European Food Safety Authority

ZOONOSES MONITORING

SWITZERLAND

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

TRENDS AND SOURCES OF ZOONOSES AND ZOONOTIC AGENTS IN HUMANS, FOODSTUFFS, ANIMALS AND FEEDINGSTUFFS

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: Switzerland

Reporting Year: 2013

Laboratory name	Description	Contribution
SFVO	Swiss Federal Veterinary Office	Swiss Zoonoses Report
SFOPH	Swiss Federal Office of public health	Foodborne outbreaks, Swiss Zoonoses Report
ZOBA	Centre for Zoonoses, Bacterial Animal Diseases Antimicrobial Resistance at Institute of Veterinary Bacteriology, Vetsuisse Faculty, University of Bern	National Reference Laboratory for Brucellosis, Salmonellosis, Campylobacteriosis, Listeriosis, Yersiniosis, Tularämia, Antimicrobial Resistance
ILS	Institute for Food Safety and Hygiene , Vetsuisse Faculty University of Zurich	National Reference Laboratory for STEC, enteropathogenic bacteria
IVB	Institute of Veterinary Bacteriology Vetsuisse Faculty University of Zurich	National Reference Laboratory for Coxiellosis, Tuberculosis
IPB	Institute of Parasitology, Vetsuisse Faculty and Faculty of Medicine University of Bern	National Reference Laboratory for Trichinellosis, Toxoplasmosis
SRC	Swiss Rabies Center at the Institute of Veterinary Virology, Vetsuisse Faculty University of Bern	National Reference Laboratory for Rabies
IPZ	Institute of Parasitology, Vetsuisse Faculty University of Zurich	National Reference Laboratory for Echinococcosis
ALP	Research Station Agroscope Liebefeld-Posieux	Official feed inspection service and Listeria Monitoring
IVI	Institute for Virology and Immunology	National Reference Laboratory for West Nil Fever

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 Switzerland 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.

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* 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

Living animals and herds: Coordinated census of agriculture. Swiss federal office of agriculture and Swiss federal office of statistics.
Slaughtered animals: Official meat inspection statistics (FSVO) and monthly agricultural statistics (Swiss Farmer's Federation).

Dates the figures relate to and the content of the figures

Number of animals held in farms in Switzerland in 2013 (data status May 2014). Number of animals slaughtered in the year 2013.

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

The indicated number of holdings is identical to the number of farms holding respective species. Agriculture census counts the number of farms. Farms with more than one holding per species are rare in Switzerland.

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

In general, the number of animal holdings decreased compared to the previous year (by 5.9% in pigs, 2.7% in sheep , 2.6% in cattle and 1.0 in goats).
Numbers of holdings with breeding hens have a large fluctuation due to a large number of very small flocks on farms which are counted in agricultural census. 33 holdings with more than 100 breeding hens keep 91% of all breeding hens. The number of holdings with laying hens increased by 1.1% whereas the number of holdings with broilers decreased by 1.7%. Over 90% of poultry meat is produced by 4 major meat producing companies.

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

Average size of the farms in 2013: 40 cattle, 193 pigs, 46 sheep, 14 goats, 211 laying hens, 6033 broilers.

Additional information

Day-old chicks and hatching eggs are imported on a large scale and reared in Switzerland. In 2013 the numbers increased compared to 2012: about 349'216 day-old chicks and 32.3 million fertilized eggs of the broiler type were imported. Exporting countries were mainly Germany, the Netherlands and France.

Table Susceptible animal populations

* Only if different than current reporting year

		Number of herds or flocks		Number of slaughtered animals		Livestock numbers (live animals)		Number of holdings	
Animal species	Category of animals	Data	Year*	Data	Year*	Data	Year*	Data	Year*
Cattle (bovine animals)	- in total			647105		1560293		39161	
Gallus gallus (fowl)	breeding flocks, unspecified - in total					167568		1298	
	laying hens					3547181		16814	
	broilers			60929365		6377308		1057	
Goats	- in total			31242		83475		5816	
Pigs	- in total			2680276		1487136		7692	
Sheep	- in total			218362		403934		8784	
Solipeds, domestic	horses - in total			3195		55732		8514	
Turkeys	- in total					58646		292	

Footnote:

The number of slaughtered turkeys is not available. In 2013, 1457 tons of turkey meat were produced.

2. INFORMATION ON SPECIFIC ZOONOSES 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

Salmonellosis in humans is notifiable (ordinance of the FDHA on doctor and laboratory reports). In the 80s Salmonellosis in humans was the most reported food borne disease. After reaching a peak in 1992 with 113 reports per 100,000 inhabitants the incidence declined steadily and in 1995 Campylobacteriosis took over to be the most reported food borne disease. Since 2003 the incidence of Salmonellosis was never over 30.0 reports per 100,000 inhabitants. S. Enteritidis was the most frequently isolated serovar followed by S. Typhimurium.

From 2002 until 2009 cheese production in cheese-making facilities was officially sampled and monitored for Salmonella in a national surveillance programme. As since 2004 no Salmonella were detected, the official testing on Salmonella in dairy products was stopped in 2009.

In 2007 a study in broiler meat at retail showed that Salmonella prevalence was low in Swiss products (0.4% compared to 15.3% within imported products). In 2008 a baseline study of Salmonella spp. in broiler carcasses resulted in a Salmonella prevalence of 2.6%.

From 1995 until 2006 the infection of chicken with S. Enteritidis was notifiable and a control programme for S. Enteritidis was in place for breeding flocks and laying hen flocks (TSV, Article 255-261). During this period the incidence of S. Enteritidis infection in breeding and laying hen flocks steadily declined from 38 to 3 infected flocks per year. Since 2007 Salmonella infection in poultry and pigs is notifiable according to the regulation 2160/2003 of the European community. The control programme covers the detection of S. Enteritidis and S. Typhimurium including it's monophasic variant S. enterica serovar 4,[5],12:i:- in breeding flocks with over 250 places, laying hen flocks with over 1000 places, broiler flocks with over 5000 places and turkey flocks with over 500 places. For breeding flocks S. Hadar, S. Virchow and S. Infantis are included additionally. Since 2007, no more than 5 cases per year in poultry were reported. Most cases covered by the control programme occurred in laying hens. In broiler chickens many different Salmonella serotypes were detected, controlled serovars were found one each in 2010 and 2011. The first and only case in breeding flocks (S. Enteritidis) in the control programme was found in 2012.

Baseline studies were carried out in 2005 – 2008 resulting in the following prevalence estimates: in laying hens 1.3 % (3 of 235 flocks; 2006), in broilers 0.3% (1 of 299 flocks; 2007), in slaughter pigs 2.3% (14 of 615; 2007) and in breeding pigs 13.0% (29 of 223; 2008). In laying hens and broilers all isolates were either S. Enteritidis or S. Typhimurium. In slaughter pigs 60% and in breeding pigs 27% of the detected serovars were S. Enteritidis or S. Typhimurium - proving again the presence of these two serovars in the pig population. The prevalence in slaughter pigs in 2007 was equal as in previous research studies. As breeding pigs have not been addressed before the prevalence obtained 2008 cannot be compared with previous data.

Furthermore, Salmonellosis is notifiable in all animals and regularly reported. In the past 10 years (2004-2013) 657 salmonellosis cases were recorded by cantonal veterinarians ranging between 49 and 83 cases per year. 45% occurred in cows, 31% in reptiles, 20% in dogs/cats and 6% in sheep.

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

1'271 cases in humans were reported in 2013, which represents a notification rate of 15.7 cases per 100'000 inhabitants (2012: 1242 cases or 15.5/100'000). The Salmonella cases have stagnated at this level since 2009. As in previous years the most affected age group were children under 5 years

Also 2013 the typical seasonal increase of notifications in the summer and autumn months occurred and the most frequently reported serovars were S. Enteritidis (28%), S. Typhimurium (16%) and the monophasic strain 4,12:i:- (16%).
In 2013, 2 cases (S. Enteritidis (1x) and S. Typhimurium (1x)) of salmonella infection were detected in the framework of the control programme in poultry flocks. Both cases occurred in laying hens > 1000 places. In the latter 1 further suspect case was found for S. Enteritidis / S. Typhimurium, which could not be confirmed in animal samples. Serovars which are not covered in the control programme were detected as follows: in laying hen flocks > 1000 places S. Infantis (2x) and S. Montevideo/ S. enterica subsp. diarizonae (1x) ; in broiler flocks > 5000 places [13,23:i:- (monophasic)] (2x), S. Rissen (1x), S. Livingston (1x), S. Kisarawe (1x), S. Mbandaka (1x); in turkey flock > 500 places S. Indiana (1x).
Outside from the control programme, two further very small laying hen flocks (12 and 140 animals, respectively) were tested positive for S. Typhimurium.
2013, 72 salmonellosis cases in animals were reported. Affected were as usually mainly cows (27x), reptiles (24x) and dogs/cats (11x). The number of reports rose to the level of the years 2009/2010. Compared to 2012, the cases rose mainly in cattle.
In veterinary diagnostic laboratories 4830 tests for salmonellosis were carried out in the context of clinical investigations, mainly in cattle (46%) and dogs/cats (35%), followed by horses (4%), pigs (3%) and birds (3%). According to the rise in the case reports, the number of positive findings in cattle rose as well. As the total number of cattle tested remained more or less the same as in 2012, salmonellosis in cattle seems to have increased slightly. Serovars found in cattle are mainly S. Typhimurium and it's monophasic variant 4,12:i:-.
To examine Swiss raw milk quality, 601 samples of farm bulk milk were examined for the presence of Salmonella at the research station Agroscope Liebefeld-Posieux (ALP) in 2013. The representative sampling involved 150 farm milk producers in 5 regions of Switzerland. No Salmonella were detected.

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

The longstanding S. Enteritidis control programme showed its effect in the decline of human cases. However, salmonellosis is still the second most frequent zoonosis in Switzerland with stagnation in numbers of cases since 2009. It remains unclear to what extent pigs and cattle play a role as source of infection for humans. Stepping up and expanding the national control programme might be needed in order to further reduce human salmonellosis cases.

Recent actions taken to control the zoonoses

Control measures were implemented in breeding flocks according to Commission Regulation (EC) No. 200/2010, in laying hen flocks according to Commission Regulation (EC) No. 517/2011, in broilers according to Commission Regulation (EC) No. 200/2012 and in turkeys according to Commission Regulation (EC) No. 1190/2012.
The Hygiene Ordinance lays down limits for Salmonella in various foods. If these limits are exceeded, the cantonal laboratories are required to report this to the FSVO. The foods affected are confiscated and destroyed. Depending on the situation, the products may be recalled, and a warning is issued to the population.
All larger cheese manufacturers have a hygiene management system in place that conforms to ISO 9000.

Additional information

1. In a S. Kentucky study conducted in 2010 (Bonalli et al.) 106 human S. Kentucky strains, isolated from patients between 2004 and 2009, were genotyped using PFGE. There was some evidence of a non-recognised outbreak of S. Kentucky in 2006. Travels to North Africa were a risk factor for S. Kentucky infection [Bonalli, M., Stephan, R., Käppeli, U., Cernela, N., Adank, L., Hächler, H. Salmonella enterica serotype Kentucky associated with human infections in Switzerland: genotype and resistance trends 2004-2009, International Food Research (May 2011)].
2. The industry takes responsibility for the monitoring of poultry meat production in a system of self-

auditing following the HACCP principles. Results of the Salmonella monitoring of the largest poultry producers and abattoirs are available covering more than 92% of the production. Samples are taken several times a year at random. Fresh poultry meat, poultry meat preparations and poultry meat products were tested at different stages such as slaughterhouse, cutting plant and processing plant. No imported meat samples were included in the data analysis. In total 3636 tests were done in 2013 (including 71% single samples and 29% batch-related). 50 (1%) of the 3636 samples proved positive for Salmonella spp. (S. Infantis (28x), S. Braederup (4x), S. Mbandaka (1x), Agona (1x), Salmonella spp. (16x)). 37 of the 50 (74%) positive samples were batch samples.

3. The FSVO runs a border inspection programme in which risked-based random samples are taken from commodities from third countries. As commodities from third countries can only be inspected at the airports and because this mode of importation is quite expensive not many samples can be tested. In 2013, 13 raw fish samples from Vietnam, 7 ready to eat fish products from Vietnam, Indonesia and Thailand and 27 fresh beef meat samples from South America and the United States were tested negative for Salmonella.

4. Further information can be found on the FSVO website www.blv.admin.ch.

2.1.2 Salmonellosis in humans

Table Salmonella in humans - Species/serotype distribution

Species/serotype Distribution	Cases	Cases Inc.	Autochthon cases	Autochthon Inc.	Imported cases	Imported Inc.	Unknown status
Salmonella	1271	15.5	0	0	0	0	1271
S. Enteritidis	358	4.4					358
S. Typhimurium	200	2.5					200
S. Infantis	26	0.3					26
Other serovars	272	3.4					272
S. Paratyphi B	10	0.1					10
S. Szentes	10	0.1					10
S. Newport	20	0.2					20
S. Kentucky	18	0.2					18
S. Species	31	0.4					31
S. 4,12:-:-	203	2.5					203
S. Virchow	22	0.3					22
S. Rissen	12	0.1					12
S. Derby	11	0.1					11
S. Saintpaul	11	0.1					11
S. 4,12:b:-	11	0.1					11
S. Stanley	39	0.5					39
S. Napoli	17	0.2					17

Table Salmonella in humans - Species/serotype distribution

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	8	4	4	2	2	0	34	20	14
1 to 4 years	51	23	28	30	18	12	90	51	39
5 to 14 years	51	25	26	36	26	10	68	40	28
15 to 24 years	62	26	35	29	16	13	116	51	65
25 to 44 years	67	37	30	28	14	14	145	82	63
45 to 64 years	57	31	26	41	22	18	149	80	69
65 years and older	62	31	31	34	13	21	111	54	57
Total :	358	177	180	200	111	88	713	378	335

Table Salmonella in humans - Seasonal distribution

Seasonal Distribution Months	S. Enteritidis Cases	S. Typhimurium Cases	Salmonella spp. Cases
January	16	20	52
February	26	9	40
March	16	15	33
April	26	20	46
May	32	10	47
June	21	15	51
July	22	12	58
August	81	26	110
September	31	22	80
October	52	24	76
November	22	20	82
December	13	7	38
Total :	358	200	713

2.1.3 Salmonella in foodstuffs

A. Salmonella spp. in broiler meat and products thereof

Preventive measures in place

The Hygiene Ordinance lays down limits for Salmonella in various foods. If these limits are exceeded, the cantonal laboratories are required to report this to the FSVO. The foods affected are confiscated and destroyed. Depending on the situation, the products may be recalled, and a warning is issued to the population.

Results of the investigation

In the framework of the self auditing system of the poultry meat industry 3448 samples of broiler meat were tested for Salmonella in 2013. 45 of 3448 (1.3%) were Salmonella spp. positive (S. Infantis (28x), S. Braederup (4x), S. Mbandaka (1x), S. Agona (1x), Salmonella spp. (11x)). Most positives samples (34 (=75%)) were neck skin samples taken at the slaughterhouse. Others were fresh broiler meat (6x), meat preparations (4x) and mechanically separated broiler meat (1x).

B. Salmonella spp. in turkey meat and products thereof

Preventive measures in place

The Hygiene Ordinance lays down limits for Salmonella in various foods. If these limits are exceeded, the cantonal laboratories are required to report this to the FSVO. The foods affected are confiscated and destroyed. Depending on the situation, the products may be recalled, and a warning is issued to the population.

Results of the investigation

In the framework of the self auditing system of the poultry meat industry 188 samples of turkey meat were tested for Salmonella in 2013. 5 of 188 (3%) were Salmonella spp. positive (serovars unknown). All 5 positive samples were mechanically separated turkey meat.

C. Salmonella spp., unspecified in Food All foodstuffs - at border control - Monitoring

Monitoring system

Sampling strategy

The FVO runs a border inspection programme in which risked-based random samples are taken from commodities imported from third countries. As commodities from third countries can only be inspected at the airports and because this mode of importation is quite expensive not many samples can be tested.

Results of the investigation

In 2013, 13 raw fish samples from Vietnam, 7 ready to eat fish products from Vietnam, Indonesia and Thailand and 27 fresh beef meat samples from South America and the United States were tested negative for Salmonella.

D. Salmonella in Food Dairy products, unspecified - Monitoring

Monitoring system

Sampling strategy

2007 a Listeria Monitoring Programme (LMP) was set up by ALP. Products are tested for Listeria as part of quality assurance programmes. As part of an ongoing additional study within the LMP the prevalence of various pathogenic organisms is evaluated to examine Swiss raw milk quality. In 2013 601 samples of farm bulk milk were examined for the presence of Salmonella. The representative sampling involved 150 farm milk producers in 5 regions of Switzerland.

Preventive measures in place

It is the responsibility of the producers to implement a hygiene concept that guarantees the safety of their products. The Hygiene Ordinance lays down limits for Salmonella in various foods. If these limits are exceeded, the cantonal laboratories are required to report this to the FSVO. The foods affected are confiscated and destroyed. Depending on the situation, the products may be recalled, and a warning is issued to the population. All the larger cheese manufacturers have a hygiene management system in place that conforms to ISO 9000.

Results of the investigation

All 601 bulk milk samples tested negative for Salmonella.

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	FSVO	Unspecified	HACCP and own checks	food sample > neck skin	Domestic	Single	25g	16	0		
Meat from broilers (Gallus gallus) - carcase - Slaughterhouse	FSVO	Unspecified	HACCP and own checks	food sample > neck skin	Domestic	Batch	25g	840	34		
Meat from broilers (Gallus gallus) - fresh - Cutting plant	FSVO	Unspecified	HACCP and own checks	food sample > meat	Domestic	Single	25g	302	2		
Meat from broilers (Gallus gallus) - fresh - Processing plant	FSVO	Unspecified	HACCP and own checks	food sample > meat	Domestic	Batch	25g	39	0		
Meat from broilers (Gallus gallus) - fresh - Processing plant	FSVO	Unspecified	HACCP and own checks	food sample > meat	Domestic	Single	25g	338	1		
Meat from broilers (Gallus gallus) - fresh - Slaughterhouse	FSVO	Unspecified	HACCP and own checks	food sample > meat	Domestic	Single	25g	221	3		
Meat from broilers (Gallus gallus) - meat preparation - Processing plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	346	1		
Meat from broilers (Gallus gallus) - meat preparation - Processing plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Batch	25g	131	3		
Meat from broilers (Gallus gallus) - meat products - cooked, ready-to-eat - Processing plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	599	0		
Meat from broilers (Gallus gallus) - mechanically separated meat (MSM) - Cutting plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	380	1		
Meat from broilers (Gallus gallus) - minced meat - Cutting plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Batch	25g	1	0		
Meat from broilers (Gallus gallus) - minced meat - Processing plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	235	0		

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 turkey - carcase - Slaughterhouse	FSVO	Unspecified	HACCP and own checks	food sample > neck skin	Domestic	Single	25g	8	0		
Meat from turkey - carcase - Slaughterhouse	FSVO	Unspecified	HACCP and own checks	food sample > neck skin	Domestic	Batch	10g	27	0		
Meat from turkey - fresh - Cutting plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	49	0		
Meat from turkey - meat preparation - Processing plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	8	0		
Meat from turkey - mechanically separated meat (MSM) - Cutting plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	95	5		
Meat from turkey - minced meat - Cutting plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	1	0		

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified	S. Agona	S. Braenderup	S. Infantis	S. Mbandaka
Meat from broilers (Gallus gallus) - carcase - Slaughterhouse						
Meat from broilers (Gallus gallus) - carcase - Slaughterhouse		2		4	28	
Meat from broilers (Gallus gallus) - fresh - Cutting plant		2				
Meat from broilers (Gallus gallus) - fresh - Processing plant						
Meat from broilers (Gallus gallus) - fresh - Processing plant		1				

Table Salmonella in poultry meat and products thereof

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified	S. Agona	S. Braenderup	S. Infantis	S. Mbandaka
Meat from broilers (Gallus gallus) - fresh - Slaughterhouse		3				
Meat from broilers (Gallus gallus) - meat preparation - Processing plant						1
Meat from broilers (Gallus gallus) - meat preparation - Processing plant		3				
Meat from broilers (Gallus gallus) - meat products - cooked, ready-to-eat - Processing plant						
Meat from broilers (Gallus gallus) - mechanically separated meat (MSM) - Cutting plant			1			
Meat from broilers (Gallus gallus) - minced meat - Cutting plant						
Meat from broilers (Gallus gallus) - minced meat - Processing plant						
Meat from turkey - carcase - Slaughterhouse						
Meat from turkey - carcase - Slaughterhouse						
Meat from turkey - fresh - Cutting plant						
Meat from turkey - meat preparation - Processing plant						
Meat from turkey - mechanically separated meat (MSM) - Cutting plant		5				
Meat from turkey - minced meat - Cutting plant						

Table Salmonella in poultry meat and products thereof

Table Salmonella in milk and dairy products

	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
Milk, cows' - raw milk for manufacture - intended for manufacture of raw or low heat-treated products - Processing plant - Surveillance [1)]	ALP	Selective sampling	Industry sampling	food sample > milk	Domestic	Batch	25g	601	0		

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Milk, cows' - raw milk for manufacture - intended for manufacture of raw or low heat-treated products - Processing plant - Surveillance [1)]		

Comments:

[1)] bulk milk samples

Footnote:

ALP = Agroscope Liebefeld Research Institute, 3003 Bern

Table Salmonella in other food

	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
Fish - raw - Border inspection activities - Monitoring [1)]	FSVO	Selective sampling	Official sampling	food sample	Imported from outside EU	Single	25g	13	0		
Fishery products, unspecified - ready-to-eat - Border inspection activities - Monitoring [2)]	FSVO	Selective sampling	Official sampling	feed sample	Imported from outside EU	Single	25g	7	0		

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Fish - raw - Border inspection activities - Monitoring [1)]		
Fishery products, unspecified - ready-to-eat - Border inspection activities - Monitoring [2)]		

Comments:

[1)] Samples originated from Vietnam.

[2)] Samples originated from Vietnam, Thailand and Indonesia.

Footnote:

The FSVO runs a border inspection programme in which risked-based random samples are taken from commodities from third countries. As commodities from third countries can only be inspected at the airports and because this mode of importation is quite expensive not many samples can be tested.

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 bovine animals - fresh - chilled - Border inspection activities - Monitoring [1)]	FSVO	Selective sampling	Official sampling	food sample > meat	Imported from outside EU	Single	25g	27	0		

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Meat from bovine animals - fresh - chilled - Border inspection activities - Monitoring [1)]		

Comments:

[1)] Samples originated from South America.

Footnote:

The FSVO runs a border inspection programme in which risked-based random samples are taken from commodities from third countries. As commodities from third countries can only be inspected at the airports and because this mode of importation is quite expensive not many samples can be tested.

2.1.4 Salmonella in animals

A. Salmonella spp. in Gallus Gallus - breeding flocks

Vaccination policy

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

Vaccination is prohibited.

Control program/mechanisms

The control program/strategies in place

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

Control measures are taken according to the Swiss ordinance of epizootics (TSV, Article 255-261) and Commission Regulation (EC) No. 200/2010. Since 2007, the control programme covers breeding holdings with more than 250 places. Salmonella serotypes S. Enteritidis, S. Typhimurium including it's monophasic variant 4,12:i:-, S. Hadar, S. Infantis and S. Virchow are subject to state control measures.

Measures in case of the positive findings or single cases

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

If Salmonella serotypes subject to control measures are detected in the environment, there is a suspicion of Salmonella infection. In the event of a suspected infection, the official veterinarian samples 20 killed animals or fallen stock per flock and submits the meat and organs to bacteriological testing for Salmonella. If S. Enteritidis, S. Typhimurium including it's monophasic variant 4,12:i:-, S. Hadar, S. Infantis and/or S. Virchow are detected in the animal samples, a case of Salmonella infection is reported. In this case animal movements from this holding are prohibited (Article 69 TSV) in order to prevent spread of disease. The quarantined flocks must not be changed either by moving animals to other flocks or by introducing animals from other flocks. In breeding flocks the animals are killed and the eggs are no longer allowed to be used for breeding purposes. The quarantine conditions are lifted when all animals have been killed and the premises were cleaned, disinfected and freedom from Salmonella of the premises by means of bacteriological testing was proven.

Notification system in place

Salmonella infection in poultry (TSV, Art. 4 (disease to be controlled) and Article 255-261) is notifiable.

Results of the investigation

In 2013 no cases or suspect cases in breeding flocks occurred, neither in the framework of the control programme nor in smaller herds.

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

Since 2007 - when the control programme started - the first and only Salmonella positive breeding flock was detected in 2012. It is assumed, that this was a rare event and that the Salmonella situation in breeding flocks in Switzerland is very good.

Additional information

Further information can be found on the FSVO website www.blv.admin.ch.

B. Salmonella spp. in Gallus Gallus - broiler flocks

Vaccination policy

Broiler flocks

Vaccination is prohibited.

Control program/mechanisms

The control program/strategies in place

Broiler flocks

Since 01.01.2009 control measures in broiler flocks are taken according to the Swiss ordinance of epizootics (TSV, Article 255-261) and Commission Regulation (EC) No. 200/2012. The national control programme covers broiler flocks on farms with at least 5000 places. Salmonella serotypes S. Enteritidis and S. Typhimurium including it's monophasic variant 4,12:i:- are subject to state control measures.

Measures in case of the positive findings or single cases

Broiler flocks: Before slaughter at farm

If Salmonella serotypes subject to control measures are detected in the environment, there is a suspicion of Salmonella infection. In the event of a suspected infection, the official veterinarian samples 20 killed animals or fallen stock per flock and submits the meat and organs to bacteriological testing for Salmonella. If S. Enteritidis and/or S. Typhimurium including it's monophasic variant 4,12:i:- are detected in the animal samples, a case of Salmonella infection is reported. In this case animal movements from this holding are prohibited (TSV, Article 69) in order to prevent spread of disease. The quarantined flocks must not be changed either by moving animals to other flocks or by introducing animals from other flocks. The infected flocks must be slaughtered or culled. Fresh meat has to be disposed of or subjected to treatment in order to destroy the Salmonella before being marketed as food. The quarantine conditions are lifted when all animals have been culled or slaughtered and the premises were cleaned, disinfected and freedom from Salmonella of the premises by means of bacteriological testing was proven.

Notification system in place

Salmonella infection in broilers (TSV, Art. 4 (disease to be controlled) and Article 255-261) is notifiable.

Results of the investigation

In 2013 there was no broiler flock positive for a serovar covered by the target. 6 broiler flocks were tested positive for other Salmonella serovars [13,23:i:- (monophasic) (2x), S. Rissen (1x), S. Livingston (1x), S. Kisarawe (1x), S. Mbandaka (1x)].

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

The results of the control programme show that the Salmonella prevalence in broilers in Switzerland is low. Only one case each in 2010 and 2011 were detected in the framework of the control programme since 2007. Switzerland wants to maintain the current situation by applying the aforementioned control measures.

Additional information

Further information can be found on the FSVO website www.blv.admin.ch.

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

Vaccination policy

Laying hens flocks

Vaccination is prohibited.

Control program/mechanisms

The control program/strategies in place

Laying hens flocks

Control measures are taken according to the Swiss ordinance of epizootics (TSV, Article 255-261) and Commission Regulation (EC) No. 517/2011. The control programme covers all laying hen flocks on farms with at least 1000 places. S. Enteritidis and S. Typhimurium including it's monophasic variant 4,12:i:- are subject to state control measures.

Measures in case of the positive findings or single cases

Laying hens flocks

If Salmonella serotypes subject to control measures are detected in the environment, there is a suspicion of Salmonella infection. In the event of a suspected infection, the official veterinarian samples 20 killed animals or fallen stock per flock and submits the meat and organs to bacteriological testing for Salmonella. If S. Enteritidis and/or S. Typhimurium including it's monophasic variant 4,12:i:- are detected in the animal samples, a case of Salmonella infection is reported. In this case animal movements from this holding are prohibited (Article 69 TSV) in order to prevent spread of disease. The quarantined flocks must not be changed either by moving animals to other flocks or by introducing animals from other flocks. The infected flocks must be slaughtered or culled. Fresh meat and eggs either have to be disposed of or subjected to treatment in order to destroy the Salmonella before being marketed as food. The quarantine conditions are lifted when all animals have been culled or slaughtered and the premises were cleaned, disinfected and freedom from Salmonella of the premises by means of bacteriological testing was proven.

Notification system in place

Salmonella infection in laying hens (TSV, Art. 4 (disease to be controlled) and Article 255-261) is notifiable.

Results of the investigation

In 2013 2 laying hen flocks were tested positive for a Salmonella serovar covered by the target (S. Typhimurium (1x), S. Enteritidis (1x)). One further suspect of S. Typhimurium/ S. Enteritidis was noted which could not be confirmed in animal samples. Serovars which are not covered in the control programme in laying hen flocks > 1000 places were detected in three flocks [S. Infantis (2x) and S. Montevideo/S. enterica subsp. diarizonae (1x)].

Outside the control programme two further, very small laying hen flocks (12 and 140 animals, respectively) were tested positive for S. Typhimurium.

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

The prevalence of Salmonella spp. in flocks of laying hens in Switzerland is low. No more than 4 cases of Salmonella infection in laying hens per year are reported which is in concordance with the 1,3% prevalence estimate from the baseline study in 2006. The slightly higher detection of S. Enteritidis in environmental samples in laying hen flocks in 2012 could no longer be observed in 2013.

Additional information

Further information can be found on the FSVO website www.blv.admin.ch.

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

Vaccination policy

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

Vaccination is prohibited.

Meat production flocks

Vaccination is prohibited.

Control program/mechanisms

The control program/strategies in place

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

Control measures are taken according to the Swiss ordinance of epizootics (TSV, Article 255-261) and Commission Regulation (EC) No. 1190/2012. The control programme covers all flocks of turkeys on farms with at least 500 places. S. Enteritidis and S. Typhimurium including it's monophasic variant 4,12:i:- are subject to state control measures.

Measures in case of the positive findings or single cases

If Salmonella serotypes subject to control measures are detected in the environment, there is a suspicion of Salmonella infection. In the event of a suspected infection, the official veterinarian samples 20 killed animals or fallen stock per flock and submits the meat and organs to bacteriological testing for Salmonella. If S. Enteritidis and/or S. Typhimurium including it's monophasic variant 4,12:i:- are detected in the animal samples, a case of Salmonella infection is reported. In this case animal movements from this holding are prohibited (TSV, Article 69) in order to prevent spread of disease. The quarantined flocks must not be changed either by moving animals to other flocks or by introducing animals from other flocks. The infected flocks must be slaughtered or culled. Fresh meat has to be disposed of or subjected to treatment in order to destroy the Salmonella before being marketed as food. The quarantine conditions are lifted when all animals have been culled or slaughtered and the premises were cleaned, disinfected and freedom from Salmonella of the premises by means of bacteriological testing was proven.

Notification system in place

Salmonella infection in turkeys (TSV, Art. 4 (disease to be controlled) and Article 255-261) is notifiable.

Results of the investigation

In 2013 one flock of turkeys was tested positive for Salmonella (S. Indiana (1x)). Thus, there were no positive flocks for a serovar covered by the target.

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

As there are not many turkey flocks and Salmonella did not appear to be a specific problem in turkeys in Switzerland, the baseline study on the prevalence of Salmonella in turkey flocks was not conducted. The results of the control programme in the recent years showed that the target of the control programme can be reached.

Additional information

Further information can be found on the FSVO website www.blv.admin.ch.

E. Salmonella in Animals All animals

Control program/mechanisms

The control program/strategies in place

There is a passive surveillance in place: animal keepers, livestock inspectors, AI technicians, animal health advisory services, meat inspectors, abattoir personnel, police and customs officers have to report any suspected case of salmonellosis in animals to a veterinarian. If Salmonella are confirmed by a diagnostic laboratory, this must be reported to the cantonal veterinarian. Cases in cows, goats or dairy sheep must be reported to the cantonal health and food safety authorities.

Measures in case of the positive findings or single cases

If biungulates are affected, the sick animals must be isolated and the whole herd and the environment must be tested. Healthy animals from this herd may be slaughtered with a special official permit and subject to appropriate precautions at the abattoir. Milk from animals that are excreting Salmonella must not be used for human consumption and may only be used as animal feed after pasteurisation or boiling. If the disease occurs in animals other than biungulates, appropriate action must likewise be taken to prevent any risk to humans.

Notification system in place

Salmonellosis in animals is notifiable (TSV, Art. 4: diseases to be controlled) and Article 222-227).

Results of the investigation

2013, 72 salmonellosis cases in animals were reported. Affected were as usually mainly cows (27x), reptiles (24x) and dogs/cats (11x).
In veterinary diagnostic laboratories 4830 antigen tests for salmonellosis were carried out in the context of clinical investigations in 2013, mainly in cattle (46%) and dogs/cats (35%), followed by horses (4%), pigs (3%) and birds (3%), (see table).

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

The number of salmonellosis reports in animals rose to the level of the years 2009/2010. The number of cases mainly rose in cattle. Serovars found in cattle are mainly S. Typhimurium and it’s monophasic variant 4,12,:i:-. As the total number of cattle tested remained more or less the same as in 2012, salmonellosis in cattle seems to have increased slightly. Data from the following years will help to better interpretate this observation.

Additional information

Further information can be found on the FSVO website www.blv.admin.ch.

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) - parent breeding flocks for broiler production line - adult - Farm - Control and eradication programmes	56	cantons	Census	Official sampling	environmental sample > boot swabs	Domestic	no	Flock	39	0	
Gallus gallus (fowl) - parent breeding flocks for broiler production line - adult - Farm - Control and eradication programmes	56	cantons	Census	Official and industry sampling	environmental sample > boot swabs	Domestic	yes	Flock	48	0	
Gallus gallus (fowl) - parent breeding flocks for broiler production line - adult - Farm - Control and eradication programmes	56	cantons	Census	Industry sampling	environmental sample > boot swabs	Domestic	no	Flock	37	0	
Gallus gallus (fowl) - parent breeding flocks for broiler production line - day-old chicks - Farm - Control and eradication programmes	56	cantons	Census	Official sampling	environmental sample	Domestic	no	Flock	41	0	
Gallus gallus (fowl) - parent breeding flocks for broiler production line - during rearing period - Farm - Control and eradication programmes	56	cantons	Census	Official sampling	environmental sample > boot swabs	Domestic	no	Flock	51	0	
Gallus gallus (fowl) - parent breeding flocks for egg production line - adult - Farm - Control and eradication programmes	46	cantons	Census	Official and industry sampling	environmental sample > boot swabs	Domestic	yes	Flock	26	0	
Gallus gallus (fowl) - parent breeding flocks for egg production line - adult - Farm - Control and eradication programmes	46	cantons	Census	Industry sampling	environmental sample > boot swabs	Domestic	no	Flock	22	0	
Gallus gallus (fowl) - parent breeding flocks for egg production line - adult - Farm - Control and eradication programmes	46	cantons	Census	Official sampling	environmental sample > boot swabs	Domestic	no	Flock	7	0	
Gallus gallus (fowl) - parent breeding flocks for egg production line - day-old chicks - Farm - Control and eradication programmes	46	cantons	Census	Official sampling	environmental sample	Domestic	no	Flock	9	0	

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) - parent breeding flocks for egg production line - during rearing period - Farm - Control and eradication programmes	46	cantons	Census	Official sampling	environmental sample > boot swabs	Domestic	no	Flock	20	0	

	S. Hadar	S. Infantis	S. Typhimurium	S. Virchow	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Gallus gallus (fowl) - parent breeding flocks for broiler production line - adult - Farm - Control and eradication programmes						
Gallus gallus (fowl) - parent breeding flocks for broiler production line - adult - Farm - Control and eradication programmes						
Gallus gallus (fowl) - parent breeding flocks for broiler production line - adult - Farm - Control and eradication programmes						
Gallus gallus (fowl) - parent breeding flocks for broiler production line - day-old chicks - Farm - Control and eradication programmes						
Gallus gallus (fowl) - parent breeding flocks for broiler production line - during rearing period - Farm - Control and eradication programmes						
Gallus gallus (fowl) - parent breeding flocks for egg production line - adult - Farm - Control and eradication programmes						

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
Gallus gallus (fowl) - parent breeding flocks for egg production line - adult - Farm - Control and eradication programmes						
Gallus gallus (fowl) - parent breeding flocks for egg production line - adult - Farm - Control and eradication programmes						
Gallus gallus (fowl) - parent breeding flocks for egg production line - day-old chicks - Farm - Control and eradication programmes						
Gallus gallus (fowl) - parent 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:-
Alpacas - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	6	0			
Bears - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	2	0			
Birds - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	175	25			
Buffalos - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	3	0			
Camels - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	2	0			
Cats - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	691	7			
Cattle (bovine animals) - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	2243	270			
Deer - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	2	0			
Dogs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	975	17			
Ferrets - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	2	0			
Goats - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	43	3			
Monkeys - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	10	0			
Other animals - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	207	59			
Otter - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	4	2			
Pigs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	160	19			
Rabbits - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	35	0			
Reptiles - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	15	14			

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:-
Sheep - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	36	6			
Snakes - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	17	12			
Solipeds, domestic - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	182	4			
Turtles - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	2	0			
Wild animals - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	18	2			

	Salmonella spp., unspecified
Alpacas - Clinical investigations	
Bears - Clinical investigations	
Birds - Clinical investigations	25
Buffalos - Clinical investigations	
Camels - Clinical investigations	
Cats - Clinical investigations	7
Cattle (bovine animals) - Clinical investigations	270
Deer - Clinical investigations	
Dogs - Clinical investigations	17
Ferrets - Clinical investigations	

Table Salmonella in other animals

	Salmonella spp., unspecified
Goats - Clinical investigations	3
Monkeys - Clinical investigations	
Other animals - Clinical investigations	59
Otter - Clinical investigations	2
Pigs - Clinical investigations	19
Rabbits - Clinical investigations	
Reptiles - Clinical investigations	14
Sheep - Clinical investigations	6
Snakes - Clinical investigations	12
Solipeds, domestic - Clinical investigations	4
Turtles - Clinical investigations	
Wild animals - Clinical investigations	2

Footnote:

All data categorised as “clinical investigation” are summaries of data from the ILD (= information system of laboratory data). ILD is run by the FSVO. All labs, which are approved for the diagnosis of notifiable diseases, have to report their results in this system. Only tests of antigen detection were selected for the zoonosis reporting in the context of “clinical investigation”.

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) - broilers - before slaughter - Farm - Control and eradication programmes	1125	cantons	Census	Official sampling	environmental sample > boot swabs	Domestic	no	Flock	67	0	
Gallus gallus (fowl) - broilers - before slaughter - Farm - Control and eradication programmes [1)]	1125	cantons	Census	Industry sampling	environmental sample > boot swabs	Domestic	no	Flock	562	6	
Gallus gallus (fowl) - broilers - before slaughter - Farm - Control and eradication programmes [2)]	1125	cantons	Census	Official and industry sampling	environmental sample > boot swabs	Domestic	yes	Flock	629	6	
Turkeys - fattening flocks - before slaughter - Farm - Control and eradication programmes	45	cantons	Census	Official and industry sampling	environmental sample > boot swabs	Domestic	yes	Flock	41	1	
Turkeys - fattening flocks - before slaughter - Farm - Control and eradication programmes	45	cantons	Census	Industry sampling	environmental sample > boot swabs	Domestic	no	Flock	40	1	
Turkeys - fattening flocks - before slaughter - Farm - Control and eradication programmes	45	cantons	Census	Official sampling	environmental sample > boot swabs	Domestic	no	Flock	1	0	
Gallus gallus (fowl) - laying hens - adult - Farm - Control and eradication programmes	994	cantons	Suspect sampling	Official sampling	animal sample > organ/tissue	Domestic	no	Flock	6	2	1
Gallus gallus (fowl) - laying hens - adult - Farm - Control and eradication programmes	994	cantons	Census	Official sampling	environmental sample > boot swabs	Domestic	no	Flock	460	1	
Gallus gallus (fowl) - laying hens - adult - Farm - Control and eradication programmes [3)]	994	cantons	Census	Official and industry sampling	environmental sample > boot swabs	Domestic	yes	Flock	901	2	1
Gallus gallus (fowl) - laying hens - adult - Farm - Control and eradication programmes	994	cantons	Census	Industry sampling	environmental sample > boot swabs	Domestic	no	Flock	840	5	1
Gallus gallus (fowl) - laying hens - during rearing period - Farm - Control and eradication programmes	994	cantons	Census	Official sampling	environmental sample > boot swabs	Domestic	no	Flock	195	0	

Table Salmonella in other poultry

	S. Typhimurium	S. 1,4,[5],12:i:-	Salmonella spp., unspecified	S. 13,23:i:-	S. Indiana	S. Infantis	S. Kisarawe	S. Livingstone	S. Mbandaka	S. Montevideo	S. Rissen
Gallus gallus (fowl) - broilers - before slaughter - Farm - Control and eradication programmes											
Gallus gallus (fowl) - broilers - before slaughter - Farm - Control and eradication programmes [1)]				2			1	1	1		1
Gallus gallus (fowl) - broilers - before slaughter - Farm - Control and eradication programmes [2)]				2			1	1	1		1
Turkeys - fattening flocks - before slaughter - Farm - Control and eradication programmes					1						
Turkeys - fattening flocks - before slaughter - Farm - Control and eradication programmes					1						
Turkeys - fattening flocks - before slaughter - Farm - Control and eradication programmes											
Gallus gallus (fowl) - laying hens - adult - Farm - Control and eradication programmes	1										
Gallus gallus (fowl) - laying hens - adult - Farm - Control and eradication programmes						1					
Gallus gallus (fowl) - laying hens - adult - Farm - Control and eradication programmes [3)]	1										
Gallus gallus (fowl) - laying hens - adult - Farm - Control and eradication programmes	1		1			1				1	
Gallus gallus (fowl) - laying hens - during rearing period - Farm - Control and eradication programmes											

Comments:

Table Salmonella in other poultry

Comments:

[1)] Isolate 13,23:-i:- was found in two flocks of the same farm.

[2)] Isolate 13,23:-i:- was found in two flocks of the same farm.

[3)] In total 6 flocks tested positive in the environmental samples, but only 2 could be confirmed as positive flocks in animal tissues. In the environmental samples of the 4 other flocks following Serovars were found (1x unknown (either S. Typhimurium or S. Enteritidis), 1x S. Montevideo (double-infection with S. diarizonae) and 2x S. Infantis (in two flocks of the same farm).

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	ALP	Selective sampling	Official sampling	feed sample	Domestic	Single	25g	267	1		
Compound feedingstuffs for pigs - final product - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Domestic	Single	25g	65	0		
Compound feedingstuffs for cattle - final product - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Unknown	Single	25g	11	0		
Compound feedingstuffs for horses - final product - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Domestic	Single	25g	1	0		
Compound feedingstuffs for horses - final product - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Unknown	Single	25g	1	0		
Compound feedingstuffs for pigs - final product - Feed mill - Surveillance [1)]	ALP	Selective sampling	Official sampling	feed sample	Unknown	Single	25g	3	0		
Compound feedingstuffs for poultry (non specified) - final product - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Unknown	Single	25g	1	0		
Compound feedingstuffs for poultry (non specified) - final product - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Domestic	Single	25g	65	0		
Compound feedingstuffs for rabbits - final product - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Domestic	Single	25g	3	0		
Compound feedingstuffs for sheep - final product - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Domestic	Single	25g	5	0		

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 sheep - final product - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Unknown	Single	25g	2	0		

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

Table Salmonella in compound feedingstuffs

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified	S. Ouakam
Compound feedingstuffs for rabbits - final product - Feed mill - Surveillance			
Compound feedingstuffs for sheep - final product - Feed mill - Surveillance			
Compound feedingstuffs for sheep - final product - Feed mill - Surveillance			

Comments:

1)

Footnote:

ALP = Agroscope Liebefeld Research Institute, Posieux, official feed inspection service

unknown = sample origin might be EU or third countries

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	ALP	Selective sampling	Official sampling	feed sample	Domestic	Single	25g	4	0		
Feed material of marine animal origin - fish meal - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Unknown	Single	25g	2	0		
Feed material of land animal origin - dairy products - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Unknown	Single	25g	1	0		

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Feed material of land animal origin - dairy products - Feed mill - Surveillance		
Feed material of marine animal origin - fish meal - Feed mill - Surveillance		
Feed material of land animal origin - dairy products - Feed mill - Surveillance		

Footnote:

ALP = Agroscope Liebefeld Research Institute, Posieux, official feed inspection service

unknown = sample origin might be EU or third countries

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 - wheat derived - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Domestic	Single	25g	1	0		
Feed material of cereal grain origin - other cereal grain derived - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Unknown	Single	25g	2	0		
Feed material of cereal grain origin - maize derived - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Domestic	Single	25g	2	0		
Feed material of oil seed or fruit origin - rape seed derived - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Domestic	Single	25g	2	0		
Feed material of oil seed or fruit origin - soya (bean) derived - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Domestic	Single	25g	2	0		
Feed material of oil seed or fruit origin - sunflower seed derived - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Unknown	Single	25g	1	0		
Feed material of oil seed or fruit origin - other oil seeds derived - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Domestic	Single	25g	1	0		
Other feed material - tubers, roots and similar products - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Unknown	Single	25g	1	0		
Feed material of cereal grain origin - maize derived - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Unknown	Single	25g	9	0		
Feed material of cereal grain origin - wheat derived - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Unknown	Single	25g	2	0		
Feed material of oil seed or fruit origin - soya (bean) derived - Feed mill - Surveillance	ALP	Selective sampling	Official sampling	feed sample	Unknown	Single	25g	52	0		
Other feed material - other plants - Feed mill - Surveillance [1)]	ALP	Selective sampling	Official sampling	feed sample	Domestic	Single	25g	1	0		

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
Other feed material - other plants - Feed mill - Surveillance [2)]	ALP	Selective sampling	Official sampling	feed sample	Unknown	Single	25g	3	0		
Other feed material - yeast - Feed mill - Surveillance [3)]	ALP	Selective sampling	Official sampling	feed sample	Unknown	Single	25g	1	0		

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Feed material of cereal grain origin - wheat derived - Feed mill - Surveillance		
Feed material of cereal grain origin - other cereal grain derived - Feed mill - Surveillance		
Feed material of cereal grain origin - maize derived - Feed mill - Surveillance		
Feed material of oil seed or fruit origin - rape seed derived - Feed mill - Surveillance		
Feed material of oil seed or fruit origin - soya (bean) derived - Feed mill - Surveillance		
Feed material of oil seed or fruit origin - sunflower seed derived - Feed mill - Surveillance		
Feed material of oil seed or fruit origin - other oil seeds derived - Feed mill - Surveillance		
Other feed material - tubers, roots and similar products - Feed mill - Surveillance		

Table Salmonella in other feed matter

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Feed material of cereal grain origin - maize derived - Feed mill - Surveillance		
Feed material of cereal grain origin - wheat derived - Feed mill - Surveillance		
Feed material of oil seed or fruit origin - soya (bean) derived - Feed mill - Surveillance		
Other feed material - other plants - Feed mill - Surveillance [1)]		
Other feed material - other plants - Feed mill - Surveillance [2)]		
Other feed material - yeast - Feed mill - Surveillance [3)]		

Comments:

[1)] Mycoprotein (1x)

[2)] Mycoprotein (1x), Dextrose Monohydrat (1x), cacao shells (1x)

[3)] brewer's yeast

Footnote:

ALP = Agroscope Liebefeld Research Institute, Posieux, official feed inspection service

unknown = sample origin might be EU or third countries

2.1.6 Antimicrobial resistance in Salmonella isolates

A. Antimicrobial resistance in Salmonella in cattle

Sampling strategy used in monitoring

Frequency of the sampling

Samples were collected from clinical or subclinical material.

Type of specimen taken

Clinical samples

Methods of sampling (description of sampling techniques)

Not applicable

Procedures for the selection of isolates for antimicrobial testing

All Salmonella isolates were submitted to susceptibility testing.

Methods used for collecting data

All Salmonella isolates were submitted to susceptibility testing.

Laboratory methodology used for identification of the microbial isolates

Samples were cultured and identified using standard microbiological procedures.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

A micro-dilution method (Sensititre®-System, MCS-Diagnostics) was used for susceptibility testing, including the following antimicrobials: ampicillin, cefotaxime, ceftazidime, chloramphenicol, ciprofloxacin, colistin, florfenicol, gentamicin, kanamycin, nalidixic acid, sulfamethoxazole, streptomycin, trimethoprim, tetracycline

Cut-off values used in testing

Whenever possible the epidemiological cut-off values according to EUCAST were used.

Preventive measures in place

No specific preventive measures for antimicrobial resistance in Salmonella. General preventive measures include education of veterinarians and farmers, disease eradication programmes, incentives for good farming practice and limitation of use of antimicrobials to veterinary prescription.

Control program/mechanisms

The control program/strategies in place

None

Recent actions taken to control the zoonoses

None

Suggestions to the European Union for the actions to be taken

None

Measures in case of the positive findings or single cases

None

Notification system in place

None

Results of the investigation

57 Salmonella spp. isolates from cattle of different holdings were available for susceptibility testing. 39 S. Typhimurium, 14 monophasic S. Typhimurium and 2 S. Enteritidis were available. All monophasic S. Typhimurium were resistant to ampicillin, streptomycin, sulfamethoxazol and tetracycline. Resistance was rare in S. Typhimurium (92.3% of the isolates were susceptible to all tested antimicrobials) and absent in S. Enteritidis.

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

Resistance was most frequently observed against antimicrobials that have been used in food animals for many years. No resistances against third-generation cephalosporins were found.

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

Salmonella prevalence in healthy animals in Switzerland is very low, therefore Salmonella isolates from clinical material are used for Monitoring. As salmonella prevalence and resistance rates are low, relevance of beef as transmitter of resistant salmonella to humans is estimated to be small.

Additional information

Further information can be found in the annual report on the sale of antibiotics for veterinary use and antibiotic resistance monitoring of livestock in Switzerland (Arch-Vet 2013) on the FSVO website www.blv.admin.ch

B. Antimicrobial resistance in Salmonella in pigs

Sampling strategy used in monitoring

Frequency of the sampling

Samples were collected from clinical or subclinical material.

Type of specimen taken

Clinical samples

Methods of sampling (description of sampling techniques)

Not applicable

Procedures for the selection of isolates for antimicrobial testing

All Salmonella isolates were submitted to susceptibility testing.

Methods used for collecting data

All samples were analysed in the same laboratory (Centre for Zoonoses, Bacterial Animal Diseases and Antibiotic Resistance, University of Bern, Switzerland).

Laboratory methodology used for identification of the microbial isolates

Samples were cultured and identified using standard microbiological procedures.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

A micro-dilution method (Sensititre®-System, MCS-Diagnostics) was used for susceptibility testing, including the following antimicrobials: ampicillin, cefotaxime, ceftazidime, chloramphenicol, ciprofloxacin, colistin, florfenicol, gentamicin, kanamycin, nalidixic acid, sulfamethoxazole, streptomycin, trimethoprim, tetracycline

Cut-off values used in testing

Whenever possible the epidemiological cut-off values according to EUCAST were used.

Preventive measures in place

No specific preventive measures for antimicrobial resistance in Salmonella. General preventive measures include education of veterinarians and farmers, disease eradication programmes, incentives for good farming practice and limitation of use of antimicrobials to veterinary prescription.

Control program/mechanisms

The control program/strategies in place

None

Recent actions taken to control the zoonoses

None

Suggestions to the European Union for the actions to be taken

None

Measures in case of the positive findings or single cases

None

Notification system in place

None

Results of the investigation

7 Salmonella spp. isolates from pigs of different holdings were available for susceptibility testing. 1 S. Typhimurium, 3 monophasic S. Typhimurium, 1 S. Enteritidis, and 2 S. Kedougou were available. All monophasic S. Typhimurium and the S. Typhimurium isolate were resistant to ampicillin, streptomycin, sulfamethoxazol and tetracycline. Resistance was absent in S. Enteritidis.

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

Resistance was most frequently observed against antimicrobials that have been used in food animals for many years. No resistances against third-generation cephalosporins were found.

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

Salmonella prevalence in healthy animals in Switzerland is very low, therefore Salmonella isolates from clinical material are used for Monitoring. As salmonella prevalence and resistance rates are low, relevance of pork as transmitter of resistant salmonella to humans is estimated to be small.

Additional information

Further information can be found in the annual report on the sale of antibiotics for veterinary use and antibiotic resistance monitoring of livestock in Switzerland (Arch-Vet 2013) on the FSVO website www.blv.admin.ch

C. Antimicrobial resistance in Salmonella in poultry

Sampling strategy used in monitoring

Frequency of the sampling

Samples were collected from clinical material or were taken in the framework of the control programme for Salmonella in poultry (TSV, Art.4 and Art. 255-256).

Type of specimen taken

Clinical samples / samples taken in the framework of the control programme for Salmonella

Methods of sampling (description of sampling techniques)

Not applicable

Procedures for the selection of isolates for antimicrobial testing

All Salmonella isolates were submitted to susceptibility testing.

Methods used for collecting data

All samples were analysed in the same laboratory (Centre for Zoonoses, Bacterial Animal Diseases and Antibiotic Resistance, University of Bern, Switzerland).

Laboratory methodology used for identification of the microbial isolates

Samples were cultured and identified using standard microbiological procedures.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

A micro-dilution method (Sensititre®-System, MCS-Diagnostics) was used for susceptibility testing, including the following antimicrobials: ampicillin, cefotaxime, ceftazidime, chloramphenicol, ciprofloxacin, colistin, florfenicol, gentamicin, kanamycin, nalidixic acid, sulfamethoxazole, streptomycin, trimethoprim, tetracycline

Cut-off values used in testing

Whenever possible the epidemiological cut-off values according to EUCAST were used.

Preventive measures in place

No specific preventive measures for antimicrobial resistance in Salmonella. General preventive measures include education of veterinarians and farmers, disease eradication programmes, incentives for good farming practice and limitation of use of antimicrobials to veterinary prescription.

Control program/mechanisms

The control program/strategies in place

None

Recent actions taken to control the zoonoses

None

Suggestions to the European Union for the actions to be taken

None

Measures in case of the positive findings or single cases

None

Notification system in place

None

Results of the investigation

18 Salmonella spp. isolates from poultry were available for susceptibility testing. 8 S. Typhimurium, 3 S. Enteritidis, 1. S. Indiana, 1 S. Infantis, 1 S. Braenderup, 1 S. Lome, 1 S. Mbandaka, 1 S. Montevideo and 1 monophasic Salmonella -13,23:i:-. One isolate (S. Indiana) was resistant against five different antimicrobials (ampicillin, streptomycin, sulfamehtoxazol, tetracycline, trimpethoprim). All other Salmonella isolates were fully susceptible against all tested antimicrobials.

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

Resistance was observed against antimicrobials that have been used in food animals for many years. No resistances against third-generation cephalosporins were found.

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

Salmonella prevalence in healthy animals in Switzerland is very low, therefore Salmonella isolates from clinical material and from control programme in poultry are used for AMR-Monitoring. As salmonella prevalence and resistance rates in Swiss poultry are very low, relevance of Swiss poultry products as transmitter of resistant salmonella to humans is estimated to be small.

Additional information

Further information can be found in the annual report on the sale of antibiotics for veterinary use and antibiotic resistance monitoring of livestock in Switzerland (Arch-Vet 2013) on the FSVO website www.blv.admin.ch

Table Antimicrobial susceptibility testing of S. Enteritidis in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. Enteritidis	Poultry, unspecified - Unknown - Control and eradication programmes																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	3																									
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	3	0									2	1													
Aminoglycosides - Kanamycin	8	3	0													3										
Aminoglycosides - Streptomycin	16	3	0												1	2										
Amphenicols - Chloramphenicol	16	3	0														3									
Amphenicols - Florfenicol	16	3	0													3										
Cephalosporins - Cefotaxime	0.5	3	0							2	1															
Fluoroquinolones - Ciprofloxacin	0.06	3	0				1		2																	
Penicillins - Ampicillin	8	3	0												3											
Quinolones - Nalidixic acid	16	3	0													3										
Tetracyclines - Tetracycline	8	3	0											2	1											
Trimethoprim	2	3	0										3													
Cephalosporins - Ceftazidime	2	3	0									3														
Polymyxins - Colistin	2	3	0												3											
Sulfonamides - Sulfamethoxazole	256	3	0																1	2						

Table Antimicrobial susceptibility testing of S. Enteritidis in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. Enteritidis	Poultry, unspecified - Unknown - Control and eradication programmes	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	3	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. Enteritidis in Pigs - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. Enteritidis	Pigs - unspecified - Unknown - Clinical investigations																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory													1													
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	1	0										1													
Aminoglycosides - Kanamycin	8	1	0													1										
Aminoglycosides - Streptomycin	16	1	0													1										
Amphenicols - Chloramphenicol	16	1	0														1									
Amphenicols - Florfenicol	16	1	0													1										
Cephalosporins - Cefotaxime	0.5	1	0								1															
Fluoroquinolones - Ciprofloxacin	0.06	1	0				1																			
Penicillins - Ampicillin	8	1	0											1												
Quinolones - Nalidixic acid	16	1	0													1										
Tetracyclines - Tetracycline	8	1	0											1												
Trimethoprim	2	1	0										1													
Cephalosporins - Ceftazidime	2	1	0									1														
Polymyxins - Colistin	2	1	0												1											
Sulfonamides - Sulfamethoxazole	256	1	0																1							

Table Antimicrobial susceptibility testing of S. Enteritidis in Pigs - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. Enteritidis	Pigs - unspecified - Unknown - Clinical investigations	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	1	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. Mbandaka in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. Mbandaka	Poultry, unspecified - Unknown - Control and eradication programmes																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory													1													
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	1	0										1													
Aminoglycosides - Kanamycin	8	1	0													1										
Aminoglycosides - Streptomycin	16	1	0															1								
Amphenicols - Chloramphenicol	16	1	0														1									
Amphenicols - Florfenicol	16	1	0														1									
Cephalosporins - Cefotaxime	0.5	1	0								1															
Fluoroquinolones - Ciprofloxacin	0.06	1	0						1																	
Penicillins - Ampicillin	8	1	0											1												
Quinolones - Nalidixic acid	16	1	0													1										
Tetracyclines - Tetracycline	8	1	0												1											
Trimethoprim	2	1	0										1													
Cephalosporins - Ceftazidime	2	1	0									1														
Polymyxins - Colistin	2	1	0												1											
Sulfonamides - Sulfamethoxazole	256	1	0																		1					

Table Antimicrobial susceptibility testing of S. Mbandaka in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. Mbandaka	Poultry, unspecified - Unknown - Control and eradication programmes	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	1	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. Braenderup in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. Braenderup	Poultry, unspecified - Unknown - Control and eradication programmes																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory													1													
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	1	0										1													
Aminoglycosides - Kanamycin	8	1	0														1									
Aminoglycosides - Streptomycin	16	1	0														1									
Amphenicols - Chloramphenicol	16	1	0														1									
Amphenicols - Florfenicol	16	1	0													1										
Cephalosporins - Cefotaxime	0.5	1	0							1																
Fluoroquinolones - Ciprofloxacin	0.06	1	0						1																	
Penicillins - Ampicillin	8	1	0												1											
Quinolones - Nalidixic acid	16	1	0													1										
Tetracyclines - Tetracycline	8	1	0												1											
Trimethoprim	2	1	0										1													
Cephalosporins - Ceftazidime	2	1	0									1														
Polymyxins - Colistin	2	1	0												1											
Sulfonamides - Sulfamethoxazole	256	1	0																	1						

Table Antimicrobial susceptibility testing of S. Braenderup in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. Braenderup	Poultry, unspecified - Unknown - Control and eradication programmes	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	1	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. enterica subsp. diarizonae in Cattle (bovine animals) - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. enterica subsp. diarizonae	Cattle (bovine animals) - unspecified - Unknown - Clinical investigations																								
Isolates out of a monitoring program (yes/no)																									
Number of isolates available in the laboratory													1												
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	1	0									1														
Aminoglycosides - Kanamycin	8	1	0													1										
Aminoglycosides - Streptomycin	16	1	0															1								
Amphenicols - Chloramphenicol	16	1	0													1										
Amphenicols - Florfenicol	16	1	0													1										
Cephalosporins - Cefotaxime	0.5	1	0							1																
Fluoroquinolones - Ciprofloxacin	0.06	1	0						1																	
Penicillins - Ampicillin	8	1	0											1												
Quinolones - Nalidixic acid	16	1	0													1										
Tetracyclines - Tetracycline	8	1	0											1												
Trimethoprim	2	1	0										1													
Cephalosporins - Ceftazidime	2	1	0									1														
Polymyxins - Colistin	2	1	0												1											
Sulfonamides - Sulfamethoxazole	256	1	0																	1						

Table Antimicrobial susceptibility testing of S. enterica subsp. diarizonae in Cattle (bovine animals) - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. enterica subsp. diarizonae	Cattle (bovine animals) - unspecified - Unknown - Clinical investigations	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	1	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. Kedougou in Pigs - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. Kedougou	Pigs - unspecified - Unknown - Clinical investigations																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	2																									
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	2	0									1	1													
Aminoglycosides - Kanamycin	8	2	0													1	1									
Aminoglycosides - Streptomycin	16	2	2																2							
Amphenicols - Chloramphenicol	16	2	0														2									
Amphenicols - Florfenicol	16	2	0													2										
Cephalosporins - Cefotaxime	0.5	2	0								2															
Fluoroquinolones - Ciprofloxacin	0.06	2	2										2													
Penicillins - Ampicillin	8	2	0											1	1											
Quinolones - Nalidixic acid	16	2	0															2								
Tetracyclines - Tetracycline	8	2	0												2											
Trimethoprim	2	2	2																2							
Cephalosporins - Ceftazidime	2	2	0									2														
Polymyxins - Colistin	2	2	0												2											
Sulfonamides - Sulfamethoxazole	256	2	2																					2		

Table Antimicrobial susceptibility testing of S. Kedougou in Pigs - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. Kedougou	Pigs - unspecified - Unknown - Clinical investigations	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	2	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. 13,23:i:- in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. 13,23:i:-	Poultry, unspecified - Unknown - Control and eradication programmes																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory													1													
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	1	0									1														
Aminoglycosides - Kanamycin	8	1	0													1										
Aminoglycosides - Streptomycin	16	1	0														1									
Amphenicols - Chloramphenicol	16	1	0														1									
Amphenicols - Florfenicol	16	1	0														1									
Cephalosporins - Cefotaxime	0.5	1	0								1															
Fluoroquinolones - Ciprofloxacin	0.06	1	0						1																	
Penicillins - Ampicillin	8	1	0											1												
Quinolones - Nalidixic acid	16	1	0													1										
Tetracyclines - Tetracycline	8	1	0												1											
Trimethoprim	2	1	0										1													
Cephalosporins - Ceftazidime	2	1	0										1													
Polymyxins - Colistin	2	1	0												1											
Sulfonamides - Sulfamethoxazole	256	1	0																		1					

Table Antimicrobial susceptibility testing of S. 13,23:i:- in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. 13,23:i:-	Poultry, unspecified - Unknown - Control and eradication programmes	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	1	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. Typhimurium in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. Typhimurium	Poultry, unspecified - Unknown - Control and eradication programmes																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	8																									
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	8	0									1	7													
Aminoglycosides - Kanamycin	8	8	0													8										
Aminoglycosides - Streptomycin	16	8	0													4	4									
Amphenicols - Chloramphenicol	16	8	0													1	7									
Amphenicols - Florfenicol	16	8	0												1	7										
Cephalosporins - Cefotaxime	0.5	8	0							6	2															
Fluoroquinolones - Ciprofloxacin	0.06	8	0				6		2																	
Penicillins - Ampicillin	8	8	0											6	2											
Quinolones - Nalidixic acid	16	8	0													8										
Tetracyclines - Tetracycline	8	8	0											1	6	1										
Trimethoprim	2	8	0										8													
Cephalosporins - Ceftazidime	2	8	0									8														
Polymyxins - Colistin	2	8	0												8											
Sulfonamides - Sulfamethoxazole	256	8	0															1	5	2						

Table Antimicrobial susceptibility testing of S. Typhimurium in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. Typhimurium	Poultry, unspecified - Unknown - Control and eradication programmes	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	8	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. Typhimurium in Pigs - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. Typhimurium	Pigs - unspecified - Unknown - Clinical investigations																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory													1													
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	1	0									1														
Aminoglycosides - Kanamycin	8	1	0													1										
Aminoglycosides - Streptomycin	16	1	1																	1						
Amphenicols - Chloramphenicol	16	1	1																	1						
Amphenicols - Florfenicol	16	1	1																	1						
Cephalosporins - Cefotaxime	0.5	1	0							1																
Fluoroquinolones - Ciprofloxacin	0.06	1	0						1																	
Penicillins - Ampicillin	8	1	1																1							
Quinolones - Nalidixic acid	16	1	0													1										
Tetracyclines - Tetracycline	8	1	1																	1						
Trimethoprim	2	1	0										1													
Cephalosporins - Ceftazidime	2	1	0									1														
Polymyxins - Colistin	2	1	0												1											
Sulfonamides - Sulfamethoxazole	256	1	1																					1		

Table Antimicrobial susceptibility testing of S. Typhimurium in Pigs - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. Typhimurium	Pigs - unspecified - Unknown - Clinical investigations	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	1	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. Typhimurium, monophasic in Cattle (bovine animals) - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. Typhimurium, monophasic	Cattle (bovine animals) - unspecified - Unknown - Clinical investigations																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory		14																								
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	14	0									3	10	1												
Aminoglycosides - Kanamycin	8	14	0													14										
Aminoglycosides - Streptomycin	16	14	14																		14					
Amphenicols - Chloramphenicol	16	14	0													1	13									
Amphenicols - Florfenicol	16	14	0													14										
Cephalosporins - Cefotaxime	0.5	14	0							12	2															
Fluoroquinolones - Ciprofloxacin	0.06	14	0				3		11																	
Penicillins - Ampicillin	8	14	14																14							
Quinolones - Nalidixic acid	16	14	0													14										
Tetracyclines - Tetracycline	8	14	14																	14						
Trimethoprim	2	14	0										12	2												
Cephalosporins - Ceftazidime	2	14	0									14														
Polymyxins - Colistin	2	14	1												13	1										
Sulfonamides - Sulfamethoxazole	256	14	14																					14		

Table Antimicrobial susceptibility testing of S. Typhimurium, monophasic in Cattle (bovine animals) - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. Typhimurium, monophasic	Cattle (bovine animals) - unspecified - Unknown - Clinical investigations	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	14	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. Enteritidis in Cattle (bovine animals) - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. Enteritidis	Cattle (bovine animals) - unspecified - Unknown - Clinical investigations																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory													2													
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	2	0									2														
Aminoglycosides - Kanamycin	8	2	0													2										
Aminoglycosides - Streptomycin	16	2	0												1			1								
Amphenicols - Chloramphenicol	16	2	0														2									
Amphenicols - Florfenicol	16	2	0													2										
Cephalosporins - Cefotaxime	0.5	2	0							1	1															
Fluoroquinolones - Ciprofloxacin	0.06	2	0				2																			
Penicillins - Ampicillin	8	2	0											1	1											
Quinolones - Nalidixic acid	16	2	0													2										
Tetracyclines - Tetracycline	8	2	0												2											
Trimethoprim	2	2	0										2													
Cephalosporins - Ceftazidime	2	2	0									2														
Polymyxins - Colistin	2	2	0												2											
Sulfonamides - Sulfamethoxazole	256	2	0																	2						

Table Antimicrobial susceptibility testing of S. Enteritidis in Cattle (bovine animals) - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. Enteritidis	Cattle (bovine animals) - unspecified - Unknown - Clinical investigations	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	2	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. Lome in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. Lome	Poultry, unspecified - Unknown - Control and eradication programmes																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory													1													
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	1	0									1														
Aminoglycosides - Kanamycin	8	1	0													1										
Aminoglycosides - Streptomycin	16	1	0														1									
Amphenicols - Chloramphenicol	16	1	0													1										
Amphenicols - Florfenicol	16	1	0													1										
Cephalosporins - Cefotaxime	0.5	1	0								1															
Fluoroquinolones - Ciprofloxacin	0.06	1	0				1																			
Penicillins - Ampicillin	8	1	0											1												
Quinolones - Nalidixic acid	16	1	0													1										
Tetracyclines - Tetracycline	8	1	0												1											
Trimethoprim	2	1	0										1													
Cephalosporins - Ceftazidime	2	1	0									1														
Polymyxins - Colistin	2	1	0												1											
Sulfonamides - Sulfamethoxazole	256	1	0																1							

Table Antimicrobial susceptibility testing of S. Lome in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. Lome	Poultry, unspecified - Unknown - Control and eradication programmes	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	1	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. Indiana in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. Indiana	Poultry, unspecified - Unknown - Control and eradication programmes																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory													1													
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	1	0										1													
Aminoglycosides - Kanamycin	8	1	0													1										
Aminoglycosides - Streptomycin	16	1	1																		1					
Amphenicols - Chloramphenicol	16	1	0														1									
Amphenicols - Florfenicol	16	1	0													1										
Cephalosporins - Cefotaxime	0.5	1	0							1																
Fluoroquinolones - Ciprofloxacin	0.06	1	0				1																			
Penicillins - Ampicillin	8	1	1																1							
Quinolones - Nalidixic acid	16	1	0													1										
Tetracyclines - Tetracycline	8	1	1																	1						
Trimethoprim	2	1	1																1							
Cephalosporins - Ceftazidime	2	1	0									1														
Polymyxins - Colistin	2	1	0												1											
Sulfonamides - Sulfamethoxazole	256	1	1																					1		

Table Antimicrobial susceptibility testing of S. Indiana in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. Indiana	Poultry, unspecified - Unknown - Control and eradication programmes	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	1	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. Infantis in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. Infantis	Poultry, unspecified - Unknown - Control and eradication programmes																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory													1													
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	1	0									1														
Aminoglycosides - Kanamycin	8	1	0													1										
Aminoglycosides - Streptomycin	16	1	0														1									
Amphenicols - Chloramphenicol	16	1	0														1									
Amphenicols - Florfenicol	16	1	0													1										
Cephalosporins - Cefotaxime	0.5	1	0								1															
Fluoroquinolones - Ciprofloxacin	0.06	1	0				1																			
Penicillins - Ampicillin	8	1	0											1												
Quinolones - Nalidixic acid	16	1	0													1										
Tetracyclines - Tetracycline	8	1	0												1											
Trimethoprim	2	1	0										1													
Cephalosporins - Ceftazidime	2	1	0										1													
Polymyxins - Colistin	2	1	0												1											
Sulfonamides - Sulfamethoxazole	256	1	0																		1					

Table Antimicrobial susceptibility testing of S. Infantis in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. Infantis	Poultry, unspecified - Unknown - Control and eradication programmes	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	1	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. Montevideo in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. Montevideo	Poultry, unspecified - Unknown - Control and eradication programmes																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory													1													
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	1	0									1														
Aminoglycosides - Kanamycin	8	1	0													1										
Aminoglycosides - Streptomycin	16	1	0														1									
Amphenicols - Chloramphenicol	16	1	0														1									
Amphenicols - Florfenicol	16	1	0													1										
Cephalosporins - Cefotaxime	0.5	1	0							1																
Fluoroquinolones - Ciprofloxacin	0.06	1	0				1																			
Penicillins - Ampicillin	8	1	0											1												
Quinolones - Nalidixic acid	16	1	0													1										
Tetracyclines - Tetracycline	8	1	0												1											
Trimethoprim	2	1	0										1													
Cephalosporins - Ceftazidime	2	1	0									1														
Polymyxins - Colistin	2	1	0												1											
Sulfonamides - Sulfamethoxazole	256	1	0																1							

Table Antimicrobial susceptibility testing of S. Montevideo in Poultry, unspecified - Unknown - Domestic - Control and eradication programmes - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. Montevideo	Poultry, unspecified - Unknown - Control and eradication programmes	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	1	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. Dublin in Cattle (bovine animals) - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. Dublin	Cattle (bovine animals) - unspecified - Unknown - Clinical investigations																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory													1													
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	1	0										1													
Aminoglycosides - Kanamycin	8	1	0													1										
Aminoglycosides - Streptomycin	16	1	0															1								
Amphenicols - Chloramphenicol	16	1	0													1										
Amphenicols - Florfenicol	16	1	0													1										
Cephalosporins - Cefotaxime	0.5	1	0							1																
Fluoroquinolones - Ciprofloxacin	0.06	1	0				1																			
Penicillins - Ampicillin	8	1	0											1												
Quinolones - Nalidixic acid	16	1	0													1										
Tetracyclines - Tetracycline	8	1	0												1											
Trimethoprim	2	1	0										1													
Cephalosporins - Ceftazidime	2	1	0									1														
Polymyxins - Colistin	2	1	1													1										
Sulfonamides - Sulfamethoxazole	256	1	0																	1						

Table Antimicrobial susceptibility testing of S. Dublin in Cattle (bovine animals) - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. Dublin	Cattle (bovine animals) - unspecified - Unknown - Clinical investigations	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	1	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. Typhimurium	Cattle (bovine animals) - unspecified - Unknown - Clinical investigations																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	39																									
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	39	0									12	27													
Aminoglycosides - Kanamycin	8	39	0													39										
Aminoglycosides - Streptomycin	16	39	3													1	29	6	1		2					
Amphenicols - Chloramphenicol	16	39	2													6	31			2						
Amphenicols - Florfenicol	16	39	2													34	3		2							
Cephalosporins - Cefotaxime	0.5	39	0							27	12															
Fluoroquinolones - Ciprofloxacin	0.06	39	0				13		26																	
Penicillins - Ampicillin	8	39	2											25	12				2							
Quinolones - Nalidixic acid	16	39	0													39										
Tetracyclines - Tetracycline	8	39	2												37				2							
Trimethoprim	2	39	0										38	1												
Cephalosporins - Ceftazidime	2	39	0									37	2													
Polymyxins - Colistin	2	39	0												39											
Sulfonamides - Sulfamethoxazole	256	39	2														1	4	18	14				2		

Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. Typhimurium	Cattle (bovine animals) - unspecified - Unknown - Clinical investigations	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	39	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of S. Typhimurium, monophasic in Pigs - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

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

S. Typhimurium, monophasic	Pigs - unspecified - Unknown - Clinical investigations																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	3																									
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	3	0										3													
Aminoglycosides - Kanamycin	8	3	0													3										
Aminoglycosides - Streptomycin	16	3	3																		3					
Amphenicols - Chloramphenicol	16	3	0														3									
Amphenicols - Florfenicol	16	3	0													2	1									
Cephalosporins - Cefotaxime	0.5	3	0							3																
Fluoroquinolones - Ciprofloxacin	0.06	3	0				1		2																	
Penicillins - Ampicillin	8	3	3																3							
Quinolones - Nalidixic acid	16	3	0													3										
Tetracyclines - Tetracycline	8	3	3																	3						
Trimethoprim	2	3	0										3													
Cephalosporins - Ceftazidime	2	3	0									3														
Polymyxins - Colistin	2	3	0												3											
Sulfonamides - Sulfamethoxazole	256	3	3																					3		

Table Antimicrobial susceptibility testing of S. Typhimurium, monophasic in Pigs - unspecified - Unknown - Domestic - Clinical investigations - Unspecified - Not applicable - animal sample - quantitative data [Dilution method]

S. Typhimurium, monophasic	Pigs - unspecified - Unknown - Clinical investigations	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	3	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

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

Test Method Used	Standard methods used for testing

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

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

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Polymyxins	Colistin		2	

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

Test Method Used	Standard methods used for testing

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

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

Test Method Used	Standard methods used for testing

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

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

Human campylobacteriosis is notifiable (ordinance of the FDHA on medical doctor and laboratory reporting). In the 1980s, campylobacteriosis was the second most reported food borne disease in humans behind salmonellosis. In 1995 the case curve for campylobacteriosis crossed over that for enteric salmonellae. Since then campylobacteriosis has been the main reported food-borne infectious disease in Switzerland. After reaching a peak in 2000 with 97 reports per 100,000 inhabitants, the incidence declined steadily until 2005, but always remained over 65 reports per 100,000 inhabitants. From 2005 until 2012 numbers increased again to over 100 reports per 100,000 inhabitants, with an in-between drop in 2010 to 84 reports per 100,000. C. jejuni has always been the most isolated species in humans.
Campylobacteriosis in animals is notifiable (TSV, Article 5: disease to be monitored). Few campylobacteriosis cases are reported by cantonal veterinarians because infected animals usually don't get ill. In the last 10 years (2004-2013) 193 campylobacteriosis cases were reported, mainly in dogs (72%), in cats (16%) and in cattle (9%). From 2004 until 2012 the reports ranged between 5 and 26 per year.
As poultry represents the most important reservoir of Campylobacter, the occurrence of this pathogen in broiler chicken farms has been studied since 2002 as part of the monitoring programme on antimicrobial resistance. Until 2007 samples were only taken during 2 months in spring. The percentage of positive flocks was with roughly 40% in 2002 and 2007 higher than in the years in between with approximately 25%. The EU-wide baseline study in 2008 revealed that there are remarkable differences in the percentages of positive flocks during the year. Thus, from 2009 onwards samples were taken evenly distributed throughout the year. In caecum samples in 2009 the obtained prevalence was 44%. In cloacal swabs, which were taken since 2010, the prevalence was slightly lower and ranged between 33% (2010) and 38% (2013).
In the EU-wide baseline study in 2008 70.6% (cumulated qualitative and quantitative approach) of the broiler carcasses at the slaughter house were Campylobacter-positive. The prevalence of Campylobacter in poultry meat at retail in 2007 and in broiler meat at retail in 2009/2010 was estimated to be 43.7% and 38.4%, respectively. In both studies it could be shown that frozen products and products without skin have a smaller risk to be contaminated with Campylobacter than fresh products and products with skin.
A survey conducted in 2006 in calves revealed a Campylobacter prevalence of 40.4%. In the framework of the antimicrobial resistance monitoring the prevalence in calves in 2010 was with 15% much lower (37 of 245; C. jejuni (25x) and C. coli (12x)). Prevalence was also lower in meat producing cattle (>12 months) with 10% (10 of 100, C. jejuni (10x)) in 2008 and 13% (48 of 373; C. jejuni (38x) and C. coli (10x)) in 2012. The Campylobacter prevalence in pigs remained stable from 2009 until 2011 (66% - 68%) and dropped in 2012 to 48% (145 of 305; 144x C. coli and 1x C. jejuni). The main species in pigs was C. coli.

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

The number of notified campylobacteriosis cases in 2013 decreased to 7481 (92.5 per 100'000 inhabitants compared to 8432 cases or 105/100'000 in 2012). 2012 had the highest rate of new infections since the introduction of mandatory notification. In the last 5 years case numbers fluctuated between 6612 and 8432. The next years will show whether 2012 remains a peak year and whether 2013 was the beginning of a declining trend. Similar to previous years, the most affected age groups were infants under 1 year (129/100'000) and young adults aged 15 to 24 years (134/100'000). Furthermore, there is an

increase of case reports among the elderly aged > 65: the notification rate rose steadily from 49/100‘000 inhabitants in 2004 to 100/100‘000 in 2013. As in 2012 the winter peak was again extremely high with 873 registered cases in January 2013. The typical summer peak occurred in August 2013 and included 862 cases. In accordance with other years, most cases were caused by C. jejuni (71% of all cases, in 19% of cases no distinction was made between C. jejuni and C. coli).
In animals, 82 cases (56 in dogs, 13 in cats and 9 in cattle) of campylobacteriosis were reported by cantonal veterinarians in 2013. The notification rate was much higher than in previous years and the increase was not linked to a particular species. Cases rose proportional to the number of cases per species in previous years. The number of laboratory tests for campylobacteriosis in the context of clinical investigations (2187 in 2013) were even slightly lower than in previous years. Reasons for the probable increase of campylobacteriosis in animals remain unclear.
2013, a random sample of broilers and pigs was investigated at slaughter in the framework of the antimicrobial resistance monitoring programme using cloacal/rectum-anal swabs.169 of 448 broiler herds (37.7%) were Campylobacter-positive (C. jejuni (157x) and C. coli (12x)). In the pigs, 226 of the 348 samples (65%) were Campylobacter-positive. All 226 isolates were C. coli. These results lie within the range since 2010.
To examine Swiss raw milk quality, 601 samples of farm bulk milk representing 150 farms in 5 regions of the country, were examined for the presence of Campylobacter at the research station Agroscope Liebefeld-Posieux (ALP) in 2013. In none of the tested samples Campylobacter was detected.

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

Mainly the handling of raw poultry meat and the consumption of undercooked contaminated poultry meat and poultry liver leads to campylobacteriosis cases in humans. Meat from cattle and pigs and the contact to pets seem to be less important. Comparison of isolates from humans and animals collected between 2001 and 2012 identified chickens as the main source for human campylobacteriosis (71% of the human cases were attributed to chickens, 19% to cattle, 9% to dogs and 1% to pigs; Kittl et al., 2013).
It is assumed that the high rate of disease in young adults aged 15-24 years is attributable to less regard for kitchen hygiene at this age and increased travel. Data from 2009 indicated that approximately 18% of the cases were travel associated (Niederer et al. 2012).
Infections above average in summer (July/August) could be related to the higher infection rate in poultry flocks, higher barbecue activities and travels abroad, the peak around New Years Eve to increased consumption of meat dishes such as “Fondue Chinoise” and travelling abroad.

Recent actions taken to control the zoonoses

In 2009 Switzerland formed a so called Campylobacter-platform with stakeholders of the poultry industry, researchers and national and cantonal authorities, all of them concerned by the persisting high incidence of human campylobacteriosis, the high prevalence in broiler flocks and the lack of efficient control options. The platform’s aim is information exchange, coordination and evaluation of control measures, identification of gaps of knowledge and initialization of applied research projects with the focus on risk factors for human infection, Campylobacter-free broiler production and disease awareness along the food chain. Concrete achievements were different scientific publications and also two legal regulations. One of this regulations decrees that from January 1st 2014 poultry liver from Campylobacter-positive herds can only be sold frozen (SR 817.024.1, Ordinance on Hygiene, article 33a). According to the second regulation, pre -packed fresh poultry meat and meat preparations need a label informing the consumers to thoroughly cook the products before consumption and to follow certain rules of kitchen hygiene (SR 817.022.108, Ordinance on Food of Animal Origin, article 9).

Additional information

1. Kittl et al. (2013). Source attribution of human Campylobacter isolates by MLST and fla-typing and association of genotypes with quinolone resistance. PLoS One 8(11): e81796.
2. Kittl S, Korczak BM, Niederer L, Baumgartner A, Buettner S, Overesch G, Kuhnert P., 2013:

Comparison of genotypes and antibiotic resistances of Campylobacter jejuni and Campylobacter coli on chicken retail meat and at slaughter. Appl Environ Microbiol. Jun 2013; 79(12): 3875–3878.
3. Niederer L, Kuhnert P, Egger R, Büttner S, Hächler H, Korczak, BM., 2012: Genotypes and antibiotic resistances of Campylobacter jejuni and Campylobacter coli isolates from domestic and travel-associated human cases. Appl Environ Microbiol.Jan;78(1):288-91
4. Wirz SE, Overesch G, Kuhnert P, Korczak BM, 2010: Genotype and antibiotic resistance analysis of Campylobacter isolates from ceaca and the carcasses of slaughtered broiler flocks. Appl Environ Microbiol. 2010 Oct;76(19):6377-86.
5. Kittl S, Kuhnert P, Hächler H, Korczak BM., 2011: Comparison of genotypes and antibiotic resistance of Campylobacter jejuni isolated from humans and slaughtered chickens in Switzerland. J Appl Microbiol. 2011 Feb;110(2):513-520.
6. Egger R, Korczak BM, Niederer L, Overesch G, Kuhnert P.. 2011: Genotypes and antibiotic resistance of Campylobacter coli in fattening pigs. Vet Microbiol. 2011 Aug 19.
7. The industry takes responsibility for the monitoring of poultry meat production in a system of self-auditing following the HACCP principles. Results of the Campylobacter monitoring of the largest poultry producers and abattoirs are available covering more than 92% of the production. Samples are taken several times a year at random. Fresh poultry meat, poultry meat preparations and poultry meat products were tested at different stages such as slaughterhouse, cutting plant and processing plant. No imported meat samples were included in the data analysis. In total 1554 tests were done in 2013 including 90% single samples and 10% batch-related. 296 (19%) of them proved positive for Campylobacter spp. [C. jejuni (48x), C. coli (5x) and unspecified (243x), see also Campylobacter poultry meat table].
8. Further information can be found on the FSVO website www.blv.admin.ch.

2.2.2 Campylobacteriosis in humans

Table Campylobacter in humans - Species/serotype distribution

Species/serotype Distribution	Cases	Cases Inc.	Autochthon cases	Autochthon Inc.	Imported cases	Imported Inc.	Unknown status
Campylobacter	7481	92.63	0	0	0	0	0
C. coli	403	4.99					
C. jejuni	5298	65.61					
C. upsaliensis	4	0.05					
C. fetus	23	0.28					
C. hyointestinalis	1	0.01					
C. curvus	1	0.01					
Campylobacter spp., unspecified	1751	21.68					

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	5	4	1	75	41	34	23	11	9
1 to 4 years	14	7	7	253	154	99	54	31	19
5 to 14 years	25	16	9	360	214	146	98	58	39
15 to 24 years	67	30	37	907	441	466	296	141	151
25 to 44 years	93	45	48	1451	745	706	529	261	254
45 to 64 years	102	55	47	1230	706	524	455	255	186
65 years and older	95	52	43	967	523	444	346	173	165
Age unknown	0	0	0	18	7	11	18	6	6
Total :	401	209	192	5261	2831	2430	1819	936	829

Table Campylobacter in humans - Seasonal distribution

Seasonal Distribution / Months	C. coli	C. jejuni	C. upsaliensis	Campylobacter spp., unspecified
	Cases	Cases	Cases	Cases
January	34	656		183
February	14	231		94
March	14	219	1	63
April	19	273	1	114
May	27	342		120
June	33	475		175
July	42	547		196
August	62	606	1	193
September	52	515		176
October	45	520	1	175
November	34	432		145
December	27	482		142
Total :	403	5298	4	1776

2.2.3 Campylobacter in foodstuffs

A. Thermophilic Campylobacter in Broiler meat and products thereof

Results of the investigation

In the framework of the self auditing system of the poultry meat industry 1484 samples of broiler meat were tested for Campylobacter in 2013. 272 of 1484 (18%) were Campylobacter spp. positive.

B. Thermophilic Campylobacter spp., unspecified in Food Meat from turkey

Results of the investigation

In the framework of the self auditing system of the poultry meat industry 70 samples of turkey meat were tested for Campylobacter in 2013. 24 of 70 (34%) were Campylobacter spp. positive.

Table Campylobacter in other food

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Campylobacter	C. coli	C. jejuni
Milk, cows' - raw milk for manufacture - intended for manufacture of raw or low heat-treated products - Processing plant [1)]											
Milk, cows' - raw milk for manufacture - intended for manufacture of raw or low heat-treated products - Processing plant - Surveillance [2)]	ALP	Selective sampling	Industry sampling	food sample > milk	Domestic	Batch	25g	601	0		

	C. lari	C. upsaliensis	Thermophilic Campylobacter spp., unspecified
Milk, cows' - raw milk for manufacture - intended for manufacture of raw or low heat-treated products - Processing plant [1)]			
Milk, cows' - raw milk for manufacture - intended for manufacture of raw or low heat-treated products - Processing plant - Surveillance [2)]			

Comments:

[1)] bulk milk sample

[2)] bulk milk sample

Footnote:

ALP = Agroscope Liebefeld Research Institute, 3003 Bern

Table Campylobacter in poultry meat

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Campylobacter	C. coli	C. jejuni
Meat from broilers (Gallus gallus) - carcase - Slaughterhouse	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Batch	25g	142	10		
Meat from broilers (Gallus gallus) - carcase - Slaughterhouse	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	16	10		
Meat from broilers (Gallus gallus) - fresh - Cutting plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	242	117	2	23
Meat from broilers (Gallus gallus) - fresh - Processing plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	211	38		
Meat from broilers (Gallus gallus) - fresh - Slaughterhouse	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	99	40	3	25
Meat from broilers (Gallus gallus) - meat preparation - Processing plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	170	52		
Meat from broilers (Gallus gallus) - meat products - cooked, ready-to-eat - Processing plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	599	0		
Meat from broilers (Gallus gallus) - mechanically separated meat (MSM) - Cutting plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	10g	5	5		
Meat from turkey - carcase - Slaughterhouse	FSVO	Unspecified	HACCP and own checks	food sample > neck skin	Domestic	Single	25g	8	3		
Meat from turkey - fresh - Cutting plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	52	20		
Meat from turkey - meat preparation - Processing plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	9	1		
Meat from turkey - minced meat - Cutting plant	FSVO	Unspecified	HACCP and own checks	food sample	Domestic	Single	25g	1	0		

Table Campylobacter in poultry meat

	C. lari	C. upsaliensis	Thermophilic Campylobacter spp., unspecified
Meat from broilers (Gallus gallus) - carcase - Slaughterhouse			10
Meat from broilers (Gallus gallus) - carcase - Slaughterhouse			10
Meat from broilers (Gallus gallus) - fresh - Cutting plant			92
Meat from broilers (Gallus gallus) - fresh - Processing plant			38
Meat from broilers (Gallus gallus) - fresh - Slaughterhouse			12
Meat from broilers (Gallus gallus) - meat preparation - Processing plant			52
Meat from broilers (Gallus gallus) - meat products - cooked, ready-to-eat - Processing plant			0
Meat from broilers (Gallus gallus) - mechanically separated meat (MSM) - Cutting plant			5
Meat from turkey - carcase - Slaughterhouse			3
Meat from turkey - fresh - Cutting plant			20
Meat from turkey - meat preparation - Processing plant			1
Meat from turkey - minced meat - Cutting plant			0

Table Campylobacter in poultry meat

2.2.4 Campylobacter in animals

A. Thermophilic Campylobacter in Gallus gallus

Monitoring system

Sampling strategy

2013, a random sample of 448 broiler herds was investigated at slaughter using cloacal swabs (5 swabs pooled per herd). The samples were taken in the framework of the antimicrobial resistance monitoring and the number of samples should provide at least 170 isolates for the susceptibility testing. The broiler slaughter plants included in the surveillance programme account for > 90% of the total production of broilers in Switzerland. The number of samples for each plant has been determined in proportion to the number of animals slaughtered per year. Each sample represents one herd.

Frequency of the sampling

At slaughter

From January to December approximately 9 samples per week.

Type of specimen taken

At slaughter

Cloacal swabs

Methods of sampling (description of sampling techniques)

At slaughter

In total 5 cloacal swabs from different broilers of one slaughter batch were taken. The samples were taken using a swab in standard transportation medium (Transport swabs, Oxoid TS0001A, Amies W/O CH). Immediately after collection the samples were sent to the laboratory for analysis.

Case definition

At slaughter

Herds which tested positive for C. jejuni or C. coli.

Diagnostic/analytical methods used

At slaughter

At the laboratory, cloacal swabs were pooled and direct culture was carried out on a selective medium suitable for Campylobacter (mCCDA, Oxoid, Pratteln, Switzerland). Speciation of suspect colonies was carried out using Matrix-assisted laser desorption/ ionization time-of-flight mass spectrometry (MALDI TOF MS) (Bruker Daltonics, Bremen, Germany).

Vaccination policy

No vaccination available.

Other preventive measures than vaccination in place

The poultry industry encourages farmers to lower the Campylobacter burden by incentives for negative herds at slaughter. No immunoprophylactic measures are allowed.

Measures in case of the positive findings or single cases

No measures are taken.

Notification system in place

Mandatory notification for the detection of Campylobacter spp.

Results of the investigation

In 2013, 169 (37.7%) of the 448 sampled broiler flocks were positive for Campylobacter. 157 isolates of C. jejuni and 12 C. coli were identified.

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

Since 2010 the Campylobacter prevalence in cloacal swabs ranged between 33% and 38%.

Additional information

Further information can be found on the FSVO website www.blv.admin.ch.

B. Campylobacter spp., unspecified in Animals Pigs - fattening pigs - unspecified - at slaughterhouse - Surveillance - official controls - objective sampling

Monitoring system

Sampling strategy

2013, a random sample of 348 pigs was investigated at slaughter using rectum-anal swabs. The samples were taken evenly distributed throughout the year, in order to exclude seasonal effects. The pig slaughter plants included in the surveillance programme accounted for >85% of the total production of pigs in Switzerland. The number of samples for each plant was determined in proportion to the number of animals slaughtered per year. The samples were taken in the framework of the antimicrobial resistance monitoring and the number of samples taken should provide at least 170 isolates for the susceptibility testing.

Frequency of the sampling

approx. 6 samples per week

Type of specimen taken

rectum-anal swabs

Methods of sampling (description of sampling techniques)

The samples were taken rectally using a swab in standard transportation medium (Transport swabs, Oxoid TS0001A, Amies W/O CH). Immediately after collection the samples were sent to the laboratory for analysis.

Case definition

Samples which tested positive for C. jejuni or C. coli.

Diagnostic/analytical methods used

At the laboratory direct culture was carried out on a selective medium suitable for Campylobacter (mCCDA, Oxoid, Pratteln, Switzerland). Speciation of suspect colonies was carried out using Matrix-assisted laser desorption/ ionization time-of-flight mass spectrometry (MALDI TOF MS) (Bruker Daltonics, Bremen, Germany).

Vaccination policy

No vaccination available.

Other preventive measures than vaccination in place

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Measures in case of the positive findings or single cases

No measures are taken.

Notification system in place

Mandatory notification for the detection of Campylobacter spp. .

Results of the investigation

2013, 226 of 348 (65%) sampled pigs were found Campylobacter positive. All 226 Campylobacter positive samples were identified as C. coli strains.

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

C. coli is prevalent in most swine holdings. As Campylobacter doesn’t survive on the surface of swine carcass due to drying process, there occurrence in pigs has not a great impact on public health.

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

source of infection)

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Additional information

Further information can be found on the FSVO website www.blv.admin.ch.

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
Alpacas - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	3	0			
Birds - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	35	0			
Camels - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	2	0			
Cats - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	677	9			
Cattle (bovine animals) - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	254	4			
Dogs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	991	42			
Ferrets - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	3	0			
Gallus gallus (fowl) - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	2	0			
Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring [1)]	FSVO	Objective sampling	Official sampling	animal sample > cloacal swab	Domestic	Flock	448	169	12	157	
Goats - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	12	0			
Other animals - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	57	1			
Pigs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	4	1			
Pigs - fattening pigs - Slaughterhouse - Monitoring [2)]	FSVO	Objective sampling	Official sampling	animal sample > rectum-anal swab	Domestic	Animal	348	226	226	0	
Rabbits - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	29	0			
Reptiles - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	1	0			
Sheep - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	19	0			

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
Snakes - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	1	0			
Solipeds, domestic - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	94	1			
Wild animals - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	3	0			

	C. upsaliensis	Thermophilic Campylobacter spp., unspecified
Alpacas - Clinical investigations		
Birds - Clinical investigations		
Camels - Clinical investigations		
Cats - Clinical investigations		9
Cattle (bovine animals) - Clinical investigations		4
Dogs - Clinical investigations		42
Ferrets - Clinical investigations		
Gallus gallus (fowl) - Clinical investigations		
Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring [1)]		
Goats - Clinical investigations		
Other animals - Clinical investigations		1
Pigs - Clinical investigations		1

Table Campylobacter in animals

	C. upsaliensis	Thermophilic Campylobacter spp., unspecified
Pigs - fattening pigs - Slaughterhouse - Monitoring [2)]		
Rabbits - Clinical investigations		
Reptiles - Clinical investigations		
Sheep - Clinical investigations		
Snakes - Clinical investigations		
Solipeds, domestic - Clinical investigations		1
Wild animals - Clinical investigations		

Comments:

[1)] Data originated from the antimicrobial resistence monitoring.

[2)] Data originated from the antimicrobial resistence monitoring.

Footnote:

All data categorised as “clinical investigation” are summaries of data from the ILD (= information system of laboratory data). ILD is run by the FSVO. All labs, which are approved for the diagnosis of notifiable diseases, have to report their results in this system. Only tests of antigen detection were selected for the zoonosis reporting in the context of “clinical investigation”.

2.2.5 Antimicrobial resistance in Campylobacter isolates

A. Antimicrobial resistance in Campylobacter jejuni and coli in pigs

Sampling strategy used in monitoring

Frequency of the sampling

Sampling in the framework of a monitoring programme on antimicrobial resistance in food-producing animals. In total 348 fecal samples of fattening pigs were evenly collected throughout the year. The pig slaughter plants included in the surveillance programme account for > 85% of the total production of pigs in Switzerland. The number of samples for each plant has been determined in proportion to the number of animals slaughtered per year. The number of samples taken should provide at least 170 isolates for the susceptibility testing.

Type of specimen taken

Rectum anal swaps.

Methods of sampling (description of sampling techniques)

At slaughter: The samples were taken rectally using a swab in standard transportation medium (Transport Swabs, Oxoid TS0001A, AMIES W/O CH). Immediately after collection, the samples were sent to the laboratory for analysis.

Procedures for the selection of isolates for antimicrobial testing

From each sample and campylobacter subtype one isolate was submitted to susceptibility testing.

Methods used for collecting data

All samples were analyzed in the same laboratory (Centre for Zoonoses, Bacterial Animal Diseases and Antibiotic Resistance, University of Bern, Switzerland).

Laboratory methodology used for identification of the microbial isolates

Samples were cultured for Campylobacter spp. within 72 h after sampling using standard microbiological procedures with direct cultivation on selective culture media. Specification of suspect colonies was carried out using Matrix-assisted laser desorption/ionization time of flight mass spectrometry (MALD TOF MS) (Burker Daltonics).

Laboratory used for detection for resistance

Antimicrobials included in monitoring

A micro-dilution method (Sensititre®-System, MCS-Diagnostics) was used for susceptibility testing including the following antimicrobials: chloramphenicol, ciprofloxacin, erythromycin, gentamicin, nalidixic acid, streptomycin, tetracycline

Cut-off values used in testing

Resistance was defined following the epidemiological cut-off values published by the Europaean Committee on Antimicrobial Susceptiblitiy Testing (EUCAST).

Preventive measures in place

No specific preventive measures for antimicrobial resistance in campylobacter. General preventive measures include education of veterinarians and farmers, disease eradication programmes, incentives for good farming practice and limitation of use of antimicrobials to veterinary prescription.

Control program/mechanisms

The control program/strategies in place

None

Recent actions taken to control the zoonoses

None

Suggestions to the European Union for the actions to be taken

None

Measures in case of the positive findings or single cases

None

Notification system in place

None

Results of the investigation

266 C. coli isolates from fattening pigs were subjected to susceptibility testing. The highest proportions of resistant C. coli isolates were found against streptomycin (74.3%). High levels of resistance were also found against ciprofloxacin (38.1%), nalidixic acid (38.5%) and tetracycline (29.2%). 12.4% of the isolates were resistant to erythromycin. 13.3 % of the C. coli isolates were fully sensitive to all tested antimicrobials, 4 % showed resistance to more than four antimicrobials.

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

Prevalence of resistance against streptomycin decreased significantly in the past 7 years but is still very high. Resistance levels for tetracycline and ciprofloxacin are high. The prevalence of resistance for ciprofloxacin slightly increased from 2006 to 2011 and slightly decreased in 2013. The prevalence of resistance to erythromycin is around 10% since the beginning of the monitoring in 2006. 8 isolates (3%) showed resistance to both ciprofloxacin and erythromycin.

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

Consumption of pork amounted to 23.46 kg per person in the year 2013. This corresponds to 45.1% of the total meat consumption. As the prevalence of campylobacter is substantially reduced during the meat processing, relevance of pork as transmitter of resistant campylobacter to humans is estimated to be small. Nevertheless the large percentage of isolates resistant to fluoroquinolones and macrolides is of concern, because these antimicrobials are used to treat human campylobacter infections.

Additional information

Further information can be found in the annual report on the sale of antibiotics for veterinary use and antibiotic resistance monitoring of livestock in Switzerland (Arch-Vet 2013) on the FSVO website www.blv.admin.ch

B. Antimicrobial resistance in Campylobacter jejuni and coli in poultry

Sampling strategy used in monitoring

Frequency of the sampling

Sampling in the framework of a monitoring programme on antimicrobial resistance in food-producing animals. In total cloacal swabs (5 from each batch) from 448 slaughter batches of broilers were collected evenly throughout the year. The broiler slaughter plants included in the surveillance programme account for > 95% of the total production of broilers in Switzerland. The number of samples for each plant has been determined in proportion to the number of broilers slaughtered per year. Each sample represents one herd. The number of samples taken should provide at least 170 isolates for the susceptibility testing.

Type of specimen taken

Cloacal swabs

Methods of sampling (description of sampling techniques)

In total 5 cloacal swabs (from 5 different broilers) per slaughter batch were collected using a swab in standard transportation medium (Transport Swabs, Oxoid TS0001A, AMIES W/O CH). Immediately after collection, the samples were sent to the laboratory for pooling and analysis.

Procedures for the selection of isolates for antimicrobial testing

From each sampled slaughter batch and campylobacter subtype, one isolate was submitted to susceptibility testing.

Laboratory methodology used for identification of the microbial isolates

Samples were cultured for Campylobacter spp. within 72 h after sampling using standard microbiological procedures with direct cultivation on selective culture media. Specification of suspect colonies was carried out using Matrix-assisted laser desorption/ionization time of flight mass spectrometry (MALD TOF MS) (Burker Daltonics). A micro-dilution method (Sensititre®-System, MCS-Diagnostics) was used for susceptibility testing

Laboratory used for detection for resistance

Antimicrobials included in monitoring

A micro-dilution method (Sensititre®-System, MCS-Diagnostics) was used for susceptibility testing, including the following antimicrobials: chloramphenicol, ciprofloxacin, erythromycin, gentamicin, nalidixic acid, streptomycin, tetracycline

Cut-off values used in testing

Resistance was defined following the epidemiological cut-off values published by the Europaean Committee on Antimicrobial Susceptiblitiy Testing (EUCAST).

Preventive measures in place

None

Control program/mechanisms

The control program/strategies in place

None

Recent actions taken to control the zoonoses

None

Suggestions to the European Union for the actions to be taken

None

Measures in case of the positive findings or single cases

None

Notification system in place

None

Results of the investigation

157 C. jejuni and 11 C. coli isolates from broilers were subjected to susceptibility testing. The highest proportions of resistant isolates for both species were found against ciprofloxacin, nalidixic acid and tetracycline. For C. coli additionally high levels of resistance against streptomycin could be detected. 49.7 % of the C. jejuni isolates and 18.2 % of the C. coli isolates were fully susceptible to all tested antimicrobials. Two C. jejuni isolates and one C. coli isolate were resistant to both, ciprofloxacin and erythromycin.

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

Resistance in campylobacter from poultry has been monitored in Switzerland since 2002. Prevalence of resistance is constantly low for gentamicin and erythromycin in C. jejuni. The prevalence of resistance to ciprofloxacin in C. jejuni significantly increased from about 15% in 2006 to 41.4% in 2013. The Number of C. coli isolates is too small to be able to make reliable conclusions on trends

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

Consumption of poultry meat was 11.42 kg per person in 2013 which corresponds to 22% of total meat consumption. About 50% of the poultry meat consumed in Switzerland is imported. Campylobacter survives well in poultry meat, therefore broilers are an important source of human infection with Campylobacter jejuni. It is thus important for public health to maintain a favourable resistance situation in campylobacter in broilers. The increase of resistances against ciprofloxacin gives cause for certain concern because quinolones are on the WHO list of critically important antimicrobials and are a preferred empiric treatment for gastrointestinal diseases.

Additional information

Further information can be found in the annual report on the sale of antibiotics for veterinary use and antibiotic resistance monitoring of livestock in Switzerland (Arch-Vet 2013) on the FSVO website www.blv.admin.ch

Table Antimicrobial susceptibility testing of C. coli in Gallus gallus (fowl) - broilers - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - cloacal swab - quantitative data [Dilution method]

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

C. coli	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications																								
Isolates out of a monitoring program (yes/no)																									
Number of isolates available in the laboratory	11																								
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	11	0								2	5	4												
Aminoglycosides - Streptomycin	4	11	6											5				6							
Amphenicols - Chloramphenicol	16	11	1												1	7	2		1						
Fluoroquinolones - Ciprofloxacin	0.5	11	6							1	3	1				6									
Quinolones - Nalidixic acid	16	11	6													5				6					
Tetracyclines - Tetracycline	2	11	3									3	4		1		1	2							
Macrolides - Erythromycin	8	11	1										2	2	3	3		1							

C. coli	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	11	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.12	16
Aminoglycosides - Streptomycin	1	16
Amphenicols - Chloramphenicol	2	32
Fluoroquinolones - Ciprofloxacin	0.06	4
Quinolones - Nalidixic acid	2	64

Table Antimicrobial susceptibility testing of C. coli in Gallus gallus (fowl) - broilers - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - cloacal swab - quantitative data [Dilution method]

C. coli	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	11	
Antimicrobials:	lowest	highest
Tetracyclines - Tetracycline	0.25	16
Macrolides - Erythromycin	0.5	32

Table Antimicrobial susceptibility testing of C. coli in Pigs - fattening pigs - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab - quantitative data [Dilution method]

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

C. coli	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications																								
Isolates out of a monitoring program (yes/no)																									
Number of isolates available in the laboratory	226																								
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	226	1								73	110	39	2	1			1								
Aminoglycosides - Streptomycin	4	226	168											46	11	1	11	157								
Amphenicols - Chloramphenicol	16	226	0												46	138	40	2								
Fluoroquinolones - Ciprofloxacin	0.5	226	86							82	52	4	2	1		85										
Quinolones - Nalidixic acid	16	226	87												14	97	26	2		87						
Tetracyclines - Tetracycline	2	226	66									82	53	17	8	8		58								
Macrolides - Erythromycin	8	226	28										63	59	62	12	2		28							

C. coli	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	226	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.12	16
Aminoglycosides - Streptomycin	1	16
Amphenicols - Chloramphenicol	2	32
Fluoroquinolones - Ciprofloxacin	0.06	4
Quinolones - Nalidixic acid	2	64

Table Antimicrobial susceptibility testing of C. coli in Pigs - fattening pigs - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab - quantitative data [Dilution method]

C. coli	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	226	
Antimicrobials:	lowest	highest
Tetracyclines - Tetracycline	0.25	16
Macrolides - Erythromycin	0.5	32

Table Antimicrobial susceptibility testing of C. jejuni in Gallus gallus (fowl) - broilers - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - cloacal swab - quantitative data [Dilution method]

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

C. jejuni	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications																								
Isolates out of a monitoring program (yes/no)																									
Number of isolates available in the laboratory	157																								
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	157	0								123	32	1		1										
Aminoglycosides - Streptomycin	4	157	6											149	2		2	4							
Amphenicols - Chloramphenicol	16	157	0												81	69	5	2							
Fluoroquinolones - Ciprofloxacin	0.5	157	65							48	39	2	3			65									
Quinolones - Nalidixic acid	16	157	65												28	58	5	1		65					
Tetracyclines - Tetracycline	1	157	33									96	26	2	3			30							
Macrolides - Erythromycin	4	157	2										89	48	17	1		1	1						

C. jejuni	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	157	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.12	16
Aminoglycosides - Streptomycin	1	16
Amphenicols - Chloramphenicol	2	32
Fluoroquinolones - Ciprofloxacin	0.06	4
Quinolones - Nalidixic acid	2	64

Table Antimicrobial susceptibility testing of C. jejuni in Gallus gallus (fowl) - broilers - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - cloacal swab - quantitative data [Dilution method]

C. jejuni	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	157	
Antimicrobials:	lowest	highest
Tetracyclines - Tetracycline	0.25	16
Macrolides - Erythromycin	0.5	32

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	EFSA	2	
	Streptomycin	EFSA	4	
Fluoroquinolones	Ciprofloxacin	EFSA	0.5	
Macrolides	Erythromycin	EFSA	8	
Quinolones	Nalidixic acid	EFSA	16	
Tetracyclines	Tetracycline	EFSA	2	
Amphenicols	Chloramphenicol		8	

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	NON-EFSA		
	Streptomycin	NON-EFSA		
Fluoroquinolones	Ciprofloxacin	NON-EFSA		
Macrolides	Erythromycin	NON-EFSA		
Quinolones	Nalidixic acid	NON-EFSA		
Tetracyclines	Tetracycline	NON-EFSA		

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	NON-EFSA		
	Streptomycin	NON-EFSA		
Fluoroquinolones	Ciprofloxacin	NON-EFSA		
Macrolides	Erythromycin	NON-EFSA		
Quinolones	Nalidixic acid	NON-EFSA		
Tetracyclines	Tetracycline	NON-EFSA		

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	EFSA	2	
	Streptomycin	EFSA	4	
Fluoroquinolones	Ciprofloxacin	EFSA	0.5	
Macrolides	Erythromycin	EFSA	4	
Quinolones	Nalidixic acid	EFSA	16	
Tetracyclines	Tetracycline	EFSA	1	
Amphenicols	Chloramphenicol		16	

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	NON-EFSA		
	Streptomycin	NON-EFSA		
Fluoroquinolones	Ciprofloxacin	NON-EFSA		
Macrolides	Erythromycin	NON-EFSA		
Quinolones	Nalidixic acid	NON-EFSA		
Tetracyclines	Tetracycline	NON-EFSA		

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	NON-EFSA		
	Streptomycin	NON-EFSA		
Fluoroquinolones	Ciprofloxacin	NON-EFSA		
Macrolides	Erythromycin	NON-EFSA		
Quinolones	Nalidixic acid	NON-EFSA		
Tetracyclines	Tetracycline	NON-EFSA		

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

Listeriosis in humans is notifiable (ordinance of the FDHA on doctor and laboratory reports). People mainly affected are adults aged over 60. In the 1990s human listeriosis cases fluctuated between 19 and 45 cases per year, from 2000 onwards between 28 and 76 cases per year. Especially in 2005 and 2006 there was an increase in listeriosis cases with more than 70 cases. In 2005, the elevated number of cases was partly due to an outbreak with a particular cheese contaminated with Listeria monocytogenes (serotyp 1/2a). The higher number of cases in 2006 could not be linked to a particular outbreak. The biggest epidemic outbreak in Switzerland with 122 cases occurred in the 1980s due to contaminated cheese.
In the aftermath of the epidemic outbreak in the late 1980s the Swiss government decreed the creation of appropriate means to prevent a repetition of such a case. Agroscope Liebefeld-Posieux Research Institute ALP was given the order to create a Listeria Monitoring Programme (LMP) in cooperation with the Swiss dairy industry. From 1990 on milk and milk products have been tested for Listeria spp. as part of quality assurance programmes. Since 2007 Listeria monocytogenes was present in less than in 1% of the samples in all years. Usually samples from the environment were tested positive. If rarely cheese samples were positive, L. monocytogenes was only found on the cheese surface.
An ALP Listeria Advisory Team can be called in for planning and consultation in decontamination of facilities and providing checkups of company safety concepts. An evaluation in 2008 showed that in 85% of cases the measures advised proved successful over the subsequent years of operation.
In addition, from 2002 until 2011 several hundred samples of semi-hard and soft-cheese from either raw or pasteurized cow’s, sheep’s and goat’s milk were tested every year for Listeria spp. within the framework of the national testing programme in the dairy industry by official food control. As only a few samples were positive each year the programme was stopped 2011.
Listeriosis in animals is notifiable (TSV, Article 5: disease to be monitored). From 1991 until 1995 not more than 3 cases of listeriosis per year were reported. Most cases occurred between 1999 and 2004, ranging between 27 and 34 per year. Since 2005, no more than 21 cases per year were reported. In the past 10 years (2004 until 2013) 158 listeriosis cases were reported by cantonal veterinarians, 98% of them affected ruminants (cattle, sheep and goats).

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

In 2013, the number of reported cases in humans increased to 64 laboratory confirmed cases with a notification rate of 0.8 per 100’000 inhabitants (2012: 39 cases, 0.5 per 100’000 inhabitants). Despite this increase, the notification rate was within the range of yearly fluctuations. Persons over 65 years of age remain the most affected age group. In two cases newborns were affected, where a transmission from the mother to her child was likely. The cases occurred during the whole year. Like in previous years the two most frequently identified serovars were 1/2a (47%) and 4b (38%).
In the framework of the Listeria Monitoring Programme (LMP) 2793 samples were tested for the presence of Listeria spp. in 2013. L. monocytogenes were detected in 6 samples (0.2%), 4 of which were samples from the environment, 2 from the surface of semi-hard cheese. Other species of Listeria spp. were found in 108 samples (3.9%). Furthermore, 601 samples of farm bulk milk were examined for the presence of Listeria monocytogenes to examine Swiss raw milk quality. The representative sampling involved 150 farm milk producers in 5 regions of Switzerland. 2 of 601 samples (0.3%) were positive on L.

monocytogenes (<1 cfu/mL). In 5 samples (0.8%) other species of Listeria have been detected.
2013, 8 cases of listeriosis in ruminants were registered in animals (4 in cattle,3 in goats and 1 in sheep).
In veterinary diagnostic laboratories 49 tests for listeriosis were carried out in the context of clinical investigations, 78% in ruminants, 10% in horses, 8% in dogs and cats and 4% in other animals.

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

L. monocytogenes are repeatedly leading to disease in humans. Even if the number of cases is relatively small, the high mortality, especially in older people, makes it very significant.
Monitoring the occurrence of Listeria spp. at different stages in the food chain is extremely important to prevent infections with contaminated food. Milk products and cheeses are a potential source of infection.
With regard to Listeria spp. in the dairy industry, the situation has remained on a constantly low level for many years.
In animals, the reported listeriosis cases have remained stable at a low level over the last years.

Recent actions taken to control the zoonoses

The research institute of Agroscope Liebefeld-Posieux (ALP) started in 2012 with the analysis of raw milk for the presence of various pathogens.

Additional information

1. In a border control inspection program risk-based random samples are taken. In 2013, 24 raw fish samples from Vietnam, the United States and Morocco as well as 6 ready to eat fishproducts from Vietnam, Indonesia and Thailand were tested negative for Listeria monocytogenes.
2. Further information can be found on the FSVO website www.blv.admin.ch.

2.3.2 Listeriosis in humans

Table Listeria in humans - Species/serotype distribution

Species/serotype Distribution	Cases	Cases Inc.
Listeria	64	.8
Listeria spp., unspecified	3	0.04
L. monocytogenes - L. monocytogenes serovar 4b	24	0.3
L. monocytogenes - L. monocytogenes serovar 1/2a	30	0.37
L. monocytogenes - L. monocytogenes serovar 1/2b	7	0.09

Table Listeria in humans - Age distribution

Age distribution	L. monocytogenes			Listeria spp., unspecified		
	All	M	F	All	M	F
<1 year	2	1	1			
5 to 14 years	1	1				
15 to 24 years	2	1	1			
25 to 44 years	3	1	2			
45 to 64 years	11	6	5			
65 years and older	45	27	18			
Total :	64	37	27	0	0	0

2.3.3 Listeria in foodstuffs

A. L. monocytogenes in Food Cheeses made from cows' milk

Preventive measures in place

The implementation of a hygiene concept in order to control the safety of the products is in the responsibility of the producers. All larger cheese producers run a certified quality management fulfilling ISO 9000. The federal research station Agroscope Liebefeld Posieux (ALP) is running a Listeria monitoring program for early detection of Listeria in production facilities.

Measures in case of the positive findings or single cases

The concerned food has to be confiscated and destroyed. Depending on the situation the product is recalled and a public warning is submitted.

Results of the investigation

In the framework of the Listeria Monitoring Programme (LMP) 2793 samples were tested for the presence of Listeria spp. in 2013. L. monocytogenes were detected in 6 samples (0.2%), 4 of which were samples from the environment, 2 from the surface of semi-hard cheese. Other species of Listeria spp. were found in 108 samples (3.9%). Furthermore, 601 samples of farm bulk milk were examined for the presence of Listeria monocytogenes to examine Swiss raw milk quality. The representative sampling involved 150 farm milk producers in 5 regions of Switzerland. 2 of 601 samples (0.3%) were positive on L. monocytogenes (<1 cfu/mL). In 5 samples (0.8%) other species of Listeria have been detected.

Table Listeria monocytogenes in milk and dairy products

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for L. monocytogenes	Units tested with detection method	Listeria monocytogenes presence in x g
Milk, cows' - raw milk for manufacture - intended for manufacture of raw or low heat-treated products - Processing plant - Surveillance [1)]	ALP	Selective sampling	Industry sampling	food sample > milk	Domestic	Batch	25g	601	2	601	2
Cheeses made from cows' milk - soft and semi-soft - made from raw or low heat-treated milk - Processing plant - Surveillance	ALP	Unspecified	Industry sampling	food sample	Domestic	Single	25g	939	2	939	2
Cheeses made from cows' milk - hard - made from raw or low heat-treated milk - Processing plant - Surveillance	ALP	Unspecified	Industry sampling	food sample	Domestic	Single	25g	1526	0	1526	0

	Units tested with enumeration method	> detection limit but <= 100 cfu/g	L. monocytogenes > 100 cfu/g
Milk, cows' - raw milk for manufacture - intended for manufacture of raw or low heat-treated products - Processing plant - Surveillance [1)]	2	0	0
Cheeses made from cows' milk - soft and semi-soft - made from raw or low heat-treated milk - Processing plant - Surveillance	0	0	0
Cheeses made from cows' milk - hard - made from raw or low heat-treated milk - Processing plant - Surveillance	0	0	0

Comments:

[1)] bulk milk samples

Table Listeria monocytogenes in milk and dairy products

Footnote:

ALP = Agroscope Liebefeld Research Institute, 3003 Bern

Table Listeria monocytogenes in other foods

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for L. monocytogenes	Units tested with detection method	Listeria monocytogenes presence in x g
Fish - raw - chilled - Border inspection activities - Monitoring [1)]	FSVO	Selective sampling	Official sampling	food sample	Imported from outside EU	Single	25g	24	0	24	0
Fishery products, unspecified - ready-to-eat - Border inspection activities - Monitoring [2)]	FSVO	Selective sampling	Official sampling	food sample	Imported from outside EU	Single	25g	6	0	6	0

	Units tested with enumeration method	> detection limit but <= 100 cfu/g	L. monocytogenes > 100 cfu/g
Fish - raw - chilled - Border inspection activities - Monitoring [1)]			
Fishery products, unspecified - ready-to-eat - Border inspection activities - Monitoring [2)]			

Comments:

[1)] Samples orginated from Vietnam, United States and Morocco.

[2)] Samples originated from Vietnam, Indonesia and Thailand.

Footnote:

The FSVO runs a border inspection programme in which risked-based random samples are taken from commodities from third countries. As commodities from third countries can only be inspected at the airports and because this mode of importation is quite expensive not many samples can be tested.

2.3.4 Listeria 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
Cats - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	1	0		
Cattle (bovine animals) - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	9	4		4
Dogs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	3	0		
Goats - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	8	7		7
Other animals - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	1	0		
Pigs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	1	0		
Sheep - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	21	16		16
Solipeds, domestic - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	5	0		

Footnote:

All data categorised as “clinical investigation” are summaries of data from the ILD (= information system of laboratory data). ILD is run by the FSVO. All labs, which are approved for the diagnosis of notifiable diseases, have to report their results in this system. Only tests of antigen detection were selected for the zoonosis reporting in the context of “clinical investigation”.

2.4 E. COLI INFECTIONS

2.4.1 General evaluation of the national situation

A. Verotoxigenic Escherichia coli infections general evaluation

History of the disease and/or infection in the country

Detection of VTEC in humans is notifiable since 1999. Confirmed human VTEC cases fluctuated between 31 and 72 cases per year. The notification rate of VTEC infections was never above 1.1 reports per 100,000 inhabitants in the total population. Children under 5 years were the age group mostly affected. In the last 10 years, the notification rate ranged between 3 and 9 reports per 100’000 inhabitants in this age group without a clear time trend.

97 human non-O157 VTEC isolates collected from patients from 2000 to 2009 were further characterized: 40 different serotypes were found, of which serotypes O26:H11/H-; O103:H2; O121:H19; O145:H28/H- dominated. O26:H11/H- was the one which was most frequently associated with HUS. The high genetic diversity of strains indicates that non-O157 STEC infections in Switzerland are often sporadic and not linked to bigger outbreaks (Käppeli et al., 2011a).

Moreover, 44 O157 VTEC strains isolated from different patients from 2000 through 2009 were further characterized and linked to medical history data. Non-bloody diarrhoea was experienced by 15.9%, BD by 61.4% of the patients, and 29.5% developed HUS. All strains belonged to MLST type 11, were positive for vtx2 variants (vtx2 and/or vtx2c), eae and ehxA, and only two strains showed antibiotic resistance. Of the 44 strains, nine phage types (PTs) were detected the most frequent being PT32 (43.2%) and PT8 (18.2%) (Käppeli et al. 2011b).

Ruminants, especially small ruminants, are an important reservoir for VTEC in Switzerland. 14% of fecal samples from cattle, 30% from sheep and 22% from pigs were VTEC-positive in 2000. Younger bovines were found to excrete more frequently VTEC than older bovines. Caution is therefore needed when interpreting average figures on the occurrence of VTEC for the whole cattle population. In swine, characterization data of the strains showed that they are harbouring mainly vtx2e and therefore belong to low pathogenic VTEC group.

In 2012 shiga toxin genes and the top-five STEC serogroups were frequently found in young Swiss cattle at slaughter, but success rates for strain isolation were low and only few strains showed a virulence pattern of human pathogenic VTEC. Of 563 fecal samples with available results, 74.1% tested positive for vtx genes (42% O145, 26% O103, 24% O26, 8% O157 and 1% O111). From the strains which could be isolated, all 17 O26 strains were eae-positive, and 9 strains harboured vtx (vtx1 (8x), vtx2 (1x)). Of the 28 O145 strains, 10 were eae-positive including 4 harbouring vtx1 or vtx2. Of the 12 O157 strains 5 harboured vtx2 and eae and were identified as VTEC O157:H7/H(-). The other 7 O157 strains were negative for vtx and eae or positive only for eae (Hofer et al. 2013).

Further possible reservoirs are described in wild boars, wild ruminants and rabbits. In a study in wild boars from canton Geneva in 2007/2008, VTEC was detected in 9% (14/153) of the examined tonsils using real-time PCR. Fecal samples of 73 wild boars were all negative. These results indicate that wild boars are carriers of foodborne pathogens in tonsils, but shedding in feces occurs rarely (Wacheck et al., 2010). Of 239 fecal samples of wild ruminants in 2011, 32.6% tested positive for vtx, 6.7% for intimin and 13.8% for both. Among the 56 isolated VTEC strains, 44.6% harbored genes for the Vtx2 group, 30.4% for the Vtx1 group, and 21.4% for both Vtx1 and Vtx2. The 56 VTEC strains were isolated from 18 red deer, 19 roe deer, 13 chamois and 6 ibex. Further characterization data of the isolated strains were required to assess their actual human pathogenicity (Obwegeser et al., 2012). In Swiss rabbits in 2008, genes for Verotoxins have only been detected in a small minority of the rabbit fecal samples (3.0%). E. coli harboring intimin

were found in a high prevalence in Swiss rabbits at slaughter. Such animals represent a source of carcass contamination at slaughter (Kohler et al. 2008).
In the 1990s 2.4% of minced meat samples and 21.6% of uncooked, deep-frozen hamburgers were positive for VTEC.
In 29 of 1422 samples (2%) of raw milk cheese - collected in the national monitoring program for dairy products from 2006 to 2008 - VTEC strains were isolated (24 semi-hard and 5 soft cheeses). All isolated strains belonged to non-O157 serotypes (13 of 24 strains typeable with O antisera belonged to the serogroups O2, O22 and O91; 9 strains harbored hlyA; none of the strains tested positive for eae) (Stephan et al. 2008, Zweifel et al. 2010). A study looking at the die-off behavior of Shiga-toxin producing E. coli during the ripening process of semi-hard raw milk cheeses revealed that VTEC could be detected after 16 weeks of ripening irrespective of the selected burning temperature (40°C und 46°C) and the initial contamination level (low level and high level) (Peng et al. 2013).
In a study concerned with the occurrence of VTEC in foods of plant origin, one of 233 samples (ready-to-eat lettuce (142x), freshly cut fruits (64x) and sprouts (27x)) was found to be contaminated with a low pathogenic VTEC (Althaus et al. 2012).

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

2013, 80 laboratory confirmed cases of human VTEC infections were registered (O157 (6x), O26 (1x), non -O157 (12x), unknown (61x)). The notification rate was 1.0 per 100’000 inhabitants (2012: 0.8), which is in the normal range of yearly differences. Children under 5 years of age were the most frequently affected (6.4 per 100’000 inhabitants). From 11 cases of haemolytic-uraemic syndrome (HUS) 8 were registered in children under 4 years.
Although O157:H7 is the predominant cause of HUS, strain O26:H11/H- has emerged to the most common non-O157 strain causing human bloody diarrhea and HUS in many countries. In a study conducted 2012 O26:H11/H- isolates from human fecal samples having bloody diarrhea and/or HUS (27x) and healthy cattle (11x) and sheep (1x) fecal samples were analysed. Within the E. coli O26 isolates more sequence type (ST)21 strains were identified than ST29 (60% and 75% of the human and animal isolates, respectively). Whereas all human isolates harboured at least one vtx, only one isolate each from one cattle and sheep did. Both animal strains harbouring vtx belonged to ST29. The results indicate that cattle and sheep are a possible reservoirs of the emerging O26:H11/H- ST29 (Zweifel et al., 2013). Such E. coli O26 strains can probably lose and gain vtx-encoding phages. Exchange between VTEC O26 strains and their vtx-negative variants might lead to the development of new clones.
To examine Swiss raw milk quality, 601 samples of farm bulk milk were examined 2013 for the presence of STEC at the research station Agroscope Liebefeld-Posieux (ALP). The representative sampling involved 150 farm milk producers in 5 regions of Switzerland. 22 samples (3.7%) were PCR-positive for stx-genes and among the 11 STEC (1.8%) obtained isolates, one O26 belonging to the most pathogenic subgroups could be identified (0.2%).

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

Reported VTEC cases in humans are stable. As most of the laboratories do not routinely test for VTEC, it is very likely that the impact of VTEC is underestimated. In view of the low infectious dose of VTEC (<100 microorganisms) an infection via contaminated food or water is easily possible. Strict maintenance of good hygiene practices at slaughter and in the context of milk production is of central importance to ensure both public health protection and meat quality. In addition, thorough cooking of critical foods prevents infection with VTEC originally present in raw products. Data from the national monitoring program for dairy products 2006-2008 confirm that raw milk cheese may constitute a possible source of VTEC infections and are a relevant hazard in this type of dairy product. Especially, because VTEC seems to be able to survive during the ripening process of semi-hard raw milk cheeses.

Recent actions taken to control the zoonoses

Two studies relating to verotoxigenic E. coli in foodstuffs and one in human and animal fecal samples were conducted by the national reference laboratory to generate new information (Althaus et al. 2012, Peng et al. 2013 and Zweifel et al. 2013).
The FSVO runs a border inspection programme in which risked-based random samples are taken from commodities from third countries. As commodities from third countries can only be inspected at the airports and because this mode of importation is quite expensive not many samples are tested. In 2013, 29 bovine meat samples from South America were tested negative for E. coli. Also 6 ready to eat fishproducts from Vietnam, Indonesia and Thailand were tested negative for E. coli.

Additional information

1. Zweifel et al. (2013). Detection of the emerging Shiga toxin-producing Escherichia coli O26:H11/H- sequence type 29 (ST29) clone in human patients and healthy cattle in Switzerland Applied and Environmental Microbiology 79(17): 5411-3.
2. Peng et al. (2013). Behavoiur of Shiga toxin-producing and generic E. coli during ripening of semi-hard raw milk cheese. Journal of Dairy Science 31, 117-120.
3. Althaus et al. (2012). Bacteriological survey of ready-to-eat lettuce, fresh-cut fruits and sprouts collected from the Swiss market. Journal of Food Protection 75, 1338-1341.
4. Obwegeser et al. (2012). Shedding of foodborne pathogens and microbial carcass contamination of hunted wild ruminants. Veterinary Microbiology 159, 149–154.
5. Hofer et al. (2013). Application of a real-time PCR-based system for monitoring of O26, O103, O111, O145 and O157 Shiga Toxin-producing Escherichia coli in cattle at slaughter. Zoonoses and Public Health, 2013, 1863-2378 (electronic).
6. Käppeli et al. (2011a). Shiga toxin-producing Escherichia coli non-O157 strains associated with human infections in Switzerland: 2000-2009. Emerging Infectious Diseases 17, 180-185.
7. Käppeli et al. (2011b). Shiga toxin-producing Escherichia coli O157 associated with human infections in Switzerland, 2000-2009. Epidemiology and Infection 139, 1097–1104.
8. Zweifel et al. (2010). Characteristics of Shiga Toxin-Producing Escherichia coli isolated from Swiss raw milk cheese within a 3-year monitoring program. Journal of Food Protection, 73, 88-91.
9. Wacheck et al. (2010) Wild boars as an important reservoir for foodborne pathogens. Foodborne Pathogens and Disease, Volume 7, Number 3.
10. Stephan et al. (2008). Prevalence and characteristics of Shiga toxin-producing Escherichia coli in Swiss raw milk cheeses collected at producer level. Journal of Dairy Science 91, 2561-2565.
11. Federal Office of Public Health (2008). Enterohämorrhagische Escherichia coli (EHEC), epidemiologische Daten in der Schweiz von 1996 bis 2006. Bulletin of the FOPH; No. 14: 240-246.
12. Kohler et al. (2008). Shedding of food-borne pathogens and microbiological carcass contamination in rabbits at slaughter. Veterinary Microbiology 132, 149–157.
13. Kaufmann et al. (2006). Escherichia coli O157 and non-O157 Shiga toxin-producing Escherichia coli in fecal samples of finished pigs at slaughter in Switzerland. Journal of Food Protection 69, 260–266.
14. Zweifel et al. (2006). Bedeutung von Escherichia coli O157 beim Schlachtschaf in der Schweiz. Schweizer Archiv für Tierheilkunde 148, 289–295.
15. Zweifel et al. (2004). Prevalence and characteristics of Shiga toxin-producing Escherichia coli, Salmonella spp. and Campylobacter spp. isolated from slaughtered sheep in Switzerland. International Journal of Food Microbiology 92, 45-53.
16. Al-Saigh et al (2004). Fecal shedding of Escherichia coli O157, Salmonella, and Campylobacter in Swiss cattle at slaughter. Journal of Food Protection 67, 2004, 679–684.
17. Schmid et al (2002). Verocytotoxin-producing Escherichia coli in patients with diarrhoea in Switzerland. Eur J Clin Microbiol Infect Dis. 21:810-813.
18. Stephan et al. (2000). Occurrence of verotoxin-producing Escherichia coli (VTEC) in fecal swabs from slaughter cattle and sheep – an observation from a meat hygiene view. Schweizer Archiv für Tierheilkunde 142, 110–114.

19. Further information can be found on the FSVO website www.blv.admin.ch.

2.4.2 E. coli infections in humans

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	0	0	0	0	0	0
- lab. confirmed cases	11	0.14				
- caused by O157 (VT+)	2	0.02				
- caused by other VTEC	2	0.02				
- laboratory confirmed	69	0.85				
- caused by 0157 (VT+)	4	0.05				
- caused by other VTEC	11	0.14				

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			E.coli, pathogenic, unspecified		
	All	M	F	All	M	F	All	F	M	All	M	F
<1 year	6	4	2	1	1					5	3	2
1 to 4 years	20	7	13	2	1	1	5	1	4	13	5	8
5 to 14 years	6	4	2	1		1	3	2	1	2	2	
15 to 24 years	7	3	4							7	3	4
25 to 44 years	12	4	8				1		1	11	4	7
45 to 64 years	9	4	5	1		1	2		2	6	4	2
65 years and older	20	13	7	1	1		2	2		17	10	7
Total :	80	39	41	6	3	3	13	5	8	61	31	30

2.4.3 Escherichia coli, pathogenic in foodstuffs

Table VT E. coli in food

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Analytical Method	Sampling unit	Sample weight	Units tested	Total units positive for Verotoxigenic E. coli (VTEC)	Verotoxigenic E. coli (VTEC) - VTEC O157
Fishery products, unspecified - ready-to-eat - Border inspection activities - Monitoring [1)]	FSVO	Selective sampling	Official sampling	food sample	Imported from outside EU	Detection method - presence in x g	Single	25g	7	0	
Meat from bovine animals - fresh - chilled - Border inspection activities - Monitoring [2)]	FSVO	Selective sampling	Official sampling	food sample > meat	Imported from outside EU	Detection method - presence in x g	Single	25g	29	0	
Milk, cows' - raw milk for manufacture - intended for manufacture of raw or low heat-treated products - Processing plant - Surveillance [3)]	ALP	Selective sampling	Industry sampling	food sample > milk	Domestic	PCR	Batch	25g	601	22	

	Verotoxigenic E. coli (VTEC) - VTEC non-O157	Verotoxigenic E. coli (VTEC) - VTEC, unspecified	Verotoxigenic E. coli (VTEC) - VTEC O26
Fishery products, unspecified - ready-to-eat - Border inspection activities - Monitoring [1)]			
Meat from bovine animals - fresh - chilled - Border inspection activities - Monitoring [2)]			
Milk, cows' - raw milk for manufacture - intended for manufacture of raw or low heat-treated products - Processing plant - Surveillance [3)]		22	

Comments:

Table VT E. coli in food

Comments:

[1)] Samples orignated from Vietnam, Indonesia and Thailand.

[2)] Samples originated from South America.

[3)] 22 bulk milk samples (3.7%) were PCR-positive for stx-genes. Among 11 VTEC obtained isolates, one O26 belonging to the most pathogenic subgroups could be identified (0.2%).

Footnote:

ALP = Agroscope Liebefeld Research Institute, 3003 Bern.

The FSVO runs a border inspection programme in which risked-based random samples are taken from commodities from third countries. As commodities from third countries can only be inspected at the airports and because this mode of importation is quite expensive not many samples can be tested.

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

Tuberculosis in humans is notifiable (ordinance of the FDHA on medical doctor and laboratory reporting). Human tuberculosis cases due to Mycobacterium bovis (M.) are reported on a low scale (not more than 15 cases per year since 2005), which corresponds to less than 2% of all reported tuberculosis cases.
In animals, tuberculosis is notifiable (TSV, Article 3: disease to be eradicated and 158 – 159). Vaccination is prohibited. Requirements of section 3.2.3.10 of the OIE International Animal Health Code are fulfilled since 1959. Free status is recognised by EU (Bilateral Agreement on Agriculture, Veterinary Annex). Between 1960 and 1980, the entire bovine population was tested every other year in an active surveillance programme. Since 1980, passive surveillance at the slaughterhouse is performed. Isolated cases of bovine tuberculosis have been found (most recently in 1998), which were partly due to reactivation of M. bovis infections in humans with subsequent infection of bovine animals. In 1997 a survey in a randomized sample of about 10% of farms (4874 farms) was conducted to prove freedom from disease. 111‘394 cattle were tuberculin tested. On 72 farms, tests had to be repeated. All farms were negative.
In 1998, lymph nodes from slaughtered captive deer from 124 sampled holdings (from a total of 485 farmed deer holdings) showed no lesions typical of bovine tuberculosis and were tested negative in culture for M. bovis and M. tuberculosis (Wyss et al. 2000).
In a study conducted in 2010, 23 of 582 cattle of the Canton St. Gallen, which had spent the Alpine pasturing season 2009 on Alpine pastures in Austria, reacted with an unclear result in the tuberculin skin test, but were negative after retesting with the tuberculin skin test and/or the Interferon-gamma test. In addition, in 6 of 165 wild boars (4%) bacteria from the MTBC complex were detected, but none of these tested positive for M. bovis or M. caprae. 269 wild red deer were tested negative for tuberculosis (Schöning et al. 2012).
Between 1991 and 2012 cases in animals were reported extremely rarely (no more than 2 cases per year since 1991). In the last 10 years (2004 to 2013) a total of 19 cases were registered, affecting cats (2), parrots (1), dogs (1), horses (1), lamas (1) and cattle (13). The cases in cattle were all detected in 2013 during outbreak investigations and were the first in cattle since 1998.

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

In 2013, 456 diagnostically confirmed human cases of tuberculosis and 72 non-laboratory confirmed cases were reported. 356 of the laboratory confirmed cases were caused by M. tuberculosis, 2 by M. bovis, 6 by M. africanum and 1 by M. caprae. 91 strains were M. tuberculosis-complex positive, but could not be identified further. The two M. bovis cases were one Swiss women aged 90 and one 25 year old women from Eritrea.
In animals 10 cases of tuberculosis in cattle were reported belonging to two different outbreaks. A first case (M. bovis) was detected during meat inspection at the slaughterhouse in the western part of Switzerland. During the outbreak investigation of this initial case further additional 6 cases were detected which were all linked to the initial case farm. On this initial farm tuberculosis stayed undetected for many years. The other 3 cases (M. caprae) belonged to a second outbreak in the eastern part of Switzerland. Here the origins of infection were wild deer in Austria. All infected animals were on Alpine pastures in Austria during summer where M. caprae is endemic. Outbreak investigations are still ongoing. So far, 26 positive cattle were found on these 10 case farms (1 cattle each on 6 farms and 2, 4, 6 or 8 cattle on one

farm each).
In veterinary diagnostic laboratories 238 tests were carried out, mainly in cattle (80%) and deer (8%).

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

Human tuberculosis cases due to M. bovis were reported on a low scale and corresponded to less than 2% of all reported tuberculosis cases since more than 10 years. 2013 it were below 0.5%. Swiss livestock is recognized free of bovine tuberculosis. The outbreaks in 2013 showed that isolated TB cases do exist. The risk of a TB infection by contact to infected bovines or through Swiss food containing mycobacteria (like milk, which is in addition mostly pasteurised) within Switzerland is negligible. Even during an outbreak udder lesions which lead to an excretion of the bacteria in the raw milk are rare. The average bacteria count would then be around 1000 bacteria per ml, without the possibility to grow further in the milk. In addition, usually only one animal is affected in a herd, so that the bulk milk will have an diluting effect. For an infection of an adult person a high amount (millions of bacteria) is necessary. Raw milk is not ready for consumption and needs to be heat treated (minimum 70°C) before consumption. Products from pasteurized milk are no risk at all as bacteria are eliminated trough the heat treatment. Infections over contact (aerogen transmission) are more likely as only a few bacteria are needed.
Human cases of tuberculosis are anticipated to be mainly attributable to stays abroad or to the consumption of foreign products. However, natives aged over 65 years could have been infected in their childhood, when the disease in Swiss cattle was more frequent.
Risk factors for the incursion of the disease are international trade with animals, summer grazing of Swiss cattle in risk areas and wild animals living close to the Austrian or German border. The cases in 2013 in eastern Switzerland prove, that summer grazing in Tyrolia and Vorarlberg, Austria, where M. caprae infection is endemic in red deer since the 90ties, is a risk for infection for Swiss cattle. Although the source of infection of the first outbreak wit
M. bovis remains unclear, international trade needs to be looked at closer. According also to the number of cases reported in the EU (ADNS system) tuberculosis cases seem to be increasing in the recent years (like in UK, France, Italy, Spain and Portugal). Infected wild animals are a potential reservoir and were found in all these countries (wild boars, deer, badgers), especially in areas with high wild animal densities.

Recent actions taken to control the zoonoses

In 2010 a study in cattle which were on Alpine pastures in Austria 2009 as well as red deer and wild boar in the Alpine region in 2010 were all tested negative.
As detecting suspect cases during meat inspection in slaughterhouses is a challenge in a country with a very low prevalence disease awareness at slaughterhouses was started to be strengthened.
In 2013, after the detection of the first case in cattle since 1998, a new project was lanced in Switzerland to improve the disease awareness at the meat inspection in slaughterhouses, called LyMON. A manual with pictures on how bovine TB looks like was distributed to all meat inspectors at the slaughterhouse. In addition, sending in lymphatic tissue with unspecific alterations for analysis was enhanced. From 01.10.2013 – 31.12.2013 lymphatic tissue with unspecific alterations of 20 cattle were analysed using Ziehl-Neelsen staining and a genus-specific mycobacterial PCR. All samples were negative for bacteria of the M. tuberculosis-complex.

Additional information

1. Wyss D., Giacometti M., Nicolet J., Burnens A., Pfyffer GE., Audige L., (2000). Farm and slaughter survey of bovine tuberculosis in captive deer in Switzerland. Vet. Rec. 147,713 -717.
2. Schöning, J. 2012: Untersuchungen zum Vorkommen der Rindertuberkulose bei Wildtieren und zum Risiko der Entwicklung eines Reservoirs bei Wildungulaten in der Schweiz und im Fürstentum Liechtenstein. Inauguraldissertation der Vetsuisse Fakultät der Universität Bern, 2012.
3. Further information can be found on the FSVO website www.blv.admin.ch.

2.5.2 Tuberculosis, mycobacterial diseases in humans

Table Mycobacterium in humans - Species/serotype distribution

Species/serotype Distribution	Cases	Cases Inc.	Autochthon cases	Autochthon Inc.	Imported cases	Imported Inc.
Mycobacterium	528	6.53	0	0	0	0
M. bovis	2	0.02				
M. tuberculosis	356	4.41				
Mycobacterium spp., unspecified	163	2.02				
M. caprae	1	0.01				
M. africanum	6	0.07				

Footnote:

In the group of unspecified Mycobacterium spp. are 91 cases of M. tub. complex (cases inc. 1.13) and 72 (cases inc. 089) non laboratory confirmed cases.

Table Mycobacterium in humans - Age distribution

Age distribution	M. bovis		
	All	M	F
25 to 44 years	1		1
65 years and older	1		1
Total :	2	0	2

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

Switzerland is officially acknowledged as free from bovine tuberculosis since 1959. Freedom from disease has been proven in 1997 conducting a survey in a randomized sample of 4874 farms. 111‘394 cattle were tuberculin tested. In 72 farms tests had to be repeated. All farms were negative.

Notification system in place

Bovine tuberculosis is notifiable since 1950 (TSV, Art. 3: disease to be eradicated and Art. 158 - Art. 165). Notifications of suspicious cases are mandatory. Actions to be taken in suspicious farms are ban of all animal traffic and investigation of the whole herd. In confirmed cases (herds) all diseased or suspicious cattle has to be slaughtered and the milk of them is disposed. The barn has to be disinfected.

Results of the investigation

2013 13 cases of tuberculosis in cattle were reported belonging to two different outbreaks. A first case (M. bovis) had occurred during meat inspection at the slaughterhouse in the western part of Switzerland. During the outbreak investigation of this first case further additional 9 cases were detected which all were linked to the initial case farm. On this initial farm tuberculosis stayed undetected for many years. The other 3 cases (M. caprae) belonged to a second outbreak in the eastern part of Switzerland. Here the origins of infection were wild deer in Austria. All infected animals were on Alpine pastures in Austria during summer. Outbreak investigations are still ongoing. So far, 26 positive cattle were found on 10 of these case farms (1 cattle each on 6 farms and 2, 4, 6 or 8 cattle on one farm each).

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

Swiss livestock is recognized free of bovine tuberculosis. The outbreaks in 2013 showed that isolated TB cases do exist.

Risk factors for the incursion of the disease are international trade with animals, summer grazing of Swiss cattle in risk areas and wild animals living close to the Austrian or German border. The cases in 2013 in eastern Switzerland prove, that summer grazing in Tyrolia and Vorarlberg, Austria, where M. caprae infection is endemic in red deer since the 90ties, is a risk for infection for Swiss cattle. Although the source of infection of the first outbreak wit M. bovis remains unclear, international trade needs to be looked at closer. According also to the number of cases reported in the EU (ADNS system) tuberculosis cases seem to be increasing in the recent years (like in UK, France, Italy, Spain and Portugal). Infected wild animals are a potential reservoir and were found in all these countries (wild boars, deer, badgers), especially in areas with high wild animal densities.

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

In countries with very low prevalence disease awareness at slaughterhouses need to be strengthened regularly in order to not miss isolated cases.

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
Cats - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	4	1		
Deer - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	18	0		
Dogs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	1	0		
Goats - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	2	0		
Other animals - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	12	0		
Pigs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	4	1		
Sheep - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	2	0		
Solipeds, domestic - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	3	0		
Wild animals - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	1	0		

	Mycobacterium spp., unspecified	M. avium complex	M. avium complex - M. avium subsp. avium
Cats - Clinical investigations		1	
Deer - Clinical investigations			
Dogs - Clinical investigations			
Goats - Clinical investigations			
Other animals - Clinical investigations			

Table Tuberculosis in other animals

	Mycobacterium spp., unspecified	M. avium complex	M. avium complex - M. avium subsp. avium
Pigs - Clinical investigations			1
Sheep - Clinical investigations			
Solipeds, domestic - Clinical investigations			
Wild animals - Clinical investigations			

Footnote:

All data categorised as “clinical investigation” are summaries of data from the ILD (= information system of laboratory data). ILD is run by the FSVO. All labs, which are approved for the diagnosis of notifiable diseases, have to report their results in this system. Only tests of antigen detection were selected for the zoonosis reporting in the context of “clinical investigation”.

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

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

Region	Total number of existing bovine		Officially free herds		Infected herds		Routine tuberculin testing		Number of tuberculin tests carried out before the introduction into the herds (Annex A(I)(2)(c) third indent (1) of Directive 64/432/EEC)	Number of animals with suspicious lesions of tuberculosis examined and submitted to histopathological and bacteriological	Number of animals detected positive in bacteriological examination
	Herds	Animals	Number of herds	%	Number of herds	%	Interval between routine tuberculin tests	Number of animals tested			
Schweiz/Suisse/Svizzera	39161	1560293	391451	999.59	10	.03	no routine test	8591	0	20	26
Total : [1)]	39161	1560293	391451	999.59	10	.03	N.A.	8591	0	20	26

Comments:

[1)] N.A.

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

Brucellosis in humans is notifiable (ordinance of the FOHA on doctor and laboratory reports). The number of detections of Brucella spp. in humans has been rare for many years.
Brucellosis in animals is notifiable (TSV, Article 3: disease to be eradicated: bovine brucellosis since 1956, in sheep and goats since 1966; Article 4: disease to be controlled: brucellosis in rams). Government measures are applied to control brucellosis in sheep and goats (Brucella melitensis, TSV, Articles 190-195), in cattle (Brucella abortus, TSV, Articles 150-157) , in pigs (Brucella suis as well as Brucella abortus and Brucella melitensis, TSV, Articles 207 – 211) and in rams (B. ovis, TSV, Articles 233-236). Cattle, pigs, sheep and goats must be tested for brucellosis in cases where the causes of abortion are being investigated (TSV, Article 129).
Vaccination is prohibited since 1961. Switzerland is officially recognized by EU (Bilateral Agreement on Agriculture, Veterinary Annex) as free of brucellosis in cattle, sheep and goats. Requirements of section 3.2.1.5 of the OIE International Animal Health Code are fulfilled since 1963.
Brucella abortus in bovines was last reported in 1996, Brucella melitensis in small ruminants in 1985. Freedom from bovine brucellosis has been proven the last time in 1997 when a random sample of 139‘655 cows (in general older than 24 months) in 4’874 farms was tested negative using a serological test. Since 1998 the freedom of the sheep and goat population from brucellosis is documented annually with serological testing of randomly selected farms according to EU regulation 91/68/EEC .
Brucella suis in pigs is very rare. However, it is known that B. suis Biovar 2 is prevalent in wild boars (Leuenberger et al., 2007). Outdoor pigs which are outside the whole day, close to the forest (<50m) and with low fences (<60cm) have the highest risk of contact with wild boars. From 252 wild boars tested from 2008 until 2010 28.8% (95% CI 23.0%-34.0%) were B. suis Biovar 2 positive by culture and PCR and 35.8% (95% CI 30.0%-42.0%) had antibodies against B. suis (Wu et al. 2011). These findings were significantly higher than in previous studies indicating a spread of B. suis Biovar 2 in Swiss wild boars. A questionnaire revealed that 31% of the gamekeeper and 25% of outdoor pig holders observed at least 1 interaction between wild boars and pigs in the past 20 years. 5% of holdings reported hybrids (Wu et al. 2012).
After a reported case in wild boars in 2001, the first outbreak since many years with B. suis Biovar 2 occurred in domestic pigs in 2009. The primary case was in a farm with Mangalitza pigs, which were reared outdoor and therefore contact to wild boars was very likely. Two secondary farms had contact to the first one via animal traffic. The outbreak isolates constituted a unique cluster by MLVA (Multi locus variable number of tandem repeats) and was distinct from that of isolates obtained from wild boars, suggesting that direct transmission of the pathogen from wild boars to domestic pigs was not responsible for this outbreak. (Abril 2011)). In 2010, B. suis Biovar 2 was again detected in one wild boar.
In addition, a clinical case of B. ovis in rams was detected in 2010, after 9 years of no reported cases. B. ovis in rams was mainly detected between 1994 and 2001. In this time period 101 cases were reported, ranging from 1 to 34 per year.

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

2013 4 brucellosis cases in humans were reported (in 2012: 3 cases). All 4 cases were women aged between 22 and 75 years. 3 times B. melitensis and 1 time B. canis were detected.

2013, no cases of brucellosis were reported by the cantonal veterinarians. In the yearly national survey 751 sheep farms (22768 blood samples) and 476 goat farms (3426 blood samples) were tested negative for Brucella melitensis. Furthermore, in diagnostic laboratories 1241 animals were tested for brucellosis in the context of clinical investigations or abortions.

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

Human infections with Brucella spp. through the consumption of Swiss raw milk or dairy products from non -heat-treated milk (for example sheep or goat's cheese) is considered to be of negligible risk because its prevalence is probably close to zero in the Swiss animal population as no new cases in dairy livestock were found since many years. Cases of brucellosis in humans are anticipated to be attributable either to stays abroad or to the consumption of foreign products.

B. suis Biovar 2 seem to occur from time to time in wild boars and holdings which keep pigs outdoors. Contacts between wild boars and pigs kept outdoor are most likely to occur at the border of the Jura and the middle part of Switzerland. However, B. suis Biovar 2 is very rarely notified in humans, probably as it is known to be less virulent to humans than Biovar 1 and 3.

Recent actions taken to control the zoonoses

National surveys on a yearly basis are carried out to document freedom from brucellosis in sheep and goat. A research study was conducted in 2008 -2010 to obtain recent B. suis prevalence data in wild boars and to evaluate risk factors for the infection of pigs which are reared outdoor (results see above).

Additional information

1. Leuenberger R, Boujon P, Thür B, Miserez R, Garin-Bastuji B, Rüfenacht J, Stärk KD (2007): Prevalence of classical swine fever, Aujeszky's disease and brucellosis in a population of wild boar in Switzerland, Vet Rec; 160(11):362-8.

2. Hinić V., Brodard I., Thomann A., Cvetnić Z., Makaya P.V., Frey J., Abril C. (2008): Novel identification and differentiation of Brucella melitensis, B. abortus, B. suis, B. ovis, B. canis, and B. neotomae suitable for both conventional and real-time PCR systems; J Microbiol Methods Oct 75(2):375-8

3. Hinić V, Brodard I, Thomann A, Holub M, Miserez R, Abril C. (2009): IS711-based real-time PCR assay as a tool for detection of Brucella spp. in wild boars and comparison with bacterial isolation and serology; BMC Veterinary Research. Jul 14;5:22

4. Hinić V., Brodard I., Petridou E., Filiousis G., Contos V., Frey J., Abril C. (2009): Brucellosis in a dog caused by Brucella melitensis Rev 1,Vet Microbiol, Sept 26

5. Abril C, Thomann A, Brodard I, Wu N, Ryser-Degiorgis MP, Frey J, Overesch G. (2011): A novel isolation method of Brucella species and molecular tracking of Brucella suis biovar 2 in domestic and wild animals, Vet Microbiol. 2011 Mar 5

6. Wu, N Abril, C., Hinic, V., Brodard, I., Thür, B., Fattebert, J., Hüssy, D., Ryser-Degiorgis, M.P. (2011): Free-ranging wild boar may represent a threat to disease freedom in domestic pigs in Switzerland. J Wildl Dis.

7. Wu, N., Abril, C., Thomann, A., Grosclaude, E., Doherr, M.G., Boujon, P., Ryser-Degiorgis, M.P. (2012): Risk factors for contacts between wild boar and outdoor pigs in Switzerland and investigations on potential Brucella suis spill-over. BMC Vet Res

8. Further information can be found on the FSVO website www.blv.admin.ch.

2.6.2 Brucellosis in humans

Table Brucella in humans - Species/serotype distribution

Species/serotype Distribution	Cases	Cases Inc.	Autochthon cases	Autochthon Inc.	Imported cases	Imported Inc.
Brucella	4	.05	0	0	0	0
B. melitensis	3	0.04				
B. canis	1	0.01				

Table Brucella in humans - Age distribution

Age distribution	B. abortus			B. melitensis			Brucella spp., unspecified		
	All	M	F	All	M	F	All	M	F
15 to 24 years							1		1
25 to 44 years				2		2			
65 years and older				1		1			
Total :	0	0	0	3	0	3	1	0	1

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

Switzerland is officially acknowledged as free from bovine brucellosis since 1959. Bovine brucellosis is notifiable since 1956. Requirements of section 3.2.1.5 of the OIE International Animal Health Code are fulfilled since 1963. Free status is recognised by EU (Bilateral Agreement on Agriculture, Veterinary Annex).

Freedom from disease has been proven in 1997 conducting a survey in a randomized sample of 4874 farms. 139‘655 cows (in general older than 24 months) were tested using serological test. There were no positive findings in these samples.

Vaccination policy

Vaccination is prohibited since 1961.

Measures in case of the positive findings or single cases

Actions to be taken in suspicious farms are ban of all animal traffic and investigation of the whole herd as well as the placenta of calving cows.

In confirmed cases (herds) all diseased cattle have to be killed. All placentas, abortion material and the milk of diseased and suspicious cows have to be disposed. The barn has to be disinfected.

Official meat inspection is investigating each carcass, its organs and lymphatic tissue on the prevalence of abnormal alterations. Whole carcasses need to be destroyed if lesions typical for brucellosis could be confirmed by a laboratory test. Without lesions or in case of unclear laboratory results the udder, genitals and the blood need to be destroyed (VHyS, Annex 7).

Notification system in place

Notification of suspicious cases and outbreaks is mandatory since 1956. Brucellosis in bovine animals is regulated as zoonoses to be eradicated (TSV, Art. 150 - Art. 157).

Results of the investigation

No cases occurred in the passive surveillance after 1997, when freedom was proven in a nationwide survey.

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

There are no observations that would challenge the freedom of Swiss cattle population from brucellosis.

B. Brucella melitensis in goats

Status as officially free of caprine brucellosis during the reporting year

The entire country free

Switzerland is officially acknowledged as free from ovine and caprine brucellosis.
Freedom from disease has been proven every year since 1998 conducting a survey in a randomized sample of farms. Free status is recognized by EU (Bilateral Agreement on Agriculture, Veterinary Annex). EU regulation 91/68/EEC that defines populations of sheep and goat as one epidemiological unit is the basis of the survey. Scientific basis is published by Hadorn et al. 2002: Risk-based design of repeated surveys for the documentation of freedom from non-highly contagious diseases. Preventive Veterinary Medicine (2002) 56: 179-192.

Vaccination policy

Vaccination is prohibited since 1961.

Measures in case of the positive findings or single cases

Actions to be taken in suspicious farms are ban of all animal traffic and the investigation of the whole herd. In confirmed cases the whole herd has to be killed immediately. All placentas, abortion material and the milk of diseased and suspicious animals have to be disposed. The barn has to be disinfected.
Official meat inspection is investigating each carcass, its organs and lymphatic tissue on the prevalence of abnormal alterations. Whole carcasses need to be destroyed if lesions typical for brucellosis could be confirmed by a laboratory test. Without lesions or in case of unclear laboratory results the udder, genitals and the blood need to be destroyed (VHyS, Annex 7).

Notification system in place

Notification of suspicious cases and outbreaks is mandatory since 1966. Brucellosis in sheep and goats is regulated as zoonoses to be eradicated (TSV, Art. 190 - Art. 195).

Results of the investigation

In 2013 a randomized sample of 751 sheep farms (22768 blood samples) and 476 goat farms (3426 blood samples) were tested negative for Brucella melitensis using serological tests. In addition, no cases of brucellosis in sheep and goats were reported.

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

There are no observations that would challenge the freedom of Swiss sheep and goat population from brucellosis.

C. Brucella melitensis in sheep

Status as officially free of ovine brucellosis during the reporting year

The entire country free

see Brucella melitensis in goats

Table Brucellosis in other animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Units tested	Total units positive for Brucella	B. abortus	B. melitensis	B. suis
Alpacas - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	2	0			
Cattle (bovine animals) - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	1166	0			
Goats - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	24	0			
Monkeys - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	1	0			
Other animals - Clinical investigations [1)]	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	3	0			
Pigs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	9	0			
Sheep - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	33	0			
Solipeds, domestic - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	2	0			
Wild animals - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	1	0			

	Brucella spp., unspecified
Alpacas - Clinical investigations	
Cattle (bovine animals) - Clinical investigations	
Goats - Clinical investigations	
Monkeys - Clinical investigations	
Other animals - Clinical investigations [1)]	

Table Brucellosis in other animals

	Brucella spp., unspecified
Pigs - Clinical investigations	
Sheep - Clinical investigations	
Solipeds, domestic - Clinical investigations	
Wild animals - Clinical investigations	

Comments:

[1)] 1x musk ox

Footnote:

All data categorised as “clinical investigation” are summaries of data from the ILD (= information system of laboratory data). ILD is run by the FSVO. All labs, which are approved for the diagnosis of notifiable diseases, have to report their results in this system. Only tests of antigen detection were selected for the zoonosis reporting in the context of “clinical investigation”.

Table Ovine or Caprine 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.

Region	Total number of existing		Officially free herds		Infected herds		Surveillance			Investigations of suspect cases				
	Herds	Animals	Number of herds	%	Number of herds	%	Number of herds tested	Number of animals tested	Number of infected herds	Number of animals tested with serological blood tests	Number of animals positive serologically	Number of animals examined microbio logically	Number of animals positive microbio logically	Number of suspended herds
Schweiz/Suisse/Svizzera [1)]	14600	487409	14600	100	0	0	1227	26194	0	199	0	7	0	0
Total : [2)]	14600	487409	14600	100	0	0	1227	26194	0	199	0	7	0	0

Comments:

[1)] In 2013 a randomized sample of 751 sheep farms (22768 blood samples) and 476 goat farms (3426 blood samples) were tested negative for Brucella melitensis using serological tests.

[2)] N.A.

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.

Region	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
																		Sero logically	BST		
Schweiz/Suisse/Svizzera [1)]	39161	1560293	39161	100	0	0							3745	0	0	3365	0	6	0	0	0
Total : [2)]	39161	1560293	39161	100	0	0	0	0	0	0	0	0	3745	0	0	3365	0	6	0	0	0

Comments:

[1)] Freedom from disease has been proven in 1997 conducting a survey in a randomized sample of 4874 farms. 139‘655 cows were tested using serological test. Tests were performed in blood samples from 31042 animals and in 18952 bulk milk samples. There were no positive findings in these samples.

[2)] N.A.

2.7 YERSINIOSIS

2.7.1 General evaluation of the national situation

A. Yersinia enterocolitica general evaluation

History of the disease and/or infection in the country

Since 1999 Yersiniosis in humans is no longer notifiable. From 1988 until 1998 the number of reported cases dropped from about 170 to 50 cases per year. Since 2005 the national reference laboratory NENT detects about 20 to 30 isolates of Yersinia spp. from human samples per year, mainly Y. enterocolitica. Analysis of 128 human Y. enterocolitica isolates from 2001 to 2010 showed that 60% belonged to the pathogenic biotypes 2, 3 or 4 and 40% to the apathogenic biotype 1A. 5% (6 of 128) of the people had an anamnesis with travelling before they got ill (Fredriksson-Ahomaa, 2012).
In animals, yersiniosis is notifiable (TSV, Article 5: disease to be monitored and Article 291).
Never more than 3 cases per year were reported, adding up to 17 cases in the past ten years (2004-2013): 4 in monkeys, 3 in cattle, 2 in dogs, and 1 each in sheep, hares, rabbits, alpacas and birds. 3 cases affected “other species”.
2001 64% (56 of 8) of fattening pig farms were Yersinia positive in faecal samples. Y. enterocolitica was isolated in 38% (133 of 352) of the faecal samples with following Biotypes: Biotype 1A (37%), Biotype 2/neither O:3 nor O:9 (29%), Biotype 2/O:9 (13,5%), Biotype 4/O:3 (10%) and Biotype 3/O:3 (4%). In this study the use of medical feed at beginning of housing was a potential risk factor.
2002 15,5% of 865 Swiss pig meat samples (Schnitzel, minced meat, chopped meat) collected in 283 different markets were Y. enterocolitica positive (mainly Biotype 1A). Only in 0,7% of the 865 samples potentially humanpathogenic Y. enterocolitica were isolated. From 2003 until 2005 carcass surfaces of 80 slaughter pigs each year were sampled at the four largest slaughter houses. From each pig samples from 4 different regions of the carcass were pooled. Between 1% and 6% of Yersinia contamination on the carcass surfaces were found.
In 2006, tonsils of 212 slaughter pigs representing 16 farms were sampled in one single slaughter house. Using real-time PCR 88% of the 212 tonsils were positive. In culture prevalence rates were much lower (34%). 69 isolates (96%) were found to be Biotype 4/O:3, 6 isolates were Biotype 2/O:5;27 and 1 Biotype 2/O:9 (Fredriksson-Ahomaa, M. et al., 2007).
In 2007/2008 65% of 153 wild boars shot in the region of Geneva had antibodies in the tonsil fluids. Using PCR 44% of the tonsils were positive for Yersinia spp.: 35% for Y. enterocolitica and 20% for Y. pseudotuberculosis. In culture detection rates again were much lower: 9% for Y. enterocolitica and 3% for Y. pseudotuberculosis.
In a study conducted in 2012/2013 229 of 410 tonsils of slaughter pigs were positive for Yersinia enterocolitica using culture methods according to ISO 10273:2003 (56%; 95% CI 51-61%). All isolates except one belonged to the potentially humanpathogenic iovars. 74% belonged to Biovar 4/O:3 and 16% to Biovar 3/O:5,27. Other rare Biovars were Biovar 3/O:5, Biovar 3/O:9, Biovar 4/O:5 and Biovar 4/O:5,27. Biovar 1A was detected only in one sample. This prevalence was higher than the 34% estimate from 2006 (Fredriksson-Ahomaa, M. et al., 2007).

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

2013 there were 36 detections of Y. enterocolitica in human samples in the national reference laboratory NENT. Since 2009 never more than 30 isolates were detected. As the diagnostic method for the human isolates was changed in 2013, the results from 2013 are no longer 100% comparable with the years before.
The number of reported cases in animals in the recent years is constant at a very low level. 2013 6 cases

were reported. Next to two cases in dogs and one in birds, three cases affected cattle. Because cattle were not affected in the last ten years, these three cases were closer looked at. All three single cows had mastitis and Yersinia pseudotuberculosis was isolated in their milk samples. Other cows in the herds were not involved.

In reporting veterinary diagnostic laboratories 1882 tests for yersiniosis were carried out in the context of clinical investigations in 2013, mainly in dogs and cats (81%), cattle (6%) and horses (5%). Only dogs were found positive.

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

It can be assumed that more than half of all slaughter pigs carry potentially humanpathogenic Yersinia enterocolitica in their tonsils. How often pig meat is contaminated and how often these agents cause disease in humans is not really known. The number of tests carried out in the human reference laboratory are constant at a very low level in the recent years in Switzerland.

Recent actions taken to control the zoonoses

Switzerland carried out a Yersinia prevalence study in tonsils in slaughter pigs from March 2012 to February 2013 (Meidinger et al. 2013) according to the technical specifications for harmonized national surveys on Yersinia enterocolitica in slaughter pigs (EFSA Journal 2009; 7(11):1374).

Additional information

1. Meidinger, A. Countrywide survey on the detection and biotype distribution of Yersinia enterocolitica from slaughter pigs in Switzerland. Inauguraldissertation der Vetsuisse Fakultät der Universität Bern, 2013

2. Fredriksson-Ahomaa, M. et al., 2012: Yersinia enterocolitica strains associated with human infections in Switzerland, 2001-2010: Eur J Clin Microbiol Infect Dis (2012) 31:1543–1550.

3. Fredriksson-Ahomaa, M. et al., 2011: Different enteropathogenic yersinia strains found in wild boars and domestic pigs. Foodborne Pathog Dis 8,733-7.

4. Fredriksson-Ahomaa, M. et al., 2009: Prevalence of pathogenic Yersinia enterocolitica and Yersinia pseudotuberculosis in wild boars in Switzerland. Int J Food Microbiol, 135, 199-202.

5. Fredriksson-Ahomaa, M. et al., 2007: Prevalence of pathogenic Yersinia enterocolitica in pigs slaughtered at a Swiss abattoir. Int J Food Microbiol, 119, 207-212.

6. Further information can be found on the FSVO website www.blv.admin.ch.

2.7.2 Yersinia in foodstuffs

Table Yersinia in food

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Yersinia	Y. enterocolitica	Y. pseudotuberculosis
Milk, cows' - raw milk for manufacture - intended for manufacture of raw or low heat-treated products - Processing plant - Surveillance [1)]	ALP	Selective sampling	Industry sampling	food sample > milk	Domestic	Batch	25g	601	0		

	Yersinia spp., unspecified	Y. enterocolitica - O:3	Y. enterocolitica - O:9	Y. enterocolitica - unspecified
Milk, cows' - raw milk for manufacture - intended for manufacture of raw or low heat-treated products - Processing plant - Surveillance [1)]				

Comments:

[1)] bulk milk samples

Footnote:

ALP = Agroscope Liebefeld Research Institute, 3003 Bern

2.7.3 Yersinia in animals

Table Yersinia in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Units tested	Total units positive for Yersinia	Y. enterocolitica	Y. pseudotuberculosis	Yersinia spp., unspecified
Alpacas - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	1	0			
Birds - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	34	0			
Camels - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	1	0			
Cats - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	636	0			
Cattle (bovine animals) - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	108	0			
Dogs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	884	16			16
Ferrets - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	2	0			
Goats - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	8	0			
Hedgehogs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	1	0			
Other animals - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	62	0			
Pigs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	4	0			
Rabbits - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	31	0			
Reptiles - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	1	0			
Sheep - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	14	0			
Snakes - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	1	0			

Table Yersinia in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Units tested	Total units positive for Yersinia	Y. enterocolitica	Y. pseudotuberculosis	Yersinia spp., unspecified
Solipeds, domestic - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	91	0			
Wild animals - Clinical investigations [1)]	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	3	0			

	Y. enterocolitica - O:3	Y. enterocolitica - O:9	Y. enterocolitica - unspecified
Alpacas - Clinical investigations			
Birds - Clinical investigations			
Camels - Clinical investigations			
Cats - Clinical investigations			
Cattle (bovine animals) - Clinical investigations			
Dogs - Clinical investigations			
Ferrets - Clinical investigations			
Goats - Clinical investigations			
Hedgehogs - Clinical investigations			
Other animals - Clinical investigations			
Pigs - Clinical investigations			
Rabbits - Clinical investigations			
Reptiles - Clinical investigations			

Table Yersinia in animals

	Y. enterocolitica - O:3	Y. enterocolitica - O:9	Y. enterocolitica - unspecified
Sheep - Clinical investigations			
Snakes - Clinical investigations			
Solipeds, domestic - Clinical investigations			
Wild animals - Clinical investigations [1)]			

Comments:

[1)] 1x chamois

Footnote:

All data categorised as “clinical investigation” are summaries of data from the ILD (= information system of laboratory data). ILD is run by the FSVO. All labs, which are approved for the diagnosis of notifiable diseases, have to report their results in this system. Only tests of antigen detection were selected for the zoonosis reporting in the context of “clinical investigation”.

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

Trichinellosis in humans is notifiable since 1st January 2009 (ordinance of the FDHA on doctor and laboratory reporting), in animals since 1966 (TSV, Article 5: disease to be monitored). Since then the Federal Office of Public Health received very few reports of human trichinellosis, never exceeding 4 per year.

The testing on trichinellosis of all slaughter pigs is mandatory since 1st January 2007 according to Commission Regulation (EC) No. 2075/2005. Exceptions are made for slaughterhouses with a small capacity who do not export to the EU. Meat of pigs which have not been tested for trichinellosis from these small slaughterhouses are labeled with a special stamp and cannot be exported. Trichinella infections in pigs were not detected for many decades. From 2001 to 2004, between 400’000 and 490’000 pigs (15 to 19% of all slaughtered pigs) were tested per year without any positive findings. Since 2005 the number of slaughtered pigs tested increased steadily, all with negative results: 34% in 2005, 44% in 2006 and about 90% in 2007-2009. In addition, 20’000 slaughter pigs were tested with an improved digestion method in 2009. All animals were free of antibodies against Trichinella spp. (Schuppers et al., 2009, Zoonoses and Public Health). Since 2010 the percentage of tested slaughter pigs and horses was around 93% and 85%, respectively. Furthermore, between 1900 and 3400 wild boars were tested each year for Trichinella with negative results.

Cases in the wildlife population concerned always carnivorous wild animals. In the last 10 years less than 3 cases per year were reported. The 17 cases reported by cantonal veterinarians from 2004 to 2013 concerned lynx (82%), foxes (12%) and wolves (6%). The nematodes involved were all Trichinella britovi. A study conducted from 1999 until 2007 found that 15 of 55 (27.3%) assessed lynxes harbored Trichinella britovi larvae. In 2006/2007 21 of 1298 (1.6%) assessed foxes proved positive for Trichinella britovi larvae (Frey et al., Veterinary Parasitology, 2009). In 2008 all 1458 wild boars tested negative for Trichinella by artificial digestion, but 3 had antibodies against Trichinella (seroprevalence 0.2%). This illustrates that wild boars may come in contact with this nematode (Frey et al., Schweiz. Archiv für Tierheilkunde, 2009).

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

In 2013 there was one case in a 66 year old woman. Most probable source of infection was a recent journey to Africa. In 2012, there was one case in a 22 year old hunter/butcher from the French part of Switzerland. He got most likely infected by eating raw sausage pastry containing wild boar meat. As the young man was tested positive only by serology, the exact Trichinella species could not be investigated. Although there were never reports of Trichinella-positive findings in Swiss wild boars it cannot be ruled out that the suspected source of infection was a Swiss wild boar.

In 2013, 2.5 million slaughter pigs (93% of all slaughtered pigs) were tested for Trichinella with a negative result. Due to the extensive testing over the last years with only negative results, Swiss slaughter pigs are projected to be free of Trichinella. In addition, 2779 horses (87% of all slaughtered horses) and roughly 2130 wild boars were also tested negative for trichinellosis. However, Trichinella is sporadically detected in the wild animal population other than wild boars. 2013, two cases of Trichinella britovi infections in lynx were reported by cantonal veterinarians.

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

Trichinellosis in humans is very rare in Switzerland and often associated with infections abroad. As infections in wild animal populations can occur and infections in wild boars in Switzerland cannot be completely excluded, meat especially from wild boars should not be consumed raw. Although the risk of transmission from wild animals to domestic pigs is negligible, the surveillance of trichinellosis in wild animals is vital. As all infections in wildlife in the past were T. britovi, Switzerland is considered free of Trichinella spiralis.

Additional information

1. Jakob et al., Schweiz. Arch. Tierheilk. 136: 298-308,1994
2. Frey et al., Veterinary Parasitology, 2009
3. Frey et al., Schweiz. Archiv für Tierheilkunde, 2009
4. Schuppers et al., Zoonoses and Public Health, 2009
5. Further information can be found on the FSVO website www.blv.admin.ch.

2.8.2 Trichinellosis in humans

Table Trichinella in humans - Species/serotype distribution

Species/serotype Distribution	Cases	Cases Inc.	Autochthon cases	Autochthon Inc.	Imported cases	Imported Inc.
Trichinella	1	.01	0	0	0	0
Trichinella spp., unspecified	1	0.01				

Table Trichinella in humans - Age distribution

Age distribution	Trichinella spp., unspecified		
	All	M	F
65 years and older	1		1
Total :	1	0	1

2.8.3 Trichinella in animals

A. Trichinella in horses

Monitoring system

Sampling strategy

The investigation of horses is mandatory (Swiss ordinance of slaughter and meat control, VSFK, Art. 31).

Frequency of the sampling

All slaughtered horses are tested during or immediately after the slaughter process.

Type of specimen taken

Piece of tongue

Methods of sampling (description of sampling techniques)

Detection of Trichinella spp. larvae.

Diagnostic/analytical methods used

Artificial digestion method according to Commission Regulation (EC) No. 2075/2005.

Results of the investigation including the origin of the positive animals

In 2013, 2779 horses (87% of all slaughtered horses) were tested for Trichinella with negative results.

Notification system in place

Trichinellosis in animals is notifiable (TSV, Article 5).

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

There are no observations that would challenge the freedom of Swiss horses from trichinellosis.

Additional information

Further information can be found on the FSVO website www.blv.admin.ch.

B. Trichinella in pigs

Monitoring system

Sampling strategy

General

The investigation of slaughtered pigs and wild boars is mandatory (Swiss ordinance of slaughter and meat control, VSFK, Art. 31). All pigs slaughtered in slaughterhouses that are approved to export in the EU are sampled for Trichinella examination. Exception of this test obligation is made for small slaughterhouses of the national market which do not export to the EU.

Frequency of the sampling

General

Census sampling with the exception of pigs slaughtered in small slaughterhouses and only produced for the local market, is done during or immediately after the slaughter process.

Type of specimen taken

General

Piece of pillar of the diaphragm.

Methods of sampling (description of sampling techniques)

General

Piece of pillar of the diaphragm taken at slaughter.

Case definition

General

Detection of Trichinella spp. larvae.

Diagnostic/analytical methods used

General

Artificial digestion method according to Commission Regulation (EC) No. 2075/2005.

Measures in case of the positive findings or single cases

A positive tested batch at a slaughter house would be traced back and contaminated carcasses disposed.

Notification system in place

Trichinellosis in animals is notifiable (TSV, Article 5).

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

In 2013, 2.5 Mio slaughter pigs (93% of the total slaughter population) were tested and no Trichinella larvae were found. In addition, roughly 2130 wild boars were tested with negative results.

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

Although the risk of the parasite cycle crossing from the wild animal population into the conventional domestic pig population can be regarded as negligible, the risk has to be categorised differently or higher with regard to the special situation of grazing pigs.

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

As all results were negative since many years in domestic pigs, it is highly unlikely that Trichinella infections acquired from domestic pig meat originating from Switzerland do occur.

Additional information

Further information can be found on the FSVO website www.blv.admin.ch.

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 - Slaughterhouse - Surveillance [1)]	FSVO	Census	Official sampling	animal sample	Domestic	Animal	2504793	0		
Solipeds, domestic - horses - Slaughterhouse - Surveillance [2)]	FSVO	Census	Official sampling	animal sample	Domestic	Animal	2779	0		
Wild boars - wild - Surveillance [3)]	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	2133	0		

Comments:

[1)] Data originate from the FLEKO (Fleischkontrollstatistik = meat inspection statistics).

[2)] Data originate from the FLEKO (Fleischkontrollstatistik = meat inspection statistics).

[3)] Data originate from the FLEKO (Fleischkontrollstatistik = meat inspection statistics) and from the ILD (= information system of laboratory data). Up to date there is no further differentiation possible among wild animals. However, it is known that only a few other wild animals other than wild boars are tested for trichinella. In 2013, two lynx were found positive for Trichinella britovi.

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 granulosus sensu lato, the causative agent of Cystic Echinococcosis has nearly been extincted in Switzerland, sporadically imported cases are diagnosed in humans or animals (dogs or cattle and sheep, probably infected from imported infected dogs).
Alveolar echinococcosis (AE) is caused by the fox tapeworm Echinococcus multilocularis. An infection results in disease with severe consequences for the person concerned. Since 1999 no official data of human cases of Echinococcosis are available, as they are no longer notifiable to FOPH. However, the Institute of Parasitology of the University of Zurich data on human cases from cohorts of large treatment centres and centres for serodiagnosis of the disease. The frequency of AE increased between 2001 - 2005 by the 2.5-fold compared to the time period 1990-2000. From 2006-2010 the average incidence was 0.25 cases per 100’000 inhabitants per year, adding up to approximately 20 newly diagnosed cases annually. From 1984 to 2010 the average age at time of diagnosis was roughly 55 years. With every 20 years of life the age specific incidence increased significantly. 55% had been diagnosed in patients living in urban areas. However, the incidence in rural areas was still significantly higher (0.26 per 100’000 per year compared to 0.12 in urban areas). Incidence increased mainly in 6 major agglomeration areas: around Constanz, Zurich, Bern, Basel, Lausanne and Geneva. 55% were female cases.
In addition, data on hospitalizations due to alveolar echinococcosis are available at the Federal Statistical Office (FSO) from 2008 until 2012. The numbers are comparable to the aforementioned data. Cases of people being hospitalised the first time ranged from 17 (in 2008) to 38 people (in 2012), corresponding to an incidence rate of 0.22 to 0.47 cases per 100’000 inhabitants per year. Since 2009 human cases increased slightly each year by 3 to 4 cases (28, 31, 35 and 38 cases from 2009 to 2012, respectively).
In animals, echinococcosis is notifiable (TSV, Article 5: disease to be monitored). Since 1996 reported cases rank between 0 and 11 cases per year. In the past ten years (2004 to 2013) 61 echinococcosis cases were reported, mainly in dogs (48%) and foxes (33%).
In 2007 and 2008, the Institute of Parasitology of the University of Zurich tested mice and feacal fox samples in the region of Zurich. About 17% of the mice (100 mice from 634 in 2007 resp. 66 from 393 in 2008) were positive for E. multilocularis. In the fox faecal samples the number of positive samples declined in general from 26% in 2007 to 19% in 2008 (361/1376 in 2007 resp. 202/1044 in 2008). However in regions without deworming baits containing praziquantel fox faecal samples remained at the same level (63/254 (25%)).
In a dog survey in 2009 the prevalence of E. multilocularis (determined by egg isolation and species specific PCR) was found to be 0% (0.0/0.0-2.5) in 118 randomly collected pet dogs, but 2.4% (0.5-6.9%) in 124 farm dogs with free access to the surrounding fields. Eggs were also isolated from hair samples of dogs: no taeniid-eggs were found on the surface of pet dogs, whereas in 2 cases (1.6%) taeniid-eggs were isolated from farm dogs. Species identification in these two cases could not be achieved by PCR.
In 2012, the first reported case in a cow since 1991 was detected during meat inspection. No laboratory data was available for this case.

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

Albeit the increased risk of infection since 2001, an infection of humans with E. multilocularis is rare. The incidence of human AE-cases of approximately 0.25 cases per 100’000 inhabitants per year since 2006 seems to have further increased to a level of approximately 0.40 cases per 100’000 inhabitants since 2009.
The increased risk was probably caused by a general increase of the fox population from 1984 to 2000 due to the successful immunization campaigns against rabies in foxes, and by the encroachment of foxes to the urban areas. The prevalence of E. multicularis in foxes is estimated to lie between 30% and 70%. The Institute of Parasitology of the University of Zurich found in a research project 2012 53% (105 of 200) and 2013 57% (57 of 100) of hunted foxes from Eastern Switzerland positive for E. multilocularis. 2013 the prevalences in rodents in the Zürich region was low: only 3 of 200 A. scherman or 6 of 259 M. arvalis were infected.
2013 11 cases in animals were registered, affecting 6 dogs, 2 monkeys, 1 fox, 1 outdoor wool pig and 1 beaver. This is within the range of the recent years. Furthermore, 79 tests for echinococcosis were carried out in veterinary diagnostic laboratories in the context of clinical investigations mainly in dogs (73%) and foxes (19%). The dogs also contributed most to the positive findings.

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

In fresh foodstuffs, outdoor cultivation for example can lead to the occurrence of fox tapeworm eggs, but there are no figures on the degree of contamination of individual foods. Moreover, people can also become infected through contact with soil, shoes and also dogs that are contaminated with fox tapeworm eggs.

Recent actions taken to control the zoonoses

Owners from dogs which regularly are hunting mice are encouraged to deworm their dogs regularly (see also www.ESCCAP.ch).
The Institute of Parasitology of the University of Zurich evaluated the control of the disease in the urban periphery of Zurich from 2006-2011. The monthly distribution of anthelmintic baits (Praziquantel) for foxes proved to be effective. Areas with bait distribution showed a significant decrease of the E. multilocularis egg contamination. However, the positive effect lasts only a short period of time. Therefore the distribution of anthelmintic baits needs to be repeated regularly which is expensive. All in all these experiments and studies in Germany, France and Japan confirmed the feasibility of this approach. Regarding the long latency of 5 –15 years of alveolar echinococcosis, however, such measures can only be cost effective if they are pursued for several decades and concentrate on highly endemic areas in densely populated zones. Thus, the implementation of this approach strongly depends on factors such as public attitude, available financial resources and priority setting of political decision-makers.

Additional information

1. Information on fox tapeworm: www.paras.uzh.ch/infos and www.ESCCAP.ch.
2. Torgerson, P.R., Schweiger, A., Deplazes, et al., 2008, Alveolar echinococcosis: From a deadly disease to a well-controlled infection. Relative survival and economic analysis in Switzerland over the last 35 years. J. of Hepatol. 49: 72-77 .
3. Schweiger A, Ammann RW, Candinas D, Clavien P-A, Eckert J, Gottstein B, et al. Human alveolar echinococcosis after fox population increase, Switzerland. Emerg Infect Dis. 2007 Jun. Available from http://www.cdc.gov/EID/content/13/6/878.htm.
4. Hegglin, D., & Deplazes, P., 2013, Control of Echinococcus multilocularis: Strategies, feasibility and cost-benefit analyses. Int. J. Par., 43: 327–337.
5. Expertgroup ESCCP_CH: www.ESCCAP.ch.
6. Guidelines for deworming of dogs and cats are published for Switzerland in www.ESCCAP.ch.
7. Data for hospitalisation due to Echinococcosis: FSO website www.bfs.admin.ch.

8. Further information can be found on the FSVO website www.blv.admin.ch.

2.9.2 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
Beavers - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	Schweiz/Suisse/Svizzera	2	2		
Dogs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	Schweiz/Suisse/Svizzera	85	7		
Foxes - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	Schweiz/Suisse/Svizzera	1	0		
Monkeys - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	Schweiz/Suisse/Svizzera	2	1		
Solipeds, domestic - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	Schweiz/Suisse/Svizzera	1	1		

	Echinococcus spp., unspecified
Beavers - Clinical investigations	2
Dogs - Clinical investigations	7
Foxes - Clinical investigations	
Monkeys - Clinical investigations	1
Solipeds, domestic - Clinical investigations	1

Footnote:

All data categorised as “clinical investigation” are summaries of data from the ILD (= information system of laboratory data). ILD is run by the FSVO. All labs, which are approved for the diagnosis of notifiable diseases, have to report their results in this system. Only tests of antigen detection were selected for the zoonosis reporting in the context of “clinical investigation”.

Table Echinococcus in animals

2.10 TOXOPLASMOSIS

2.10.1 General evaluation of the national situation

A. Toxoplasmosis general evaluation

History of the disease and/or infection in the country

Toxoplasmosis in humans is not notifiable. Thus, no data on the frequency of human toxoplasmosis are available. Some sporadic human cases have however been reported.
In animals, toxoplasmosis is notifiable (TSV, Article 5: disease to be monitored and Article 291). Veterinarians and diagnostic laboratories must report any suspected case of toxoplasmosis to the cantonal veterinarian, who may issue an order for the suspected case to be investigated. In the past ten years (2004-2013) a total of 21 cases were reported by cantonal veterinarians. Never more than 4 cases per year were recorded. Affected animals were goats (5x), cats (3x), monkeys (3x), sheep (2x), lemurs (2x), kangaroo (2x), suricate (1x), marmot (1x), bird (1x) and other species (1x).
Infections with Toxoplasma gondii in meat-producing animals are widespread in Switzerland.
In 2000, Toxoplasma-DNA in meat-producing animals was present in meat samples in 1% of the assessed cows, 0% of young cattle, 2% of young bulls, 1% of calves, 0% of pigs and 4% of ovine samples. Toxoplasma antibodies could be detected in 32% of cows and young cattle, 21% in young bulls, 4% in calves and 53% in sheep; in the breeding pigs 27% and in the fattening pigs 1% (Wyss et al., 2000).
In 2009, again meat from various animal categories was sampled at the slaughterhouse. Using real-time PCR it could be shown that DNA of T. gondii was detectable in 4.7% of bovine, 2.2% of porcine, 2.0% of ovine and 0.7% of wild boar samples. Toxoplasma antibodies were detected in 13% of calves (6/47), 37% of cattle (48/129), 62% of fattening bulls (62/100), 53% of cows (69/130), 14% of fattening pigs (7/50), 13% of free-ranging pigs (13/100), 36% of sows (43/120), 6.7% in wild boars (10/150), 33% of lambs (33/100) and 81% of ewes (121/150). As the same standardised ELISA was used and various other studies showed that both substrates (serum and meat juice) are directly comparable the T. gondii seroprevalence in all species rose over the past 10 years. With the switch from the conventional PCR to the real-time system, PCR has become more sensitive, so that the increase in the T. gondii DNA-prevalence in meat samples apparent in most species (except sheep) requires cautious interpretation. The difference in prevalence was only significant in calves. The increasing age of the animals was identified as a risk factor for Toxoplasma infection, while the housing conditions (conventional fattening pigs versus free-range pigs) appeared to have no influence on the results of serological testing. (Berger-Schoch et al., 2011). The low rate of infection in wild boars can most likely be explained by the fact that wild pigs normally live extensively in areas with low cat density. In addition, a study in free-ranging alpine ibex revealed very low numbers of Toxoplasma gondii antibody positive ibex. It seems unlikely that alpine ibex are a reservoir for this abortive agent (Marreros, N. et al. 2011).
In order to address another source of human infection, faecal samples of 252 cats were investigated in the same study. Oocysts of T. gondii were found in 0.4% of the specimen. Genotyping of the isolates of the survey from 2009 indicated that all 3 classical (I, II, III) genotypes occur in Switzerland (Berger-Schoch et al., 2011).

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

In 2013, 3 cases in animals (one each in goats, a marmot and a suricate) were reported by cantonal veterinarians, which was in the range of the past 10 years.
In veterinary diagnostic laboratories 82 tests for toxoplasmosis were carried out in the context of clinical investigations in 2013, mainly in cats (60%) and dogs (25%).

There is a risk of exposure in Switzerland both from the consumption of meat and from cats as contaminators of the environment.
The results of the last study from 2009 showed, that infections with Toxoplasma gondii in meat-producing animals are widespread in Switzerland and that the risk appears to have increased in the past ten years.
The oocyst excretion rate of 0.4 % found in cats may appear low. But when one considers that an infected cat may excrete large quantities of oocysts for up to 20 days, and these can survive for a year or more under favourable conditions (i.e. not too cold, hot or dry) the environmental contamination with T. gondii must not be underestimated.

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

Humans become infected by the oral route, either through the uptake of infectious oocysts from the environment or by means of tissue cysts from raw or insufficiently cooked meat.
Pregnant women are informed about the recommendations from the FOPH to disclaim on raw or insufficient cooked meat and that caution is generally called for when faced with cat faeces (and potentially contaminated surroundings). The serosurveillance of pregnant women for anti-Toxoplasma antibodies has been discontinued since 2009.
In non-immune sheep and goats (first-time infection) Toxoplasma gondii is regarded as a major cause of abortion and loss of lambs.

Additional information

1. Frey CF, Berger-Schoch AE, Hermann DC, Schares G, Müller N, Bernet D, Doherr MG, Gottstein B (2012): Vorkommen und Genotypen von Toxoplasma gondii in der Muskulatur von Schaf, Rind und Schwein sowie im Katzenkot in der Schweiz. Schweiz. Arch. Tierheilk. 154: 251-255
2. Berger-Schoch A.E., Bernet D. et al., (2011), Toxoplasma gondii in Switzerland: A serosurvey based on meat juice analysis of slaughter pigs, wild boar, sheep and cattle. Zoonoses and Public Health, 58(7):472-8.
3. Berger-Schoch A.E., Herrmann D.C. et al., (2011) Molecular prevalence and genotypes of Toxoplasma gondii in feline faeces (oocysts) and meat from sheep, cattle and pigs in Switzerland. Veterinary Parasitology, 177: 290–297.
4. Marreros, N. et al. (2011), Epizootiologic investigations of selected abortive agents in free-ranging Alpine ibex (Capra ibex ibex) in Switzerland, J Wildl Dis. 2011 Jul;47(3):530-43.
5. Spycher A, Geigy C, Howard J, Posthaus H, Gendron K, Gottstein B, Debache K, Herrmann DC, Schares G, Frey CF (2011). Isolation and genotyping of Toxoplasma gondii causing fatal systemic toxoplasmosis in an immunocompetent 10-year-old cat. J Vet Diagn Invest. 23: 104-108
6. Wyss R., Sager H. et al. (2000): The occurrence of Toxoplasma gondii and Neospora caninum as regards meat hygiene. Schweiz. Arch. Tierheilkd. 142(3): 95-108.
7. Further information can be found on the FSVO website www.blv.admin.ch.

2.10.2 Toxoplasma in animals

Table Toxoplasma in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Analytical Method	Sampling unit	Units tested	Total units positive for Toxoplasma	T. gondii	Toxoplasma spp., unspecified
Alpacas - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	2	0		
Beavers - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	1	0		
Capricorns - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	1	0		
Cats - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	48	1		1
Deer - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	1	0		
Dogs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	20	0		
Goats - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	1	0		
Guinea pigs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	1	0		
Kangaroos - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	1	1		1
Other animals - Clinical investigations [1)]	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	3	3		3
Sheep - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	3	1		1

Comments:

[1)] 2x marmots and 1x musk ox

Footnote:

All data categorised as “clinical investigation” are summaries of data from the ILD (= information system of laboratory data). ILD is run by the FSVO. All labs, which are approved for the diagnosis of notifiable diseases, have to report their results in this system. Only tests of antigen detection were selected for the zoonosis reporting in the context of “clinical investigation”.

Table Toxoplasma in animals

2.11 RABIES

2.11.1 General evaluation of the national situation

A. Rabies general evaluation

History of the disease and/or infection in the country

Rabies in humans is a notifiable disease (ordinance of the FDHA on doctor and laboratory reporting). In the period from 1967 until 1999, an estimated number of some 25 000 postexposure treatments in humans were done due to the increased risk of rabies infections. Rabies caused in 1977 three human deaths.
Rabies in animals falls into the category of an animal disease to be eradicated (TSV, Article 3). According to Articles 142-149 of the animal health ordinance, government action is taken to control the disease. Anyone who sees a wild animal or stray pet that behaves in a way that appears suspiciously like rabies is required to report this to the police, hunting authorities or a veterinarian. Animal keepers must also report pets that behave in a way that is suspiciously like rabies to a veterinarian. (Re-)Import conditions for cats, dogs and ferrets were implemented in 2003 and adapted in 2004 according to the EU regulation 998/2003/EC.
The European fox rabies epizootic starting in 1939 at the eastern border of Poland reached Switzerland on March 3, 1967. From 1967 until 1999 a total of 17’108 rabies cases, of which 73% in foxes and 14% in domestic animals were diagnosed. To eliminate rabies, in 1978 the first field trial world-wide for the oral immunization of foxes against rabies was conducted in Switzerland. Overall, between 1978 and 1998 a total of 2.8 million baits containing a modified live virus were distributed. The 1990s were characterized by a recrudescence of rabies in spite of regular oral immunization of foxes. The last case of fox rabies occurred in 1996. Bat rabies has been diagnosed in 3 cases in the past 37 years (1992, 1993, 2002) and remains a source, albeit little, of infection for animals and humans.
According to the definitions of the OIE and WHO (no cases for at least two years) the territory of Switzerland is considered to be free of rabies since 1999. A suspected case of rabies in a dog (urban rabies) was confirmed in 2003, but since the dog was a foundling picked up close to the French border with a viral sequence closely related to North African strains from dogs, it did not indicate a focus of rabies infection in Switzerland but an illegal import.
2012, an imported human rabies case was detected in Switzerland. An American citizen was transferred of a hospital in Dubai to a hospital in Zurich, where he died. The history showed that he was bitten by a bat in California 3 months before onset of the first symptoms.

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

2013, 805 sera from humans were tested for neutralizing antibodies at the national reference laboratory for rabies. In 503 cases (63%) antibody titers were controlled after pre-expositional immunization, in 265 of cases (33%) the blood was checked after post exposure prophylaxis (PEP), 11 were clinical suspect cases and in 26 cases no reason for the investigation was given. This amount of testing is stable at this level since many years.
102 animals were tested for rabies at the national reference laboratory (Swiss Rabies Center) in 2013, none of which were positive. The samples most frequently originated from dogs and cats (68%), foxes (19%) and bats (7%). Additionally, 1200 sera of dogs and cats were tested in the context of travelling procedures in order to detect the level of neutralising antibodies. This was in the range of the previous year. Compared to the number of cat and dog sera tested before 2012 the number stayed much lower. The decrease in 2012 was associated with the fact that the blood test for travelling to England, Ireland and

Scandinavia was no longer mandatory for domestic rabies free countries like Switzerland.

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

Switzerland and its neighboring countries were free from European fox rabies in 2013. Due to an extensive immunization campaign in 2012 and 2013 - reaching from the Slovenian to the Swiss border - further spread of the outbreak in Italy was prevented (two foxes were diagnosed positive in October 2008 in northeastern Italy followed by 68 cases in 2009 and 188 Jan-Mai 2010). The last rabies case in Italy was reported in February 2011 in the region Veneto. 2013 Greece reported new rabies cases, mainly in foxes. Rabies was most likely (re-)introduced to Greece by rabid wild foxes crossing borders in the north of the country. Close collaboration with neighboring countries is important especially with regards to control measures in wild animals.

However, illegal imports from dogs and cats from rabies countries (like Marocco) into the EU are reported regularly and remain a certain risk for pets and their owners. In 2013 illegal imported rabies cases occurred in Spain, Germany, and France – leading to timely investigations, euthanisation of contact animals, post exposure prophylaxis (PEP) and prophylactic vaccinations.

Also bat rabies (like the ones in 1992,1993 and 2002) can be a source of infection - as the imported human case in 2012 showed. Prevalence of rabies virus in the bat population especially in North- and South-America is quite high. Thus, people travelling into rabies risk countries should be better informed.

Recent actions taken to control the zoonoses

Vaccination of dogs is recommended (and common), but not mandatory. (Re-)Import conditions for cats, dogs and ferrets are implemented according to the EU regulation 998/2003/EC. Animals with suspect symptoms originating from countries with urban rabies are tested for rabies. Furthermore, the recent situation in the neighboring countries and the EU is closely monitored.

Additional information

1. Diagnostic/analytical methods used

All test concerning rabies are carried out in the reference laboratory, the Swiss Rabies Center =>http://www.ivv.unibe.ch/Swiss_Rabies_Center/swiss_rabies_center.html). It is authorized by the EU for rabies testing, see http://ec.europa.eu/food/animal/liveanimals/pets/approval_en.htm.

For rabies virus detection immunfluorescence (FAT) and virus isolation using murine neuroblastoma cell culture (RTCIT) is used and the rabies antibody detection is carried out using the rapid fluorescent focus inhibition test (RFFIT) as described in the OIE manual, see http://www.oie.int/eng/normes/mmanual/a_00044.htm.

2. Swiss Rabies Center: http://www.ivv.unibe.ch/content/diagnostics/swiss_rabies_center/
3. Further information can be found on the FSVO website www.blv.admin.ch.
4. http://www.promedmail.org/direct.php?id=20130623.1787886
5. http://www.gideononline.com/tag/rabies/
6. http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=20474

2.11.2 Lyssavirus (rabies) in animals

A. Rabies in dogs

Monitoring system

Case definition

An animal is rabies diseased if the analytical method (see below) gives a positive result.

Vaccination policy

Vaccination of the Swiss dog population is recommended (and common), but not mandatory.

Other preventive measures than vaccination in place

(Re-)Import conditions for cats, dogs and ferrets according to the EU regulation 998/2003/EC.

Notification system in place

Rabies in animals falls into the category of an animal disease to be eradicated (TSV, Article 3). According to Articles 142-149 of the animal health ordinance, government action is taken to control the disease. Animal keepers must report pets that behave in a way that is suspiciously like rabies to a veterinarian.

Additional information

1. Diagnostic/analytical methods used
For rabies virus detection immunfluorescence (FAT) and virus isolation using murine neuroblastoma cell culture (RTCIT) is used and the rabies antibody detection is carried out using the rapid fluorescent focus inhibition test (RFFIT) as described in the OIE manual, see http://www.oie.int/eng/normes/mmanual/a_00044.htm.
2. Swiss Rabies Center: http://www.cx.unibe.ch/ivv/Swiss_Rabies_Center/swiss_rabies_center.html.
3. Further information can be found on the FSVO website www.blv.admin.ch.

Table Rabies in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Region	Units tested	Total units positive for Lyssavirus (rabies)	Rabies virus (RABV)	EBLV-1
Badgers - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	Schweiz/Suisse/Svizzera	2	0		
Bats - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	Schweiz/Suisse/Svizzera	7	0		
Cats - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	Schweiz/Suisse/Svizzera	15	0		
Cattle (bovine animals) - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	Schweiz/Suisse/Svizzera	2	0		
Deer - wild - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	Schweiz/Suisse/Svizzera	1	0		
Dogs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	Schweiz/Suisse/Svizzera	54	0		
Foxes - wild - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	Schweiz/Suisse/Svizzera	19	0		
Other animals - Clinical investigations [1)]	FSVO	Unspecified	Not applicable	animal sample	Domestic	Animal	Schweiz/Suisse/Svizzera	1	0		

	EBLV-2	Lyssavirus (unspecified virus)
Badgers - Clinical investigations		
Bats - Clinical investigations		
Cats - Clinical investigations		
Cattle (bovine animals) - Clinical investigations		
Deer - wild - Clinical investigations		
Dogs - Clinical investigations		

Table Rabies in animals

	EBLV-2	Lyssavirus (unspecified virus)
Foxes - wild - Clinical investigations		
Other animals - Clinical investigations [1)]		

Comments:

[1)] 1 petauridae

2.12 STAPHYLOCOCCUS INFECTION

2.12.1 General evaluation of the national situation

2.12.2 Staphylococcus in animals

Table Staphylococcus in Animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Staphylococcus	S. aureus, meticillin resistant (MRSA)	S. aureus, meticillin resistant (MRSA) - spa -type t011
Cattle (bovine animals) - meat production animals - Slaughterhouse - Monitoring [1)]		Objective sampling	Official sampling	animal sample > nasal swab	Domestic	Animal		253	10	10	5
Pigs - fattening pigs - Slaughterhouse - Monitoring		Objective sampling	Official sampling	animal sample > nasal swab	Domestic	Animal		351	73	73	10

	S. aureus, meticillin resistant (MRSA) - spa -type t108	S. aureus, meticillin resistant (MRSA) - spa -type t034	S. aureus, meticillin resistant (MRSA) - MRSA, unspecified
Cattle (bovine animals) - meat production animals - Slaughterhouse - Monitoring [1)]		3	2
Pigs - fattening pigs - Slaughterhouse - Monitoring		63	

Comments:

[1)] calves (under 1year)

Table Staphylococcus in Animals

Footnote:

The two 'unspecified' MRSA-isolates from calves were typed as spa-type t032 and spa-type t1224, respectively.

2.12.3 Antimicrobial resistance in Staphylococcus isolates

A. Antimicrobial resistance of S. aureus, meticillin resistant (MRSA) in Animals Pigs

Sampling strategy used in monitoring

Frequency of the sampling

A random sample of 351 fattening pigs was investigated at slaughter using nasal swabs. The slaughter plants included in the monitoring program accounted for over 85% of the total production of pigs in Switzerland. The number of samples for each plant has been determined in proportion to the number of animals slaughtered per year. The samples were taken by the competent authority in the framework of the antimicrobial resistance monitoring. The samples were taken evenly distributed over the year, in order to exclude seasonal effects.

Type of specimen taken

Nasal swabs

Methods of sampling (description of sampling techniques)

Samples were taken using transport swabs (Oxoid Ltd, Basingstoke, England) from the nares of the pigs subsequent to stunning by officials of the Swiss abattoir authorities. They were transported to the laboratory immediately after sampling without cooling.

Procedures for the selection of isolates for antimicrobial testing

From each positive sample one MRSA isolate was submitted to susceptibility testing.

Methods used for collecting data

All samples were analyzed in the same laboratory (Centre for Zoonoses, Bacterial Animal Diseases and Antibiotic Resistance, University of Bern, Switzerland).

Laboratory methodology used for identification of the microbial isolates

Swabs were transferred into tubes containing 10 ml Mueller Hinton Broth supplemented with 6.5% NaCl and incubated aerobically at 37°C for 24 h under agitation. One ml from this pre-enrichment was inoculated into 9 ml tryptone soy broth containing 3.5 mg/L cefoxitin and 75 mg/L aztreonam, and further incubated aerobically at 37°C for 24 h. A loopful was then spread onto MRSA selective agar plates (BBL ™ CHROMagar ™ MRSA; Becton Dickinson, Franklin Lakes, NJ), which were incubated at 37°C for 24 h. Pink to mauve-colored colonies were regarded as suspicious and five presumptive colonies were cultivated onto tryptone soy agar plates containing 5% sheep blood (TSA-SB) (Oxoid Ltd, Basingstoke, England) at 37°C for 24 h. S. aureus was identified using Vitek 2 with Gram-Positive (GP) cards (BioMérieux, Mary l'Etoile, France) following manufacturer's recommendations.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

A micro-dilution method (Sensititre®-System, MCS-Diagnostics) was used for susceptibility testing, including the following antimicrobials: chloramphenicol, ciprofloxacin, clindamycin, erythromycin, fusidic acid, genatmicin, kanamycin, linezolid, mupirocin, penicillin, quinuprisitin/dalfoprisitn, rifampin, tetracycline, trimethoprim, tiamulin, streptomycin, sulfamethoxazol, vancomycin

Cut-off values used in testing

Resistance was defined following the epidemiological cut-off values published by the Europaean Committee on Antimicrobial Susceptiblitiy Testing (EUCAST).

Preventive measures in place

None

Control program/mechanisms

The control program/strategies in place

None

Recent actions taken to control the zoonoses

None

Suggestions to the European Union for the actions to be taken

None

Measures in case of the positive findings or single cases

None

Notification system in place

None

Results of the investigation

MRSA prevalence in fattening pigs was 20.8% (95%CI 16.7-25.5%). 63 isolates belonged to the genotype CC398-t034, 10 to the genotype CC398-t011. 36 isolates belonging to the most commonly detected genotype CC 398-t034 shared an identical resistance profile. They showed resistance to ß-lactams , tetracycline, macrolides, lincosamides, trimethoprim, pleuromutilins, streptomycin and quinupristin/dalfopristin. 21 additional isolates were resistant to all these antimicrobials except streptomycin, whereas two isolates had additional resistance to all tested aminoglycosides and two isolates (one t-011/one t-034) additionally were resistant to fusidic-acids, mupirocin and sulfamethoxazol, the t-034 isolate showed a resistance to rifampin and ciprofloxacin, too.

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

MRSA prevalence in fattening pigs has significantly increased over the last years. It was 2.2% (95%CI 0.9 -3.9) in 2009 and had a threefold increase in 2010 and 2011 reaching 5.9% (95% CI 3.8-8.7) and 5.6% (95% CI 3.6 - 8.4), respectively. Prevalence in 2012 reached 18.1% (95% CI 14.7-22.2) and was therefore about the same as in 2013. The marked increase is due to a spread of a single clone of CC398-t034 within the Swiss population of fattening pigs.

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

The increased MRSA prevalence in fattening pigs is giving cause for a certain concern. The monitoring of the situation will be continued. People in close contact with animals have been shown to have a higher risk of carrying MRSA. In a study carried out in 2009 no MRSA were found on food of animal origin in Switzerland.

Additional information

Further information can be found in the annual report on the sale of antibiotics for veterinary use and antibiotic resistance monitoring of livestock in Switzerland (Arch-Vet 2013) on the FSVO website www.blv.admin.ch / Overesch G, Büttner S, Rossano A, Perreten V: The increase of methicillin-resistant Staphylococcus aureus (MRSA) and the presence of an unusual sequence type ST49 in slaughter pigs in Switzerland. BMC Veterinary Research 2011, 7:30 / Overesch G, Büttner S, Perreten V: Evolution of methicillin-resistant Staphylococcus aureus (MRSA). Fleischwirtschaft International 6/2012, 61-63

B. Antimicrobial resistance of S. aureus, meticillin resistant (MRSA) in Animals Cattle (bovine animals)

Sampling strategy used in monitoring

Frequency of the sampling

A random sample of 253 veal calves was investigated at slaughter using nasal swabs. The slaughter plants included in the monitoring program accounted for over 90% of the total production of veal calves in Switzerland. The number of samples for each plant has been determined in proportion to the number of animals slaughtered per year. The samples were taken by the competent authority in the framework of the antimicrobial resistance monitoring. The samples were taken evenly distributed over the year, in order to exclude seasonal effects.

Type of specimen taken

Nasal swabs

Methods of sampling (description of sampling techniques)

Samples were taken using transport swabs (Oxoid Ltd, Basingstoke, England) from the nares of the pigs subsequent to stunning by officials of the Swiss abattoir authorities. They were transported to the laboratory immediately after sampling without cooling.

Procedures for the selection of isolates for antimicrobial testing

From each positive sample one MRSA isolate was submitted to susceptibility testing.

Methods used for collecting data

All samples were analyzed in the same laboratory (Centre for Zoonoses, Bacterial Animal Diseases and Antibiotic Resistance, University of Bern, Switzerland).

Laboratory methodology used for identification of the microbial isolates

Swabs were transferred into tubes containing 10 ml Mueller Hinton Broth supplemented with 6.5% NaCl and incubated aerobically at 37°C for 24 h under agitation. One ml from this pre-enrichment was inoculated into 9 ml tryptone soy broth containing 3.5 mg/L cefoxitin and 75 mg/L aztreonam, and further incubated aerobically at 37°C for 24 h. A loopful was then spread onto MRSA selective agar plates (BBL ™ CHROMagar ™ MRSA; Becton Dickinson, Franklin Lakes, NJ), which were incubated at 37°C for 24 h. Pink to mauve-colored colonies were regarded as suspicious and five presumptive colonies were cultivated onto tryptone soy agar plates containing 5% sheep blood (TSA-SB) (Oxoid Ltd, Basingstoke, England) at 37°C for 24 h. S. aureus was identified using Vitek 2 with Gram-Positive (GP) cards (BioMérieux, Mary l'Etoile, France) following manufacturer's recommendations.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

A micro-dilution method (Sensititre®-System, MCS-Diagnostics) was used for susceptibility testing, including the following antimicrobials: chloramphenicol, ciprofloxacin, clindamycin, erythromycin, fusidic acid, genatmicin, kanamycin, linezolid, mupirocin, penicillin, quinuprisitin/dalfoprisitn, rifampin, tetracycline, trimethoprim, tiamulin, streptomycin, sulfamethoxazol, vancomycin

Cut-off values used in testing

Resistance was defined following the epidemiological cut-off values published by the Europaean Committee on Antimicrobial Susceptiblitiy Testing (EUCAST).

Preventive measures in place

None

Control program/mechanisms

The control program/strategies in place

None

Recent actions taken to control the zoonoses

None

Suggestions to the European Union for the actions to be taken

None

Measures in case of the positive findings or single cases

None

Notification system in place

None

Results of the investigation

MRSA prevalence in veal calves was 4.0% (95%CI 1.9-7.1%). 3 isolates belonged to the genotype CC398 -t034, 5 to the genotype CC398-t011, and one to the genotype CC398-t1255 and t-032, respectively. 2 isolates belonging to the genotype CC 398-t034showed resistance to ß-lactams, aminoglycosids, tetracycline, macrolides, lincosamides, trimethoprim, pleuromutilins and quinupristin/dalfopristin. Only one isolate (t-032) was susceptible to tetracycline.

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

In 2010 MRSA prevalence in veal calves was 2.1% (95%CI 0.7–4.8). In 2010 all isolates belonged to the genotype CC398-t011, that still is the most prevalent genotype in 2013. It was the first time in the framework of our monitoring, that we isolated CC398-t034 from veal calves and it will have to be observed, if this strain will also spread in calve-population in Switzerland. Spa-type t032 is one of the most often found MRSA-types in humans.

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

The MRSA prevalence in veal calves is still low, compared to the prevalence in pigs. The monitoring of the situation will be continued. People in close contact with animals have been shown to have a higher risk of carrying MRSA. In a study carried out in 2009 no MRSA were found on food of animal origin in Switzerland.

Additional information

Further information can be found in the annual report on the sale of antibiotics for veterinary use and antibiotic resistance monitoring of livestock in Switzerland (Arch-Vet 2013) on the FSVO website www.blv.admin.ch

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) - spa-type t011 - CC398 in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

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

CC398	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	5																									
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	5	0											5												
Aminoglycosides - Kanamycin	8	5	0													5										
Aminoglycosides - Streptomycin	16	5	0														5									
Amphenicols - Chloramphenicol	16	5	0														3	2								
Fluoroquinolones - Ciprofloxacin	1	5	0									5														
Tetracyclines - Tetracycline	1	5	5															5								
Trimethoprim	2	5	0												5											
Antimycobacterial drugs - Rifampicin	0.032	5	0					5																		
Cephalosporins - Cefoxitin	4	5	5															5								
Fusidanes - Fusidic acid	0.5	5	0										5													
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	2	5	0											5												
Lincosamides - Clindamycin	0.25	5	4								1					4										
Macrolides - Erythromycin	1	5	4										1				4									
Monocarboxylic acid - Mupirocin	1	5	0										5													
Oxazolidines - Linezolid	4	5	0											2	3											
Penicillins - Penicillin	0.125	5	5												5											
Pleuromutilins - Tiamulin	2	5	0										5													

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) - spa-type t011 - CC398 in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

CC398	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications																								
Isolates out of a monitoring program (yes/no)																									
Number of isolates available in the laboratory	5																								
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
Streptogramins - Quinupristin/Dalfopristin	1	5	0										2	3											
Sulfonamides - Sulfamethoxazole	128	5	0																	5						

CC398	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	5	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	1	16
Aminoglycosides - Kanamycin	4	64
Aminoglycosides - Streptomycin	4	32
Amphenicols - Chloramphenicol	4	64
Fluoroquinolones - Ciprofloxacin	0.25	8
Tetracyclines - Tetracycline	0.5	16
Trimethoprim	2	32
Antimycobacterial drugs - Rifampicin	0.016	0.5
Cephalosporins - Cefoxitin	0.5	16

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) - spa-type t011 - CC398 in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

CC398	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	5	
Antimicrobials:	lowest	highest
Fusidanes - Fusidic acid	0.5	4
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	1	16
Lincosamides - Clindamycin	0.12	4
Macrolides - Erythromycin	0.25	8
Monocarboxylic acid - Mupirocin	0.5	2
Oxazolidines - Linezolid	1	8
Penicillins - Penicillin	0.12	2
Pleuromutilins - Tiamulin	0.5	4
Streptogramins - Quinupristin/Dalfopristin	0.5	4
Sulfonamides - Sulfamethoxazole	64	512

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) - spa-type t034 - CC398 in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

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

CC398	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	3																									
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	3	2											1				2								
Aminoglycosides - Kanamycin	8	3	2													1				2						
Aminoglycosides - Streptomycin	16	3	3																3							
Amphenicols - Chloramphenicol	16	3	0														2	1								
Fluoroquinolones - Ciprofloxacin	1	3	0									1	2													
Tetracyclines - Tetracycline	1	3	3															3								
Trimethoprim	2	3	3																3							
Antimycobacterial drugs - Rifampicin	0.032	3	0					3																		
Cephalosporins - Cefoxitin	4	3	3															3								
Fusidanes - Fusidic acid	0.5	3	0										3													
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	2	3	0											3												
Lincosamides - Clindamycin	0.25	3	3													3										
Macrolides - Erythromycin	1	3	3														3									
Monocarboxylic acid - Mupirocin	1	3	0										3													
Oxazolidines - Linezolid	4	3	0												3											
Penicillins - Penicillin	0.125	3	3												3											
Pleuromutilins - Tiamulin	2	3	3													3										

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) - spa-type t034 - CC398 in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

CC398	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications																								
Isolates out of a monitoring program (yes/no)																									
Number of isolates available in the laboratory	3																								
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
Streptogramins - Quinupristin/Dalfopristin	1	3	3													3									
Sulfonamides - Sulfamethoxazole	128	3	0																	3						

CC398	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	3	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	1	16
Aminoglycosides - Kanamycin	4	64
Aminoglycosides - Streptomycin	4	32
Amphenicols - Chloramphenicol	4	64
Fluoroquinolones - Ciprofloxacin	0.25	8
Tetracyclines - Tetracycline	0.5	16
Trimethoprim	2	32
Antimycobacterial drugs - Rifampicin	0.016	0.5
Cephalosporins - Cefoxitin	0.5	16

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) - spa-type t034 - CC398 in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

CC398	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	3	
Antimicrobials:	lowest	highest
Fusidanes - Fusidic acid	0.5	4
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	1	16
Lincosamides - Clindamycin	0.12	4
Macrolides - Erythromycin	0.25	8
Monocarboxylic acid - Mupirocin	0.5	2
Oxazolidines - Linezolid	1	8
Penicillins - Penicillin	0.12	2
Pleuromutilins - Tiamulin	0.5	4
Streptogramins - Quinupristin/Dalfopristin	0.5	4
Sulfonamides - Sulfamethoxazole	64	512

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) - spa-type t1255 - CC398 in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

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

CC398	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	1																									
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	1	0											1												
Aminoglycosides - Kanamycin	8	1	0													1										
Aminoglycosides - Streptomycin	16	1	0														1									
Amphenicols - Chloramphenicol	16	1	0															1								
Fluoroquinolones - Ciprofloxacin	1	1	1													1										
Tetracyclines - Tetracycline	1	1	1															1								
Trimethoprim	2	1	0												1											
Antimycobacterial drugs - Rifampicin	0.032	1	0					1																		
Cephalosporins - Cefoxitin	4	1	1															1								
Fusidanes - Fusidic acid	0.5	1	0										1													
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	2	1	0											1												
Lincosamides - Clindamycin	0.25	1	1													1										
Macrolides - Erythromycin	1	1	1														1									
Monocarboxylic acid - Mupirocin	1	1	0										1													
Oxazolidines - Linezolid	4	1	0												1											
Penicillins - Penicillin	0.125	1	1												1											
Pleuromutilins - Tiamulin	2	1	0										1													

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) - spa-type t1255 - CC398 in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

CC398	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications																								
Isolates out of a monitoring program (yes/no)																									
Number of isolates available in the laboratory	1																								
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
Streptogramins - Quinupristin/Dalfopristin	1	1	1													1										
Sulfonamides - Sulfamethoxazole	128	1	0																		1					

CC398	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	1	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	1	16
Aminoglycosides - Kanamycin	4	64
Aminoglycosides - Streptomycin	4	32
Amphenicols - Chloramphenicol	4	64
Fluoroquinolones - Ciprofloxacin	0.25	8
Tetracyclines - Tetracycline	0.5	16
Trimethoprim	2	32
Antimycobacterial drugs - Rifampicin	0.016	0.5
Cephalosporins - Cefoxitin	0.5	16

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) - spa-type t1255 - CC398 in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

CC398	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	1	
Antimicrobials:	lowest	highest
Fusidanes - Fusidic acid	0.5	4
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	1	16
Lincosamides - Clindamycin	0.12	4
Macrolides - Erythromycin	0.25	8
Monocarboxylic acid - Mupirocin	0.5	2
Oxazolidines - Linezolid	1	8
Penicillins - Penicillin	0.12	2
Pleuromutilins - Tiamulin	0.5	4
Streptogramins - Quinupristin/Dalfopristin	0.5	4
Sulfonamides - Sulfamethoxazole	64	512

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

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

S. aureus, meticillin resistant (MRSA)	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	1																									
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	1	0											1												
Aminoglycosides - Kanamycin	8	1	0													1										
Aminoglycosides - Streptomycin	16	1	0													1										
Amphenicols - Chloramphenicol	16	1	0														1									
Fluoroquinolones - Ciprofloxacin	1	1	1														1									
Tetracyclines - Tetracycline	1	1	0										1													
Trimethoprim	2	1	1														1									
Antimycobacterial drugs - Rifampicin	0.032	1	0					1																		
Cephalosporins - Cefoxitin	4	1	1															1								
Fusidanes - Fusidic acid	0.5	1	0										1													
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	2	1	0											1												
Lincosamides - Clindamycin	0.25	1	0								1															
Macrolides - Erythromycin	1	1	0									1														
Monocarboxylic acid - Mupirocin	1	1	0											1												
Oxazolidines - Linezolid	4	1	0												1											
Penicillins - Penicillin	0.125	1	1												1											
Pleuromutilins - Tiamulin	2	1	0											1												

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

S. aureus, meticillin resistant (MRSA)	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications																								
Isolates out of a monitoring program (yes/no)																									
Number of isolates available in the laboratory													1												
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
Streptogramins - Quinupristin/Dalfopristin	1	1	0										1												
Sulfonamides - Sulfamethoxazole	128	1	0																	1					

S. aureus, meticillin resistant (MRSA)	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	1	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	1	16
Aminoglycosides - Kanamycin	4	64
Aminoglycosides - Streptomycin	4	32
Amphenicols - Chloramphenicol	4	64
Fluoroquinolones - Ciprofloxacin	0.25	8
Tetracyclines - Tetracycline	0.5	16
Trimethoprim	2	32
Antimycobacterial drugs - Rifampicin	0.016	0.5
Cephalosporins - Cefoxitin	0.5	16

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

S. aureus, meticillin resistant (MRSA)	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	1	
Antimicrobials:	lowest	highest
Fusidanes - Fusidic acid	0.5	4
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	1	16
Lincosamides - Clindamycin	0.12	4
Macrolides - Erythromycin	0.25	8
Monocarboxylic acid - Mupirocin	0.5	2
Oxazolidines - Linezolid	1	8
Penicillins - Penicillin	0.12	2
Pleuromutilins - Tiamulin	0.5	4
Streptogramins - Quinupristin/Dalfopristin	0.5	4
Sulfonamides - Sulfamethoxazole	64	512

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) - spa-type t011 - CC398 in Pigs - fattening pigs - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

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

CC398	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	10																									
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	10	3											7				3								
Aminoglycosides - Kanamycin	8	10	3													7				3						
Aminoglycosides - Streptomycin	16	10	5														4	1	5							
Amphenicols - Chloramphenicol	16	10	0													1	9									
Fluoroquinolones - Ciprofloxacin	1	10	1									4	4	1	1											
Tetracyclines - Tetracycline	1	10	10															10								
Trimethoprim	2	10	6												4				6							
Antimycobacterial drugs - Rifampicin	0.032	10	0					10																		
Cephalosporins - Cefoxitin	4	10	10														1	9								
Fusidanes - Fusidic acid	0.5	10	1										9		1											
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	2	10	0											10												
Lincosamides - Clindamycin	0.25	10	2								8					2										
Macrolides - Erythromycin	1	10	1									2	7				1									
Monocarboxylic acid - Mupirocin	1	10	1										9		1											
Oxazolidines - Linezolid	4	10	0												9	1										
Penicillins - Penicillin	0.125	10	10												10											
Pleuromutilins - Tiamulin	2	10	2										5	3		2										

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) - spa-type t011 - CC398 in Pigs - fattening pigs - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

CC398	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications																								
Isolates out of a monitoring program (yes/no)																									
Number of isolates available in the laboratory	10																								
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
Streptogramins - Quinupristin/Dalfopristin	1	10	2										6	2	1	1									
Sulfonamides - Sulfamethoxazole	128	10	1																	9			1			

CC398	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	10	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	1	16
Aminoglycosides - Kanamycin	4	64
Aminoglycosides - Streptomycin	4	32
Amphenicols - Chloramphenicol	4	64
Fluoroquinolones - Ciprofloxacin	0.25	8
Tetracyclines - Tetracycline	0.5	16
Trimethoprim	2	32
Antimycobacterial drugs - Rifampicin	0.016	0.5
Cephalosporins - Cefoxitin	0.5	16
Fusidanes - Fusidic acid	0.5	4

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) - spa-type t011 - CC398 in Pigs - fattening pigs - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

CC398	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	10	
Antimicrobials:	lowest	highest
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	1	16
Lincosamides - Clindamycin	0.12	4
Macrolides - Erythromycin	0.25	8
Monocarboxylic acid - Mupirocin	0.5	2
Oxazolidines - Linezolid	1	8
Penicillins - Penicillin	0.12	2
Pleuromutilins - Tiamulin	0.5	4
Streptogramins - Quinupristin/Dalfopristin	0.5	4
Sulfonamides - Sulfamethoxazole	64	512

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) - spa-type t034 - CC398 in Pigs - fattening pigs - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

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

CC398	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	63																									
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	63	3											60		1		2								
Aminoglycosides - Kanamycin	8	63	3													58	2			3						
Aminoglycosides - Streptomycin	16	63	41													3	18	1	41							
Amphenicols - Chloramphenicol	16	63	0													2	56	5								
Fluoroquinolones - Ciprofloxacin	1	63	3									18	42				3									
Tetracyclines - Tetracycline	1	63	63															63								
Trimethoprim	2	63	63																63							
Antimycobacterial drugs - Rifampicin	0.032	63	1					62					1													
Cephalosporins - Cefoxitin	4	63	63														9	54								
Fusidanes - Fusidic acid	0.5	63	1										62			1										
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	2	63	0											63												
Lincosamides - Clindamycin	0.25	63	61								2				1	60										
Macrolides - Erythromycin	1	63	59									3	1				59									
Monocarboxylic acid - Mupirocin	1	63	1										61	1	1											
Oxazolidines - Linezolid	4	63	0											1	60	2										
Penicillins - Penicillin	0.125	63	63												63											
Pleuromutilins - Tiamulin	2	63	61										2			61										

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) - spa-type t034 - CC398 in Pigs - fattening pigs - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

CC398	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications																								
Isolates out of a monitoring program (yes/no)																									
Number of isolates available in the laboratory	63																								
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
Streptogramins - Quinupristin/Dalfopristin	1	63	61										2		5	56									
Sulfonamides - Sulfamethoxazole	128	63	1																	62			1			

CC398	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	63	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	1	16
Aminoglycosides - Kanamycin	4	64
Aminoglycosides - Streptomycin	4	32
Amphenicols - Chloramphenicol	4	64
Fluoroquinolones - Ciprofloxacin	0.25	8
Tetracyclines - Tetracycline	0.5	16
Trimethoprim	2	32
Antimycobacterial drugs - Rifampicin	0.016	0.5
Cephalosporins - Cefoxitin	0.5	16
Fusidanes - Fusidic acid	0.5	4

Table Antimicrobial susceptibility testing of S. aureus, meticillin resistant (MRSA) - spa-type t034 - CC398 in Pigs - fattening pigs - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - nasal swab - quantitative data [Dilution method]

CC398	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	63	
Antimicrobials:	lowest	highest
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	1	16
Lincosamides - Clindamycin	0.12	4
Macrolides - Erythromycin	0.25	8
Monocarboxylic acid - Mupirocin	0.5	2
Oxazolidines - Linezolid	1	8
Penicillins - Penicillin	0.12	2
Pleuromutilins - Tiamulin	0.5	4
Streptogramins - Quinupristin/Dalfopristin	0.5	4
Sulfonamides - Sulfamethoxazole	64	512

2.13 Q-FEVER

2.13.1 General evaluation of the national situation

A. Coxiella burnetii (Q-fever) general evaluation

History of the disease and/or infection in the country

A big outbreak occurred back in 1983 when 12 flocks of sheep apparently shedding Coxiella (C.) burnetii were descending from mountain pastures. During this outbreak over 400 human cases were registered. Most of them lived close to the roads where the sheep passed through.
From 1989 to 1991, 32 to 52 cases were reported per year. Mandatory notification was discontinued in 1999 as the number of reported cases decreased. After a small outbreak in 2012 notification of Q-fever was reintroduced in November 2012 (ordinance of the FDHA on medical doctor and laboratory reporting).
Screening of C. burnetii using PCR in various foodstuff (bovine, ovine, caprine milk and egg shells) in the years 2005-2006 showed that C. burnetii could be detected in bovine milk samples (17 of 359 (4.7%) milk samples were positive which corresponds to 8 from 27 (29.6%) farms). 504 egg shells, 81 samples from 13 sheep farms and 39 samples of 39 goat farms tested negative. In 2007, 431 of 872 (49,5%) bulk tank milk samples, each representing one farm, were positive using a different PCR method with a higher sensitivity. The prevalence of C. burnetii in bovine bulk tank milk was estimated to be between 30% and 50% (Baumgartner 2011).
Coxiellosis in animals is notifiable (TSV, Article 5: disease to be monitored). Abortions in cattle after three months of pregnancy and every abortion in sheep, goats and pigs have to be reported to a veterinarian. If more than one animal in a holding of ruminants aborts within the space of four months, or if an abortion occurs in a dealer’s stable or during alpine pasturing, cattle, sheep and goats undergo laboratory investigation. If clinically suspected cases are confirmed by a laboratory, the cantonal veterinarian is notified. At the beginning of the 1990s numbers per year were high with about 100 reported cases a year. Numbers then steadily declined to about 40 cases per year in 1996 until 2005. From 2006 on coxiellosis cases rose again to about 70 cases per year and stayed at this level since then. Cases concerned mainly cattle, while in sheep and goats only sporadic cases were reported. From the 658 coxiellosis cases in the last ten years (2004 to 2013), 83% occurred in cattle, 12% in goats and 5% in sheep.
The seroprevalence of the pathogen is estimated about 30% in cattle and about 1–3% in sheep and goats (data from the Swiss reference laboratory). In a recent study conducted 2011 a herd seroprevalence of coxiellosis was determined by ELISA of 11.11% for goats and 5% for sheep from a representative sample of 72 goat and 100 sheep farms. At animal level the seroprevalence was 3.43% (11/321) in goats and 1.8% (9/500) in sheep, respectively. In 97 collected abortion samples (43 from goats and 54 from sheep) the bacterial load was quantified by real-time PCR. In 13.4% of the tested samples a high amount of >104 bact/mg placenta was detected.

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

2013, 27 human cases were reported with a notification rate of 0.33 per 100’000 inhabitants. As Q-Fever was not notifiable since 1999, this notification rate cannot be compared to the situation in recent years. However, the number of reports is considerable low, suggesting that at least cases with severe clinical symptoms are not that frequent. The last outbreak occurred from February to August 2012. 17 human Q-Fever cases were registered in the canton of Vaud, of which 10 people were hospitalised. In 12 cases an epidemiological link could be established to an infected sheep herd with roughly 200 sheep. Only 4 cases lived next to this sheep herd, most other patients came from the surrounding area.
2013 68 cases of coxiellosis in ruminants (57 in cattle, 10 in goats and 1 in sheep) were reported to the

FSVO by cantonal veterinarians. Since 2006 the reports fluctuated between 60 and 86 reported cases per year. Since 2007 the number of reports was increasing resulting in a peak in 2012. The next years will show, if the decrease in 2013 initiates a declining trend.
In veterinary diagnostic laboratories 3731 tests for Coxiella spp. were carried out in the context of clinical investigations. Samples were derived from cattle (89%), sheep (5%) and goats (5%).

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

Coxiella burnetii as a cause of abortions seems to be more frequent in cattle. However, infected cattle are less dangerous for humans than infected sheep and goats. Although the seroprevalence of C. burnetii in the Swiss small ruminant population is rather low, Q-fever in small ruminants remains under certain epidemiological circumstances a public health threat.

Recent actions taken to control the zoonoses

Due to the outbreak in 2012 Q-Fever in humans is again notifiable since November 2012.
Efforts to intensify disease awareness, to motivate farmers to send abortion material to the laboratories for further investigation as well as to improve knowledge how to avoid infections are ongoing.

Additional information

1. Metzler AE et al., 1983: Distribution of Coxiella burnetii: a seroepidemiological study of domestic animals and veterinarians [in German]. Schweizer Archiv für Tierheilkunde, 125, 507-517.
2. Fretz, R., Schaeren, W., Tanner, M., Baumgartner, A., 2007: Screening of various foodstuffs for occurrence of Coxiella burnetii in Switzerland. Int J Food Microbiol 116, 414-418.
3. Baumgartner, A., Niederhauser, I., Schaeren, W.2011: Occurrence of Coxiella burnetii DNA in bulk tank milk samples in Switzerland. Archiv für Lebensmittelhygiene 62, 200-204.
4. Further information can be found on the FSVO website www.blv.admin.ch.

2.13.2 Coxiella (Q-fever) in animals

Table Coxiella burnetii (Q fever) in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Analytical Method	Sampling unit	Units tested	Total units positive for Coxiella (Q-fever)	C. burnetii	No of clinically affected herds
Alpacas - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	2	0		
Cattle (bovine animals) - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	3347	52	52	
Deer - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	1	0		
Goats - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	175	11	11	
Monkeys - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	1	0		
Other animals - Clinical investigations [1)]	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	2	0		
Pigs - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	6	0		
Sheep - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	195	7	7	
Solipeds, domestic - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	1	0		
Wild animals - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	Unknown	Animal	1	0		

Comments:

[1)] 1x musk ox

Footnote:

All data categorised as “clinical investigation” are summaries of data from the ILD (= information system of laboratory data). ILD is run by the FSVO. All labs, which are approved for the diagnosis of notifiable diseases, have to report their results in this system. Only tests of antigen detection were selected for the zoonosis reporting in the context of “clinical investigation”.

2.14 TULARAEMIA

2.14.1 General evaluation of the national situation

2.14.2 Francisella in animals

A. Francisella in Animals

Notification system in place

Tularemia in humans (ordinance of the FDHA on medical doctor and laboratory reporting) and animals (TSV, Art. 5: disease to be monitored) is notifiable. In animals, monitoring is based on voluntary testing of wild animals found dead or hunted as well as animals showing clinical signs consistent with tularemia.

Results of the investigation

Before 2008 reported human cases were always below 10 confirmed cases per year. Since then cases were usually over 10 cases per year (with the exception of 2009 with 4 cases per year). In 2012, the FOPH registered 40 confirmed cases in humans which is 2.5 times as many cases then the years before. Most cases were reported in the canton of Zürich. In 2013 30 cases were reported, most of them occurred again in the canton of Zurich. Compared to 2012 the number of reports dropped by 25%. Since 2009 they were for the first time decreasing. So far it seems that 2012 was a peak year.
One third of the human cases coincide with a tick bite during the incubation period. Thus the Spiez laboratory and the NBC-EOD Centre of Competence collected 2009 at 165 different locations about 60000 ticks. 0,01% (6 samples) were positive for F. tularensis using PCR. In 2012, another 14000 ticks were collected at these 6 positive locations from 2009. 0.1% (18 samples) were positive for F. tularensis using PCR, the minimum expected. Most positive samples were found in the canton of Zürich, a densely populated region, indicating that this might be an endemic area for F. tularensis in Switzerland. 2 of the 6 samples from 2009 and 11 of the 18 samples in 2012 could be successfully cultivated and isolated. All isolates belong to the F. tularensis subspecies holarctica, which is endemic in Europe.
In animals, never more than 8 cases per year were reported. In the past ten years (2004-2013) it were 22 cases of which 82% were in hares and 18% in monkeys. 2012 slightly more cases were detected due to an ongoing research project at the University of Bern (see additional information below). 2012, also wild mice which had died in a research barn in the canton of Zurich were tested positive for F. tularensis. The wild mice have free access to go in and out of this barn. None of the researchers from the research barn in the canton of Zurich developed tularemia and there was no link to any of the human cases reported in the canton of Zürich.
2013 3 cases in hares were reported by cantonal veterinarians. According to the laboratory information system 1 marmot and 2 beaver were tested negative for F. tularensis.

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

Tularemia in humans is sporadic. The next years will show, if the rising trend in humans since 2007 had reached its peak in 2012. The rise of reported cases might be the result of an increased disease awareness as well as improved diagnostic methods (use of PCR for confirmation). Why the number dropped in 2013 remains unclear.
The biological cycle of F. tularensis is not well understood. Today, an epidemiological study is ongoing. The comparison of strains isolated from wild animals, humans and ticks using whole genome sequencing will help to better understand the epidemiology of tularemia. For this purpose also the collection of ticks continues. In 2013 20000 ticks were collected at clinical hot spots and 7 samples were positive for F.

tularensis using PCR. In addition, in June 2014 ticks from canton Ticino will be sampled.Voluntary testing of wild animals found dead or hunted is clearly a big challenge of the monitoring in place. Results of the passive surveillance in wild animals need to be considered as rather poor and inconsistent. It can only be concluded, that tularemia is present in the Swiss wild hare population.

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

Tularemia affects mainly wild animals, especially hares and rodents but also zoo animals. Contact to wild animals (mainly mice and hares) might be an important source of infection to humans. Other sources of infection can be bites of ticks or insects as well as the inhalation of dust/aerosol and contaminated water or food. Those at risk are mainly gamekeepers, hunters, people who work in agriculture or forestry, wild animal veterinary practitioners and laboratory staff.

Additional information

1. During the last years, an increased number of tularemia cases in humans and animals was observed in Switzerland. However, the source of infection remains virtually unknown as well as the ecology of this bacterium including the maintenance of F. tularensis and its boosting in the environment. To better understand these issues which are a matter of biological safety, a project aiming to dissect the life cycle of this microorganism senso lato started on June, 1st 2012 at the University of Bern (Paola Pilo: “Ecology of Francisella tularensis and its impact on biological safety”). The study is based on four approaches: The identification of the infection route in hares; the assessment of beaver’s role, and other aquatic mammals, in the maintenance of F. tularensis in the environment; the assessment of tick cell lines as supportive substrate for F. tularensis survival and evaluation of its cytotoxicity; investigation of freshwater protozoa as reservoir. Unpublished preliminary data of positive animals tested for F. tularensis were: 24 mice, 18 hares, 2 monkeys and 1 stone marten in 2012 and 9 hares in 2013.
2. Further information can be found on the FSVO website www.blv.admin.ch, the FOPH website www.bag.admin.ch or the website of Spiez laboratory http://www.labor-spiez.ch/en/the/bs/enthebsnant.htm .

2.15 CYSTICERCOSIS, TAENIOSIS

2.15.1 General evaluation of the national situation

2.15.2 Cysticerci in animals

A. Cysticerci in Animals

Monitoring system

Sampling strategy

Cattle, small ruminants and swine are inspected at slaughter for lesions of Cysticerci.
According to the ordinance of 23 November 2005 on hygiene in the slaughter process (VhyS; SR 817.190.1), all cattle older than 6 months must be checked with incisions into the jaw muscles and heart.

Measures in case of the positive findings or single cases

Carcasses with mild lesions are frozen, carcasses with massive lesions condemned.

Notification system in place

Cyyticercosis in animals is not notifiable. However, data on carcasses with massiv lesions which needed to be condemned due to cyticerci during meat inspection according to the ordinance of 23 November 2005 on hygiene in the slaughter process (VhyS; SR 817.190.1) are documented in the FLEKO (meat inspection statistics), however without precise species diagnosis. No data exist on carcasses with mild lesions which needed to be frozen.

Results of the investigation

Studies in six Swiss abattoirs from 2002 until 2005 showed that in about 0.58% of livestock animals lesions in the muscles caused by T. saginata cysticerci were found. This estimate was constant in these years. The animals most heavily infested were cows. However, the routinely performed standard meat inspection protocol has a low diagnostic sensitivity for the detection of T. saginata cysticerci infections. In an abattoir trial 2008/2009 several additional heart incisions were performed in 1088 slaughtered cattle originating from 832 farms throughout Switzerland. With the EU-approved routine meat inspection, bovine cysticercosis was diagnosed in 1.8% (20/1088) of the slaughtered animals. Additional incisions into the heart muscle revealed a further 29 cases, indicating that the prevalence was at least 4.5%. All infected animals originated from individual farms (Eichenberger et al. 2011).
Data of the Fleko (meat inspection statistics) from 2006 until 2013 support that cows are the most affected species: of 224 carcasses with massive lesions 80% were cattle, 15.5% sheep, 4% pigs and 0.5% goats. On average 28 carcasses (ranging from 13 to 44) with massiv lesions are detected each year. This corresponds to at most 0.004% of the total slaughtered population.
2013, 29 carcasses with massiv lesions were entered in the Fleko (22 cattle (76%) and 7 sheep (24%)). Unfortunately, a precise species diagnosis in the slaughterhouses is not reported. In pigs however, it is known , that T. hydatigena is found, because this can be morphologically differentiated from the zoonotic T. suis.
Data on cases with mild lesions which are frozen are not systematically collected.

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

Intestinal Taenia infections in humans are occasionally treated in Switzerland, but no prevalence has so far been recorded. No autochthon cases of cysticercosis caused by T. solium are known, but single imported cases do occur.
Numbers of carcasses condemned due to massive lesions of cyticerci were constant since 2006. As data on cases with mild lesions are not gathered in the Fleko, general data are lacking to describe the whole picture. A modeled prevalence in dairy cows was recently estimated to be 16.5% (Eichenberger et al. 2013). A case-control study in 2005/2006 considered the risk of infection for bovines to be primarily dependent on external factors: pastures bordering a railway line, the location of the pasture close to a recreational area with parking spaces and leisure activities, farmyard visitors and raw feed that has been bought to be statistically significant risk factors. In heavily infested cases, other aspects may also play a role, such as not being connected up to the sewage system or the presence of a tapeworm carrier on the farm.

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

The illness for intestinal Taenia saginata infections in humans is mostly of mild character and can be treated. Taenia saginata cysticercus infection in cattle remains an economically important parasitic disease for the livestock industry by affecting food safety. Based on the routine abattoir reports the prevalence of this zoonotic parasite in the cattle population is underestimated. Only a fraction of infected slaughter cattle are identified during meat inspection. The sensitivity of the used methods at slaughter is estimated to be 15.6% (95% CI; 13-21; Eichenberger et al. 2013). The sensitivity could be improved with additional several heart incisions.
No autochthon cases of cysticercosis caused by T. solium are known.

Additional information

1. Flütsch, F. et al: Case-control study to identify risk factors for bovine cysticercosis on farms in Switzerland; Parasitology. 2008 Apr;135(5):641-6. Epub 2008 Mar 27.
2. Eichenberger, R.M., Stephan, R., Deplazes, P., 2011. Increased sensitivity for the diagnosis of Taenia saginata cysticercus infection by additional heart examination compared to the EU-approved routine meat inspection. Food Control 22, 989-992.
3. Eichenberger et al., (2013) Multi-test analysis and model-based estimation of the prevalence of Taenia saginata cysticercus infection in naturally infected dairy cows in the absence of a gold standard reference test. International Journal for Parasitology, in press
4. Further information can be found on the FSVO website www.blv.admin.ch.

2.16 WEST NILE VIRUS INFECTIONS

2.16.1 General evaluation of the national situation

A. West Nile Virus general evaluation

History of the disease and/or infection in the country

WNF in humans is notifiable since 2006 (ordinance of the FDHA on medical doctor and laboratory reporting) and in animals since 2011 (TSV, Article 5: disease to be monitored). Up to date no autochthonous cases in humans or animals were reported in Switzerland.

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

Since 2010 one or two imported human cases per year were registered by the Federal Office of Public Health.

In 2013, one WNF-suspicious horse and 6 dead found wild birds were tested negative. No mass mortality in wild birds was observed, but would also not be expected in Switzerland.

593 and 123 mosquito pool samples (Culex, Aedes vexans and Aedes albopictus) collected in Canton Ticino and North of Alps, respectively, were WNV-negative. In 5 pools from the Ticino non-WNV-Mosquito -Flavivirus were detected (0.8%).

Since 2011 never more than one suspicious horse and 6 dead birds per year were tested negative. Furthermore, 466 (2011) and 1429 (2012) pools of mosquitos (Culex, Aedes vexans and Aedes albopictus) from Canton Ticino were all WNV-negative. In 38 pools non-WNV-Mosquito-Flavivirus were detected. From Canton Geneva 62 (2011) and 214 (2012) pools (only Culex) were negative.

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

Up to date there were no autochthonous cases of WNF. However, it cannot be excluded that WNV is circulating in Switzerland, especially in wild birds and mosquito populations. In Italy cases occurred in new regions which lie in the direction to Switzerland. In eastern Austria, WNV was detected in dead found wild birds 2012 and 2013.

Recent actions taken to control the zoonoses

Disease awareness in Switzerland is strengthened. If cases in animals or humans appear, the responsible Federal Offices will inform themselves immediately, as laid down in a concept of how to deal with WNF when it first occurs in Switzerland. Mosquito populations were monitored. A vaccine for horses was approved in 2011. Every year the Federal Food Safety and Veterinary Office and the Federal Office of Public Health evaluate the WNF situation, with a special focus on its neighbouring countries.

Additional information

1. Engler et al. 2013: European Surveillance for West Nile Virus in Mosquito Populations. Int. J. Environ. Res. Public Health

2. Further information can be found on the FSVO website www.blv.admin.ch.

2.16.2 West Nile Virus in animals

Table West Nile Virus in Animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Vaccination status	Analytical Method	Sampling unit	Region	Units tested	Total units positive for West Nile Virus
Birds - wild	FSVO	Unspecified	Not applicable	animal sample	Domestic	no	Real-Time PCR	Animal	Schweiz/Suisse/Svizzera	6	0
Solipeds, domestic - horses - Farm - Clinical investigations	FSVO	Unspecified	Not applicable	animal sample	Domestic	no	Real-Time PCR	Animal	Schweiz/Suisse/Svizzera	1	0

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

A. Antimicrobial resistance of E.coli in animal

Sampling strategy used in monitoring

Frequency of the sampling

E. coli were analysed for antimicrobial resistance in 200 samples from fattening pigs, 208 samples from veal calves and 201 samples from broiler herds. The samples were evenly collected throughout the year in a stratified and randomized sample scheme in the framework of a permanent national monitoring programme on antimicrobial resistance in Swiss food-producing animals. The slaughter plants included in the surveillance programme account for > 95% of the total broiler, > 85 % of the total pig and > 90% of the total veal calf production in Switzerland. The number of samples for each plant has been determined in proportion to the number of animals slaughtered per year. 170 of these samples from broilers, 171 of these samples from fattening pigs and 181 of these samples from veal calves were additionally screened for ESBL/AmpC producers by selective methods.

Type of specimen taken

Rectum anal swabs from pigs and veal calves, cloacal swabs from broilers. BTM samples from dairy cows.

Methods of sampling (description of sampling techniques)

Faecal samples from veal calves and pigs and 5 cloacal samples from different broilers per slaughter batch were taken at the slaughter line using a swab in standard transportation medium (Transport Swabs, Oxoid TS0001A, AMIES W/O CH). Immediately after collection, the samples were brought to the laboratory for analysis. Cloacal swabs from one slaughter batch were pooled at the laboratory.

Procedures for the selection of isolates for antimicrobial testing

From each sample positive for E. coli or ESBL/AMpC producer one isolate was submitted to susceptibility testing.

Methods used for collecting data

All samples were analysed in the same laboratory (Centre for Zoonoses, Bacterial Animal Diseases and Antibiotic Resistance, University of Bern, Switzerland).

Laboratory methodology used for identification of the microbial isolates

Samples were cultured for E. coli within 72 h after sampling using standard microbiological procedures. For detection of ESBL/AmpC producers the feacal/pooled cloacal swabs were transferred into 5ml of MacConkey broth (Oxoid) containing ceftazidime (4mg/L) and incubated at 37° for 24h unter agitation. Then, 1 full loop was plated onto selective chromogenic medium for the sreening of third generation cephalosporin-resistant Enterobacteriaceae (chromID ESBL, bioMérieux) and reincubated over night. From each selective plate, a single colony from those showing a unique color an morphology as described in the manufacturers product documentation was further indentified to species level wit Vitek2 system on AST-GN38 cards.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

A micro-dilution method (Sensititre®-System, MCS-Diagnostics) was used for susceptibility testing, including the following antimicrobials: For E.coli/ unselective method: ampicillin, cefotaxime, ceftazidime, chloramphenicol, ciprofloxacin, colistin, florfenicol, gentamicin, kanamycin, nalidixic acid, sulfamethoxazole, streptomycin, trimethoprim, tetracycline. For ESBL/AmpC producing E.coli/selective method: ampicillin, cefazolin, cefepime, cefotaxime, cefotaxime / clavulanic acid, cefoxitin, cefpodoxime,ceftazidime, ceftazidime / clavulanic acid, ceftriaxon, cephalotin, chloramphenicol, ciprofloxacin, colistin, florfenicol, gentamicin, imipinem, kanamycin, meropenem, nalidixic acid, sulfamethoxazole, streptomycin, trimethoprim, tetracycline

Cut-off values used in testing

Whenever possible the epidemiological cut-off values according to EUCAST were used. If these values were not defined or lied out of test-range clinical breakpoints according to EUCAST or according to CLSI (M100-S21) were used.

Preventive measures in place

No specific measures for antimicrobial resistance in E. coli. General preventive measures include education of veterinarians and farmers and limitation of use of antimicrobials to veterinary prescription.

Control program/mechanisms

The control program/strategies in place

None

Recent actions taken to control the zoonoses

None

Suggestions to the European Union for the actions to be taken

None

Measures in case of the positive findings or single cases

None

Notification system in place

None

Results of the investigation

189 isolates from broiler herds, 183 isolates from pigs, 176 isolates from veal calves (< 6 months old) were subjected to susceptibility testing. Resistance is common in E. coli from all three animal species. Moderate to high levels of resistance were found for tetracycline, sulfamethoxazole, streptomycin, ampicillin and trimethoprim. In broilers levels of resistance were also high for ciprofloxacin and nalidixic acid (35.4% and 34.4%, respectively). In veal calves moderate resistance was found to kanamycin (14.2%). With the unselective culture method one E. coli from broilers and two from pigs were resistant to third-generation cephalosporins whereas with selective methods 27.7% of the broiler herds, 9.4% of the pigs and 16.6% of the veal calves turned out to carry E.coli with resistance to third generation cephalosporins. These isolates showed additionally high to extremely high resistance levels for ciprofloxacin, nalidixic acid, streptomycin, sulfamethoxazole, tetracycline and trimpethoprim in all three animal species. Resistance levels were also high to extremely high for chloramphenicol, gentamicin and kanamycin in pigs and veal calves. No resistance against carbapenems was found.

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

Prevalence of resistance to ciprofloxacin and nalidixic acid showed a significant increasing trend in isolates from broilers from 2006 to 2012 and slightly decreased in 2013. The results for E. coli from pigs were similar to those of previous years. Resistance in veal calves significantly decreased in the last 7 jears against ampicillin, sulfamethoxazole, streptomycin, tetracycline and chloramphenicol. Resistance in E.coli was most frequently observed against antimicrobials that have been used in food animals for many

years, such as trimethoprim/sulfonamide, tetracycline and ampicillin. With unselective methods prevalence of E. coli with resistance to third generation cephalosporins was very low. With selective methods a higher prevalence could be detected. It was in the same range than last year for broiler herds and pigs. In veal calves prevalence was higher than in cattle in 2012 (4.1%).

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

The increasing prevalence of resistance to ciprofloxacin and nalidixic acid in E. coli from broilers is a potential public health concern. The occurrence of ESBL/AmpC producing E. coli in Switzerland found with selective methods is lower than in certain other European countries. To assess the public health relevance of the E. coli isolates with a resistance to third generation cephalosporins, these isolates have to be characterized in more detail by molecular methods and compared to clinical and subclinical isolates from humans.

Additional information

Further information can be found in the annual report on the sale of antibiotics for veterinary use and antibiotic resistance monitoring of livestock in Switzerland (Arch-Vet 2013) on the FSVO website www.blv.admin.ch

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab - quantitative data [Dilution method]

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

E.coli, non-pathogenic, unspecified	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	176																									
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	176	6									13	116	39	2	1		2	3							
Aminoglycosides - Kanamycin	8	176	25													147	4	2			23					
Aminoglycosides - Streptomycin	16	176	72												2	36	61	5	9	20	43					
Amphenicols - Chloramphenicol	16	176	17												2	41	110	6	4	13						
Amphenicols - Florfenicol	16	176	5												4	83	79	5	1	4						
Cephalosporins - Cefotaxime	0.25	176	0							150	26															
Fluoroquinolones - Ciprofloxacin	0.06	176	13			25	116		21	1	2	8		1			2									
Penicillins - Ampicillin	8	176	48											4	43	72	9		48							
Quinolones - Nalidixic acid	16	176	13													162	1			13						
Tetracyclines - Tetracycline	8	176	67											16	87	5	1		4	63						
Trimethoprim	2	176	39										124	13					39							
Cephalosporins - Ceftazidime	0.5	176	0									171	5													
Polymyxins - Colistin	2	176	0												176											
Sulfonamides - Sulfamethoxazole	64	176	81														39	29	21	6	1			80		

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab - quantitative data [Dilution method]

E.coli, non-pathogenic, unspecified	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	176	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Pigs - fattening pigs - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab - quantitative data [Dilution method]

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

E.coli, non-pathogenic, unspecified	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	183																									
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	183	4									29	92	54	4	1			3							
Aminoglycosides - Kanamycin	8	183	7													168	8			1	6					
Aminoglycosides - Streptomycin	16	183	86												1	47	43	6	13	17	56					
Amphenicols - Chloramphenicol	16	183	12												7	40	117	7	4	8						
Amphenicols - Florfenicol	16	183	0												9	69	100	5								
Cephalosporins - Cefotaxime	0.25	183	2							171	10					2										
Fluoroquinolones - Ciprofloxacin	0.06	183	9			31	116		25	2	1	5					3									
Penicillins - Ampicillin	8	183	33											6	56	83	5		33							
Quinolones - Nalidixic acid	16	183	8													172	3			8						
Tetracyclines - Tetracycline	8	183	62											18	90	11	2	1	4	57						
Trimethoprim	2	183	36										136	8	3			2	34							
Cephalosporins - Ceftazidime	0.5	183	2									176	5		1	1										
Polymyxins - Colistin	2	183	0												183											
Sulfonamides - Sulfamethoxazole	64	183	71														50	35	23	4	1		2	68		

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Pigs - fattening pigs - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab - quantitative data [Dilution method]

E.coli, non-pathogenic, unspecified	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	183	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Gallus gallus (fowl) - broilers - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - cloacal swab - quantitative data [Dilution method]

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

E.coli, non-pathogenic, unspecified	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	189																									
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	189	1									10	105	70	3				1							
Aminoglycosides - Kanamycin	8	189	5													177	7				5					
Aminoglycosides - Streptomycin	16	189	29													64	83	13	10	7	12					
Amphenicols - Chloramphenicol	16	189	2												2	46	133	6	1	1						
Amphenicols - Florfenicol	16	189	0												6	85	95	3								
Cephalosporins - Cefotaxime	0.25	189	1							173	14	1				1										
Fluoroquinolones - Ciprofloxacin	0.06	189	67			16	95		7	4	8	40	9	4		1	5									
Penicillins - Ampicillin	8	189	48										1	9	54	69	8		48							
Quinolones - Nalidixic acid	16	189	65													117	1	6	1	64						
Tetracyclines - Tetracycline	8	189	45											19	109	16			5	40						
Trimethoprim	2	189	27										136	26		1			26							
Cephalosporins - Ceftazidime	0.5	189	1									186	2				1									
Polymyxins - Colistin	2	189	0												189											
Sulfonamides - Sulfamethoxazole	64	189	51														45	43	43	7				51		

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Gallus gallus (fowl) - broilers - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - cloacal swab - quantitative data [Dilution method]

E.coli, non-pathogenic, unspecified	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	189	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.06	4
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Cephalosporins - Ceftazidime	0.25	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab (Isolation 3rd. Gen. Resistant E. coli on selective media) - quantitative data [Dilution method]

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

E.coli, non-pathogenic, unspecified	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications (Isolation 3rd. Gen. Resistant E. coli on selective media)																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	30																									
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	30	21									1	7	1			1	3	17							
Aminoglycosides - Kanamycin	8	30	22													8		2	9	2	9					
Aminoglycosides - Streptomycin	16	30	20													3	4	3	2	4	14					
Amphenicols - Chloramphenicol	16	30	12													5	12	1	1	11						
Amphenicols - Florfenicol	16	30	3												1	9	15	2		3						
Cephalosporins - Cefotaxime	0.25	30	30												2		4		2	22						
Fluoroquinolones - Ciprofloxacin	0.06	30	22			1	6			1	1	3					18									
Penicillins - Ampicillin	8	30	30																30							
Quinolones - Nalidixic acid	16	30	20													8	2			20						
Tetracyclines - Tetracycline	8	30	30																	30						
Trimethoprim	2	30	20										7	3					20							
Carbapenems - Imipenem	0.5	30	0										30													
Carbapenems - Meropenem	4	30	0											30												
Cephalosporins - Cefazolin	8	30	30															30								
Cephalosporins - Cefepime	4	30	16											3	4	7	12	4								
Cephalosporins - Cefoxitin	8	30	3													19	8	1		2						
Cephalosporins - Cefpodoxime	2	30	30															2	28							

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab (Isolation 3rd. Gen. Resistant E. coli on selective media) - quantitative data [Dilution method]

E.coli, non-pathogenic, unspecified	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications (Isolation 3rd. Gen. Resistant E. coli on selective media)																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	30																									
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
Cephalosporins - Ceftazidime	0.5	30	30											3	3	1	7	14	2							
Cephalosporins - Ceftriaxon	1	30	30													2		3	1	5	19					
Cephalosporins - Cephalothin	8	30	30															30								
Polymyxins - Colistin	2	30	0												30											
Sulfonamides - Sulfamethoxazole	64	30	25														1	4						25		

E.coli, non-pathogenic, unspecified	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications (Isolation 3rd. Gen. Resistant E. coli on selective media)	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	30	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab (Isolation 3rd. Gen. Resistant E. coli on selective media) - quantitative data [Dilution method]

E.coli, non-pathogenic, unspecified	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications (Isolation 3rd. Gen. Resistant E. coli on selective media)	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	30	
Antimicrobials:	lowest	highest
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.25	64
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Carbapenems - Imipenem	0.5	8
Carbapenems - Meropenem	1	8
Cephalosporins - Cefazolin	8	16
Cephalosporins - Cefepime	1	16
Cephalosporins - Cefoxitin	4	64
Cephalosporins - Cefpodoxime	0.25	32
Cephalosporins - Ceftazidime	0.25	128

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab (Isolation 3rd. Gen. Resistant E. coli on selective media) - quantitative data [Dilution method]

E.coli, non-pathogenic, unspecified	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications (Isolation 3rd. Gen. Resistant E. coli on selective media)	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	30	
Antimicrobials:	lowest	highest
Cephalosporins - Ceftriaxon	1	128
Cephalosporins - Cephalothin	8	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Pigs - fattening pigs - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab (Isolation 3rd. Gen. Resistant E. coli on selective media) - quantitative data [Dilution method]

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

E.coli, non-pathogenic, unspecified	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications (Isolation 3rd. Gen. Resistant E. coli on selective media)																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	16																									
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	16	5										6	4	1		1		4							
Aminoglycosides - Kanamycin	8	16	8													8			2	3	3					
Aminoglycosides - Streptomycin	16	16	12													3	1		1	4	7					
Amphenicols - Chloramphenicol	16	16	4													4	8		2	2						
Amphenicols - Florfenicol	16	16	1													5	10			1						
Cephalosporins - Cefotaxime	0.25	16	16												1				5	10						
Fluoroquinolones - Ciprofloxacin	0.06	16	10			1	5					1	2				7									
Penicillins - Ampicillin	8	16	16																16							
Quinolones - Nalidixic acid	16	16	8													7		1		8						
Tetracyclines - Tetracycline	8	16	12												4					12						
Trimethoprim	2	16	6										9	1					6							
Carbapenems - Imipenem	0.5	16	0										16													
Carbapenems - Meropenem	4	16	0											16												
Cephalosporins - Cefazolin	8	16	16															16								
Cephalosporins - Cefepime	4	16	9											1	1	5	6	3								
Cephalosporins - Cefoxitin	8	16	2													10	4			2						
Cephalosporins - Cefpodoxime	2	16	16															1	15							

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Pigs - fattening pigs - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab (Isolation 3rd. Gen. Resistant E. coli on selective media) - quantitative data [Dilution method]

E.coli, non-pathogenic, unspecified	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications (Isolation 3rd. Gen. Resistant E. coli on selective media)																								
Isolates out of a monitoring program (yes/no)																									
Number of isolates available in the laboratory	16																								
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
Cephalosporins - Ceftazidime	0.5	16	16											1	1	3	4	4	1		2					
Cephalosporins - Ceftriaxon	1	16	16												1					3	12					
Cephalosporins - Cephalothin	8	16	16															16								
Polymyxins - Colistin	2	16	0												16											
Sulfonamides - Sulfamethoxazole	64	16	12														1		1	2	1			11		

E.coli, non-pathogenic, unspecified	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications (Isolation 3rd. Gen. Resistant E. coli on selective media)	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	16	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Pigs - fattening pigs - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab (Isolation 3rd. Gen. Resistant E. coli on selective media) - quantitative data [Dilution method]

E.coli, non-pathogenic, unspecified	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications (Isolation 3rd. Gen. Resistant E. coli on selective media)	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	16	
Antimicrobials:	lowest	highest
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.25	64
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Carbapenems - Imipenem	0.5	8
Carbapenems - Meropenem	1	8
Cephalosporins - Cefazolin	8	16
Cephalosporins - Cefepime	1	16
Cephalosporins - Cefoxitin	4	64
Cephalosporins - Cefpodoxime	0.25	32
Cephalosporins - Ceftazidime	0.25	128
Cephalosporins - Ceftriaxon	1	128

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Pigs - fattening pigs - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab (Isolation 3rd. Gen. Resistant E. coli on selective media) - quantitative data [Dilution method]

E.coli, non-pathogenic, unspecified	Pigs - fattening pigs - Slaughterhouse - Monitoring - EFSA specifications (Isolation 3rd. Gen. Resistant E. coli on selective media)	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	16	
Antimicrobials:	lowest	highest
Cephalosporins - Cephalothin	8	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Gallus gallus (fowl) - broilers - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - cloacal swab (Isolation 3rd. Gen. Resistant E. coli on selective media) - quantitative data [Dilution method]

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

E.coli, non-pathogenic, unspecified	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications (Isolation 3rd. Gen. Resistant E. coli on selective media)																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	47																									
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	47	3									4	24	15	1				3							
Aminoglycosides - Kanamycin	8	47	3													43	1		3							
Aminoglycosides - Streptomycin	16	47	16													8	11	12	4	5	7					
Amphenicols - Chloramphenicol	16	47	1												2	14	30			1						
Amphenicols - Florfenicol	16	47	0												2	30	15									
Cephalosporins - Cefotaxime	0.25	47	47												2	2	4	8	10	21						
Fluoroquinolones - Ciprofloxacin	0.06	47	19				27		1		5	7	2	1			4									
Penicillins - Ampicillin	8	47	47																47							
Quinolones - Nalidixic acid	16	47	18													29				18						
Tetracyclines - Tetracycline	8	47	23											2	20	2			1	22						
Trimethoprim	2	47	33										13	1					33							
Carbapenems - Imipenem	0.5	47	0										47													
Carbapenems - Meropenem	4	47	0											47												
Cephalosporins - Cefazolin	8	47	47															47								
Cephalosporins - Cefepime	4	47	16											7	6	18	14	2								
Cephalosporins - Cefoxitin	8	47	7													34	6			7						
Cephalosporins - Cefpodoxime	2	47	47														1	1	45							

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Gallus gallus (fowl) - broilers - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - cloacal swab (Isolation 3rd. Gen. Resistant E. coli on selective media) - quantitative data [Dilution method]

E.coli, non-pathogenic, unspecified	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications (Isolation 3rd. Gen. Resistant E. coli on selective media)																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	47																									
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
Cephalosporins - Ceftazidime	0.5	47	44									1	2	16	9	3	4	11	1							
Cephalosporins - Ceftriaxon	1	47	47												1	3	1	5	4	10	23					
Cephalosporins - Cephalothin	8	47	47															47								
Polymyxins - Colistin	2	47	0												47											
Sulfonamides - Sulfamethoxazole	64	47	36														3	5	3					36		

E.coli, non-pathogenic, unspecified	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications (Isolation 3rd. Gen. Resistant E. coli on selective media)	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	47	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	4	128
Aminoglycosides - Streptomycin	2	128
Amphenicols - Chloramphenicol	2	64

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Gallus gallus (fowl) - broilers - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - cloacal swab (Isolation 3rd. Gen. Resistant E. coli on selective media) - quantitative data [Dilution method]

E.coli, non-pathogenic, unspecified	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications (Isolation 3rd. Gen. Resistant E. coli on selective media)	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	47	
Antimicrobials:	lowest	highest
Amphenicols - Florfenicol	2	64
Cephalosporins - Cefotaxime	0.25	64
Fluoroquinolones - Ciprofloxacin	0.008	8
Penicillins - Ampicillin	0.5	32
Quinolones - Nalidixic acid	4	64
Tetracyclines - Tetracycline	1	64
Trimethoprim	0.5	32
Carbapenems - Imipenem	0.5	8
Carbapenems - Meropenem	1	8
Cephalosporins - Cefazolin	8	16
Cephalosporins - Cefepime	1	16
Cephalosporins - Cefoxitin	4	64
Cephalosporins - Cefpodoxime	0.25	32
Cephalosporins - Ceftazidime	0.25	128
Cephalosporins - Ceftriaxon	1	128

Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Gallus gallus (fowl) - broilers - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - cloacal swab (Isolation 3rd. Gen. Resistant E. coli on selective media) - quantitative data [Dilution method]

E.coli, non-pathogenic, unspecified	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications (Isolation 3rd. Gen. Resistant E. coli on selective media)	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	47	
Antimicrobials:	lowest	highest
Cephalosporins - Cephalothin	8	16
Polymyxins - Colistin	2	4
Sulfonamides - Sulfamethoxazole	8	1024

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	EFSA	2	
	Kanamycin		8	
	Streptomycin	EFSA	16	
Amphenicols	Chloramphenicol	EFSA	16	
	Florfenicol		16	
Cephalosporins	Cefotaxime	EFSA	0.25	
	Ceftazidime	EFSA	0.5	
Fluoroquinolones	Ciprofloxacin	EFSA	0.064	
Penicillins	Ampicillin	EFSA	8	
Quinolones	Nalidixic acid	EFSA	16	
Sulfonamides	Sulfonamides	NON-EFSA		
	Sulfamethoxazole	EFSA	64	
Tetracyclines	Tetracycline	EFSA	8	

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 <=
Trimethoprim	Trimethoprim	EFSA	2	
Polymyxins	Colistin		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	NON-EFSA		
	Streptomycin	NON-EFSA		
Amphenicols	Chloramphenicol	NON-EFSA		
Cephalosporins	Cefotaxime	NON-EFSA		
	Ceftazidime	NON-EFSA		
Fluoroquinolones	Ciprofloxacin	NON-EFSA		
Penicillins	Ampicillin	NON-EFSA		
Quinolones	Nalidixic acid	NON-EFSA		
Sulfonamides	Sulfonamides	NON-EFSA		
	Sulfamethoxazole	NON-EFSA		
Tetracyclines	Tetracycline	NON-EFSA		
Trimethoprim	Trimethoprim	NON-EFSA		

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	NON-EFSA		
	Streptomycin	NON-EFSA		
Amphenicols	Chloramphenicol	NON-EFSA		
Cephalosporins	Cefotaxime	NON-EFSA		
	Ceftazidime	NON-EFSA		
Fluoroquinolones	Ciprofloxacin	NON-EFSA		
Penicillins	Ampicillin	NON-EFSA		
Quinolones	Nalidixic acid	NON-EFSA		
Sulfonamides	Sulfonamides	NON-EFSA		
	Sulfamethoxazole	NON-EFSA		
Tetracyclines	Tetracycline	NON-EFSA		
Trimethoprim	Trimethoprim	NON-EFSA		

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

A. Antimicrobial resistance of Enterococcus spp., unspecified in animal

Sampling strategy used in monitoring

Frequency of the sampling

Enterococci were analysed for antimicrobial resistance in 253 samples from veal calves and 249 samples from broilers. The samples were evenly collected throughout the year in a stratified and randomized sample scheme in the framework of a permanent national monitoring programme on antimicrobial resistance in Swiss food-producing animals. The slaughter plants included in the surveillance programme account for > 95% of the total broiler and > 90% of the total veal calf production in Switzerland. The number of samples for each plant has been determined in proportion to the number of animals slaughtered per year.

Type of specimen taken

Rectal-anal-swaps from veal calves, cloacal swaps from broilers.

Methods of sampling (description of sampling techniques)

Rectal-anal-samples from cattle and pigs and 5 cloacal samples from different broilers per slaughter batch were taken at the slaughter line using a swab in standard transportation medium (Transport Swabs, Oxoid TS0001A, AMIES W/O CH). Immediately after collection, the samples were brought to the laboratory for analysis. Cloacal swabs from one slaughter batch were pooled at the laboratory.

Procedures for the selection of isolates for antimicrobial testing

From each sample and Enterococcus subtype one isolate was submitted to susceptibility testing.

Methods used for collecting data

All samples were analysed in the same laboratory (Centre for Zoonoses, Bacterial Animal Diseases and Antibiotic Resistance, University of Bern, Switzerland).

Laboratory methodology used for identification of the microbial isolates

Samples were cultured for Enterococcus spp. within 72 h after sampling using standard microbiological procedures.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

A micro-dilution method (Sensititre®-System, MCS-Diagnostics) was used for susceptibility testing, including the following antimicrobials: ampicillin, amoxicillin/clavulanic acid (2:1), bacitracin, chloramphenicol, ciprofloxacin, erythromycin, florfenicol, gentamicin, linezolid, neomycin, nitrofurantoin, salinomycin, streptomycin, quinupristin/dalfopristin, tetracycline, vancomycin

Cut-off values used in testing

Whenever possible the epidemiological cut-off values according to EUCAST were used.

Preventive measures in place

No specific measures for antimicrobial resistance in Enterococcus spp. General preventive measures

include education of veterinarians and farmers and limitation of use of antimicrobials to veterinary prescription.

Control program/mechanisms

The control program/strategies in place

None

Recent actions taken to control the zoonoses

None

Suggestions to the European Union for the actions to be taken

None

Measures in case of the positive findings or single cases

None

Notification system in place

None

Results of the investigation

155 Enterococcus faecalis and 58 Enterococcus faecium isolates from broilers, 108 Enterococcus faecalis and 68 Enterococcus faecium isolates from veal calves were subjected to susceptibility testing. Resistance were commonly found in Enterococci from both animal species. Extremely high levels of resistance to neomycin were observed in E. faecalis from both animal species and high levels in E. faecium from veal calves, whereas resistance rates to neomycin significantly decreased in E. faecium from broilers in comparison to 2012. High to extremely high levels of resistance were also found to tetracycline in E. faecalis and to quinupristin/dalfopristin in E. faecium. Moderate to high levels of resistance were found to erythromycin in E. faecalis and E. faecium from broilers and veal calves . No resistance to ampicillin was found in E. faecalis and only low levels in E. faecium from veal calves. One E. faecalis isolate from veal calves showed resistance against vancomycin. No resistance to linezolid was observed.

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

In comparison with the results of the last years, resistance levels for bacitracin, tetracycline and erythromycin decreased significantly in E. faecalis from broilers and for bacitracin in E. faecalis from veal calves. No significant decreasing or increasing resistance trends were observed in E. faecium from both animal species.

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

Enterococci in the intestine of food producing animals are considered as a potential reservoir of resistance genes. Decreasing trends in resistance for some antimicrobials have to be confirmed in future surveillance.

Additional information

Further information can be found in the annual report on the sale of antibiotics for veterinary use and antibiotic resistance monitoring of livestock in Switzerland (Arch-Vet 2013) on the FSVO website www.blv.admin.ch

Table Antimicrobial susceptibility testing of E. faecium in Gallus gallus (fowl) - broilers - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - cloacal swab - quantitative data [Dilution method]

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

E. faecium	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	58																									
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	512	58	0																		58					
Aminoglycosides - Neomycin	16	58	5														13	40	4		1					
Aminoglycosides - Streptomycin	128	58	2																		56				2	
Amphenicols - Chloramphenicol	32	58	0												4	8	44	1	1							
Amphenicols - Florfenicol	8	58	0												19	39										
Fluoroquinolones - Ciprofloxacin	4	58	1										3	17	20	17	1									
Penicillins - Ampicillin	4	58	3												46	9	3									
Tetracyclines - Tetracycline	4	58	18											40			1	3	14							
Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin	32	58	40														3	8	7	10	3	27				
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	4	58	0											51	6	1										
Ionophores - Salinomycin	8	58	0											5	1	7	45									
Macrolides - Erythromycin	4	58	16										22	10	10		2	14								
Nitroimidazoles and Nitrofurans - Nitrofurantoin	256	58	0																31	23	4					
Oxazolidines - Linezolid	4	58	0											3	50	5										
Penicillins - Amoxicillin / Clavulanic acid	4	58	0												53	5										
Streptogramins - Quinupristin/Dalfopristin	1	58	36										1	21	7	29										

Table Antimicrobial susceptibility testing of E. faecium in Gallus gallus (fowl) - broilers - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - cloacal swab - quantitative data [Dilution method]

E. faecium	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	58	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	128	2048
Aminoglycosides - Neomycin	8	128
Aminoglycosides - Streptomycin	128	2048
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	32
Fluoroquinolones - Ciprofloxacin	0.5	32
Penicillins - Ampicillin	2	128
Tetracyclines - Tetracycline	1	32
Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin	8	256
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	1	32
Ionophores - Salinomycin	1	32
Macrolides - Erythromycin	0.5	16
Nitroimidazoles and Nitrofurans - Nitrofurantoin	32	256
Oxazolidines - Linezolid	0.5	32
Penicillins - Amoxicillin / Clavulanic acid	2	64
Streptogramins - Quinupristin/Dalfopristin	0.5	32

Table Antimicrobial susceptibility testing of E. faecium in Gallus gallus (fowl) - broilers - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - cloacal swab - quantitative data [Dilution method]

Table Antimicrobial susceptibility testing of E. faecalis in Gallus gallus (fowl) - broilers - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - cloacal swab - quantitative data [Dilution method]

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

E. faecalis	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications																								
Isolates out of a monitoring program (yes/no)																									
Number of isolates available in the laboratory	155																								
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	512	155	1																		154			1		
Aminoglycosides - Neomycin	16	155	154															1	35	106	13					
Aminoglycosides - Streptomycin	512	155	5																		150				5	
Amphenicols - Chloramphenicol	32	155	1													58	96			1						
Amphenicols - Florfenicol	8	155	0												92	63										
Fluoroquinolones - Ciprofloxacin	4	155	1										45	107	2				1							
Penicillins - Ampicillin	4	155	0												154	1										
Tetracyclines - Tetracycline	4	155	59											95	1		1	1	57							
Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin	32	155	29														2	53	71	9		20				
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	4	155	0											61	86	8										
Ionophores - Salinomycin	8	155	0											143	7	5										
Macrolides - Erythromycin	4	155	26										34	78	13	4	3	23								
Nitroimidazoles and Nitrofurans - Nitrofurantoin	32	155	1																154	1						
Oxazolidines - Linezolid	4	155	0											29	126											
Penicillins - Amoxicillin / Clavulanic acid	4	155	0												155											

Table Antimicrobial susceptibility testing of E. faecalis in Gallus gallus (fowl) - broilers - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - cloacal swab - quantitative data [Dilution method]

E. faecalis	Gallus gallus (fowl) - broilers - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	155	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	128	2048
Aminoglycosides - Neomycin	8	128
Aminoglycosides - Streptomycin	128	2048
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	32
Fluoroquinolones - Ciprofloxacin	0.5	32
Penicillins - Ampicillin	2	128
Tetracyclines - Tetracycline	1	32
Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin	8	256
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	1	32
Ionophores - Salinomycin	1	32
Macrolides - Erythromycin	0.5	16
Nitroimidazoles and Nitrofurans - Nitrofurantoin	32	256
Oxazolidines - Linezolid	0.5	32
Penicillins - Amoxicillin / Clavulanic acid	2	64

Table Antimicrobial susceptibility testing of E. faecium in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab - quantitative data [Dilution method]

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

E. faecium	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	68																									
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	512	68	0																		68					
Aminoglycosides - Neomycin	16	68	18														8	42	16	2						
Aminoglycosides - Streptomycin	128	68	2																		66				2	
Amphenicols - Chloramphenicol	32	68	0												1	7	60									
Amphenicols - Florfenicol	8	68	0												19	49										
Fluoroquinolones - Ciprofloxacin	4	68	2										6	54	3	3	2									
Penicillins - Ampicillin	4	68	0												66	2										
Tetracyclines - Tetracycline	4	68	7											61			1		6							
Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin	32	68	43														6	1	18	38	5					
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	4	68	0											67	1											
Ionophores - Salinomycin	8	68	0											11	57											
Macrolides - Erythromycin	4	68	8										2	2	12	44	2	6								
Nitroimidazoles and Nitrofurans - Nitrofurantoin	256	68	0																6	37	24	1				
Oxazolidines - Linezolid	4	68	0										1		65	2										
Penicillins - Amoxicillin / Clavulanic acid	4	68	0												66	2										
Streptogramins - Quinupristin/Dalfopristin	1	68	60										4	4	6	54										

Table Antimicrobial susceptibility testing of E. faecium in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab - quantitative data [Dilution method]

E. faecium	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	68	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	128	2048
Aminoglycosides - Neomycin	8	128
Aminoglycosides - Streptomycin	128	2048
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	32
Fluoroquinolones - Ciprofloxacin	0.5	32
Penicillins - Ampicillin	2	128
Tetracyclines - Tetracycline	1	32
Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin	8	256
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	1	32
Ionophores - Salinomycin	1	32
Macrolides - Erythromycin	0.5	16
Nitroimidazoles and Nitrofurans - Nitrofurantoin	32	256
Oxazolidines - Linezolid	0.5	32
Penicillins - Amoxicillin / Clavulanic acid	2	64
Streptogramins - Quinupristin/Dalfopristin	0.5	32

Table Antimicrobial susceptibility testing of E. faecium in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab - quantitative data [Dilution method]

Table Antimicrobial susceptibility testing of E. faecalis in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab - quantitative data [Dilution method]

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

E. faecalis	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications																									
Isolates out of a monitoring program (yes/no)																										
Number of isolates available in the laboratory	108																									
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	512	108	15																		92	1			15	
Aminoglycosides - Neomycin	16	108	101														1	6	24	21	56					
Aminoglycosides - Streptomycin	512	108	52																		54	2		8	44	
Amphenicols - Chloramphenicol	32	108	30													32	42	2	2	30						
Amphenicols - Florfenicol	8	108	0												62	46										
Fluoroquinolones - Ciprofloxacin	4	108	0										33	68	7											
Penicillins - Ampicillin	4	108	0												107	1										
Tetracyclines - Tetracycline	4	108	84											24				1	83							
Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin	32	108	20														7	44	37	5		15				
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	4	108	1											47	37	23	1									
Ionophores - Salinomycin	8	108	0											106	2											
Macrolides - Erythromycin	4	108	46										19	28	11	4	1	45								
Nitroimidazoles and Nitrofurans - Nitrofurantoin	32	108	7																101	6	1					
Oxazolidines - Linezolid	4	108	0										1	36	71											
Penicillins - Amoxicillin / Clavulanic acid	4	108	0												107	1										

Table Antimicrobial susceptibility testing of E. faecalis in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab - quantitative data [Dilution method]

E. faecalis	Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Monitoring - EFSA specifications	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	108	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	128	2048
Aminoglycosides - Neomycin	8	128
Aminoglycosides - Streptomycin	128	2048
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	2	32
Fluoroquinolones - Ciprofloxacin	0.5	32
Penicillins - Ampicillin	2	128
Tetracyclines - Tetracycline	1	32
Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin	8	256
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	1	32
Ionophores - Salinomycin	1	32
Macrolides - Erythromycin	0.5	16
Nitroimidazoles and Nitrofurans - Nitrofurantoin	32	256
Oxazolidines - Linezolid	0.5	32
Penicillins - Amoxicillin / Clavulanic acid	2	64

Table Antimicrobial susceptibility testing of E. faecalis in Cattle (bovine animals) - calves (under 1 year) - Slaughterhouse - Domestic - Monitoring - EFSA specifications - Objective sampling - Official sampling - animal sample - rectum-anal swab - quantitative data [Dilution method]

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	NON-EFSA	512	
	Streptomycin	EFSA	512	
	Neomycin		16	
Amphenicols	Chloramphenicol	EFSA	32	
	Florfenicol		8	
Fluoroquinolones	Ciprofloxacin	EFSA	4	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin	EFSA	4	
	Bacitracin		32	
Macrolides	Erythromycin	EFSA	4	
Oxazolidines	Linezolid	EFSA	4	
Penicillins	Ampicillin	EFSA	4	
	Amoxicillin / Clavulanic acid		4	
Tetracyclines	Tetracycline	EFSA	4	

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

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Nitroimidazoles and Nitrofurans	Nitrofurantoin		32	
Ionophores	Salinomycin		8	

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	NON-EFSA		
	Streptomycin	NON-EFSA		
Amphenicols	Chloramphenicol	NON-EFSA		
Fluoroquinolones	Ciprofloxacin	NON-EFSA		
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin	NON-EFSA		
Macrolides	Erythromycin	NON-EFSA		
Oxazolidines	Linezolid	NON-EFSA		
Penicillins	Ampicillin	NON-EFSA		
Tetracyclines	Tetracycline	NON-EFSA		

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	NON-EFSA		
	Streptomycin	NON-EFSA		
Amphenicols	Chloramphenicol	NON-EFSA		
Fluoroquinolones	Ciprofloxacin	NON-EFSA		
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin	NON-EFSA		
Macrolides	Erythromycin	NON-EFSA		
Oxazolidines	Linezolid	NON-EFSA		
Penicillins	Ampicillin	NON-EFSA		
Tetracyclines	Tetracycline	NON-EFSA		

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	NON-EFSA	512	
	Streptomycin	EFSA	128	
	Neomycin		16	
Amphenicols	Chloramphenicol	EFSA	32	
	Florfenicol		8	
Fluoroquinolones	Ciprofloxacin	EFSA	4	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin	EFSA	4	
	Bacitracin		32	
Macrolides	Erythromycin	EFSA	4	
Oxazolidines	Linezolid	EFSA	4	
Penicillins	Ampicillin	EFSA	4	
	Amoxicillin / Clavulanic acid		4	
Streptogramins	Quinupristin/Dalfopristin	EFSA	1	

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

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Tetracyclines	Tetracycline	EFSA	4	
Nitroimidazoles and Nitrofurans	Nitrofurantoin		256	
Ionophores	Salinomycin		8	

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	NON-EFSA		
	Streptomycin	NON-EFSA		
Amphenicols	Chloramphenicol	NON-EFSA		
Fluoroquinolones	Ciprofloxacin	NON-EFSA		
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin	NON-EFSA		
Macrolides	Erythromycin	NON-EFSA		
Oxazolidines	Linezolid	NON-EFSA		
Penicillins	Ampicillin	NON-EFSA		
Streptogramins	Quinupristin/Dalfopristin	NON-EFSA		
Tetracyclines	Tetracycline	NON-EFSA		

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	NON-EFSA		
	Streptomycin	NON-EFSA		
Amphenicols	Chloramphenicol	NON-EFSA		
Fluoroquinolones	Ciprofloxacin	NON-EFSA		
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin	NON-EFSA		
Macrolides	Erythromycin	NON-EFSA		
Oxazolidines	Linezolid	NON-EFSA		
Penicillins	Ampicillin	NON-EFSA		
Streptogramins	Quinupristin/Dalfopristin	NON-EFSA		
Tetracyclines	Tetracycline	NON-EFSA		

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

4.3 STAPHYLOCOCCAL ENTEROTOXINS

4.3.1 General evaluation of the national situation

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, epidemological investigations and reporting of foodborne outbreaks

The Swiss Federal Office of Public Health (FOPH) coordinates the national surveillance of communicable diseases. Notifications of physicians and laboratories are made to cantonal (regional) health authorities and to the FOPH under the provisions of the public health legislation, namely the Ordinance on Disease Notification of 13th January 1999 (version January 1 2014).

Under this scheme, data provided for each notification depend on its supplier: (i) laboratories report diagnostic confirmations (subtype, method, material) while for selected diseases (ii) physicians additionally cover the subsidiaries of clinical diagnosis, exposition, development and measures. Besides the caseoriented reporting, physicians also have to report observations of unexpected clusters of any communicable disease. At the FOPH, the combined notifications of laboratories and physicians are analyzed and published in the weekly Bulletin.

The surveillance of food-borne infectious agents follows the mandatory system. The laboratories are required to report identifications of Salmonella causing gastroenteritis, Salmonella Typhi, Salmonella Paratyphi, Campylobacter spp., Shigella spp., verotoxin-positive Escherichia coli, Listeria monocytogenes, Clostridium botulinum and hepatitis A virus. A complementary notification by physicians is required for typhoid/paratyphoid fever, diseases associated with verotoxin-positive Escherichia coli, botulism and hepatitis A. Following a modification of the Ordinance on Disease Notification, laboratories are additionally required to report identifications of Trichinella spp. since January 1 2009.

Basically, the responsibility for outbreak investigations lies with the cantonal authorities. Relevant data of food-borne outbreaks are reported in a standardized format to the Federal Food Safety and Veterinary Office (FSVO) (formerly FOPH) as soon as the investigations are accomplished. On request, the FSVO and FOPH offer the cantons their expertise in epidemiology, infectious diseases, food microbiology, risk assessment and risk management. However, under the Federal Law on the Control of Transmissible Diseases of Man and the Federal Law on Food-Stuffs and Utility Articles, the central government, respectively the FSVO and FOPH, have the duty to supervise the enforcement of the concerned legislations. In cases of outbreaks which are not limited to the territory of one canton, the federal authorities have the competence to coordinate, and if necessary, to direct control actions and information activities of the cantons. In such a situation, the concerned federal offices can conduct their own epidemiological investigations in cooperation with national reference laboratories. In the field of food-borne diseases, the federal offices are supported by the National Centre for Enteropathogenic Bacteria and Listeria (NENT). This reference laboratory disposes of the facilities, techniques and agents required not only to confirm results from other laboratories but also for epidemiological typing (serotyping and molecular typing) of various bacterial pathogens.

Description of the types of outbreaks covered by the reporting:

The outbreaks were categorised according to the "Manual for reporting of food-borne outbreaks in accordance with Directive 2003/99/EC from the year 2011".

National evaluation of the reported outbreaks in the country:

Trends in numbers of outbreaks and numbers of human cases involved

The number of outbreaks is too low to calculate precise trends. However, it can be clearly stated that the number of outbreaks decreased continuously since the mid 1980 ies. One reason for that is certainly the successful eradication of S. Enteritidis in layer flocks where the prevalence became very low. The implementation of HACCP-systems in food businesses may also have had an influence.

Relevance of the different type of places of food production and preparation in outbreaks

Restaurants and similar settings for collective catering were the most frequent settings of outbreaks.

Evaluation of the severity and clinical picture of the human cases

The available clinical data are not very good since this aspect is not in the main focus of the competent authorities.

Control measures or other actions taken to improve the situation

In Switzerland, the number of outbreaks settled down on low level and it is therefore difficult to get a further decrease.

Table Foodborne Outbreaks: summarised data

	Weak evidence or no vehicle outbreaks					
	Number of outbreaks	Human cases	Hospitalized	Deaths	Strong evidence Number of Outbreaks	Total number of outbreaks
Salmonella - S. Typhimurium	0	unknown	unknown	unknown	0	0
Salmonella - S. Enteritidis	0	unknown	unknown	unknown	0	0
Salmonella - Other serovars	0	unknown	unknown	unknown	0	0
Campylobacter	0	unknown	unknown	unknown	1	1
Listeria - Listeria monocytogenes	0	unknown	unknown	unknown	0	0
Listeria - Other Listeria	0	unknown	unknown	unknown	0	0
Yersinia	1	5	0	0	0	1
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	0	unknown	unknown	unknown	0	0
Clostridium - Cl. botulinum	0	unknown	unknown	unknown	0	0
Clostridium - Cl. perfringens	0	unknown	unknown	unknown	0	0

	Weak evidence or no vehicle outbreaks					
	Number of outbreaks	Human cases	Hospitalized	Deaths	Strong evidence Number of Outbreaks	Total number of outbreaks
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	1	21	0	0	0	1
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	3	3
Other agents - Marine biotoxins	0	unknown	unknown	unknown	0	0
Other agents - Other Agents	0	unknown	unknown	unknown	0	0

	Weak evidence or no vehicle outbreaks					
	Number of outbreaks	Human cases	Hospitalized	Deaths	Strong evidence Number of Outbreaks	Total number of outbreaks
Unknown agent	2	27	1	0	0	2

Table Foodborne Outbreaks: detailed data for Campylobacter

Please use CTRL for multiple selection fields

C. jejuni

	Value
FBO Code	
Number of outbreaks	1
Number of human cases	12
Number of hospitalisations	0
Number of deaths	0
Food vehicle	Broiler meat (Gallus gallus) and products thereof
More food vehicle information	brochette de poulet
Nature of evidence	Descriptive epidemiological evidence
Outbreak type	General
Setting	Residential institution (nursing home or prison or boarding school)
Place of origin of problem	Residential institution (nursing home or prison or boarding school)
Origin of food vehicle	Unknown
Contributory factors	Unknown
Mixed Outbreaks (Other Agent)	
Additional information	

Table Foodborne Outbreaks: detailed data for Other agents

Please use CTRL for multiple selection fields

Histamine

	Value
FBO Code	
Number of outbreaks	2
Number of human cases	4
Number of hospitalisations	0
Number of deaths	0
Food vehicle	Fish and fish products
More food vehicle information	tuna salad
Nature of evidence	Descriptive epidemiological evidence
Outbreak type	General
Setting	Restaurant or Cafe or Pub or Bar or Hotel or Catering service
Place of origin of problem	Unknown
Origin of food vehicle	Unknown
Contributory factors	Unknown
Mixed Outbreaks (Other Agent)	
Additional information	

Histamine

	Value
FBO Code	
Number of outbreaks	1
Number of human cases	3
Number of hospitalisations	1
Number of deaths	0
Food vehicle	Fish and fish products
More food vehicle information	tuna steak
Nature of evidence	Descriptive epidemiological evidence
Outbreak type	General
Setting	Restaurant or Cafe or Pub or Bar or Hotel or Catering service
Place of origin of problem	Restaurant or Cafe or Pub or Bar or Hotel or Catering service
Origin of food vehicle	Unknown
Contributory factors	Storage time/temperature abuse
Mixed Outbreaks (Other Agent)	
Additional information	