ZOONOSES MONITORING

Republic of North Macedonia

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

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

IN 2023

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 Republic of North Macedonia during the year 2023.

The information covers the occurrence of these diseases and agents in animals, foodstuffs and in some cases also in feedingstuffs. In addition the report includes data on antimicrobial resistance in some zoonotic agents and indicator 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 Union 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 European Union 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 European Union Summary Reports on zoonoses and antimicrobial resistance that are published each year by EFSA.

The national report contains two parts: tables summarising data reported in the Data Collection Framework and the related text forms. The text forms were sent by email as pdf files and they are incorporated at the end of the report.

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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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ANIMAL POPULATION TABLES

Table Susceptible animal population

		Population			
Animal species	**Category of animals**	**holding**	**animal**	**slaughter animal (heads)**	**Beehives**
Alpacas	Alpacas - zoo animals		4		
Barbary sheep	Barbary sheep - zoo animal		10		
Bears	Bears - zoo animal		4		
Bee-colonies	Bee-colonies	6,918			306,415
Birds	Birds - zoo animal		424		
Bison	Bison - zoo animals		2		
Buffalos	Buffalos - zoo animal		1		
Camels	Camels - zoo animals		3		
Cattle (bovine animals)	Cattle (bovine animals)	12,616	128,467	4,461	
	Cattle (bovine animals) - adult cattle over 2 years		79,548	2,361	
	Cattle (bovine animals) - breeding bulls		6,920		
	Cattle (bovine animals) - calves (under or around 1 year)		28,246	180	
	Cattle (bovine animals) - dairy cows		72,628		
	Cattle (bovine animals) - young cattle (1-2 years)		20,673	1,920	
Crocodile	Crocodile - zoo animals		4		
Deer	Deer - zoo animals		18		
Dogs	Dogs - pet animals		122,602		
Eagle	Eagle - zoo animals		16		
Elephants	Elephants - zoo animals		2		
Emus	Emus - zoo animals		8		
Falcons	Falcons - zoo animals		2		
Felidae	Cats - pet animals		8,402		
	Jaguar - zoo animals		1		
	Leopards - zoo animals		1		
	Lion - zoo animals		10		
	Lynx - zoo animal		3		
	Tiger - zoo animals		2		
Fish	Fish - aquarium fish	95			
	Fish - farmed	219			
	Fish - farmed - carp	39			
	Fish - farmed - salmon	59			

Animal species	Category of animals	Population			
		holding	animal	slaughter animal (heads)	Beehives
Gallus gallus (fowl)	Gallus gallus (fowl)		25		
	Gallus gallus (fowl) - broilers			283,167	
	Gallus gallus (fowl) - laying hens - adult			643,234	
	Gallus gallus (fowl) - mixed flocks/holdings	727			
Geese	Geese		14		
Guinea fowl	Guinea fowl		5		
Guinea pigs	Guinea pigs		40		
Kangaroos	Kangaroos - zoo animal		8		
Leporidae	Rabbits		40		
	Rabbits - farmed	115		1,797	
Llamas	Llamas - zoo animal		18		
Marine mammals	Marine mammals - zoo animals		2		
Monkeys	Monkeys - zoo animal		101		
Mustelidae	Ferrets - pet animals		2		
Ostriches	Ostriches - zoo animals		2		
Other carnivores	Other carnivores - zoo animals		4		
Parrots	Parrots - zoo animals		125		
Peafowl	Peafowl - zoo animal		7		
Penguin	Penguin - zoo animals		12		
Pet animals, all	Pet animals, all		131,006		
Pheasants	Pheasants - zoo animals		19		
Pigeons	Pigeons		79		
Pigs	Pigs	5,875	122,218	197,278	
	Pigs - breeding animals - unspecified - sows and boars		12,987		
	Pigs - fattening pigs - unspecified		56,166		
	Pigs - mixed herds - unspecified			3,787	
	Pigs - mixed herds - unspecified - boars		563		
	Pigs - mixed herds - unspecified - gilts		2,605		
	Pigs - mixed herds - unspecified - piglets		50,460	193,491	
	Pigs - mixed herds - unspecified - sows		12,424		
Ratites (ostrich, emu, nandu)	Ratites (ostrich, emu, nandu) - zoo animals		10		
Reptiles	Reptiles - zoo animal		28		
Rodents	Rodents - zoo animal		50		
Sea lion	Sea lion - zoo animals		2		
Small ruminants	Goats	2,251	42,017	1,366	
	Goats - animals over 1 year		36,835	709	

Animal species	Category of animals	Population			
		holding	animal	slaughter animal (heads)	Beehives
Small ruminants	Goats - animals under 1 year		5,182	657	
	Sheep	2,783	473,271	200,601	
	Sheep - animals over 1 year		427,092	153,930	
	Sheep - animals under 1 year (lambs)		46,179	46,671	
	Sheep and goats	5,034	515,288	201,967	
Snakes	Snakes - zoo animal		8		
Solipeds, domestic	Solipeds, domestic	7,949	12,297		
	Solipeds, domestic - donkeys		2,543		
	Solipeds, domestic - horses		8,667		
	Solipeds, domestic - mule		677		
	Solipeds, domestic - ponies		16		
Squirrels	Squirrels - zoo animal		7		
Strigiformes	Owls - zoo animals		2		
Swans	Swans - zoo animals		2		
Turkeys	Turkeys		5		
Turtles	Turtles	104			
	Turtles - zoo animals		15		
Wild animals	Wild animals	297			
Wild ducks	Wild ducks - zoo animals		48		
Wolves	Wolves - zoo animal		12		
Zoo animals, all	Zoo animals, all		912		

DISEASE STATUS TABLES

TABLE NAME	REGION	Zoonotic Agent	DISEASE STATUS UNIT	Number of herds with status officially free	Number of infected herds	Total number of herds
Bovine brucellosis in countries and regions that do not receive Community co-financing for eradication programme	North Macedonia	Brucella		0	15	12,621
	Вардарски (Vardarski)	Brucella		0	1	723
	Источен (Istočen)	Brucella		0	0	1,320
	Југозападен (Jugozapaden)	Brucella		0	0	1,269
	Југоисточен (Jugoistočen)	Brucella		0	0	1,384
	Пелагониски (Pelagoniski)	Brucella		0	9	2,185
	Полошки (Pološki)	Brucella		0	3	2,107
	Североисточен (Severoistočen)	Brucella		0	1	2,259
	Скопски (Skopski)	Brucella		0	1	1,374

TABLE NAME	REGION	Zoonotic Agent	DISEASE STATUS UNIT	Number of herds with status officially free	Number of infected herds	Total number of herds
Ovine or Caprine brucellosis in countries and regions that do not receive Community co-financing for eradication programme	North Macedonia	Brucella		0	23	4,339
	Вардарски (Vardarski)	Brucella		0	1	461
	Источен (Istočen)	Brucella		0	1	818
	Југозападен (Jugozapaden)	Brucella		0	0	550
	Југоисточен (Jugoistočen)	Brucella		0	1	670
	Пелагониски (Pelagoniski)	Brucella		0	4	510
	Полошки (Pološki)	Brucella		0	14	423
	Североисточен (Severoistočen)	Brucella		0	1	585
	Скопски (Skopski)	Brucella		0	1	322

DISEASE STATUS TABLES

TABLE NAME	REGION	Zoonotic Agent	DISEASE STATUS UNIT	Number of herds with status officially free	Number of infected herds	Total number of herds
Bovine tuberculosis in countries and regions that do not receive Community co-financing for eradication programme	North Macedonia	Mycobacterium tuberculosis complex (MTC)		0	10	12,621
	Вардарски (Vardarski)	Mycobacterium tuberculosis complex (MTC)		0	1	723
	Источен (Istočen)	Mycobacterium tuberculosis complex (MTC)		0	0	1,320
	Југозападен (Jugozapaden)	Mycobacterium tuberculosis complex (MTC)		0	0	1,269
	Југоисточен (Jugoistočen)	Mycobacterium tuberculosis complex (MTC)		0	0	1,384
	Пелагониски (Pelagoniski)	Mycobacterium tuberculosis complex (MTC)		0	0	2,185
	Полошки (Pološki)	Mycobacterium tuberculosis complex (MTC)		0	5	2,107
	Североисточен (Severoistočen)	Mycobacterium tuberculosis complex (MTC)		0	2	2,259
	Скопски (Skopski)	Mycobacterium tuberculosis complex (MTC)		0	2	1,374

PREVALENCE TABLES

Table BRUCELLA:Brucella in animal

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling Details	Method	Sampling unit	total units tested	total units positive	Zoonoses	N units positive
Not Available	Cattle (bovine animals) - Farm - Republic of North Macedonia - animal sample - blood - Control and eradication programmes - Official sampling - Census	N_A	Complement fixation test (CFT)	animal	1743	172	Brucella, unspecified sp.	172
	Cattle (bovine animals) - Farm - Republic of North Macedonia - animal sample - blood - Control and eradication programmes - Official sampling - Census	N_A	Direct agglutination (DA)	animal	100657	250	Brucella, unspecified sp.	250
	Cattle (bovine animals) - Farm - Republic of North Macedonia - animal sample - foetus/stillbirth - Clinical investigations - Official sampling - Suspect sampling	N_A	Detection method of microorganisms	animal	7	0	Brucella	0
	Sheep and goats - Farm - Republic of North Macedonia - animal sample - blood - Control and eradication programmes - Official sampling - Census	N_A	Complement fixation test (CFT)	animal	11543	417	Brucella, unspecified sp.	417
	Sheep and goats - Farm - Republic of North Macedonia - animal sample - blood - Control and eradication programmes - Official sampling - Census	N_A	Direct agglutination (DA)	animal	489406	549	Brucella, unspecified sp.	549
	Sheep and goats - Slaughterhouse - Republic of North Macedonia - animal sample - organ/tissue - Control and eradication programmes - Official sampling - Selective sampling	N_A	Detection method of microorganisms	animal	23	0	Brucella	0

Table CAMPYLOBACTER:Campylobacter in food

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling unit	Sample weight	Sample weight unit	Sampling Details	Method	total units tested	total units positive	Zoonoses	N units positive
Not Available	Meat from bovine animals - fresh - frozen - Border Control Posts - Not Available - food sample - meat - Surveillance - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	Not Available	25	0	Campylobacter	0
	Meat from broilers (Gallus gallus) - fresh - chilled - Border Control Posts - Not Available - food sample - meat - Surveillance - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	Not Available	5	0	Campylobacter	0
	Meat from broilers (Gallus gallus) - fresh - frozen - Border Control Posts - Not Available - food sample - meat - Surveillance - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	Not Available	10	3	Campylobacter, unspecified sp.	3
	Meat from broilers (Gallus gallus) - fresh - frozen - Processing plant - Not Available - food sample - meat - Surveillance - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	Not Available	15	0	Campylobacter	0
	Meat from broilers (Gallus gallus) - mechanically separated meat (MSM) - soft-type - frozen - Border Control Posts - Not Available - food sample - meat - Surveillance - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	Not Available	25	3	Campylobacter, unspecified sp.	3
	Meat from pig - fresh - frozen - Border Control Posts - Not Available - food sample - meat - Surveillance - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	Not Available	5	0	Campylobacter	0

Table CHLAMYDIA/ CHLAMYDOPHILA:Chlamydia/ Chlamydophila in animal

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling Details	Method	Sampling unit	total units tested	total units positive	Zoonoses	N units positive
Not Available	Cattle (bovine animals) - Farm - Republic of North Macedonia - animal sample - blood - Monitoring - passive - Official sampling - Suspect sampling	N_A	Indirect ELISA (I-ELISA)	animal	56	13	Chlamydophila, unspecified sp.	13
	Sheep and goats - Farm - Republic of North Macedonia - animal sample - foetus/stillbirth - Monitoring - passive - Official sampling - Suspect sampling	N_A	Real-Time PCR (qualitative or quantitative)	animal	1	0	Chlamydophila, unspecified sp.	0

Table CLOSTRIDIUM:Clostridium in animal

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling Details	Method	Sampling unit	total units tested	total units positive	Zoonoses	N units positive
Not Available	Cattle (bovine animals) - Farm - Republic of North Macedonia - animal sample - organ/tissue - Clinical investigations - Official sampling - Suspect sampling	N_A	Detection method of microorganisms	animal	7	1	Clostridium spp., unspecified	1

Table CLOSTRIDIUM:Clostridium in food

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling unit	Sample weight	Sample weight unit	Sampling Details	Method	total units tested	total units positive	Zoonoses	N units positive
Not Available	Meat, mixed meat - meat products - ready-to-eat - Processing plant - Not Available - food sample - Surveillance - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	Not Available	20	0	Clostridium	0

Table COXIELLA: in animal

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling unit	Method	total units tested	total units positive	Number of Clinical Affected Herds	Zoonoses	N units positive
Not Available	Cattle (bovine animals) - Farm - Republic of North Macedonia - animal sample - blood - Monitoring - passive - Official sampling - Suspect sampling	animal	Indirect ELISA (I-ELISA)	162	6		Coxiella spp., unspecified	6
	Sheep and goats - Farm - Republic of North Macedonia - animal sample - foetus/stillbirth - Monitoring - passive - Official sampling - Suspect sampling	animal	Real-Time PCR (qualitative or quantitative)	4	0		Coxiella	0

Table ESCHERICHIA COLI:Escherichia coli in food

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling unit	Sample weight	Sample weight unit	Sampling Details	Method	total units tested	total units positive	Zoonoses	N units positive
Not Available	Cheeses made from cows' milk - hard - made from pasteurised milk - Processing plant - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	Not Available	20	0	Escherichia coli	0
	Cheeses made from cows' milk - soft and semi-soft - made from pasteurised milk - Processing plant - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	Not Available	55	0	Escherichia coli	0
	Cheeses made from sheep's milk - soft and semi-soft - made from pasteurised milk - Processing plant - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	Not Available	60	0	Escherichia coli	0
	Cheeses, made from mixed milk from cows, sheep and/or goats - soft and semi-soft - made from pasteurised milk - Processing plant - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	Not Available	20	0	Escherichia coli	0
	Meat from bovine animals - minced meat - intended to be eaten cooked - frozen - Processing plant - Not Available - food sample - meat - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	Not Available	5	0	Escherichia coli	0

Table LEISHMANIA:Leishmania in animal

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling Details	Method	Sampling unit	total units tested	total units positive	Zoonoses	N units positive
Not Available	Dogs - pet animals - Veterinary clinics - Republic of North Macedonia - animal sample - blood - Clinical investigations - Private sampling - Suspect sampling	N_A	Indirect Immunofluorescent Antibody test (IFAT)	animal	71	8	Leishmania	8
	Dogs - stray dogs - Natural habitat - Republic of North Macedonia - animal sample - blood - Monitoring - active - Official sampling - Selective sampling	N_A	Indirect Immunofluorescent Antibody test (IFAT)	animal	3901	185	Leishmania	185

Table LISTERIA:Listeria in animal

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling Details	Method	Sampling unit	total units tested	total units positive	Zoonoses	N units positive
Not Available	Sheep - Farm - Republic of North Macedonia - animal sample - organ/tissue - Clinical investigations - Official sampling - Suspect sampling	N_A	Detection method of microorganisms	animal	1	0	Listeria monocytogenes	0

Table LISTERIA:Listeria in food

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling unit	Sample weight	Sample weight unit	Sampling Details	total units tested	total units positive	Method	Zoonoses	N units tested	N units positive
Not Available	Cheeses made from cows' milk - hard - made from pasteurised milk - Processing plant - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	15	0	detection	Listeria monocytogenes	15	0
	Cheeses made from cows' milk - soft and semi-soft - made from pasteurised milk - Border Control Posts - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	5	0	detection	Listeria monocytogenes	5	0
	Cheeses made from cows' milk - soft and semi-soft - made from pasteurised milk - Processing plant - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	70	0	detection	Listeria monocytogenes	70	0
	Cheeses made from sheep's milk - soft and semi-soft - made from pasteurised milk - Processing plant - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	15	0	detection	Listeria monocytogenes	15	0
	Cheeses, made from mixed milk from cows, sheep and/or goats - soft and semi-soft - made from pasteurised milk - Processing plant - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	25	0	detection	Listeria monocytogenes	25	0
	Eggs - table eggs - Processing plant - Not Available - food sample - Surveillance - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	132	0	detection	Listeria monocytogenes	132	0
	Fishery products, unspecified - raw - frozen - Border Control Posts - Not Available - food sample - Surveillance - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	15	0	detection	Listeria monocytogenes	15	0
	Meat from pig - meat products - raw and intended to be eaten raw - chilled - Border Control Posts - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	10	0	detection	Listeria monocytogenes	10	0
	Meat from pig - meat products - raw and intended to be eaten raw - chilled - Primary production - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	73	2	detection	Listeria monocytogenes	73	2
	Meat, mixed meat - meat products - fermented sausages - Border Control Posts - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	5	0	detection	Listeria monocytogenes	5	0

Table LYSSAVIRUS:Lyssavirus in animal

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling Details	Method	Sampling unit	total units tested	total units positive	Zoonoses	N units positive
Not Available	Dogs - Veterinary activities - Republic of North Macedonia - animal sample - brain - Monitoring - passive - Official sampling - Suspect sampling	N_A	Immunofluorescence method	animal	3	0	Lyssavirus	0
	Foxes - wild - Hunting - Republic of North Macedonia - animal sample - brain - Monitoring - active - Official sampling - Census	N_A	Immunofluorescence method	animal	70	0	Lyssavirus	0
	Wild animals - Natural habitat - Republic of North Macedonia - animal sample - brain - Monitoring - passive - Official sampling - Suspect sampling	N_A	Immunofluorescence method	animal	8	0	Lyssavirus	0
	Wolves - wild - Hunting - Republic of North Macedonia - animal sample - brain - Monitoring - active - Official sampling - Census	N_A	Immunofluorescence method	animal	8	0	Lyssavirus	0

Table SALMONELLA:Salmonella in animal

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling unit	Number of Flocks Under Control Programme	Target Verification	Sampling Details	Method	total units tested	total units positive	Zoonoses	Units positive
Not Available	Sheep - Farm - Republic of North Macedonia - animal sample - organ/tissue - Monitoring - active - Official sampling - Selective sampling	animal		N_A	N_A	Detection method of microorganisms	389	2	Salmonella Gallinarum	2
	Sheep - Farm - Republic of North Macedonia - animal sample - organ/tissue - Monitoring - passive - Official sampling - Selective sampling	animal		N_A	N_A	Detection method of microorganisms	9	5	Salmonella enterica subsp. enterica rough	5

Table SALMONELLA:Salmonella in food

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling unit	Sample weight	Sample weight unit	Sampling Details	Method	total units tested	total units positive	Zoonoses	N units positive
Not Available	Cheeses made from cows' milk - hard - made from pasteurised milk - Processing plant - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 6579-1:2017 Salmonella	5	0	Salmonella	0
	Cheeses made from cows' milk - soft and semi-soft - made from pasteurised milk - Border Control Posts - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 6579-1:2017 Salmonella	10	0	Salmonella	0
	Cheeses made from sheep's milk - soft and semi-soft - made from pasteurised milk - Processing plant - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 6579-1:2017 Salmonella	10	0	Salmonella	0
	Dairy products (excluding cheeses) - milk powder and whey powder - Border Control Posts - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 6579-1:2017 Salmonella	5	0	Salmonella	0
	Egg products - dried - Border Control Posts - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 6579-1:2017 Salmonella	10	0	Salmonella	0
	Eggs - table eggs - Processing plant - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 6579-1:2017 Salmonella	30	0	Salmonella	0
	Fish - raw - frozen - Border Control Posts - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 6579-1:2017 Salmonella	5	0	Salmonella	0
	Meat from broilers (Gallus gallus) - carcase - chilled - Border Control Posts - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 6579-1:2017 Salmonella	10	0	Salmonella	0
	Meat from broilers (Gallus gallus) - fresh - Border Control Posts - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 6579-1:2017 Salmonella	5	0	Salmonella	0
	Meat from broilers (Gallus gallus) - fresh - Processing plant - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 6579-1:2017 Salmonella	10	0	Salmonella	0
	Meat from broilers (Gallus gallus) - meat preparation - intended to be eaten cooked - frozen - Border Control Posts - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 6579-1:2017 Salmonella	49	7	Salmonella spp., unspecified	7
	Meat from broilers (Gallus gallus) - meat preparation - intended to be eaten cooked - frozen - Processing plant - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 6579-1:2017 Salmonella	40	0	Salmonella	0
	Meat from broilers (Gallus gallus) - mechanically separated meat (MSM) - Border Control Posts - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	10	Gram	N_A	ISO 6579-1:2017 Salmonella	25	4	Salmonella spp., unspecified	4
	Meat from pig - fresh - frozen - Border Control Posts - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 6579-1:2017 Salmonella	5	0	Salmonella	0
	Meat from pig - meat preparation - intended to be eaten cooked - chilled - Processing plant - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	10	Gram	N_A	ISO 6579-1:2017 Salmonella	15	0	Salmonella	0
	Other processed food products and prepared dishes - ices and similar frozen desserts - water-based ice creams - Border Control Posts - Not Available - food sample - Surveillance - based on Regulation 2073 - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 6579-1:2017 Salmonella	15	0	Salmonella	0

Table SALMONELLA:Salmonella in feed

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling unit	Sample weight	Sample weight unit	Sampling Details	Method	total units tested	total units positive	Zoonoses	N units positive
Not Available	Compound feedingstuffs for cattle - final product - Border Control Posts - Not Available - feed sample - Surveillance - Official sampling - Objective sampling	batch (food/feed)	50	Gram	N_A	Not Available	3	0	Salmonella	0
	Compound feedingstuffs for cattle - final product - Processing plant - Not Available - feed sample - Surveillance - Official sampling - Objective sampling	batch (food/feed)	50	Gram	N_A	Not Available	12	0	Salmonella	0
	Compound feedingstuffs for pigs - final product - Processing plant - Not Available - feed sample - Surveillance - Official sampling - Objective sampling	batch (food/feed)	50	Gram	N_A	Not Available	15	0	Salmonella	0
	Compound feedingstuffs for poultry, laying hens - final product - Processing plant - Not Available - feed sample - Surveillance - Official sampling - Objective sampling	batch (food/feed)	50	Gram	N_A	Not Available	9	0	Salmonella	0
	Feed material of marine animal origin - fish meal - Border Control Posts - Not Available - feed sample - Surveillance - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	Not Available	5	0	Salmonella	0

Table TOXOPLASMA:Toxoplasma in animal

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling Details	Method	Sampling unit	total units tested	total units positive	Zoonoses	N units positive
Not Available	Zoo animals, all - Zoo - Republic of North Macedonia - animal sample - organ/tissue - Monitoring - passive - Official sampling - Suspect sampling	N_A	PCR	animal	5	1	Toxoplasma gondii	1

Table TRICHINELLA:Trichinella in animal

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling Details	Method	Sampling unit	total units tested	total units positive	Zoonoses	N units positive
Not Available	Wild boars - wild - Hunting - Republic of North Macedonia - animal sample - organ/tissue - Surveillance - Official sampling - Census	N_A	Magnetic stirrer method for pooled sample digestion	animal	4850	17	Trichinella, unspecified sp.	17

Table YERSINIA:Yersinia in food

Area of sampling	Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy	Sampling unit	Sample weight	Sample weight unit	Sampling Details	Method	total units tested	total units positive	Zoonoses	N units positive
Not Available	Meat from bovine animals - fresh - frozen - Processing plant - Not Available - food sample - Surveillance - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 10273:2017 Yersinia enterocolitica	25	0	Yersinia	0
	Meat from broilers (Gallus gallus) - fresh - frozen - Border Control Posts - Not Available - food sample - Surveillance - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 10273:2017 Yersinia enterocolitica	15	0	Yersinia	0
	Meat from broilers (Gallus gallus) - meat products - raw but intended to be eaten cooked - chilled - Border Control Posts - Not Available - food sample - Surveillance - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 10273:2017 Yersinia enterocolitica	5	0	Yersinia	0
	Meat from broilers (Gallus gallus) - mechanically separated meat (MSM) - soft-type - frozen - Border Control Posts - Not Available - food sample - Surveillance - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 10273:2017 Yersinia enterocolitica	25	0	Yersinia	0
	Meat from pig - fresh - frozen - Border Control Posts - Not Available - food sample - Surveillance - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 10273:2017 Yersinia enterocolitica	5	0	Yersinia	0
	Meat, mixed meat - minced meat - intended to be eaten cooked - chilled - Processing plant - Not Available - food sample - Surveillance - Official sampling - Objective sampling	batch (food/feed)	25	Gram	N_A	ISO 10273:2017 Yersinia enterocolitica	35	0	Yersinia	0

FOODBORNE OUTBREAKS TABLES

Foodborne Outbreaks: summarized data

when numbers referring to cases, hospitalized people and deaths are reported as unknown, they will be not included in the sum calculation

		Outbreak strenght	Strong				Weak			
Causative agent	Food vehicle		N outbreaks	N human cases	N hospitalized	N deaths	N outbreaks	N human cases	N hospitalized	N deaths
Salmonella Enteritidis	Unknown						1	15	3	0
	Other processed food products and prepared dishes - pasta		1	8	7	0				
Salmonella spp., unspecified	Dairy products (excluding cheeses) - ice-cream		1	3	1	0				
Staphylococcus aureus	Unknown						1	6	0	0
	Sauce and dressings - mayonnaise		1	9	5	0				
Unknown	Unknown						3	18	0	0
	Other processed food products and prepared dishes - pasta - simple pasta						1	10	0	0

Strong Foodborne Outbreaks: detailed data

Causative agent	H	AG	VT	Other Causative Agent	FBO nat. code	Outbreak type	Food vehicle	More food vehicle info	Nature of evidence	Setting	Place of origin of problem	Origin of food vehicle	Contributory factors	Comment	N outbreaks	N human cases	N hosp.	N deaths
Salmonella Enteritidis	Not Available	Not Available	Not Available	Staphylococcus aureus	FBO06	General	Other processed food products and prepared dishes - pasta	N_A	Detection of causative agent in food vehicle or its component - Detection of indistinguishable causative agent in humans;Detection of causative agent in food vehicle or its component - Symptoms and onset of illness pathognomonic to causative agent	Canteen or workplace catering	Restaurant or Cafe or Pub or Bar or Hotel or Catering service	Not Available	Not Available	staphylococcus aureus was found in one food handler	1	8	7	0
Salmonella spp., unspecified	Not Available	Not Available	Not Available	Escherichia coli	FBO02	General	Dairy products (excluding cheeses) - ice-cream	deep fried ice cream with flour, eggs and bread crumbs	Descriptive environmental evidence;Detection of causative agent in food vehicle or its component - Detection of indistinguishable causative agent in humans;Detection of causative agent in food vehicle or its component - Symptoms and onset of illness pathognomonic to causative agent;Descriptive epidemiological evidence	Restaurant or Cafe or Pub or Bar or Hotel or Catering service	Not Available	Republic of North Macedonia	Unknown	escherichia coli was found in refrigerator	1	3	1	0

Causative agent	H	AG	VT	Other Causative Agent	FBO nat. code	Outbreak type	Food vehicle	More food vehicle info	Nature of evidence	Setting	Place of origin of problem	Origin of food vehicle	Contributory factors	Comment	N outbreaks	N human cases	N hosp.	N deaths
Staphylococcus aureus	Not Available	Not Available	Not Available	Not Available	FBO04	General	Sauce and dressings - mayonnaise	N_A	Descriptive environmental evidence;Detection of causative agent in food vehicle or its component - Symptoms and onset of illness pathognomonic to causative agent;Descriptive epidemiological evidence	Restaurant or Cafe or Pub or Bar or Hotel or Catering service	Not Available	Not Available	Infected food handler	N_A	1	9	5	0

Weak Foodborne Outbreaks: detailed data

Causative agent	H	AG	VT	Other Causative Agent	FBO nat. code	Outbreak type	Food vehicle	More food vehicle info	Nature of evidence	Setting	Place of origin of problem	Origin of food vehicle	Contributory factors	Comment	N outbreaks	N human cases	N hosp.	N deaths
Salmonella Enteritidis	Not Available	Not Available	Not Available	Staphylococcus aureus	FBO11	General	Unknown	N_A	Descriptive epidemiological evidence	School or kindergarten	Restaurant or Cafe or Pub or Bar or Hotel or Catering service	Not Available	Not Available	children from 6 schools tested positive for Salmonella enteritidis. The raw foods are delivered from a catering service and then prepared in schools, though no food samples tested positive for pathogens	1	15	3	0
Staphylococcus aureus	Not Available	Not Available	Not Available	Not Available	FBO07	General	Unknown	N_A	Descriptive environmental evidence; Descriptive epidemiological evidence	Restaurant or Cafe or Pub or Bar or Hotel or Catering service	Not Available	Not Available	Not Available	staphylococcus aureus was found in three food handlers	1	6	0	0
Unknown	Not Available	Not Available	Not Available	Not Available	FBO08	General	Unknown	N_A	Descriptive epidemiological evidence	Domestic premises	Not Available	Not Available	Not Available	5 cases with gastrointestinal symptoms after 4-5 hours of food consumption in a funeral; no samples were taken	1	5	0	0
					FBO09	General	Other processed food products and prepared dishes - pasta - simple pasta	N_A	Descriptive environmental evidence; Descriptive epidemiological evidence	Canteen or workplace catering	Restaurant or Cafe or Pub or Bar or Hotel or Catering service	Not Available	Not Available	cases with diarrhea, vomiting and abdominal cramps from two different factories that consume food provided by the same catering agency. No human samples were taken. Food samples tested negative for pathogens	1	10	0	0

Causative agent	H	AG	VT	Other Causative Agent	FBO nat. code	Outbreak type	Food vehicle	More food vehicle info	Nature of evidence	Setting	Place of origin of problem	Origin of food vehicle	Contributory factors	Comment	N outbreaks	N human cases	N hosp.	N deaths
Unknown	Not Available	Not Available	Not Available	Not in list	FBO05	General	Unknown	N_A	Descriptive environmental evidence; Descriptive epidemiological evidence	Camp or picnic	Not Available	Not Available	Not Available	children with abdominal cramps and vomiting wit no given samples for testing. Enterobacter cloacae detected in kitchen utensils	1	5	0	0
				Not in list;Adenoviridae	FBO03	General	Unknown	N_A	Descriptive epidemiological evidence	School or kindergarten	Not Available	Not Available	Not Available	8 children diagnosed with alimentary intoxication, with negative tested samples. Enterobacter found in samples from kitchen utensils	1	8	0	0

ANTIMICROBIAL RESISTANCE TABLES FOR SALMONELLA

Table Antimicrobial susceptibility testing of Salmonella enterica, subspecies enterica in Gallus gallus (fowl) - laying hens

Sampling Stage: Farm

Sampling Type: animal sample - faeces

Sampling Context: Control and eradication programmes

Sampler: Official sampling

Sampling Strategy: Census

Programme Code: AMR MON

Analytical Method: Micromethod dilution (in microtiter plate)

Country Of Origin:Republic of North Macedonia

Sampling Details:

ESBL Genes	AMPC Genes	CARBA Genes	MIC	AM substance	Amikacin	Ampicillin	Azithromycin	Cefotaxim	Ceftazidim	Chloramphenicol	Ciprofloxacin	Colistin
				ECOFF	4	8	16	0.5	2	16	0.064	2
				Lowest limit	4	1	2	0.25	0.25	8	0.015	1
				Highest limit	128	32	64	4	8	64	8	16
				N of tested isolates	2	2	2	2	2	2	2	2
				N of resistant isolates	0	0	0	0	0	0	0	0
Not Available	Not Available	Not Available	0.03								1	
			0.064								1	
			<=0.25					2	2			
			<=1			1						2
			<=4		2							
			<=8							2		
			8			1	2					

ESBL Genes	AMPC Genes	CARBA Genes	AM substance	Gentamicin	Meropenem	Nalidixic acid	Sulfamethoxazole	Tetracycline	Tigecycline	Trimethoprim
			ECOFF	**2**	**0.125**	**8**	**256**	**8**	**0.5**	**2**
			Lowest limit	**0.5**	**0.03**	**4**	**8**	**2**	**0.25**	**0.25**
			Highest limit	**16**	**16**	**64**	**512**	**32**	**8**	**16**
			N of tested isolates	**2**	**2**	**2**	**2**	**2**	**2**	**2**
			MIC / **N of resistant isolates**	**0**	**0**	**0**	**1**	**1**	**0**	**0**
Not Available	Not Available	Not Available	<=0.03		2					
			<=0.25						2	1
			0.5							1
			1	1						
			<=2					1		
			2	1						
			<=4			2				
			>32					1		
			128				1			
			>512				1			

ANTIMICROBIAL RESISTANCE TABLES FOR ESCHERICHIA COLI

Table Antimicrobial susceptibility testing of Escherichia coli, non-pathogenic, unspecified in Cattle (bovine animals) - calves (under 1 year)

Sampling Stage: Slaughterhouse

Sampling Type: animal sample - caecum

Sampling Context: Monitoring

Sampler: Official sampling

Sampling Strategy: Objective sampling

Programme Code: AMR MON

Analytical Method: Micromethod dilution (in microtiter plate)

Country Of Origin:Republic of North Macedonia

Sampling Details:

ESBL Genes	AMPC Genes	CARBA Genes	MIC	AM substance	Amikacin	Ampicillin	Azithromycin	Cefotaxim	Ceftazidim	Chloramphenicol	Ciprofloxacin	Colistin
				ECOFF	**8**	**8**	**16**	**0.25**	**0.5**	**16**	**0.064**	**2**
				Lowest limit	**4**	**1**	**2**	**0.25**	**0.25**	**8**	**0.015**	**1**
				Highest limit	**128**	**32**	**64**	**4**	**8**	**64**	**8**	**16**
				N of tested isolates	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**
				N of resistant isolates	**0**	**6**	**0**	**0**	**0**	**1**	**0**	**0**
Not Available	Not Available	Not Available	<=0.015								12	
			0.03								8	
			<=0.25					20	20			
			<=1			2						20
			2			8						
			<=4		19							
			4			2						
			<=8							19		
			8		1	2	8					
			16			3	12					
			32			1						
			>32			2						
			>64							1		

ESBL Genes	AMPC Genes	CARBA Genes		AM substance	Gentamicin	Meropenem	Nalidixic acid	Sulfamethoxazole	Tetracycline	Tigecycline	Trimethoprim
				ECOFF	**2**	**0.125**	**8**	**64**	**8**	**0.5**	**2**
				Lowest limit	**0.5**	**0.03**	**4**	**8**	**2**	**0.25**	**0.25**
				Highest limit	**16**	**16**	**64**	**512**	**32**	**8**	**16**
				N of tested isolates	**20**	**20**	**20**	**20**	**20**	**20**	**20**
Not Available	Not Available	Not Available	**MIC**	**N of resistant isolates**	**0**	**0**	**3**	**9**	**8**	**0**	**0**
				<=0.03		20					
				<=0.25						19	13
				<=0.5	2						
				0.5						1	6
				1	12						1
				<=2					10		
				2	6						
				<=4			17				
				8					2		
				16			3	3	1		
				32				7	4		
				>32					3		
				64				1			
				128				1			
				256				1			
				512				3			
				>512				4			

Table Antimicrobial susceptibility testing of Escherichia coli, non-pathogenic, unspecified in Pigs - fattening pigs

Sampling Stage: Slaughterhouse

Sampling Type: animal sample - caecum

Sampling Context: Monitoring

Sampler: Official sampling

Sampling Strategy: Objective sampling

Programme Code: AMR MON

Analytical Method: Micromethod dilution (in microtiter plate)

Country Of Origin:Republic of North Macedonia

Sampling Details:

ESBL Genes	AMPC Genes	CARBA Genes	MIC	AM substance	Amikacin	Ampicillin	Azithromycin	Cefotaxim	Ceftazidim	Chloramphenicol	Ciprofloxacin	Colistin
				ECOFF	**8**	**8**	**16**	**0.25**	**0.5**	**16**	**0.064**	**2**
				Lowest limit	**4**	**1**	**2**	**0.25**	**0.25**	**8**	**0.015**	**1**
				Highest limit	**128**	**32**	**64**	**4**	**8**	**64**	**8**	**16**
				N of tested isolates	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**
				N of resistant isolates	**0**	**10**	**1**	**0**	**0**	**5**	**2**	**0**
Not Available	Not Available	Not Available	<=0.015								17	
			0.03								6	
			0.064								1	
			0.125								1	
			<=0.25					26	26			
			<=1									26
			2			5						
			<=4		25							
			4			9						
			<=8							20		
			8		1	2	4					
			>8								1	
			16			1	21			1		
			32			4	1			2		
			>32			5						
			>64							3		

ESBL Genes	AMPC Genes	CARBA Genes		AM substance	Gentamicin	Meropenem	Nalidixic acid	Sulfamethoxazole	Tetracycline	Tigecycline	Trimethoprim
				ECOFF	**2**	**0.125**	**8**	**64**	**8**	**0.5**	**2**
				Lowest limit	**0.5**	**0.03**	**4**	**8**	**2**	**0.25**	**0.25**
				Highest limit	**16**	**16**	**64**	**512**	**32**	**8**	**16**
				N of tested isolates	**26**	**26**	**26**	**26**	**26**	**26**	**26**
			MIC	**N of resistant isolates**	**0**	**0**	**0**	**11**	**11**	**0**	**3**
Not Available	Not Available	Not Available		<=0.03		26					
				<=0.25						25	20
				<=0.5	4						
				0.5						1	3
				1	7						
				<=2					4		
				2	15						
				<=4			19				
				4					2		
				8			7		9		
				16				1			1
				>16							2
				32				1	3		
				>32					8		
				64				13			
				128				2			
				256				1			
				>512				8			

Table Antimicrobial susceptibility testing of Escherichia coli, non-pathogenic, unspecified in Gallus gallus (fowl) - broilers - before slaughter

Sampling Stage: Slaughterhouse

Sampling Type: animal sample - caecum

Sampling Context: Monitoring

Sampler: Official sampling

Sampling Strategy: Objective sampling

Programme Code: AMR MON

Analytical Method: Micromethod dilution (in microtiter plate)

Country Of Origin:Republic of North Macedonia

Sampling Details:

ESBL Genes	AMPC Genes	CARBA Genes	MIC	AM substance	Amikacin	Ampicillin	Azithromycin	Cefotaxim	Ceftazidim	Chloramphenicol	Ciprofloxacin	Colistin
				ECOFF	**8**	**8**	**16**	**0.25**	**0.5**	**16**	**0.064**	**2**
				Lowest limit	**4**	**1**	**2**	**0.25**	**0.25**	**8**	**0.015**	**1**
				Highest limit	**128**	**32**	**64**	**4**	**8**	**64**	**8**	**16**
				N of tested isolates	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**
				N of resistant isolates	**0**	**3**	**1**	**0**	**0**	**0**	**1**	**0**
Not Available	Not Available	Not Available	<=0.015								3	
			0.125								1	
			<=0.25					4	4			
			<=1			1						4
			<=4	4								
			<=8							3		
			8				3					
			16			1				1		
			32				1					
			>32			2						

ESBL Genes	AMPC Genes	CARBA Genes	MIC	AM substance	Gentamicin	Meropenem	Nalidixic acid	Sulfamethoxazole	Tetracycline	Tigecycline	Trimethoprim
				ECOFF	**2**	**0.125**	**8**	**64**	**8**	**0.5**	**2**
				Lowest limit	**0.5**	**0.03**	**4**	**8**	**2**	**0.25**	**0.25**
				Highest limit	**16**	**16**	**64**	**512**	**32**	**8**	**16**
				N of tested isolates	**4**	**4**	**4**	**4**	**4**	**4**	**4**
			MIC	**N of resistant isolates**	**0**	**0**	**0**	**2**	**1**	**0**	**0**
Not Available	Not Available	Not Available		<=0.03		4					
				<=0.25						3	3
				0.5						1	
				1	1						
				<=2					1		
				2	3						1
				<=4			4				
				4					2		
				32				1			
				>32					1		
				64				1			
				512				2			

OTHER ANTIMICROBIAL RESISTANCE TABLES

Table Antimicrobial susceptibility testing of Enterococcus, non-pathogenic - E. faecalis in Cattle (bovine animals) - calves (under 1 year)

Sampling Stage: Slaughterhouse

Sampling Type: animal sample - caecum

Sampling Context: Monitoring

Sampler: Official sampling

Sampling Strategy: Objective sampling

Programme Code: AMR MON

Analytical Method: Micromethod dilution (in microtiter plate)

Country Of Origin:Republic of North Macedonia

Sampling Details:

	AM substance	Ampicillin	Chloramphenicol	Ciprofloxacin	Daptomycin	Erythromycin	Gentamicin	Linezolid	Quinupristin/Dalfopristin	Teicoplanin	Tetracycline	Tigecycline	Vancomycin
	ECOFF	**4**	**32**	**4**	**4**	**4**	**64**	**4**	**1**	**2**	**4**	**0.25**	**4**
	Lowest limit	**0.5**	**4**	**0.125**	**0.25**	**1**	**8**	**0.5**	**0.5**	**0.5**	**1**	**0.03**	**1**
	Highest limit	**64**	**128**	**16**	**32**	**128**	**1024**	**64**	**64**	**64**	**128**	**4**	**128**
	N of tested isolates	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**
MIC	**N of resistant isolates**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**2**	**0**	**0**
0.064												2	
<=0.125				1									
0.125												1	
<=0.25					2								
0.25												1	
<=0.5		3								4			
0.5				1									
<=1						4					2		1
1		1		1	1			3	1				
2				1	1			1					3
<=4			2										
4									1				
<=8							1						

	AM substance	Ampicillin	Chloramphenicol	Ciprofloxacin	Daptomycin	Erythromycin	Gentamicin	Linezolid	Quinupristin/Dalfopristin	Teicoplanin	Tetracycline	Tigecycline	Vancomycin
	ECOFF	**4**	**32**	**4**	**4**	**4**	**64**	**4**	**1**	**2**	**4**	**0.25**	**4**
	Lowest limit	**0.5**	**4**	**0.125**	**0.25**	**1**	**8**	**0.5**	**0.5**	**0.5**	**1**	**0.03**	**1**
	Highest limit	**64**	**128**	**16**	**32**	**128**	**1024**	**64**	**64**	**64**	**128**	**4**	**128**
	N of tested isolates	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**
MIC	**N of resistant isolates**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**2**	**0**	**0**
8			2						1				
16							2		1				
32							1						
64											2		

Table Antimicrobial susceptibility testing of Enterococcus, non-pathogenic - E. faecalis in Pigs - fattening pigs

Sampling Stage: Slaughterhouse

Sampling Type: animal sample - caecum

Sampling Context: Monitoring

Sampler: Official sampling

Sampling Strategy: Objective sampling

Programme Code: AMR MON

Analytical Method: Micromethod dilution (in microtiter plate)

Country Of Origin:Republic of North Macedonia

Sampling Details:

	AM substance	Ampicillin	Chloramphenicol	Ciprofloxacin	Daptomycin	Erythromycin	Gentamicin	Linezolid	Quinupristin/Dalfopristin	Teicoplanin	Tetracycline	Tigecycline	Vancomycin
	ECOFF	**4**	**32**	**4**	**4**	**4**	**64**	**4**	**1**	**2**	**4**	**0.25**	**4**
	Lowest limit	**0.5**	**4**	**0.125**	**0.25**	**1**	**8**	**0.5**	**0.5**	**0.5**	**1**	**0.03**	**1**
	Highest limit	**64**	**128**	**16**	**32**	**128**	**1024**	**64**	**64**	**64**	**128**	**4**	**128**
	N of tested isolates	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**
MIC	**N of resistant isolates**	**0**	**0**	**1**	**1**	**1**	**0**	**0**	**2**	**0**	**3**	**0**	**0**
0.064												2	
<=0.125				1									
0.125												1	
<=0.25					3								
0.25												1	
<=0.5		2						1	1	4			
<=1						3							3
1		1							1				
2		1		2				3	1		1		1
<=4			2										
<=8							1						
8			2	1	1	1			1				
16							3				2		
128											1		

Table Antimicrobial susceptibility testing of Enterococcus, non-pathogenic - E. faecium in Cattle (bovine animals) - calves (under 1 year)

Sampling Stage: Slaughterhouse

Sampling Type: animal sample - caecum

Sampling Context: Monitoring

Sampler: Official sampling

Sampling Strategy: Objective sampling

Programme Code: AMR MON

Analytical Method: Micromethod dilution (in microtiter plate)

Country Of Origin:Republic of North Macedonia

Sampling Details:

	AM substance	Ampicillin	Chloramphenicol	Ciprofloxacin	Daptomycin	Erythromycin	Gentamicin	Linezolid	Quinupristin/Dalfopristin	Teicoplanin	Tetracycline	Tigecycline	Vancomycin
	ECOFF	**4**	**32**	**4**	**8**	**4**	**32**	**4**	**1**	**2**	**4**	**0.25**	**4**
	Lowest limit	**0.5**	**4**	**0.125**	**0.25**	**1**	**8**	**0.5**	**0.5**	**0.5**	**1**	**0.03**	**1**
	Highest limit	**64**	**128**	**16**	**32**	**128**	**1024**	**64**	**64**	**64**	**128**	**4**	**128**
	N of tested isolates	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**
MIC	**N of resistant isolates**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**6**	**0**	**3**	**0**	**2**
<=0.03												2	
0.064												4	
0.125												4	
<=0.25					3								
0.25				1								1	
<=0.5		6						1	2	10			
0.5				2	3								
<=1						9					7		7
1		3		3	1			2	3	1			
2		2		3	3	1		8	5		1		2
<=4			8										
4				1	1	1							
<=8							7						
8			3	1					1				2
16							2				1		
32							2						

	AM substance	Ampicillin	Chloramphenicol	Ciprofloxacin	Daptomycin	Erythromycin	Gentamicin	Linezolid	Quinupristin/Dalfopristin	Teicoplanin	Tetracycline	Tigecycline	Vancomycin
	ECOFF	**4**	**32**	**4**	**8**	**4**	**32**	**4**	**1**	**2**	**4**	**0.25**	**4**
	Lowest limit	**0.5**	**4**	**0.125**	**0.25**	**1**	**8**	**0.5**	**0.5**	**0.5**	**1**	**0.03**	**1**
	Highest limit	**64**	**128**	**16**	**32**	**128**	**1024**	**64**	**64**	**64**	**128**	**4**	**128**
	N of tested isolates	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**
MIC	**N of resistant isolates**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**6**	**0**	**3**	**0**	**2**
64											2		

Table Antimicrobial susceptibility testing of Enterococcus, non-pathogenic - E. faecium in Pigs - fattening pigs

Sampling Stage: Slaughterhouse

Sampling Type: animal sample - caecum

Sampling Context: Monitoring

Sampler: Official sampling

Sampling Strategy: Objective sampling

Programme Code: AMR MON

Analytical Method: Micromethod dilution (in microtiter plate)

Country Of Origin:Republic of North Macedonia

Sampling Details:

	AM substance	Ampicillin	Chloramphenicol	Ciprofloxacin	Daptomycin	Erythromycin	Gentamicin	Linezolid	Quinupristin/Dalfopristin	Teicoplanin	Tetracycline	Tigecycline	Vancomycin
	ECOFF	**4**	**32**	**4**	**8**	**4**	**32**	**4**	**1**	**2**	**4**	**0.25**	**4**
	Lowest limit	**0.5**	**4**	**0.125**	**0.25**	**1**	**8**	**0.5**	**0.5**	**0.5**	**1**	**0.03**	**1**
	Highest limit	**64**	**128**	**16**	**32**	**128**	**1024**	**64**	**64**	**64**	**128**	**4**	**128**
	N of tested isolates	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**
MIC	**N of resistant isolates**	**0**	**0**	**0**	**0**	**3**	**0**	**1**	**6**	**0**	**3**	**0**	**0**
<=0.03												6	
0.064												5	
0.125												2	
<=0.25					1								
<=0.5		4							4	13			
0.5				2	1								
<=1						8					7		13
1		5		4	6			5	3				
2		4		6	3	2		7	3				
<=4			9										
4				1	2				1		3		
<=8							10						
8						3		1	2				
16			2				3				1		
32			2								1		
128											1		

Table Antimicrobial susceptibility testing of Enterococcus, non-pathogenic - E. faecium in Gallus gallus (fowl) - broilers

Sampling Stage: Slaughterhouse

Sampling Type: animal sample - caecum

Sampling Context: Monitoring

Sampler: Official sampling

Sampling Strategy: Objective sampling

Programme Code: AMR MON

Analytical Method: Micromethod dilution (in microtiter plate)

Country Of Origin:Republic of North Macedonia

Sampling Details:

	AM substance	Ampicillin	Chloramphenicol	Ciprofloxacin	Daptomycin	Erythromycin	Gentamicin	Linezolid	Quinupristin/Dalfopristin	Teicoplanin	Tetracycline	Tigecycline	Vancomycin
	ECOFF	**4**	**32**	**4**	**8**	**4**	**32**	**4**	**1**	**2**	**4**	**0.25**	**4**
	Lowest limit	**0.5**	**4**	**0.125**	**0.25**	**1**	**8**	**0.5**	**0.5**	**0.5**	**1**	**0.03**	**1**
	Highest limit	**64**	**128**	**16**	**32**	**128**	**1024**	**64**	**64**	**64**	**128**	**4**	**128**
	N of tested isolates	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**
MIC	**N of resistant isolates**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**
0.064												3	
0.125												1	
<=0.5		1								4			
<=1						1					4		3
1					4			1					
2		3		4		3		3	4				1
<=4			4										
<=8							1						
16							3						

Specific monitoring of ESBL-/AmpC-/carbapenemase-producing bacteria and specific monitoring of carbapenemase-producing bacteria, in the absence of isolate detected

No data returned for this view. This might be because the applied filter excludes all data.

Specific monitoring of ESBL-/AmpC-/carbapenemase-producing bacteria and specific monitoring of carbapenemase-producing bacteria, in the absence of isolate detected

Latest Transmission set

Table Name	Last submitted dataset transmission date
Antimicrobial Resistance	20-Jul-2024
Animal Population	17-Jul-2024
Disease Status	17-Jul-2024
Food Borne Outbreaks	17-Jul-2024
Prevalence	17-Jul-2024

ZOONOSES MONITORING

NORTH MACEDONIA

TEXT FORMS FOR THE TRENDS AND SOURCES OF ZOONOSES AND ZOONOTIC AGENTS IN FOODSTUFFS, ANIMALS AND FEEDINGSTUFFS

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

IN 2023

Table of contents

1. Institutions and Laboratories involved in zoonoses monitoring and reporting

Faculty of veterinary medicine-Skopje (FVMS) is a public institution dealing with university education, scientific and applied research and provision of scientific and technical expertise for the veterinary authorities and industry in the animal health and food safety domains.(**www.fvm.ukim.edu.mk**). FVMS is consisted of three institutes such as Veterinary Institute, Food Institute and Institute for veterinary biomedicine and reproduction.(https://fvm.ukim.edu.mk/en/fakultet/organizacija/organogram/).
Laboratories of FVMS operate under highest quality management standards, and have been accredited by the Institute for accreditation of R.N.Macedonia for the standard MKC EN ISO/IEC 17025 since 2008. Currently, 175 laboratory diagnostic methods are accredited and this number reflects the continuous broadening of the accreditation scope according to the national requirements and needs. (https://iarm.gov.mk/wp-content/uploads/2021/02/OB05-25_LT-006.pdf).
Food institute is dealing with testing of Food, feed and water born zoonotic pathogens such as: *Salmonella, Campylobacter, Escherichia coli, Listeria monocytogenes, Anisakis* and other bacterial, parasitic and viral zoonotic agents. Veterinary institute is testing zoonotic pathogens in animals such as: *Brucella, Mycobacterium*, *Salmonella, Campylobacter, Escherichia coli, Listeria, Trichinella, Echinococcus, Toxoplasma,* rabies, *Coxiella* (Q fever*),* Tularaemia and other bacterial parasitic and viral zoonotic agents. Vector born zoonotic pathogens such as *Leishmania* and West Nile Virus are tested in vectors and animals as well. Laboratory tests are performed as a part of a national surveillance and monitoring programs, as well as in cases of outbreaks, or on request of a customers. FVMS regularly report for the positive testing results of zoonotic agents to the Food and veterinary agency and submit monthly and annual reports for all performed testing and results.

Short description of the institutions and laboratories involved in data collection and reporting

2. Animal population

2.1. Sources of information and the date(s) (months, years) the information relates to [(a)]

Source of information is Informative system of Food and Veterinary Agency ISFVA. Identification and registration system since 2004, starts with bovine animal, and later for other animal species 2008 sheep and goats, 2012 bees, 2013 pigs, 2016 aquatic animals and pets, 2019 equine animals.

2.2. Definitions used for different types of animals, herds, flocks and holdings as well as the production types covered

"Farm animal" shall mean a domestic animal of the bovine species including the species Bubalus bubalis and Bison bison, ovine, caprine, porcine and equidae species.

” Other animal” shall mean an animal which is not covered under the term farm animal of the species defined in indent (2) above, but which shall be identified and registered under this law depending on circumstances.

“Holding” shall mean any establishment, construction or, in the case of an open-air farm, any place in which animals covered by this law are held, kept or handled.

2.3. National changes of the numbers of susceptible population and trends

2.4. Geographical distribution and size distribution of the herds, flocks and holdings[(b)]

2.5. Additional information

(a): National identification and registration system(s), source of reported statistics (Eurostat, others)
(b): Link to website with density maps if available, tables with number of herds and flocks according to geographical area

3. General evaluation*: Please add the zoonotic agent

3.1. History of the disease and/or infection in the country[(a)]

General evaluation Mycobacterium

Bovine Tuberculosis control and eradication programmes have been implemented in the country for decades. However, after the introduction of the system for I&R for different species, the Program for control and eradication of Bovine Tuberculosis is in place since 2007.

3.2. Evaluation of status, trends and relevance as a source for humans

The Bovine Tuberculosis control and eradication program is based on a single skin test approach performed every year to all bovine animals older than 6 weeks of age. Skin test is performed by private veterinary practitioners and personnel of the Faculty of Veterinary Medicine, Skopje, re-tested suspected positive animals after 42 days with comparative tuberculin test (bovine/avian tuberculin). Confirmed positive animals are slaughtered.

3.3. Any recent specific action in the Member State or suggested for the European Union[(b)]

Write text here please

3.4. Additional information

North Macedonia is a candidate country for accession into the EU. At the moment, Food and Veterinary Agency as a competent authority is working on adoption of new national animal health legislation in line with the EU Reg. 429/2016 with accompanying Delegated and Implemented acts.

The new Program for control of Bovine Tuberculosis is on final stage of adaption, harmonised in line with Commission Delegated Regulation (EU) 2020/689**.**

* **For each zoonotic agent**

(a): Epidemiological evaluation (trends and sources) over time until recent/current situation for the different relevant matrixes (food, feed, animal). If relevant: the official "disease status" to be specified for the whole country and/or specific regions within the country

(b): If applicable

4. Description of Monitoring/Surveillance/Control programmes system*: Please add the matrix and zoonotic agent

4.1. Monitoring/Surveillance/Control programmes system[(a)]

General evaluation Brucella

1. Bovine brucellosis – B. abortus

Republic of North Macedonia is not officially free from bovine brucellosis

Bovine Brucellosis control and eradication program have been implemented in the country for decades. However, after the introduction of the system for I&R for different species, the current Program for control and eradication of Bovine Brucellosis in place since 2007.

2. Brucellosis in small ruminants – B. melitensis

Republic of North Macedonia is not recognized as country officially free from sheep and goat brucellosis.

In the last several years, the Food and Veterinary Agency implements programs for control and eradication of the disease.

The surveillance program for brucellosis in sheep and goats has been systematically implemented since 2008 when an individual identification of sheep and goats started. After several years of implementation of the program's provisions, in 2010 and 2014 after the conducted analysis of the results, revision were made to the program.

After the implementation of vaccination against Brucellosis in small ruminants the territory of the country was divided into certain number of individual regions i.e. epidemiological units were depending of the widespread of the disease in the country, the prevalence, different measures for control of Brucellosis in sheep and goats apply. After 2008 mass vaccination against brucellosis in sheep and goats was implemented and country was divided in to three regions.

In following years, vaccination of replacements animals and test and slaughter of adult animals have been implemented.

In 2016 new programme for control and eradication of brucellosis in small ruminants were implemented and two municipalities (these are municipalities where mass vaccination was carried out in 2008) and have been introduced in the scheme for testing of the animals and applying test and slaughter policy in municipalities where vaccination was implemented.

Last amendment of the program was in 2019, the Program for amending the program for control and eradication of brucellosis in sheep and goats. A key element is the sampling of brucellosis in sheep’s and goats in municipalities that have been subject to

mass vaccination against Brucellosis and where sampling is not carried out in past years.

The aim was to determine the prevalence of brucellosis in regions where no diagnostic test was performed but also to obtain official brucellosis-free status in eligible regions, and then gradually throughout the country over the coming years. With this approach, the Food and Veterinary Agency strengthens the measures for protection of human and animal health and provides basic preconditions for placing on the market and export of live sheep and goats and their products as well as conditions for introduction and maintenance of the status of sheep herds and goats as "free" of brucellosis (B. melitensis) in sheep and goats. In the next year FVA is planned to stop vaccination against brucellosis in whole the territory of country.
Currently FVA preparing new multi-annual program for control/eradication of Brucellosis in small ruminants in line with EU Regulation 2020/689.

Number of humane cases shows a decreasing trend of humane brucellosis.

Year	No. of infected people
2008	485
2009	287
2010	163
2011	96
2012	82
2013	36
2014	40
2015	24
2016	22
2017	21
2018	11
2019	15
2020	3
2021	2
2022	3
2023	6

3.Bovine Tuberculosis- Mycobacterium bovis

All bovine animals older than 6 weeks were tested once a year in the whole country. Animals with suspected of intradermal tuberculin test, are retested after 42 days with comparative tuberculin test.

Tuberculin skin testing: single (bovine tuberculin) or comparative (bovine/avian tuberculin).

Private veterinary practitioners are responsible for application of single intradermal tuberculin test. Faculty of Veterinary Medicine Skopje-responsible for comparative intradermal test (re - tuberculinisation) with avian and bovine tuberculin after at least 6 weeks.

A 'bovine' is defined as infected with bovine tuberculosis if the animal is positive by skin testing or if *Mycobacterium bovis* is isolated by culture or confirmed by laboratory analysis (PCR).
A 'holding' is defined as infected if Mycobacterium bovis was isolated from an animal of the holding.
Bovine tuberculosis diagnostic tests and procedures

- BTB infection in cattle is usually diagnosed in the live animals on the basis of delayed hypersensitivity reactions with single tuberculin test (STT) and with the comparative tuberculin test (CTT)

FVA is in the final stages of adoption of a new program for control and eradication of Bovine tuberculosis harmonised with EU Implementing Regulation 2020/689 taking into account all elements for providing control mechanisms such as preparation of a comprehensive epidemiological examination, increasing the percentage or coverage of tested bovine, regular re-testing of cattle in the presence of the official veterinarian, raising the awareness of breeders in regions where the prevalence of the disease is higher.

4.Rabies

The program for oral vaccination of foxes against rabies started in 2011 under the EU funded project “Capacity building of the veterinary service for implementation of EU Acquis EuropeAid/124586/C/SER/MK”. The program is comprised of two vaccination campaigns per year (spring and autumn), taking into consideration the epidemiological situation in the neighboring countries. Vaccination area cover all 8 regions in North Macedonia. The estimated size of ORV area is 24.329 km2. ORV will be performed twice per year (spring/autumn).

ORV efficiency control is organized in vaccination area 30 days after conclusion of autumn/spring vaccination campaign and ORV efficiency data will be analysed. For the purpose of the monitoring of ORV efficiency investigation of 4 animals (foxes, raccoon dogs) per 100 km2 for the vaccine bait uptake (detection of tetracycline in mandible tissue using luminescent microscopy) and antibody titre (using Biorad ELISA test). Due to the late delivery of the vaccine baits, the autumn Oral vaccination of foxes in 2022 has been postponed to January 2023. In period between 4th January, 2023 -16th January, 2023 were distributed 524.237 baits and second campaigns from 12.05.2023 -10.06.2023 with Rabadrop, Bioveta as.Chech Republic.

No cases of rabies in domestic and wild animals were registered during 2023.

Rabies - Awareness Campaign

During 2021 The Food and Veterinary Agency conducted the campaign "Stop Rabies" where dead animals could be reported via a mobile application that was available on the Google play store, as well as via free phone number 0800 00 210. All results were negative in 2021, 2022, 2023 and 2024.

4.2. Measures in place[(b)]

Measures in case of the positive findings or single cases (brucellosis in sheep and goats)

National surveillance program by the Competent Authority on mandatory legal base.
In case of positive result, official veterinarian should order measures as follows:
1.The herd is placed under official surveillance.
2. The implementation of the epidemiological examination in order to identify the source, the time and the method of infection and the previous and the further spread of the infection
3. Isolation of all positive animals within the herd.
4. Prohibition of any movement into or out of the herd, unless authorized by the CA, for the purpose of slaughter without delay.
5. Isolation, until the further testing or sending to slaughter.
6. Milk from the infected cows may only be fed to animals on the same farm, after suitable heat treatment.
7. Milk from cows from the infected herd (without prejudice to national provisions concerning foodstuffs) cannot be delivered to a dairy, except to undergo suitable heat treatment
8. Carcasses, half-carcasses, quarters, pieces and offal from infected cattle intended for use as feed for animals are treated in such a way to avoid contamination.
9. All positive animals must be slaughtered as soon as possible, but not later than 30 days after the owner was officially notified about the disease and his obligation.
10. After the slaughter of all positive animals and prior to restocking, general cleaning and disinfection of all herd and equipment should be performed, under official supervision and in accordance with the instructions of the official veterinarian.

Measures in case of the positive findings or single cases (brucellosis in sheep and goats)

1. The holding shall be placed under official surveillance.
2. The implementation of the epidemiological examination in order to identify the source, the time and the method of infection and the previous and the further spread of the infection and
3. It is prohibited to introduce into or to take out from the holding all susceptible animals.
4. The sheep and goats in cases of which the Brucellosis is officially confirmed sed must be isolated, and the positive animals must be visibly identified.
5. The animals in case of which the Brucellosis in sheep and goats is officially confirmed, shall be slaughtered under official supervision as soon as possible, and not later than 30 days from the day when the owner of the animal or the responsible person has been informed about the presence of the disease and the obligation for

slaughtering according to the program for eradication.

6. The milk obtained from the positive animals must be safely disposed or may be used for nutrition of the animals from the same holding following the appropriate heat treatment.

The milk obtained from the positive animals is not used for human consumption. The milk obtained from animals with negative result and the milk obtained from vaccinated animals, according to this program, may be used for human consumption in accordance with the provisions set out in the veterinary legislation.

7. Safe disposal of aborted fetuses, still born lambs and kids and placentas.

8. Daily collection of the manure and litter/bedding and burial thereof or disinfection. The manure and the litter/bedding must not be taken out at least three weeks following their collection.

9. The hay, the litter/bedding and all the other objects which came into contact with the positive animals, fetuses or placenta must be buried after previous submersion in disinfectant.

10. The premises and the area in which the animals have been present, must be thoroughly cleaned and disinfected with a disinfectant which is registered for use in the Republic of Macedonia.

11. The objects which came into contact with the diseased animals must be thoroughly cleaned and disinfected. If this activity is not possible, they must be disposed.

12. In case of complete depopulation of the holding, the repopulation can take place four weeks following the disinfection.

13. Re-testing of the animals at least 15 and maximum 30 days following the removal of the diseased animals and the disinfection. In case if the animals give negative result, they shall be tested two more times with negative results in such a way that the first testing shall be one month following the last negative result and the second shall be three months later

10.1. Notification system in place to the national competent authority[(c)]

According Law of veterinary health and Book of rules for compulsory notification animal diseases and List of animal diseases posing serious risk for spread in the territory of the country was adopted and published in "Official Journal of RNM" 41/22 and alignment with EU Regulation 32018R1882.

10.2. Results of investigations and national evaluation of the situation, the trends [(d)] and sources of infection[(e)]

Results of implementation of program of control of Bovine Tuberculosis

Year	Tested animals	Reported suspected animals	Reported suspected animal holding	Positive animals	% of positive animals
2017	174.967	192	78	61	0.03%
2018	155.624	171	64	58	0.04%

2019	151.919	93	30	38	0.025%
2020	147.915	105	25	60	0.04%
2021	137.654	100	20	45	0.032%
2022	127.727	69	13	42	0.032%
2023	100.890	37	19	95	0.09%

Results of implementation of program of control of Brucellosis in sheep and goats

Year	Tested flocks	Positive flocks	% of positive flocks	No. of tested animals	No. of positive animals	% of positive animals
2017	6.608	97	1,47%	412.978	448	0.11%
2018	5.873	112	1,64%	412.091	373	0.09%
2019	6.658	198	2,96%	531.831	1906	0,36%
2020	6.156	58	1,02%	510.335	992	0,19%
2021	5.546	44	0,81%	661.212	515	0,10%
2022	4.409	24	0.39%	491.054	169	0.12%
2023	4.326	23	0.10%	489.757	519	0.53%

Rabies

Year*	**Campaign carried out**		**Spring campaign**		**Autumn campaign**	
	YES	NO	Start Date	End Date	Start Date	End Date
2010		x				
2011	x		May 19th	June 9th	October 11th	October 31th
2012	x		/	/	October 19th	November 3th
2013	x		April 4th	April 28th	September 28th	November 22th
2014	x		April 22th	June 6th	September 25th	October 10th
2015	x		/	/	November 5th	November18th
2016	x		April 11th	April 27th	October 1th	October 12th
2017	x		April 20th	April 28th	October 26th	November 3th

2018	x		April 10th	April 23th	October 26th	November 3th	
2019	x		April 4th	April21th	October 15th	November 16th	
2020		x					
2021	x		No spring campaign		December 18th	January 2th	2022
2022	x		May12th	May20th	postponed to January 2023		
2023	x		January 4 th	January 16 th	May 15th	June 3th	

10.3. Additional information

Write text here please

* **For all combinations of zoonotic agents and matrix (Food, Feed and Animals) for 'Prevalence' and 'Disease Status': one text form reported per each combination of matrix/zoonoses or zoonotic agent**

(a): Sampling scheme (sampling strategy, frequency of the sampling, type of specimen taken, methods of sampling (description of sampling techniques) + testing scheme (case definition, diagnostic/analytical methods used, limit of detection of the method, diagnostic flow (parallel testing, serial testing) to assign and define cases. If programme approved by the EC, please provide link to the specific programme in the Commission`s website.

(b): The control program/strategies in place, including vaccination if relevant. If applicable a description of how eradication measures are/were implemented, measures in case of the positive findings or single cases; any specific action decided in the Member State or suggested for the European Union as a whole on the basis of the recent/current situation, if applicable. If programme approved by the EC, please provide link to the specific programme in the Commission`s website.

(c): Mandatory: Yes/No.

(d): Minimum five years.

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

11. Food-borne Outbreaks

11.1. System in place for identification, epidemiological investigations and reporting of food-borne outbreaks

There are several systems for detections of outbreaks (including food borne outbreaks - FBOs) in North Macedonia:
Case based surveillance is based on the universal system for reporting communicable diseases, where each medical doctor is obliged to report one of the 64 mandatory reported communicable diseases (including diseases or syndromes of food poisoning). National case definitions are fully aligned with ECDC/EU case definitions form 2012.
Laboratories are obliged to report on 56 microbiological agents (including microbiological agents causing for FBOs).

Cases detected by physicians are reported to centers for Public Health on local and regional level, while national communicable disease surveillance is responsibility of

National Institute of Public Health, where the national case-based database is located.
FBO are detected by detecting clusters of reported cases on local/regional level.
In addition, there is syndromic surveillance in place (EWARN – Early Warning and Response System for communicable diseases) were 75% of general practitioners are participating. Reporting is based on weekly aggregated data. The main purpose is to detect clusters of communicable diseases including FBO. Starting from 2020, the system for real time detection of clusters of communicable diseases is integrated in to electronic health records system in the country. From 2018 as part of event-based surveillance Institute of Public Health is running weekly epidemiological teleconference with regional level epidemiologists, the purpose is timely information exchange and detection of potential clusters or linked cases from different regions. Finally, there is system for 24/7 response, where rapid response teams (epidemiologists and laboratory experts) for Centres for Public Health can lunch outbreak investigation upon call from medical doctors for clustering of cases with food poisoning symptoms.
All outbreaks are reported on outbreak reporting forms by Centres for public health to the Ministry of health and to the Institute of Public Health. FBO are reported to the Food and Veterinary Agency as well.

5.2. Description of the types of outbreaks covered by the reporting

Every type of outbreak (or cluster of cases) is mandatory to be reported

5.3. National evaluation of the reported outbreaks in the country[(a)]

In 2021 2 foodborne and one suspected waterborne outbreak was reported.
1 FBO – 90 reported cases, 12 hospitalized cases and no death cases reported. Detected Salmonella enteritidis in feces samples from 77 cases and 3 food handlers. Salmonella san diego detected in mayonnaise samples. Acinetobacter spp. and Enterobacter spp. detected in kitchen surfaces.

2 FBO(WBO) – 93 reported cases, no hospitalized or death cases reported. Outpatient cases treated for enterocolitis, but all cases refused to give specimens for testing. Only common item identified as water from the water supply network supplying the three villages where the reported cases were from. Water supply system not disinfected regularly, but collected specimens were negative since immediate disinfection before collected samples.

3 FBO – 12 reported cases, no reported hospitalized or death cases. Staphylococcus aureus detected in feces samples from 6 cases.

5.4. Descriptions of single outbreaks of special interest

Write text here please

5.5. Control measures or other actions taken to improve the situation

For the identified outbreak control measures were put in place according to the type of the outbreak, situation in the field and according to the law and regulations in the country

5.6. Any specific action decided in the Member State or suggested for the European Union as a whole on the basis of the recent/current situation

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5.7. Additional information

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(a): Trends in numbers of outbreaks and numbers of human cases involved, relevance of the different causative agents, food categories and the agent/food category combinations, relevance of the different type of places of food production and preparation in outbreaks, evaluation of the severity of the human cases.

6. Institutions and laboratories involved in antimicrobial resistance monitoring and reporting

The central competent authority responsible for the preparation and implementation of the Annual plan for monitoring of antimicrobial resistance is the Food and Veterinary Agency of the Republic of North Macedonia.

The Food and Veterinary Agency (Department for Veterinary Public Health) is responsible for the preparation of the Annual plan for monitoring of antimicrobial resistance, coordination of activities between local official veterinarians, staff from the designated laboratory, collection, evaluation and summarization of the obtained data from the records by the local official veterinarians and laboratory results, and oversight of the antimicrobial resistance monitoring process. Official veterinarians from the Department of Inspection Supervision are responsible for the implementation of the Annual plan for monitoring of antimicrobial resistance on the field.

The authorization to perform laboratory tests (isolation and susceptibility testing) foreseen by the Annual plan for monitoring of antimicrobial resistance is given by the Director of the Agency for Food and Veterinary Medicine through a signed contract for performing laboratory services in the field of veterinary public health.

The authorization for performing the analysis foreseen with the Annual plan for monitoring of antimicrobial resistance is granted by the Director of the Food and Veterinary Agency on a basis of a signed contract awarded through a carried out tendering procedure.

The laboratory for microbiology of food and feed within the Food Institute – Faculty of veterinary medicine – Skopje, Ss Cyril and Methodius University, Skopje was the laboratory authorized for performing analysis foreseen with the Annual plan for monitoring of antimicrobial resistance for 2023.

Faculty of Veterinary Medicine - Skopje was accredited on June 25, 2008 by Accreditation Institute of the of Republic of North Macedonia for compliance with the requirements from the standard MKC EN ISO/IEC 17025:2006. (Accreditation certificate No. LT-006).

Designated laboratory uses accredited method for performing identification of isolated and detection of antimicrobial resistance according to Instruction manual according MKC EN ISO 20776-1:2008, MKC EN ISO 20776-2:2009 (Susceptibility testing of infectious agents and evaluation of performance of antimicrobial susceptibility test devices — Part 1: Broth microdilution reference method for testing the in vitro activity of antimicrobial agents against rapidly growing aerobic bacteria involved in infectious diseases) and Laboratory Protocol written by EURL-AR DTU Food National Food Institute version 1 for isolation of methicillin – resistant Staphylococcus aureus (MRSA) from food – producing animals and farm environment.

Short description of the institutions and laboratories involved in data collection and reporting

7. General Antimicrobial Resistance Evaluation

7.1. Situation and epidemiological evolution (trends and sources) regarding AMR to critically important antimicrobials[(a)] (CIAs) over time until recent situation

The annual plan for monitoring of antimicrobial resistance has been implemented for the first time in the Republic of North Macedonia since 2018 with the entry into force of the Program for antimicrobial resistance, published in the „Official Gazette of the Republic of Macedonia“ no. 49/17. The Program was fully harmonized with the Commission Implementing Decision 2013/652/EU of 12 November 2013 on the monitoring and reporting of antimicrobial resistance in zoonotic and commensal bacteria.

In 2022 Republic of North Macedonia has adopted the Program for antimicrobial resistance for the period 2022 – 2026, published in the „Official Gazette of the Republic of Macedonia“ No. 77/22. The Program is fully harmonized with the Commission Implementing Decision (EU) 1729/2020 of 17 November 2020 on the monitoring and reporting of antimicrobial resistance in zoonotic and commensal bacteria and repealing Implementing Decision 2013/652/EU. Also, the Program covers sampling and testing of isolates of methicillin - resistant *Staphylococcus aureus* according to the technical specifications on the harmonised monitoring and reporting of antimicrobial resistance in methicillin-resistant *Staphylococcus aureus* in food-producing animals and food (EFSA, 2012) and Commission Implementing Decision (EU) 2023/1017 of 23 May 2023 amending Implementing Decision (EU) 2020/1729 as regards the monitoring of methicillin-resistant *Staphylococcus aureus* (MRSA) in fattening pigs.

The Program for Antimicrobial Resistance for the period 2022 - 2026 is performing monitor of antimicrobial resistance in order to ensure compliance with the requirements stipulated by the Law on Food Safety for obtaining comparative data on the occurrence of antimicrobial resistance among agents of zoonoses, if they pose a threat to public health or other triggers. The Program lays down the detailed rules for the harmonised monitoring and reporting of antimicrobial resistance (AMR) to be carried out in accordance with the Book of rules on the manner of performing official controls and procedures for monitoring zoonoses and zoonotic agents and a list of zoonoses and zoonotic agents that are regularly monitored (Official Gazette of the Republic of Macedonia No. 80/11). The Book of rules on the manner of performing official controls and procedures for monitoring zoonoses and zoonotic agents and a list of zoonoses and zoonotic agents that are regularly monitored (Official Gazette of the Republic of Macedonia No. 80/11) is fully harmonized with the Directive 2003/99/EC of the European Parliament and of the Council of 17 November 2003 on the monitoring of zoonoses and zoonotic agents, amending Council Decision 90/424/EEC and repealing Council Directive 92/117/EEC. The annual plan for monitoring of antimicrobial resistance for 2023 was an integral part of the Annual Order for the execution of veterinary measures and controls for the protection of public health from contaminants or residues transferred from animals or animal products in 2023.

The Program for antimicrobial resistance for the period 2022 – 2026 covers the following bacteria obtained from samples from certain food - producing animal populations and certain food:
(a) *Salmonella* spp.;
(b) *Campylobacter jejuni* and *Campylobacter coli* (*C. jejuni* and *C. coli*);
(c) Indicator commensal *Escherichia coli* (*E. coli*);
(d) Indicator commensal *Enterococcus faecalis* and *Enterococcus faecium* (*E. faecalis* and *E. faecium*).

The Program also lays down the specific requirements for the harmonised monitoring and reporting of the *Salmonella* spp. and *E. coli* producing the following enzymes in certain food - producing animal populations and in certain food:
(a) Extended-Spectrum β-Lactamases (ESBL);
(b) AmpC β-Lactamases (AmpC);
(c) Carbapenemases.

Additionally, according to the Annual Order for the execution of veterinary measures and controls for the protection of public health from contaminants or residues transferred from animals or products of animal origin, Program for antimicrobial resistance for the period 2022 - 2026 and the Annual plan for monitoring of antimicrobial resistance in 2023, the FVA also perform monitoring of methicillin - resistant *Staphylococcus aureus* in broilers, fattening pigs, dairy cows, cattle under one years of age and cattle under two years of age in breeding farms (milking cattles), in farms, during slaughter in slaughterhouses and in fresh meat from cattle, fattening pigs and broilers.

Due to a low bacterial prevalence, low number of epidemiological units and low number of productions in the country, we have decided to collect samples each year for laying hens, broilers, cattle under one years of age, fattening pigs and fresh meat from cattle under one years of age, pigs and broilers in slaughterhouses and retail for all bacterial species. Due to a low bacterial prevalence, additional we included isolates obtained from the National control plan for Salmonella spp. and isolates form the Book of rules on special requirements for microbiological criteria for food, that is harmonized with regulation 2073/2005 (points 2.1.3, 2.1.4 and 2.1.5 of Chapter 2 of Annex I to Regulation (EC) No. 2073/2005).

Sample size, sample frequency and sampling design are in accordance with the Commission Implementing Decision (EU) 1729/2020.

7.2. Public health relevance of the findings on food-borne AMR in animals and foodstuffs

According to number of slaughter animals and the category of approved slaughterhouses, at the beginning of the year we prepare an Annual plan for AMR in accordance with the Program for antimicrobial resistance for the period 2022 – 2026, that is public published. Based on that, every epidemiological unit and slaughterhouse have defined number of samples to be collected per month. Samples originates from retail are divided based on consumption of different type of meat that is covered by the program. FVA has implemented Guideline for the sampling strategy and sampling method for the program for antimicrobial resistance.

According to the Annual plan for monitoring of antimicrobial resistance for 2023, a total number of 385 samples from domestic production were planned. A total number of 369 samples or 95.84% realization were carried out by the official veterinarians from the Department for State Inspection for Veterinary Public Health in the Department for Inspection Supervision. From the total number of 369 samples taken, a total number of 86 isolates were obtained, which were tested for antimicrobial resistance according to the panels given in the Program for antimicrobial resistance for the period 2022-2026.

Bacterial species	Animal population	Predicted number of samples according to the Annual plan	Taken samples	No. of isolates	Prevalence (%)
Salmonella spp.	Broilers	5	5	0	0,00
	Fattening pigs	25	25	0	0,00

	Cattle under 1 year age	25	23	0	0,00
C. jejuni	Broilers	5	5	0	0,00
C. coli	Broilers	5	5	0	0,00
	Fattening pigs	25	25	0	0,00
Indicator commensal *E. coli*	Broilers	5	5	4	80,00
	Fattening pigs	25	26	26	100,00
	Cattle under 1 year age	25	22	20	90,91
E. coli producing ESBLs, AmpC or carbapenemases	Broilers	5	5	0	0,00
	Fattening pigs	15	15	0	0,00
	Cattle under 1 year age	15	14	0	0,00
E. faecalis	Broilers	5	5	0	0,00
	Fattening pigs	25	25	4	16,00
	Cattle under 1 year age	25	23	4	17,39
E. faecium	Broilers	5	5	4	80,00
	Fattening pigs	25	25	13	52,00
	Cattle under 1 year age	25	23	11	47,83
Methicillin - resistant *Staphylococcus aureus*	Fattening pigs for slaughter and pigs for fattening (3 – 11 weeks of age)	45	45	0	0,00
	Broilers	5	3	0	0,00
	Cattle under 1 year age	20	20	0	0,00
	Dairy cattle	60	56	0	0,00
	Fresh meat from pigs	10	9	0	0,00
	Fresh meat from broilers	5	5	0	0,00
	Fresh meat from cattle under 1 year age	5	4	0	0,00
Total		385	369	86	23,31

7.3. Recent actions taken to control AMR in food producing animals and food

See point 7.2.

7.4. Any specific action decided in the Member State or suggestions to the European Union for actions to be taken against food-borne AMR threat

All analytical methods used for detection and confirmation are accredited. We used methods according to ISO and EURL AR (DTU DK). The broth microdilution method and commercial prepared plates in accordance with the Decision 1729/2020 were used to test the antimicrobial susceptibility of bacteria. Designated laboratory for performing identification of isolated and detection of antimicrobial resistance was the Faculty of Veterinary Medicine. The analytical method used for antimicrobial susceptibility determination for *Salmonella spp. Enterococcus spp., Campylobacter spp., E. coli* and MRSA with broth micro dilution technique is in accordance with the ISO 20776-1:2008. For isolation of *Enterococcus* spp., the designated laboratory uses accredited in-house method.

7.5. Additional information

Designated laboratory uses accredited method for performing identification of isolated and detection of antimicrobial resistance according to Instruction manual according MKC EN ISO 20776-1:2008, MKC EN ISO 20776-2:2009 (Susceptibility testing of infectious agents and evaluation of performance of antimicrobial susceptibility test devices — Part 1: Broth microdilution reference method for testing the in vitro activity of antimicrobial agents against rapidly growing aerobic bacteria involved in infectious diseases) and Laboratory Protocol written by EURL-AR DTU Food National Food Institute version 1 for isolation of methicillin – resistant Staphylococcus aureus (MRSA) from food – producing animals and farm environment.

FVA through the designated laboratory tests the isolates of antimicrobial agents and interprets the results using the epidemiological limit values and the concentration range indicated in tables of the Program for antimicrobial resistance. Also, FVO takes in consideration the recommendations given by EFSA related to panels of antimicrobial substances to be included in AMR monitoring, EUCAST epidemiological cut-off values (ECOFFs) and concentrations ranges to be used for testing isolates included in the annual plan for monitoring of antimicrobial resistance.

Panel of antimicrobial substances to be included in AMR monitoring, EUCAST thresholds for resistance and concentration ranges to be tested in *Salmonella* spp. and indicator commensal *E. coli* (First panel)

Antimicrobial	*Salmonella* spp.	*E. coli*	Concentration range, mg/L (no. of wells)
	ECOFF	ECOFF	
Amikacin	> 4	> 8	4–128(6)
Ampicillin	> 8	> 8	1–32 (6)
Azithromycin	> 16	> 16	2–64 (6)
Cefotaxime	> 0.5	> 0.25	0.25–4 (5)
Ceftazidime	> 2	> 0.5	0.25–8 (6)
Chloramphenicol	> 16	> 16	8–64 (4)
Ciprofloxacin	> 0.064	> 0.064	0.015–8 (10)
Colistin	> 2	> 2	1–16 (5)
Gentamicin	> 2	> 2	0.5–16 (6)
Meropenem	> 0.125	> 0.125	0.03–16 (10)
Nalidixic acid	> 8	> 8	4–64 (5)
Sulfamethoxazole	> 256	> 64	8–512 (7)
Tetracycline	> 8	> 8	2–32 (5)
Tigecycline	> 0.5	> 0.5	0.25–8 (6)
Trimethoprim	> 2	> 2	0.25–16 (7)

Panel of antimicrobial substances, EUCAST epidemiological cut-off values (ECOFFs) and concentrations ranges to be used for testing only *Salmonella* spp. and *E. coli* isolates resistant to cefotaxime or ceftazidime or meropenem – (Second panel)

Antimicrobial	*Salmonella* spp.	*E. coli*	Concentration range, mg/L (no. of wells)
	ECOFF	ECOFF	
Cefepime	> 0,125	> 0,125	0,064-32
Cefotaxime	> 0,5	> 0,25	0,25-64
Cefotaxime + clavulanic acid	> 0,5	> 0,25	0,064-64
Cefoxitin	> 8	> 8	0,5-64
Ceftazidime	> 2	> 0,5	0,25-128
Ceftazidime + clavulanic acid	> 2	> 0,5	0,125-128
Ertapenem	> 0.064	> 0.064	0,015-2
Imipenem	> 1	> 0,5	0,125-16
Meropenem	> 0,125	> 0,125	0,03-16
Temocillin	> 16	> 16	0,5-128

Panel of antimicrobial substances to be included in AMR monitoring, interpretative thresholds for resistance and concentration ranges to be tested in *C. jejuni* and *C. coli*

Antimicrobial	*C. jejuni*	*C. coli*	Concentration range, mg/L (no. of wells)
	ECOFF	ECOFF	
Chloramphenicol	> 16	> 16	2–64 (6)
Ciprofloxacin	> 0.5	> 0.5	0.125–32 (9)
Ertapenem	> 0.5	> 0.5	0.125–4 (6)
Erythromycin	> 4	> 8	1–512 (10)
Gentamicin	> 2	> 2	0.25–16 (7)

Tetracycline	> 1	> 2	0.5–64 (8)

Panel of antimicrobial substances to be included in AMR monitoring, interpretative thresholds for resistance and concentration ranges to be tested in *E. faecalis* and *E. faecium*

Antimicrobial	*E. faecalis* ECOFF	*E. faecium* ECOFF	Concentration range, mg/L (no. of wells)
Ampicillin	> 4	> 4	0.5–64 (8)
Chloramphenicol	> 32	> 32	4–128 (6)
Ciprofloxacin	> 4	> 4	0.125–16 (8)
Daptomycin	> 4	> 8	0.25–32 (8)
Erythromycin	> 4	> 4	1–128 (8)
Gentamicin	> 64	> 32	8–1024 (8)
Linezolid	> 4	> 4	0.5–64 (8)
Quinopristin/Dalfopristin	> 1	> 1	0.5-64 (8)
Teicoplanin	> 2	> 2	0.5–64 (8)
Tetracycline	> 4	> 4	1–128 (8)
Tigecycline	> 0.25	> 0.25	0.03–4 (8)
Vancomycin	> 4	> 4	1–128 (8)

Proposed panel of antimicrobial substances, EUCAST epidemiological cut-off values (ECOFFs) and concentration ranges to be tested in all MRSA isolates

Antimicrobial	*S. aureus*	Concentration range, mg/L		
	ECOFF	Optimal	Advised	Minimum
Cefoxitin	>4	4-64	4-32	4-32
Chloramphenicol	>16	1-128	4-64	4-32
Ciprofloxacin	>1	0.06-256	0.25-16	0.5-8
Clindamycin	>0.25	0.03-256	0.12-8	0.12-8
Erythromycin	>1	0.06-512	0.5-64	0.5-32
Gentamicin	>2	0.06-64	0.5-32	0.5-16
Linezolid	>4	0.25-8	1-8	2-8
Mupirocin	>1	0.06-512	0.25-256	0.25-8
Quinupristin/dalfopristin	>1	0.06-4	0.25-4	0.25-4
Sulfamethoxazole/trimethoprim ([a])	>0.5	0.03-4	0.12-4	0.25-4
Tetracycline	>1	0.12-256	0.5-64	0.5-8
Tiamulin	>2	0.25-64	0.5-8	1-8
Vancomycin	>2	0.25-8	1-8	1-8

([a]) It may be considered to test sulfamethoxazole and trimethoprim separately. In that case, the following values are used to test for susceptibility: Sulfamethoxazole: ECOFF: >128, Clinical breakpoint: >1024 (CLSI), Optimal range: 4-2048 (10), Advised range: 32-1024 (5), Minimum range: 128-1024 (4). Trimethoprim: ECOFF: >2, Clinical breakpoint: >4, Optimal range: 0.25-512 (12), Advised range: 0.5-32 (7), Minimum range: 1-16 (5).

Proposed panel of optional antimicrobial substances, EUCAST epidemiological cut-off values (ECOFFs) and concentration ranges to be tested in all MRSA isolates

Antimicrobial	*S. aureus*	Concentration range, mg/L		
	ECOFF	Optimal	Advised	Minimum
Cefoxitin	NA	0.25-8	0.5-8	2-8
Chloramphenicol	>8	0.25-32	1-32	2-32
Ciprofloxacin	>0.5	0.03-1	0.12-1	0.25-1
Clindamycin	>0.5	0.06-16	0.12-8	0.12-4
Erythromycin	>1	0.06-16	0.25-8	0.5-4

(a): The CIAs depends on the bacterial species considered and the harmonised set of substances tested within the framework of the harmonised monitoring:

- For *Campylobacter* spp., macrolides (erythromycin) and fluoroquinolones (ciprofloxacin);

- For *Salmonella* and *E. coli*, 3rd and 4th generation cephalosporins (cefotaxime) and fluoroquinolones (ciprofloxacin) and colistin (polymyxin);

8. General Description of Antimicrobial Resistance Monitoring: *Escherichia coli (E. coli)* in broilers, cattle under 1 year age and fattening pigs

8.1. General description of sampling design and strategy, stratification procedure per animal population and food category and randomisation procedure per animal population and food category

FVA considers EFSA technical specifications on randomised sampling for harmonised monitoring of antimicrobial resistance in zoonotic and commensal bacteria, but also reporting guidance and recommendations given through the scientific panels and scientific networks in EFSA.

FVA ensure a proportionate stratified sampling of samples of caecal content in slaughterhouses processing at least 60 % of the specific domestic animal population with an even distribution over the monitoring period of the samples taken, and randomisation of the sampling days of each month. The samples are taken from healthy animals sampled from randomly selected epidemiological units. The epidemiological unit for fattening pigs and bovine animals under one year of age is the slaughter batch. Only one sample from the same epidemiological unit shall be taken per year. Each sample shall be taken from one carcass randomly selected from the epidemiological unit. However, for broilers, each sample shall be taken from ten carcasses randomly selected from the epidemiological unit. In 2023, caecal samples in slaughterhouses from broilers, fattening turkeys, fattening pigs and bovine animals were not collected and were not covered by the Annual plan for monitoring of antimicrobial resistance in 2023.

FVA ensure a proportionate stratified sampling of samples of the fresh meat taken at retail without pre-selecting samples based on the origin of the food, with a proportional allocation of the number of samples to the population of the geographical region. FVA also ensure an even distribution over the monitoring year of the samples of fresh meat and a randomisation of the sampling days of each month. The batches to be sampled on a given day shall be randomly selected.

The number of samples collected per slaughterhouse is proportional to the annual throughput of each slaughterhouse covered by the sampling plan.

8.2. Analytical method used for detection and confirmation

Designated laboratory uses accredited method for performing identification of isolated and detection of antimicrobial resistance according to Instruction manual according MKC EN ISO 20776-1:2008, MKC EN ISO 20776-2:2009 (Susceptibility testing of infectious agents and evaluation of performance of antimicrobial susceptibility test devices — Part 1: Broth microdilution reference method for testing the in vitro activity of antimicrobial agents against rapidly growing aerobic bacteria involved in infectious diseases).

8.3. Laboratory methodology used for detection of antimicrobial resistance

FVA uses the epidemiological cut-off values and the concentration ranges given below (referred as first panel) to determine the antimicrobial susceptibility of *E. coli.* Any *E. coli* isolate showing

resistance to cefotaxime or ceftazidime or meropenem further is tested with a second panel of antimicrobial substances given below (referred as second panel).

Panel of antimicrobial substances to be included in AMR monitoring, EUCAST thresholds for resistance and concentration ranges to be tested in *E. coli* (First panel)

Antimicrobial	*E. coli* ECOFF	Concentration range, mg/L (no. of wells)
Amikacin	> 8	4–128(6)
Ampicillin	> 8	1–32 (6)
Azithromycin	> 16	2–64 (6)
Cefotaxime	> 0.25	0.25–4 (5)
Ceftazidime	> 0.5	0.25–8 (6)
Chloramphenicol	> 16	8–64 (4)
Ciprofloxacin	> 0.064	0.015–8 (10)
Colistin	> 2	1–16 (5)
Gentamicin	> 2	0.5–16 (6)
Meropenem	> 0.125	0.03–16 (10)
Nalidixic acid	> 8	4–64 (5)
Sulfamethoxazole	> 64	8–512 (7)
Tetracycline	> 8	2–32 (5)
Tigecycline	> 0.5	0.25–8 (6)
Trimethoprim	> 2	0.25–16 (7)

Panel of antimicrobial substances, EUCAST epidemiological cut-off values (ECOFFs) and concentrations ranges to be used for testing only *E. coli* isolates resistant to cefotaxime or ceftazidime or meropenem – (Second panel)

Antimicrobial	*E. coli* ECOFF	Concentration range, mg/L (no. of wells)
Cefepime	> 0,125	0,064-32
Cefotaxime	> 0,25	0,25-64
Cefotaxime + clavulanic acid	> 0,25	0,064-64
Cefoxitin	> 8	0,5-64
Ceftazidime	> 0,5	0,25-128
Ceftazidime + clavulanic acid	> 0,5	0,125-128
Ertapenem	> 0.064	0,015-2
Imipenem	> 0,5	0,125-16
Meropenem	> 0,125	0,03-16
Temocillin	> 16	0,5-128

9. General Description of Antimicrobial Resistance Monitoring: *Enterococcus faecalis* and *Enterococcus faecium (E. faecalis and E. faecium)* in broilers, fattening pigs and cattle under 1 year age

9.1. General description of sampling design and strategy, stratification procedure per animal population and food category and randomisation procedure per animal population and food category

FVA considers EFSA technical specifications on randomised sampling for harmonised monitoring of antimicrobial resistance in zoonotic and commensal bacteria, but also reporting guidance and recommendations given through the scientific panels and scientific networks in EFSA.

FVA ensure a proportionate stratified sampling of samples of caecal content in slaughterhouses processing at least 60 % of the specific domestic animal population with an even distribution over the monitoring period of the samples taken, and randomisation of the sampling days of each month. The samples are taken from healthy animals sampled from randomly selected epidemiological units. The epidemiological unit for fattening pigs and bovine animals under one year of age is the slaughter batch. Only one sample from the same epidemiological unit shall be taken per year. Each sample shall be taken from one carcass randomly selected from the epidemiological unit. However, for broilers, each sample shall be taken from ten carcasses randomly selected from the epidemiological unit.

The number of samples collected per slaughterhouse is proportional to the annual throughput of each slaughterhouse covered by the sampling plan.

9.2. Analytical method used for detection and confirmation

All the analytical methods used for detection and confirmation are accredited. We used methods according to ISO and EURL AR (DTU DK). The broth microdilution method and commercial prepared plates in accordance with the Decision 1729/2020 were used to test the antimicrobial susceptibility of bacteria. Designated laboratory for performing identification of isolated and detection of antimicrobial resistance was the Faculty of Veterinary Medicine. For isolation of Enterococcus spp., the designated laboratory uses accredited in-house method.

9.3. Laboratory methodology used for detection of antimicrobial resistance

FVA uses the epidemiological cut-off values and the concentration ranges given below to determine the antimicrobial susceptibility of *E. faecalis* and *E. faecium.*

Panel of antimicrobial substances to be included in AMR monitoring, interpretative thresholds for resistance and concentration ranges to be tested in *E. faecalis* and *E. faecium*

Antimicrobial	*E. faecalis* ECOFF	*E. faecium* ECOFF	Concentration range, mg/L (no. of wells)
Ampicillin	> 4	> 4	0.5–64 (8)
Chloramphenicol	> 32	> 32	4–128 (6)
Ciprofloxacin	> 4	> 4	0.125–16 (8)
Daptomycin	> 4	> 8	0.25–32 (8)
Erythromycin	> 4	> 4	1–128 (8)
Gentamicin	> 64	> 32	8–1024 (8)
Linezolid	> 4	> 4	0.5–64 (8)
Quinopristin/Dalfopristin	> 1	> 1	0.5-64 (8)
Teicoplanin	> 2	> 2	0.5–64 (8)
Tetracycline	> 4	> 4	1–128 (8)
Tigecycline	> 0.25	> 0.25	0.03–4 (8)
Vancomycin	> 4	> 4	1–128 (8)