknown	unknown	unknown	0	0
Yersinia	0	unknown	unknown	unknown	0	0
Escherichia coli, pathogenic - Verotoxigenic E. coli (VTEC)	0	unknown	unknown	unknown	0	0
Bacillus - B. cereus	0	unknown	unknown	unknown	0	0
Bacillus - Other Bacillus	0	unknown	unknown	unknown	0	0
Staphylococcal enterotoxins	1	17	1	0	0	1
Clostridium - Cl. botulinum	0	unknown	unknown	unknown	0	0
Clostridium - Cl. perfringens	1	14	0	0	0	1

	Weak evidence or no vehicle outbreaks				Strong evidence Number of Outbreaks	Total number of outbreaks
	Number of outbreaks	Human cases	Hospitalized	Deaths		
Clostridium - Other Clostridia	0	unknown	unknown	unknown	0	0
Other Bacterial agents - Brucella	0	unknown	unknown	unknown	0	0
Other Bacterial agents - Shigella	0	unknown	unknown	unknown	0	0
Other Bacterial agents - Other Bacterial agents	0	unknown	unknown	unknown	0	0
Parasites - Trichinella	0	unknown	unknown	unknown	0	0
Parasites - Giardia	0	unknown	unknown	unknown	0	0
Parasites - Cryptosporidium	0	unknown	unknown	unknown	0	0
Parasites - Anisakis	0	unknown	unknown	unknown	0	0
Parasites - Other Parasites	0	unknown	unknown	unknown	0	0
Viruses - Norovirus	0	unknown	unknown	unknown	0	0
Viruses - Hepatitis viruses	0	unknown	unknown	unknown	0	0
Viruses - Other Viruses	0	unknown	unknown	unknown	0	0
Other agents - Histamine	0	unknown	unknown	unknown	0	0
Other agents - Marine biotoxins	0	unknown	unknown	unknown	0	0
Other agents - Other Agents	0	unknown	unknown	unknown	0	0

Unknown agent

Weak evidence or no vehicle outbreaks				Strong evidence Number of Outbreaks	Total number of outbreaks
Number of outbreaks	Human cases	Hospitalized	Deaths		
0	unknown	unknown	unknown	0	0