



## DENMARK

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

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

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

IN 2007

**INFORMATION ON THE REPORTING AND MONITORING SYSTEM**Country: **Denmark**Reporting Year: **2007****Institutions and laboratories involved in reporting and monitoring:**

Laboratory name	Description	Contribution
National Food Institute, Technical University of Denmark (DTU Food)	The National Food Institute conducts research and gives advice on nutrition, food safety, environment and health. Our work involves the entire food chain within five primary disciplines: nutrition, chemistry, toxicology, microbiology and epidemiology. We carry out scientifically based risk assessments, give advice to Danish and international authorities and industry, monitor food consumption patterns and the national food safety situation, and provide diagnostic and analytical services. The National Food Institute is the national reference laboratory for chemical and microbial food safety and also serves as an international reference laboratory for the EU, WHO (World Health Organization) and EFSA (European Food Safety Authority) in a number of areas.	The national reporting officer is employed at the Danish Zoonosis Centre at The national Food Institute. Contributing with data and text.

Danish Veterinary and Food administrations (DVFA)	The Danish Veterinary and Food Administration (DVFA) is part of the Ministry of Family and Consumer Affairs. DVFA deals with food safety and health from farm to fork. The head office is situated just north of Copenhagen and handles development, co-ordination and the formation of rules and regulations. Food control and veterinary inspections are handled by three regional veterinary and food control centres. The regional centres are local knowledge centres on food issues and give information and advice to consumers, livestock owners, enterprises and practising veterinarians.	Data
Statens Serum Institut (SSI)	Statens Serum Institut is an enterprise under the Danish Ministry for Interior and Health and the Institute's duties partly integrated in the national Danish health services. Statens Serum Institut prevents and controls infectious diseases and congenital disorders.	Data
National Veterinary Institute, technical University of Denmark (DTU Vet)	The National Veterinary Institute conducts research and gives advice on animal diseases. We carry out scientifically based risk assessments, give advice to Danish and international authorities and provide diagnostic and analytical services. The Institute covers all disciplines relating to infectious diseases: pathology, bacteriology, virology, parasitology, immunology, vaccinology, serology and epidemiology. The National Veterinary Institute serves as an international reference laboratory for the EU and OIE (World Organisation for Animal Health) and gives advice EFSA (European Food Safety Authority) in a number of areas.	Data

<p>Danish Plant Directorate (PDir)</p>	<p>The Danish Plant Directorate is a government institution under the Danish Ministry of Food, Agriculture and Fisheries. The Danish Plant Directorate concentrates on the first stage of the food chain from farm to fork. The Danish Plant Directorate lays down regulations, performs administrative functions, carries out inspections, prepares legislation, provides service to the authorities and prepares policies in its fields of competence.</p>	<p>Data</p>
<p>Danish Poultry Council (DPC)</p>	<p>Danish Poultry Council (DPC) is an umbrella organisation for the Danish poultry industry and DPC coordinates the veterinary conditions for the table egg production and the broiler production. DCP is responsible for the contact with the authorities.</p>	<p>Data</p>

## **PREFACE**

This report is submitted to the European Commission in accordance with Article 9 of Council Directive 2003/99/EC<sup>1</sup>. 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 Denmark during the year 2007. The information covers the occurrence of these diseases and agents in humans, animals, foodstuffs and in some cases also in feedingstuffs. In addition the report includes data on antimicrobial resistance in some zoonotic agents and commensal bacteria as well as information on epidemiological investigations of foodborne outbreaks. Complementary data on susceptible animal populations in the country is also given.

The information given covers both zoonoses that are important for the public health in the whole European Community as well as zoonoses, which are relevant on the basis of the national epidemiological situation.

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

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

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

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<sup>1</sup> Directive 2003/99/EC of the European Parliament and of the Council of 12 December 2003 on the monitoring of zoonoses and zoonotic agents, amending Decision 90/424/EEC and repealing Council Directive 92/117/EEC, OJ L 325, 17.11.2003, p. 31

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## 1. ANIMAL POPULATIONS

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

### **A. Information on susceptible animal population**

#### **Sources of information:**

Data source: The Central husbandry Register, administered under the ministry of Family and Consumer Affairs. All farmers in Denmark are obliged to report changes in production type and herds size to this database.

#### **Dates the figures relate to and the content of the figures:**

Average number of livestock and herds in 2007.

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

Not all farmers remember to report changes in production type and herds size, even though they are obliged to. So the database is in need of an update.

**Table Susceptible animal populations**

\* Only if different than current reporting year

Animal species	Category of animals	Number of herds or flocks		Number of slaughtered animals		Livestock numbers (live animals)		Number of holdings	
			Year*		Year*		Year*		Year*
Cattle (bovine animals)	in total	24883		511600		1545000			
Gallus gallus (fowl)	parent breeding flocks for egg production line (1)	6						5	
	parent breeding flocks for meat production line (2)	98						17	
	breeding flocks for meat production line - in total	152						46	
	laying hens	336				2900000		245	
	broilers	570		103236000		14239000		232	
	breeding flocks for egg production line - in total	12						7	
	Goats	in total	3217		1959		20022		
Pigs	in total	12342		21391000		13900000			
Sheep	in total	9818		87600		180641			
Solipeds, domestic horses	- in total			2500					
Turkeys	in total	46				454471			

(1): This is the Danish capacity. The TOTAL number of flocks during the production period in 2007 is 12 flocks

(2): This is the Danish capacity. The TOTAL number of flocks during the production period in 2007 is 258

**Footnote**

In the "number of herds or flocks" and the "livestock numbers" columns data reported represent the Danish capacity on dec 31st 2007 and not the total number of flocks/ herds. This is stated in the prevalence tables.

## **2. INFORMATION ON SPECIFIC ZOOSES AND ZOO NOTIC AGENTS**

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

## **2.1. SALMONELLOSIS**

### **2.1.1. General evaluation of the national situation**

#### **A. General evaluation**

##### **History of the disease and/ or infection in the country**

The number of human Salmonella infections in Denmark began to rise in the mid 80's. During the following years three distinct waves of salmonellosis related to the consumption of broiler meat (peaking in 1988), pork (peaking in 1994) and table eggs (peaking in 1997) were observed. Since 1997, a steadily decreasing trend has been seen. This reduction in the incidence of human cases may to a large extent be attributed to the large-scale national efforts aimed at reducing the occurrence of Salmonella in broilers, pigs and table-egg layers raised in Denmark.

In 2006, 1,658 laboratory-confirmed episodes of salmonellosis were reported corresponding to 30.5 cases per 100,000 inhabitants. This represents an increase of 8% in the number of infections compared to 2004, and a decrease of 7% compared to 2005. Overall, the number of infections with *S. Enteritidis* and *S. Typhimurium* has been stable for the past three years.

To obtain a better understanding of the dynamics of the occurrence of human Salmonella infections, a mathematical model to estimate the contribution of major animal and food sources to human infections with Salmonella has been applied. This model is based on a comparison of the number of human cases caused by different Salmonella sero- and phage types with the prevalence of Salmonella types isolated from the various animal-food sources.

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

In 2007, 1649 laboratory-confirmed episodes of salmonellosis were reported corresponding to 30.2 cases per 100,000 inhabitants. This is similar to the 2006 findings.

In 2007, there were 566 reported episodes of *S. Enteritidis* corresponding to an incidence of 10.4 per 100,000. There were 343 reported episodes of *S. Typhimurium* corresponding to an incidence of 6.3 per 100,000 inhabitants. This is a 17% decrease compared to 2006.

Other Salmonella serotypes accounted for 740 episodes, an increase of 8% compared to 2006 and corresponding to an incidence of 13.6 per 100,000 inhabitants.

The level of antimicrobial resistance in Salmonella from the tested animal population and meat products, were similar to previous years.

The number of cases reported as travel-related is known to be underreported. Before 2003, the number of travel-related cases among patients with unknown travel history was estimated using data from cases with a known travel history (i.e. responding yes or no to travel). However, from 2003 and onwards, this approach proved extremely difficult, since the majority (approximately 70% in 2005) of patients has no travel information. Consequently, the estimate of the total number of travel-associated cases is very uncertain and should be interpreted with care.

By the end of 2007 an interview survey was initiated in order to get better information about travel history of human cases

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

The Salmonella surveillance programmes for poultry, swine and cattle have clearly showed that there

is a strong correlation between the number of human cases and infection level in the herds.

## 2.1.2. Salmonellosis in humans

### A. Salmonellosis in humans

#### **Reporting system in place for the human cases**

Salmonella spp. is notifiable through the laboratory surveillance system. Cases diagnosed by a clinical microbiological laboratory are reported to the Unit of Gastrointestinal Infections at Statens Serum Institut (SSI).

#### **Case definition**

A case is considered Salmonella-positive when Salmonella has been isolated in samples from this person, or a clinical case with an epidemiological link to a culture confirmed case.

#### **Diagnostic/ analytical methods used**

Bacteriology followed by serotyping and sometimes genotyping

#### **Notification system in place**

Cases of notifiable zoonotic enteric pathogens diagnosed by a clinical microbiological laboratory are reported through the laboratory surveillance system to the Unit of Gastrointestinal Infections at SSI. The laboratories must report positive results to the SSI within one week. Further, all Salmonella isolates are sent to the reference laboratory at SSI for further typing. The results are recorded in the National Register of Enteric Pathogens (NREP) maintained by SSI. Positive cases are recorded as episodes, i.e. each person-infectious agent combination is only registered once in a six-month period.

#### **History of the disease and/ or infection in the country**

The number of human Salmonella infections in Denmark began to rise in the mid 80's. During the following years three distinct waves of salmonellosis related to the consumption of broiler meat (peaking in 1988), pork (peaking in 1994) and table eggs (peaking in 1997) were observed. Since 1997, a steadily decreasing trend has been seen. This reduction in the incidence of human cases may to a large extent be attributed to the large-scale national efforts aimed at reducing the occurrence of Salmonella in broilers, pigs and table-egg layers raised in Denmark.

#### **Results of the investigation**

In 2007, 1649 laboratory-confirmed episodes of salmonellosis were reported corresponding to 30.2 cases per 100,000 inhabitants. This is similar to the 2006 findings.

In 2007, there were 566 reported episodes of *S. Enteritidis* corresponding to an incidence of 10.4 per 100,000. There were 343 reported episodes of *S. Typhimurium* corresponding to an incidence of 6.3 per 100,000 inhabitants. This is a 17% decrease compared to 2006.

Other Salmonella serotypes accounted for 740 episodes, an increase of 8% compared to 2006 and corresponding to an incidence of 13.6 per 100,000 inhabitants.

#### **Relevance as zoonotic disease**

The Salmonella surveillance programmes for poultry, swine and cattle have clearly showed that there

is a strong correlation between the number of human cases and infection level in the herds.

### **2.1.3. Salmonella in foodstuffs**

#### **A. Salmonella spp. in eggs and egg products**

##### **Monitoring system**

###### **Sampling strategy**

The national Salmonella control programme for eggs was implemented in 1996-1997. Eggs are only tested at the producer level. In Denmark the breeder and layer flocks are tested many times during the production period.

##### **Preventive measures in place**

All shell eggs are distributed in a cold chain (not exceeding 12°C) and kept refrigerated at retail; eggs are generally refrigerated in private homes.

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

The level of Salmonella-contaminated shell eggs has not been measured from the initiation of the control program. However, a year before the program began, a study of 13,000 eggs from different types of production determined the level to be 1 per 1,000 eggs (20% of the contaminated eggs harbored *S. Enteritidis*)

#### **B. Salmonella spp. in broiler meat and products thereof**

##### **Monitoring system**

###### **Sampling strategy**

###### **At slaughterhouse and cutting plant**

The mandatory examination of end-products was carried out through random sampling of batches of chicken cuts shortly prior to packaging. A batch is defined as the amount of meat from animals slaughtered between two cleanings and disinfections of the processing equipment.

###### **At meat processing plant**

Monitoring for zoonotic pathogens in foodstuffs is coordinated both at the regional and at the central level of administration. Each RVFCA is responsible for the control carried out in its own region, and the DVFA is responsible for the regulation, control strategy and the surveillance at the overall national level.

###### **At retail**

Monitoring for zoonotic pathogens in foodstuffs is coordinated both at the regional and at the central level of administration. Each RVFCA is responsible for the control carried out in its own region, and the DVFA is responsible for the regulation, control strategy and the surveillance at the overall national level.

### **Frequency of the sampling**

#### **At slaughterhouse and cutting plant**

Every batch is sampled

#### **At meat processing plant**

Other: Depend on the survey

#### **At retail**

Other: Depend on the survey

### **Type of specimen taken**

#### **At slaughterhouse and cutting plant**

Fresh meat

#### **At meat processing plant**

Other: depend on the survey

#### **At retail**

Other: Depend on the survey

### **Methods of sampling (description of sampling techniques)**

#### **At slaughterhouse and cutting plant**

Random sampling of batches of broiler meat cuts shortly prior to packaging. 5 g subsample are collected from a sample (meat cuts), if possible with skin. Samples are pooled in 25 g for AM positive batches and 50 g for AM negative batches

#### **At meat processing plant**

Depend on the survey

#### **At retail**

Depend on the survey

### **Definition of positive finding**

#### **At slaughterhouse and cutting plant**

A sample is considered positive when Salmonella has been isolated

#### **At meat processing plant**

A sample is considered positive when Salmonella has been isolated

#### **At retail**

A sample is considered positive when Salmonella has been isolated

### **Diagnostic/ analytical methods used**

#### **At slaughterhouse and cutting plant**

Other: Depend on the laboratory

#### **At meat processing plant**

Other: Depend on the survey

#### **At retail**

Other: Depend on the survey

### **Control program/ mechanisms**

#### **The control program/ strategies in place**

The national Salmonella control programme for poultry implemented in 1988 and adjusted in 1996 and 2000. The Salmonella surveillance programme is mandatory.

### **Measures in case of the positive findings or single cases**

When Salmonella is detected in a sample, the DFVA must be notified and actions will be taken to identify the source.

The Danish surveillance programme for multi-drug resistant S. Typhimurium DT104 (MRDT104) has been in place since 1998. The programme mandates a zero-tolerance for this pathogen in all foods. Meat imported from 3rd countries and the EU is randomly tested for Salmonella. Sample analysis is performed at the RVFCA. If MRDT104 is detected the batch is rejected or heat-treated.

2006, in November the sampling plan for this programme was changed, as the programme is now a part of the project on intensified control for Salmonella and Campylobacter in Danish and imported meat

### **Notification system in place**

The Salmonella surveillance programme is mandatory and detection of Salmonella sp. is notifiable to the DFVA

### **Results of the investigation**

In 2007, the monthly percentage of positive batches ranged from 0% to 4.7% with an annual prevalence of 1.2% out of 828 batches. This is a decrease compared to 2006 (1.9% positive)

## **C. Salmonella spp. in turkey meat and products thereof**

### **Monitoring system**

#### **Sampling strategy**

##### **At slaughterhouse and cutting plant**

The mandatory examination of end-products was carried out through random sampling of batches of Turkey cuts shortly prior to packaging. A batch is defined as the amount of meat from animals slaughtered between two cleanings and disinfections of the processing equipment.

Since 2004 very few turkeys are slaughtered in Denmark, as the only major turkey slaughterhouse closed. Turkeys raised in Denmark were hereafter transported abroad for slaughter.

#### **At meat processing plant**

Monitoring for zoonotic pathogens in foodstuffs is coordinated both at the regional and at the central level of administration. Each Regional Veterinary and Food Control Authority (RVFCA) is responsible for the control carried out in its own region, and the Danish Veterinary and Food Administration (DVFA) is responsible for the regulation, control strategy and the surveillance at the overall national level.

#### **At retail**

Monitoring for zoonotic pathogens in foodstuffs is coordinated both at the regional and at the central level of administration. Each Regional Veterinary and Food Control Authority (RVFCA) is responsible for the control carried out in its own region, and the Danish Veterinary and Food Administration (DVFA) is responsible for the regulation, control strategy and the surveillance at the overall national level.

### **Frequency of the sampling**

#### **At slaughterhouse and cutting plant**

Every batch is sampled

#### **At meat processing plant**

Other: Depend on the survey

#### **At retail**

Other: Depend on the survey

### **Type of specimen taken**

#### **At slaughterhouse and cutting plant**

Fresh meat

#### **At meat processing plant**

Other: Depend on the survey

#### **At retail**

Other: Depend on the survey

### **Methods of sampling (description of sampling techniques)**

### **At slaughterhouse and cutting plant**

Random sampling of batches of Turkey cuts shortly prior to packaging.  
5 g subsample are collected from a sample (meat cuts), if possible with skin. Samples are pooled in 25 g for AM positive batches and 50 g for AM negative batches

### **At meat processing plant**

Depend on survey

### **At retail**

Depend on survey

## **Definition of positive finding**

### **At slaughterhouse and cutting plant**

A sample is considered positive when Salmonella has been isolated.

### **At meat processing plant**

Depend on survey.

### **At retail**

depend on survey

## **Diagnostic/ analytical methods used**

### **At meat processing plant**

Other: Depend on survey

### **At retail**

Other: Depend on survey

## **Control program/ mechanisms**

### **The control program/ strategies in place**

mandatory PM examination.

## **Measures in case of the positive findings or single cases**

When Salmonella is detected in a sample, the DFVA must be notified and actions will be taken to identify the source.

The Danish surveillance programme for multi-drug resistant *S. Typhimurium* DT104 (MRDT104) has been in place since 1998. The programme mandates a zero-tolerance for this pathogen in all foods. Meat imported from 3rd countries and the EU is randomly tested for Salmonella. Sample analysis is performed at the RVFCA. If MRDT104 is detected the batch is rejected or heat-treated.

2006, in November the sampling plan for this programme was changed, as the programme is now a part of the project on intensified control for Salmonella and Campylobacter in Danish and imported

meat

### **Notification system in place**

The Salmonella surveillance programme is mandatory and detection of Salmonella spp. is notifiable to the Danish Food and Veterinary Administration (DFVA).

### **Results of the investigation**

Since 2004, turkeys are no longer slaughtered commercially in Denmark, as the only major turkey slaughterhouse closed. Most turkeys raised in Denmark are hereafter transported abroad for slaughter. In 2006, 32 flocks were tested for Salmonella and all flocks were negative

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

A part of the Danish produced turkey meat is re-imported.

## **D. Salmonella spp. in pig meat and products thereof**

### **Monitoring system**

#### **Sampling strategy**

##### **At slaughterhouse and cutting plant**

Monitoring is based on swab samples taken from three designated areas of chilled half-carcasses. The numbers of swabs collected depend on the slaughterhouse capacity. If > 200 pigs are slaughtered per day 5 swabs are collected (pooled). If > 200 pigs are slaughtered per month 5 swabs (pooled) are collected per 200 slaughtered pigs. If 50-200 pigs are slaughtered per month 5 swabs (pooled) are collected per quarter. If < 50 pigs are slaughtered per month one swab is collected per quarter.

##### **At meat processing plant**

Monitoring for zoonotic pathogens in foodstuffs is coordinated both at the regional and at the central level of administration. Each Regional Veterinary and Food Control Authority (RVFCA) is responsible for the control carried out in its own region, and the Danish Veterinary and Food Administration (DVFA) is responsible for the regulation, control strategy and the surveillance at the overall national level.

##### **At retail**

Monitoring for zoonotic pathogens in foodstuffs is coordinated both at the regional and at the central level of administration. Each Regional Veterinary and Food Control Authority (RVFCA) is responsible for the control carried out in its own region, and the Danish Veterinary and Food Administration (DVFA) is responsible for the regulation, control strategy and the surveillance at the overall national level.

### **Frequency of the sampling**

#### **At slaughterhouse and cutting plant**

Other: Depend on the slaughterhouse capacity

**At meat processing plant**

Other: Depend on the survey

**At retail**

Other: Depend on the survey

**Type of specimen taken**

**At slaughterhouse and cutting plant**

Surface of carcass

**At meat processing plant**

Other: Depend on the survey

**At retail**

Other: Depend on the survey

**Methods of sampling (description of sampling techniques)**

**At slaughterhouse and cutting plant**

The carcass are swabed in three designated areas, the jaw, breast and ham using a 16-layers sterile 10x10 cm gauze. Each area covering 10x10cm.

**At meat processing plant**

Depend on the survey

**At retail**

Depend on the survey

**Definition of positive finding**

**At slaughterhouse and cutting plant**

A sample is considered positive when Salmonella has been isolated

**At meat processing plant**

A sample is considered positive when Salmonella has been isolated

**At retail**

A sample is considered positive when Salmonella has been isolated

**Diagnostic/ analytical methods used**

**At slaughterhouse and cutting plant**

Other: Depend on the laboratory

**At meat processing plant**

Other: Depend on the survey

**At retail**

Other: Depend on the survey

**Control program/ mechanisms**

**The control program/ strategies in place**

The Salmonella surveillance programme is mandatory and detection of Salmonella spp. is notifiable to the Danish Food and Veterinary Administration.

**Recent actions taken to control the zoonoses**

None

**Suggestions to the Community for the actions to be taken**

None

**Measures in case of the positive findings or single cases**

When Salmonella is detected in a sample, the DFVA must be notified and actions will be taken to identify the source.

The Danish surveillance programme for multi-drug resistant S. Typhimurium DT104 (MRDT104) has been in place since 1998. The programme mandates a zero-tolerance for this pathogen in all foods. Meat imported from 3rd countries and the EU is randomly tested for Salmonella. Sample analysis is performed at the RVFCA. If MRDT104 is detected the batch is rejected or heat-treated.

2006, in November the sampling plan for this programme was changed, as the programme is now a part of the project on intensified control for Salmonella and Campylobacter in Danish and imported meat

**Notification system in place**

The Salmonella surveillance programme is mandatory and detection of Salmonella spp. is notifiable to the Danish Food and Veterinary Administration.

**Results of the investigation**

In 2007, 27,290 swab samples were collected and pooled and the prevalence of Salmonella in single swab samples was estimated to be 1,1% (When determining the prevalence of pooled samples, the loss of sensitivity and the probability of more than one sample being positive in each pool are taken into consideration when estimating the animal prevalence).

An additional 253 samples were collected from slaughterhouses with a small production and were analysed individually. Two of these samples were positive for Salmonella. Based on results from the

previous 12 months, the moving average varied between 0,94 and 1,09 in 2007. As in previous years, the most common serotypes observed were S. Typhimurium, S. Derby and S. Infantis.

## **E. Salmonella spp. in bovine meat and products thereof**

### **Monitoring system**

#### **Sampling strategy**

##### **At slaughterhouse and cutting plant**

Monitoring is based on swab samples taken from three designated areas of chilled half-carcasses.

##### **At meat processing plant**

Monitoring for zoonotic pathogens in foodstuffs is coordinated both at the regional and at the central level of administration. Each Regional Veterinary and Food Control Authority (RVFCA) is responsible for the control carried out in its own region, and the Danish Veterinary and Food Administration (DVFA) is responsible for the regulation, control strategy and the surveillance at the overall national level.

##### **At retail**

Monitoring for zoonotic pathogens in foodstuffs is coordinated both at the regional and at the central level of administration. Each RVFCA is responsible for the control carried out in its own region, and the DVFA is responsible for the regulation, control strategy and the surveillance at the overall national level.

### **Frequency of the sampling**

#### **At slaughterhouse and cutting plant**

Other: >200 animals/ day = 5 swaps/ day. 50<animals<200/ day = 5 swaps/ 200 animal. 50<animal<200/ month = 5 samples/ quarter. 50>animals/ month= 1 sample/ month

#### **At meat processing plant**

Other: Depend on the survey

#### **At retail**

Other: Depend on the survey

### **Type of specimen taken**

#### **At slaughterhouse and cutting plant**

Surface of carcass

#### **At meat processing plant**

Other: Depend on the survey

**At retail**

Other: Depend of the survey

**Methods of sampling (description of sampling techniques)**

**At slaughterhouse and cutting plant**

The carcass are swabed in three designated areas (the rump, breast and flank) using a 16-layers sterile 10x10 cm gauze. Each area covering 10x10cm.

**At meat processing plant**

Depend on the survey

**At retail**

Depend on the survey

**Definition of positive finding**

**At slaughterhouse and cutting plant**

A sample is considered positive when Salmonella has been isolated

**At meat processing plant**

A sample is considered positive when Salmonella has been isolated

**At retail**

A sample is considered positive when Salmonella has been isolated

**Diagnostic/ analytical methods used**

**At slaughterhouse and cutting plant**

Other: Depend on the laboratory

**At meat processing plant**

Other: Depend on the survey

**At retail**

Other: Depend on the survey

**Control program/ mechanisms**

**The control program/ strategies in place**

The Salmonella surveillance programme is mandatory and detection of Salmonella spp. is notifiable to the DFVA.

### **Recent actions taken to control the zoonoses**

None

### **Suggestions to the Community for the actions to be taken**

None

### **Measures in case of the positive findings or single cases**

When Salmonella is detected in a sample, the DFVA must be notified and actions will be taken to identify the source.

The Danish surveillance programme for multi-drug resistant S. Typhimurium DT104 (MRDT104) has been in place since 1998. The programme mandates a zero-tolerance for this pathogen in all foods. Meat imported from 3rd countries and the EU is randomly tested for Salmonella. Sample analysis is performed at the RVFCA. If MRDT104 is detected the batch is rejected or heat-treated.

2006, in November the sampling plan for this programme was changed, as the programme is now a part of the project on intensified control for Salmonella and Campylobacter in Danish and imported meat

### **Notification system in place**

The Salmonella surveillance programme is mandatory and detection of Salmonella spp. is notifiable to the DFVA.

### **Results of the investigation**

In 2007, 7350 samples were pooled and the prevalence of Salmonella was estimated to be 0.5% after using the conversion factor

(When determining the prevalence of pooled samples, the loss of sensitivity and the probability of more than one sample being positive in each pool are taken into consideration when estimating the animal prevalence).

An additional 174 samples were collected from slaughterhouses with a smaller production and analysed individually. All samples were negative. In total, S. Dublin was isolated from 68% of the positive samples

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

**Table Salmonella in poultry meat and products thereof**

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
<b>Meat from broilers (Gallus gallus) fresh</b>								
- at slaughterhouse (1)	DVFA/ DPC	slaughter batch	25g/ 50g	828	10			10

(1) : When the batch are from a AM-positive flock 50g sample are taken. If the batch are from a AM-negative flock 25 g are taken

**Table Salmonella in red meat and products thereof**

	Source of information														
	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Derby	S. Agona	S. Worthington	S. Livingstone	S. Panama	S. Pomona	S. Infantis	S. Dublin
Meat from pig fresh - at slaughterhouse	DVFA	single	27290	185	1	77	37	54	1	1	2	1	1	10	
Meat from bovine animals fresh - at slaughterhouse	DVFA/ DPC	animal	7350	22		2	5								15

## 2.1.4. Salmonella in animals

### A. Salmonella spp. in Gallus gallus - breeding flocks for egg production and flocks of laying hens

#### Monitoring system

##### Sampling strategy

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

The program is based on the principle of top-down eradication, ensuring freedom from Salmonella from the top of the broiler-breeding pyramid down. Randomly collected dead day-old chicks, blood and faecal samples (primarily sock/ boot samples) are collected in each flock. The control of breeding flocks is identical to the control program for broiler breeders.

##### **Laying hens flocks**

At the hatchery, wet dust are collected from each hatch. Randomly collected dead day-old chicks, blood and faecal samples (primarily sock/ boot samples) are collected in each flock.

#### Frequency of the sampling

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

Every flock is sampled

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

Other: Parents-Per unit: week: 1,2,4,8 and 2 weeks prior to moving. Grand parents-Per unit: week: 4,8 and 2 weeks prior to moving

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

Other: Grandparents (per flock): Every 2. week. Parents (per unit): Every week

##### **Laying hens: Day-old chicks**

Every flock is sampled

##### **Laying hens: Rearing period**

Every flock is sampled

##### **Laying hens: Production period**

Every flock is sampled

### **Type of specimen taken**

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

Internal linings of delivery boxes

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

Socks/ boot swabs

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

Other: internal linings of delivery boxes and socks/ boot swabs

**Laying hens: Day-old chicks**

Other: Dead chicks and crate material

**Laying hens: Rearing period**

Socks/ boot swabs

**Laying hens: Production period**

Socks/ boot swabs

**Laying hens: At slaughter**

Other: Meat cuttings

### **Methods of sampling (description of sampling techniques)**

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

Per delivery: 5 transport crates from one delivery: crate liners (>1m<sup>2</sup> in total) or swab samples (>1m<sup>2</sup> in total). Analysed as one pooled sample.

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

1st and 2nd week (Per house): 2 pairs of sock samples / boot swabs. Analysed as one pooled sample. Cage birds: 60 samples of fresh droppings (1g). Analysed as one pool. (Parents flocks only)

4th and 8th week (Per house): 2 pairs of sock samples / boot swabs. Analysed as one pooled sample. Cage birds: 60 samples of fresh droppings (1g). Analysed as one pool. (Grand parent and Parent flocks)

2 weeks before moving (Per house): 2 pairs of sock samples / boot swabs. Analysed as

one pooled sample. Cage birds: 60 samples of fresh droppings (1g). Analysed as one pool. (Grand parent and Parent flocks)

### **Breeding flocks: Production period**

Every two weeks (Per flock): Hatcher basket liners from 5 baskets (>1m<sup>2</sup> in total) or 10g of broken eggshells from each of 25 hatcher baskets (reduced to 25 g sub-sample)h. Analysed as one pooled sample. (Grandparent and Parent flocks)

After each hatching when the above sampling is not carried out (Per unit): Wet dust samples. Up to 4 hatchers of the same flock can be pooled (Grandparent and Parent flocks).

Every week (Per unit): 2 pairs of sock samples / boot swabs. Analysed as one pooled sample (Parent flock only)

0-4 Weeks prior to moving and 0-8 weeks prior to slaughter (Per flock):5 pairs of sock samples / boot swabs. Analysed as two pooled samples. Cage birds: 3x60 samples of fresh droppings (1g). Analysed as three pools (Grandparent and Parent flocks).

After positive findings (Per flock): 5 pairs of sock samples / boot swabs. Analysed as two pooled samples. Cage birds: 3x60 samples of fresh droppings (1g). Analysed as three pools. (Grand parent and Parent flocks)

### **Laying hens: Day-old chicks**

Day-old (Per delivery): 10 samples of crate material and 20 dead chicks.

### **Laying hens: Rearing period**

Week 3 (per flock): 5 pairs of sock samples / boot swabs. Analysed as two pooled samples. Cage birds: 5x60 samples of fresh droppings (1g). Analysed as three pooled samples.

Week 12 (Per flock): Flocks of 500 or more birds: 60 blood samples and 5 pairs of sock samples or 300 faecal samples if sock samples cannot be collected

Flocks of 200-499 birds: 55 blood samples and 5 pairs of sock sample

Flocks of less than 200 birds: Blood samplesf and 2 pairs of sock samples or 60 faecal samples

### **Laying hens: Production period**

2 pairs of sock samples / boot swabs. Analysed as one pooled sample. Cage birds: 60 samples of fresh drop-pings (1g). Analysed as one pool. 60 eggs (serology)

Eggs from barnyards and hobby flocks are tested 3 times a year per flock

### **Laying hens: At slaughter**

Different types of meat cuts from each batch are tested as close to the packing of meat cuttings as possible.

## **Case definition**

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

A sample is considered positive when Salmonella has been isolated.

When Salmonella are isolated from the samples taken during the routine sampling of a flock, the flock is put under suspicion. Thereafter, 60 eggs and 60 chickens are collected for further investigation and the flock is considered positive if two or more these samples have OD-values over 40 or Salmonella is isolated.

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

A sample is considered positive when Salmonella has been isolated or when the Salmonella OD-value is over 40.

When two or more samples have OD-values over 40 or Salmonella has been isolated from the samples taken during the routine sampling of a flock, the flock is put under suspicion. Thereafter, 60 eggs and 60 chickens are collected for further investigation. The flock is considered positive if two or more these samples have OD-values over 40 or if Salmonella is isolated.

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

A sample is considered positive when Salmonella has been isolated.

When Salmonella are isolated from the samples taken during the routine sampling of a flock, the flock is put under suspicion. Thereafter, 60 eggs and 60 chickens are collected for further investigation and the flock is considered positive if two or more these samples have OD-values over 40 or Salmonella is isolated.

**Laying hens: Day-old chicks**

A sample is considered positive when Salmonella has been isolated.

When Salmonella are isolated from the samples taken during the routine sampling of a flock, the flock is put under suspicion. Thereafter, 60 eggs and 60 chickens are collected for further investigation and the flock is considered positive if two or more these samples have OD-values over 40 or Salmonella is isolated.

**Laying hens: Rearing period**

A sample is considered positive when Salmonella has been isolated or when the Salmonella OD-value is over 40.

When two or more samples have OD-values over 40 or Salmonella has been isolated from the samples taken during the routine sampling of a flock, the flock is put under suspicion. Thereafter, 60 eggs and 60 chickens are collected for further investigation. The flock is considered positive if two or more these samples have OD-values over 40 or if Salmonella is isolated.

**Laying hens: Production period**

A sample is considered positive when Salmonella has been isolated or when the Salmonella OD-value is over 40.

When two or more samples have OD-values over 40 or Salmonella has been isolated from the samples taken during the routine sampling of a flock, the flock is put under

suspicion. Thereafter, 60 eggs and 60 chickens are collected for further investigation. The flock is considered positive if two or more these samples have OD-values over 40 or if Salmonella is isolated.

**Laying hens: At slaughter**

A sample is considered positive when Salmonella has been isolated. When Salmonella are isolated from the samples taken during the routine sampling of a flock, the flock is put under suspicion. Thereafter, 60 eggs and 60 chickens are collected for further investigation and the flock is considered positive if two or more these samples have OD-values over 40 or Salmonella is isolated.

**Diagnostic/ analytical methods used**

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

Bacteriological method: Depend on the laboratory

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

Bacteriological method: Depend on the laboratory

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

Bacteriological method: Depend on the laboratory

**Laying hens: Day-old chicks**

Bacteriological method: Depend on the laboratory

**Laying hens: Rearing period**

Other: Bacteriological and immunology

**Laying hens: Production period**

Other: Bacteriology and immunology

**Vaccination policy**

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

No salmonella vaccinations occur.

**Laying hens flocks**

No salmonella vaccinations occur.

**Control program/ mechanisms**

### **The control program/ strategies in place**

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

The first national salmonella control programme for egg production was implemented in 1996-1997 and has been adjusted over the years. The programme is mandatory.

#### **Laying hens flocks**

The first national salmonella control programme for egg production was implemented in 1996-1997 and has been adjusted over the years. The programme is mandatory.

### **Measures in case of the positive findings or single cases**

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

Confirmed-positive flocks are destroyed.

#### **Laying hens flocks**

All eggs from suspect or confirmed- *S. Enteritidis* and *S. Typhimurium* positive layer flocks are pasteurized and infected flocks are heat treated during slaughter

### **Notification system in place**

The Salmonella surveillance programme is mandatory and detection of *Salmonella* spp. is notifiable to the Danish Food and Veterinary Administration (DFVA).

### **Results of the investigation**

None of the 11 examined central rearing flocks, 12 examined adult breeding flocks or 326 pullet rearing flocks were positive for *Salmonella* in 2007.

Since the introduction of the surveillance programme in the table-egg production line in 1996, the percentage of positive flocks has declined significantly to almost zero in 2006. In the central rearing production only two positive flocks have been found since 1998 and no positive adult breeder flocks have been found since 1999

In flocks producing eggs for egg-packing centres, *Salmonella* was found in 1.0% (5 flocks) of the flocks examined, compared to 0,4% in 2006, 1,1% in 2005 and 0.8% in 2004. In total, 146 organic flocks, 155 free-range flocks, 146 battery flocks, 6 net flocks and 56 deep-litter flocks were examined.

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

The proportion of layer flocks infected with *Salmonella*, notably *S. Enteritidis*, has been markedly reduced since the initiation of the control program in 1997. More than 7% of layer flocks tested positive for *Salmonella* in the first year of the program (1998) versus 0.2% in 2007.

### **Additional information**

One house can contain more than one flock depending on the size.

Barnyard and hobby flocks are tested three times a year. Legislation demands that eggs from the barnyard flocks may be sold directly from the premises only. Testing of flocks producing eggs for

consumption within the household of the flock owner is not required as part of the Salmonella control programme, but may be done voluntarily.

## **B. Salmonella spp. in Gallus gallus - breeding flocks for meat production and broiler flocks**

### **Monitoring system**

#### **Sampling strategy**

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

The program is based on the principle of top-down eradication, ensuring freedom from Salmonella from the top of the broiler-breeding pyramid down. Randomly collected dead day-old chicks, meconium, blood and faecal samples (primarily sock/ boot samples) are collected at the farm in each breeding flock.

##### **Broiler flocks**

Randomly collected faecal samples (primarily sock/ boot samples) are collected at the farm in each broiler flock before slaughter.

#### **Frequency of the sampling**

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

Every flock is sampled

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

Other: Parents-Per unit: week: 1,2,4,8 and 2 weeks prior to moving. Grand parents-Per unit: week: 4,8 and 2 weeks prior to moving

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

Other: Grandparents (per flock): Every 2. week. Parents (per unit): Every week

##### **Broiler flocks: Before slaughter at farm**

1-3 weeks prior to slaughter

##### **Broiler flocks: At slaughter (flock based approach)**

Every flock is sampled

#### **Type of specimen taken**

##### **Breeding flocks (separate elite, grand parent and parent flocks when**

**necessary): Day-old chicks**

Internal linings of delivery boxes

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

Socks/ boot swabs

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

Other: internal linings of delivery boxes and socks/ boot swabs

**Broiler flocks: Before slaughter at farm**

Socks/ boot swabs

**Broiler flocks: At slaughter (flock based approach)**

Other: meat cuttings

**Methods of sampling (description of sampling techniques)**

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

Per delivery: 5 transport crates from one delivery: crate liners (>1m<sup>2</sup> in total) or swab samples (>1m<sup>2</sup> in total). Analysed as one pooled sample.

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

1st and 2nd week (Per unit): 2 pairs of sock samples / boot swabs. Analysed as one pooled sample. Cage birds: 60 samples of fresh droppings (1g). Analysed as one pool. (Parents flocks only)

4th and 8th week (Per unit): 2 pairs of sock samples / boot swabs. Analysed as one pooled sample. Cage birds: 60 samples of fresh droppings (1g). Analysed as one pool. (Grand parent and Parent flocks)

2 weeks before moving (Per unit): 2 pairs of sock samples / boot swabs. Analysed as one pooled sample. Cage birds: 60 samples of fresh droppings (1g). Analysed as one pool. (Grand parent and Parent flocks)

**Breeding flocks: Production period**

Every two weeks (Per flock): Hatcher basket liners from 5 baskets (>1m<sup>2</sup> in total) or 10g of broken eggshells from each of 25 hatcher baskets (reduced to 25 g sub-sample)h. Analysed as one pooled sample. (Grandparent and Parent flocks)

After each hatching when the above sampling is not carried out (Per unit): Wet dust samples. Up to 4 hatchers of the same flock can be pooled (Grandparent and Parent flocks).

Every week (Per unit): 2 pairs of sock samples / boot swabs. Analysed as one pooled

sample (Parent flock only)

0-4 Weeks prior to moving and 0-8 weeks prior to slaughter (Per flock): 5 pairs of sock samples / boot swabs. Analysed as two pooled samples. Cage birds: 3x60 samples of fresh droppings (1g). Analysed as three pools (Grandparent and Parent flocks).

After positive findings (Per flock): 5 pairs of sock samples / boot swabs. Analysed as two pooled samples. Cage birds: 3x60 samples of fresh droppings (1g). Analysed as three pools. (Grand parent and Parent flocks)

#### **Broiler flocks: Day-old chicks**

#### **Broiler flocks: Before slaughter at farm**

2-3 weeks before slaughter (Per flock): 5 pairs of sock/ boot swabs. Analysed individually

#### **Broiler flocks: At slaughter (flock based approach)**

AM-negative batches: 4 pooled samples of 10 chicken cuts of 5g

AM-positive batches: 12 pooled samples of 5 chicken cuts of 5g

### **Case definition**

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

A sample is considered positive when Salmonella has been isolated.

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

A sample is considered positive when Salmonella has been isolated or when the Salmonella OD-value is over 40.

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

A sample is considered positive when Salmonella has been isolated.

#### **Broiler flocks: Day-old chicks**

A sample is considered positive when Salmonella has been isolated.

#### **Broiler flocks: Before slaughter at farm**

A sample is considered positive when Salmonella has been isolated.

### **Diagnostic/ analytical methods used**

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

Bacteriological method:

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

Other: Bacteriological and serological methods

**Broiler flocks: Before slaughter at farm**

Other: bacteriology and immunology

**Vaccination policy**

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

No salmonella vaccinations occur

**Broiler flocks**

No salmonella vaccinations occur

**Control program/ mechanisms**

**The control program/ strategies in place**

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

The national salmonella control programme for broiler production was implemented in 1988 and adjusted over the years. The programme is mandatory.

**Broiler flocks**

The national salmonella control programme for broiler production was implemented in 1988 and adjusted over the years. The programme is mandatory.

**Measures in case of the positive findings or single cases**

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

Breeding flocks infected with Salmonella Typhimurium or S. Enteritidis are destroyed or heat treated during slaughter

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

Breeding flocks infected with Salmonella Typhimurium or S. Enteritidis are destroyed or heat treated during slaughter

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

Breeding flocks infected with Salmonella Typhimurium or S. Enteritidis are destroyed or heat treated during slaughter

### **Broiler flocks: Day-old chicks**

Broiler flocks infected with Salmonella Typhimurium or S. Enteritidis are destroyed or heat treated during slaughter

### **Broiler flocks: Rearing period**

Broiler flocks infected with Salmonella Typhimurium or S. Enteritidis are destroyed or heat treated during slaughter

### **Broiler flocks: Before slaughter at farm**

Broiler flocks infected with Salmonella Typhimurium or S. Enteritidis are destroyed or heat treated during slaughter

### **Broiler flocks: At slaughter (flock based approach)**

Broiler flocks infected with Salmonella Typhimurium or S. Enteritidis are destroyed or heat treated during slaughter

### **Notification system in place**

The Salmonella surveillance programme is mandatory and detection of Salmonella spp. is notifiable to the Danish Food and Veterinary Administration (DFVA).

### **Results of the investigation**

No central rearing flocks were positive for Salmonella in 2007. Three adult breeding flocks were positive for Salmonella (1.2% of the flocks). One flock was infected with S. Typhimurium, one with S. typhimurium DT41 and one with S. Typhimurium DT104b.

In broiler flocks, the monthly percentage of positive flocks ranged from 0.3% to 3.0% with an annual prevalence of 1.7%. This is a decrease compared to the 2005 and 2000 level, and similar to the levels observed during the years 2001-2004

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

The proportion of Salmonella-infected broiler flocks has been markedly reduced since the initiation of the control program. During the first year of the programme (1988-1989) more than 65% of broiler flocks tested positive for Salmonella, versus less than 5% in 2000 and 1.2% in 2007.

## **C. Salmonella spp. in turkey - breeding flocks and meat production flocks**

### **Monitoring system**

#### **Sampling strategy**

##### **Meat production flocks**

Since 2004 very few turkey flocks are slaughtered in Denmark, as the only major turkey slaughterhouse closed. Turkeys raised in Denmark were hereafter transported abroad for slaughter.

### **Frequency of the sampling**

#### **Meat production flocks: Before slaughter at farm**

2-4 weeks prior to slaughter

### **Type of specimen taken**

#### **Meat production flocks: Before slaughter at farm**

Socks/ boot swabs

### **Methods of sampling (description of sampling techniques)**

#### **Meat production flocks: Before slaughter at farm**

5 sock/ boot swabs per flock

### **Case definition**

#### **Meat production flocks: Before slaughter at farm**

A sample is considered positive when Salmonella has been isolated.

### **Control program/ mechanisms**

#### **The control program/ strategies in place**

##### **Meat production flocks**

Mandatory AM examination

### **Measures in case of the positive findings or single cases**

When Salmonella is detected in a sample, the DFVA must be notified and actions will be taken to identify the source.

The Danish surveillance programme for multi-drug resistant *S. Typhimurium* DT104 (MRDT104) has been in place since 1998. The programme mandates a zero-tolerance for this pathogen in all foods. Meat imported from 3rd countries and the EU is randomly tested for Salmonella. Sample analysis is performed at the RVFCA. If MRDT104 is detected the batch is rejected or heat-treated.

2006, in November the sampling plan for this programme was changed, as the programme is now a part of the project on intensified control for Salmonella and *Campylobacter* in Danish and imported meat

### **Notification system in place**

The Salmonella surveillance programme is mandatory and detection of Salmonella spp. is notifiable to the Danish Food and Veterinary Administration (DFVA).

### **Results of the investigation**

In 2006, 32 flocks were tested for Salmonella and all flocks were negative

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

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

A part of the Danish produced turkey meat is reimported.

**D. Salmonella spp. in geese - breeding flocks and meat production flocks**

**Additional information**

The production of geese in Denmark is limited.

**E. Salmonella spp. in ducks - breeding flocks and meat production flocks**

**Monitoring system**

**Sampling strategy**

**Meat production flocks**

Feecal samples (primarily as sock/ boot swabs) are collected at the farm prior to slaughter.

**Frequency of the sampling**

**Meat production flocks: Before slaughter at farm**

2-3 weeks weeks prior to slaughter

**Type of specimen taken**

**Meat production flocks: Before slaughter at farm**

Socks/ boot swabs

**Methods of sampling (description of sampling techniques)**

**Meat production flocks: Before slaughter at farm**

Five pairs of sock/ boot swabs are collected from each flock. The samples are pooled prior to bacterial analysis.

**Case definition**

**Meat production flocks: Before slaughter at farm**

A sample is considered positive when Salmonella has been isolated.

**Diagnostic/ analytical methods used**

**Meat production flocks: Before slaughter at farm**

Other: Depend on the laboratory

## **Vaccination policy**

### **Breeding flocks**

No Salmonella vaccinations occur.

### **Meat production flocks**

No Salmonella vaccinations occur.

## **Control program/ mechanisms**

### **The control program/ strategies in place**

#### **Meat production flocks**

The Salmonella surveillance programme is mandatory and detection of Salmonella spp. is notifiable to the Danish Veterinary and Food Administration (DFVA).

## **Measures in case of the positive findings or single cases**

When Salmonella is detected in a sample, the DFVA must be notified and actions will be taken to identify the source.

The Danish surveillance programme for multi-drug resistant *S. Typhimurium* DT104 (MRDT104) has been in place since 1998. The programme mandates a zero-tolerance for this pathogen in all foods. Meat imported from 3rd countries and the EU is randomly tested for Salmonella. Sample analysis is performed at the RVFCA. If MRDT104 is detected the batch is rejected or heat-treated.

2006, in November the sampling plan for this programme was changed, as the programme is now a part of the project on intensified control for Salmonella and Campylobacter in Danish and imported meat

## **Notification system in place**

The Salmonella surveillance programme is mandatory and detection of Salmonella spp. is notifiable to the DFVA.

## **Results of the investigation**

In 2007, the only Danish slaughter house slaughtering ducks was closed and duck flocks are now being exported as live animals. Therefore there is no data on ducks.

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

## **F. Salmonella spp. in pigs**

### **Monitoring system**

#### **Sampling strategy**

#### **Breeding herds**

Every month, blood samples from ten randomly selected young females (4–7 months old) are serologically tested. If the salmonella index, calculated as the average of OD-values for three months (last months average have higher weight than the two previous) are  $\geq 5$ , bacteriologic confirmatory testing is carried out at the farm.

In case of clinically symptoms of Salmonella bacteriological confirmation tests must be conducted.

The surveillance programme for detection of Salmonella infection in pig herds was implemented in the beginning of 1995.

### **Multiplying herds**

Every month, blood samples from ten randomly selected young females (4–7 months old) are serologically tested. If the salmonella index, calculated as the average of OD-values for three months (last months average have higher weight than the two previous) are  $\geq 5$ , bacteriologic confirmatory testing is carried out at the farm.

In case of clinically symptoms of Salmonella bacteriological confirmation tests must be conducted.

The surveillance programme for detection of Salmonella infection in pig herds was implemented in the beginning of 1995.

### **Fattening herds**

Slaughter pig herds are monitored continuously by serologic testing of meat juice at the slaughter house. Random meat samples for testing are collected at the slaughter line, where the number of samples and frequency of sampling per farm are determined by the size of the herd.

A Salmonella index is calculated for each finisher herd based on the weighted average Salmonella values ( $SV = OD\% \text{ minus } 10$ ) from the previous 3 months, where results from the current month weigh three times as much as the two previous ones.

Every month, finisher herds are assigned to one of three levels according to their Salmonella index: Level 1: no action required; Level 2: herd intervention necessary; Level 3: herd intervention and increased hygienic precautions during slaughter are implemented. Herds with  $40 \leq \text{index} < 70$  are assigned to Level 2; herds with index  $\geq 70$  are assigned to Level 3.

Herds placed in Level 2 or Level 3 will have bacteriologic confirmatory testing carried out. Herds supplying pigs to finisher herds in Levels 2 or 3 will also have bacteriologic confirmatory testing carried out.

In case of clinically symptoms of Salmonella bacteriological confirmation tests must be conducted.

The surveillance programme for detection of Salmonella infection in pig herds was implemented in the beginning of 1995.

## **Frequency of the sampling**

### **Breeding herds**

Other: Once a month, and when needed

### **Multiplying herds**

Other: Once a month, and when needed

**Fattening herds at farm**

Other: When needed

**Fattening herds at slaughterhouse (herd based approach)**

Depend on herd size percent of slaughtered animals are sampled

**Type of specimen taken**

**Breeding herds**

Other: Blood and faeces

**Multiplying herds**

Other: Blood and faeces

**Fattening herds at farm**

Faeces

**Fattening herds at slaughterhouse (herd based approach)**

Meat juice

**Methods of sampling (description of sampling techniques)**

**Breeding herds**

Every month, blood samples from ten randomly selected young females 4–7 months are collected. If the salmonella index, calculated as the average of OD-values for three months (last months average have higher weight than the two previous) are  $\geq 5$ , faecal samples are requested.

The number of faecal samples depend on the herds size. Herds with  $> 400$  animals collect 20 samples (5 pools) and herds with 100-400 animals collect 4-16 samples (1-4 pools).

**Multiplying herds**

Every month, blood samples from ten randomly selected young females 4–7 months are collected. If the salmonella index, calculated as the average of OD-values for three months (last months average have higher weight than the two previous) are  $\geq 5$ , faecal samples are requested.

The number of faecal samples depend on the herds size. Herds with  $> 400$  animals collect 20 samples (5 pools) and herds with 100-400 animals collect 4-16 samples (1-4 pools).

**Fattening herds at farm**

Herds placed in Level 2 or Level 3 must collect faecal samples at the farm. The

number of samples depend on the herds size. Herds with > 400 animals collect 20 samples (5 pools) and herds with 100-400 animals collect 4-16 samples (1-4 pools).

#### **Fattening herds at slaughterhouse (herd based approach)**

Random meat samples are collected in meat juice containers at the slaughter line. Depending on the herd size, 60-100 random samples will be collected from each herd. Herds producing less than 200 slaughter pigs per year are not tested.

### **Case definition**

#### **Breeding herds**

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

#### **Multiplying herds**

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

#### **Fattening herds at farm**

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

#### **Fattening herds at slaughterhouse (herd based approach)**

An individual sample is considered seropositive if OD% >20.

### **Diagnostic/ analytical methods used**

#### **Breeding herds**

Other: Bacteriological and serological

#### **Multiplying herds**

Other: Bacteriological and serological

### **Vaccination policy**

#### **Breeding herds**

No salmonella vaccination occur

#### **Multiplying herds**

No salmonella vaccination occur

#### **Fattening herds**

No salmonella vaccination occur

### **Other preventive measures than vaccination in place**

#### **Breeding herds**

## **Control program/ mechanisms**

### **The control program/ strategies in place**

#### **Breeding herds**

Each month, a serological breeder- and multiplier index (BM-index) is calculated for each herd, based on the mean serological reaction from the last three months. The index gives more weight to the results from the more recent months (1:3:6). If the BM-index exceeds 5, it is mandatory to collect pen-faecal samples for Salmonella analysis and the herd owner must inform buyers of breeding animals about the infection level and Salmonella type in the herd.

#### **Multiplied herds**

Each month, a serological breeder- and multiplier index (BM-index) is calculated for each herd, based on the mean serological reaction from the last three months. The index gives more weight to the results from the more recent months (1:3:6). If the BM-index exceeds 5, it is mandatory to collect pen-faecal samples for Salmonella analysis and the herd owner must inform buyers of breeding animals about the infection level and Salmonella type in the herd.

#### **Fattening herds**

Surveillance by serological testing of meat juice samples is carried out in herds producing more than 200 slaughter pigs per year. Each month, a serological slaughter pig index (SP-index) is calculated for each herd, based on the proportion of seropositive meat juice samples from the last three months. The index gives more weight to the results from the most recent month (1:1:3). The SP-index serve to assign the slaughter pig herds to one of three infection levels:

- Herds in Level 1 have none or only a small proportion of positive samples,
- Herds in Level 2 have a higher proportion of positive samples,
- Herds in Level 3 have an unacceptably high proportion of positive samples.

In July 2005, the surveillance system was changed into a risk-based surveillance, following which the sample size in herds with a SP-index of zero (no positive samples the previous 3 months) was reduced to one sample per month.

### **Measures in case of the positive findings or single cases**

If the salmonella index(three-months average OD-values)in breeder and multiplier herds is  $\geq 5$ , the owners must inform all buyers before the animals are transported.

Herds in Levels 2 and 3 will get a 2% and 4% reduction in payment for finishers sent for slaughter, covering the costs of special hygienic slaughtering procedures.

### **Notification system in place**

The Salmonella surveillance programme is mandatory and detection of Salmonella spp. is notifiable to the Danish Food and Veterinary Administration (DFVA).

### **Results of the investigation**

By the end of the year 2007, 1.8 % and 0.7% of the herds were assigned to Level 2 and 3  
In 2007, the percentage of breeding and multiplying herds increased dramatically compared to 2006 and in Dec 13,7% of the herds had an index above 5. The 12 month average (moving over the previous 12 month) increased from 8.2% in January to 12.5 in December  
Clinical disease in combination with finding of Salmonella was recorded in 9 herds. This represents the number of herds submitting material from clinically affected animals to the laboratory with findings of Salmonella.

### **Additional information**

Herds with clinical disease, represents the number of herds submitting material from clinically affected animals to the laboratory with findings of Salmonella.

## **G. Salmonella spp. in bovine animals**

### **Monitoring system**

#### **Sampling strategy**

A voluntary national programme for surveillance of S. Dublin was established in 2002.  
The herds are assigned to one of three levels based on serological results from tank milk samples taken by the dairy and blood samples from randomly selected animals taken at the slaughterhouse. Bloodsamples can also be requested on account of contact with a herd assigned to a more infectious level.  
Bacteriological testing of herds in level 2 and 3 is voluntary, but in case of clinically symptoms of Salmonella bacteriological confirmation tests must be conducted.  
The programme is based on serological testing of blood and milk samples collected for the BVD and IBR surveillance programmes.

#### **Frequency of the sampling**

##### **Animals at farm**

Other: when requested by the farmer

##### **Animals at slaughter (herd based approach)**

Other: milk producing herds: every 3. month, non-milk producing herds: 21 days to 5 months

#### **Type of specimen taken**

##### **Animals at farm**

Faeces

##### **Animals at slaughter (herd based approach)**

Other: Milk and blood

#### **Methods of sampling (description of sampling techniques)**

### **Animals at farm**

Faecal samples from calves or sick animals.

### **Animals at slaughter (herd based approach)**

Milk producing herds:

one tank milk sample taken by the dairy every 3. month.

Non-milk producing herds:

Blood samples from animals collected at the slaughterhouse. Herds with less than 25 animals: one samples three times a year. Herds with more than 24 animals: three samples three times a year.

## **Case definition**

### **Animals at farm**

A sample is considered positive when Salmonella has been isolated.

### **Animals at slaughter (herd based approach)**

Dairy herds are classified most likely S. Dublin free (level 1) if: 1) The results of the latest four bulk-milk test may not exceed an average antibody level of 25 OD%, 2) the latest bulk-milk sample may not exceed the average of the three previous samples with more than 20 OD%, 3) S. Dublin has not been isolated from any samples collected from the farm within the previous three months.

Farms with cattle for the meat production must meet the same obligations, but instead of bulk milk samples all blood samples must be beneath 50 OD%.

## **Diagnostic/ analytical methods used**

### **Animals at slaughter (herd based approach)**

Serological method: Mix-ELISA

## **Vaccination policy**

## **Control program/ mechanisms**

### **The control program/ strategies in place**

This programme divides the cattle herds into three levels. Level 1: Most likely S. Dublin free, level 2: S. Dublin is most likely present, or the herd has unknown status, and finally, level 3: S. Dublin has been isolated from the herd, or the herd owner has purchased animals from a known level 3 herd.

This is a voluntary programme, but herds not included cannot sell animals to other herds. It is recommended that herds only purchase animals from level 1.

All trade of live cattle is recorded in a national database. After trade or other contact between cattle herds with different S. Dublin levels, the receiving herds will be placed in the highest level for three months.

Detection of multi-resistant Salmonella Typhimurium DT104 (MRDT104) in Cattle herds is

notifiable. Animals are slaughtered under special hygienic precautions and an epidemiological investigation of the herd and its trade contacts are performed.

### **Notification system in place**

The Salmonella surveillance programme is mandatory and detection of Salmonella spp. is notifiable to the Danish Food and Veterinary Administration (DFVA).

### **Results of the investigation**

In January 2008, 16.3% of milk-producing herds were classified into level 2, which is similar to 2007. For the non-milk producing herds, the percentage of herds in level 1 increased from 77.5% in 2006 to 81,7% in 2007.

Clinical disease in combination with the finding of Salmonella was recorded in 44 herds.

Herds are placed under official veterinary supervision if MRDT104 is found in the cattle, or the herd has been in contact with herds infected with MRDT104.

### **Additional information**

It is well known that S. Dublin serum are transferred with the milk from the S. Dublin infected milk-producing cow to the new born calves and again around day 17 after birth.

## **H. Salmonella spp. in animal - Wildlife**

### **Monitoring system**

#### **Sampling strategy**

Hunters, veterinarians and the public submit wild animals to the national Veterinary Institute.

**Table Salmonella in breeding flocks of Gallus gallus**

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Typhimurium	S. Hadar	S. Infantis	S. Virchow	Salmonella spp., unspecified
<b>Gallus gallus (fowl)</b>										
<b>parent breeding flocks for egg production line</b>										
during rearing period	DVFA/ DPC	flock	11	0						
during production period	DVFA/ DPC	flock	12	0						
<b>parent breeding flocks for meat production line</b>										
during rearing period	DVFA/ DPC	flock	152	0						
during production period	DVFA/ DPC	flock	258	3		3				

**Table Salmonella in other poultry**

	Source of information		Sampling unit	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Kentucky	S. Senftenberg	S. Tennessee	S. Indiana	S. Derby	S. Infantis	S. 4,12:b:-	S. Newport
	DVFA/ DPC	DVFA/ DPC														
Gallus gallus (fowl)	laying hens during rearing period		flock	326	0											
			flock	510	5	1	3									
broilers during rearing period		DVFA/ DPC	flock	3486	65	1	7	15	1	3	10	18	2	7		1

**Table Salmonella in other animals**

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
<b>Pigs</b>							
breeding animals (1) <b>raised under controlled housing conditions in integrated production system</b> <b>sows</b> - at farm - animal sample - blood - Surveillance - official controls - official sampling - objective sampling (Herd level results are based on 72 positive samples out of 1939 animal samples per December 2007)	DVFA	herd	211	28			28
fattening pigs (2) <b>raised under controlled housing conditions in integrated production system</b> - at slaughterhouse - animal sample - meat juice - Surveillance - official controls - official sampling - objective sampling (Herd level results are based on 367 positive samples out of 5335 animal samples per December 2007)	DVFA	herd	10327	266			266
<b>Birds</b>							
<b>wild</b> - at hospital or care home - Clinical investigations - suspect sampling	Vet-DTU	single	92	20	20		
- at zoo - Clinical investigations - suspect sampling	Vet-DTU	single	25	0			
<b>Cats</b>							

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<b>pet animals</b> - at hospital or care home - Clinical investigations - suspect sampling							
	Vet-DTU	single	14	5		5	
<b>Dogs</b> <b>pet animals</b> - at hospital or care home - Clinical investigations - suspect sampling							
Vet-DTU	single	31	0				

(1) : Herd level results are based on 72 positive samples out of 1939 animal samples.  
 Per December 2007

(2) : Herd level results are based on 367 positive samples out of 5335 animal samples  
 Per December 2007

## **2.1.5. Salmonella in feedingstuffs**

### **A. Salmonella spp. in feed**

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

In general, the prevalence of Salmonella in feed was low and at the same level as previous years.

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

The most common serotypes isolated from feeding stuff is relatively uncommon among the human cases.

#### **Recent actions taken to control the zoonoses**

The Danish Plant Directorate inspects all feed compounders at risk for the presence of Salmonella. The EU regulation on feed hygiene (1831/2003) came into force in January 2006 and the Danish Plant Directorate changed focus from control of the feed to control of the responsibility of the feed business operators. Therefore fewer samples are collected by the Danish Plant Directorate and more samples are collected by the feed business operators as part of their own check system. In 2004 and 2005, the Danish Plant Directorate sampled large ships of soy bean meal. This sampling is now taken over by the importers.

The routine inspection of feed includes:

- The presence of Salmonella in compound feed is indirectly monitored by the environmental samples collected during feed processing. Companies are sampled 1 to 4 times a year depending on their individual risk profile.
- Sampling of feed materials at risk (predominantly soy bean meal and rapeseed cake). 200 samples per year.
- Samples from transport vehicles (hygiene samples) prior to loading of feed compounds. 200 samples per year.

**Table Salmonella in other feed matter**

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Ohio	S. Havana
<b>Feed material of oil seed or fruit origin</b>										
rape seed derived	PDIR	single	25g	19	1					1
soya (bean) derived	PDIR	single	25g	45	2		1		1	
<b>Other feed material</b>										
other plants (1)	PDIR	single	25g	95	0					
<b>Compound feedingstuffs, not specified</b>										
<b>process control</b>										
- Monitoring - official sampling - selective sampling (Environmental sample during feed processing)	PDIR	single	25g	973	18			18		

(1) : grass pellet

### **2.1.6. Salmonella serovars and phagetype distribution**

The methods of collecting, isolating and testing of the Salmonella isolates are described in the chapters above respectively for each animal species, foodstuffs and humans. The serotype and phagetype distributions can be used to investigate the sources of the Salmonella infections in humans. Findings of same serovars and phagetypes in human cases and in foodstuffs or animals may indicate that the food category or animal species in question serves as a source of human infections. However as information is not available from all potential sources of infections, conclusions have to be drawn with caution.

**Table Salmonella serovars in animals**

Serovars	Gallus gallus (fowl) - before slaughter - at farm - national programmes (no Community co-financing) - sampling by industry		Gallus gallus (fowl) - laying hens - during production period - at farm - animal sample - faeces - Control or eradication programmes - national programmes (no Community co-financing) - official and industry sampling		Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Other poultry	
	M	C	M	C	M	C	M	C	M	C	M	C
Sources of isolates (*)												
Number of isolates in the laboratory	65	0	5	44		9						
Number of isolates serotyped	65	0	5	44		9						
<b>Number of isolates per type</b>												
S. Derby	2											
S. Dublin				23								
S. Enteritidis	1		1									



**Table Salmonella serovars in food**

Serovars	Meat from bovine animals		Meat from pig		Meat from broilers (Gallus gallus)		Other poultry		Other products of animal origin	
	M	C	M	C	M	C	M	C	M	C
<b>Sources of isolates (*)</b>										
Number of isolates in the laboratory	N= 22	0	185	0	10	0	0	0	0	0
Number of isolates serotyped	N= 22	0	185	0	0	0	0	0	0	0
<b>Number of isolates per type</b>										
S. Agona			1							
S. Derby			54							
S. Dublin	15									
S. Enteritidis			1							
S. Infantis			10							
S. Livingstone			2							
S. Ohio			1							
S. Panama			1							
S. Pomona			1							
S. Typhimurium	2		77							
S. Worthington			1							
Not typeable	5		33							
Other serotypes			3							

**Footnote**

(\*) M : Monitoring, C : Clinical

**Table Salmonella serovars in feed**

Serovars	Compound feedingsstuffs for pigs		Compound feedingsstuffs, not specified - process control - Monitoring - official sampling - selective sampling (Environmental sampling during feed processing)		Feed material of oil seed or fruit origin - rape seed derived - Control or eradication programmes - national programmes (no Community co-financing) - official sampling		Feed material of oil seed or fruit origin - soya (bean) derived - Control or eradication programmes - national programmes (no Community co-financing) - official sampling	
	M	C	M	C	M	C	M	C
Sources of isolates (*)								
Number of isolates in the laboratory	N=		18		1		2	
Number of isolates serotyped	N=	0	18	0	1	0	2	0
<b>Number of isolates per type</b>								
S. Agona			1					
S. Havana			2		1			
S. Infantis			5					



**Table Salmonella Enteritidis phagetypes in animals**

Phagetype	Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Other poultry		Gallus gallus (fowl) - laying hens - during production period - at farm - animal sample - faeces - Control or eradication programmes - national programmes (no Community co-financing) - official and industry sampling	
	M	C	M	C	M	C	M	C	M	C
Sources of isolates (*)										
Number of isolates in the laboratory	N=								1	
Number of isolates phagetyped	N=	0	0	0	0	0	0	0	1	0
<b>Number of isolates per type</b>										
8										

**Footnote**

(\*) M : Monitoring, C : Clinical

**Table Salmonella Typhimurium phagetypes in animals**

Phagetype	Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Other poultry		Gallus gallus (fowl) - laying hens - during production period - at farm - animal sample - faeces - Control or eradication programmes - national programmes (no Community co-financing) - official and industry sampling		Gallus gallus (fowl) - broilers - before slaughter - at farm - animal sample - faeces - Control or eradication programmes - national programmes (no Community co-financing) - official and industry sampling	
	M	C	M	C	M	C	M	C	M	C	M	C
Sources of isolates (*)		16		6							7	3
Number of isolates in the laboratory	N=											
Number of isolates phagetyped	N=	0	16	0	6	0	0	0	0	0	3	0
<b>Number of isolates per type</b>												
DT 12			3									
DT 104			2	6								
DT 120			7								3	1



### **2.1.7. Antimicrobial resistance in Salmonella isolates**

Antimicrobial resistance is the ability of certain microorganisms to survive or grow in the presence of a given concentration of antimicrobial agent that usually would kill or inhibit the microorganism species in question. Antimicrobial resistant Salmonella strains may be transferred from animals or foodstuffs to humans.

#### **A. Antimicrobial resistance in Salmonella in cattle**

##### **Sampling strategy used in monitoring**

###### **Frequency of the sampling**

Only samples from clinical cases of Salmonellosis in cattle were collected

###### **Type of specimen taken**

Faecal samples

###### **Procedures for the selection of isolates for antimicrobial testing**

Clinical samples: Only one isolate per serotype per farm was selected for susceptibility testing

###### **Methods used for collecting data**

All isolated were tested at the DTU-FOOD

##### **Laboratory methodology used for identification of the microbial isolates**

Examination of samples from cattle was done by non-selective pre-enrichment of 22 g material in 200 ml of buffered peptone water (BPW) and incubated overnight at 37°C . A plate with Modified Semi-solid Rappaport-Vassiliadis medium was inoculated with 0.1 ml of BPW deposited on the agar as 3 drops. Overnight incubation at 41.5°C was followed by serotyping of suspect colonies by slide agglutination.

##### **Laboratory used for detection for resistance**

###### **Antimicrobials included in monitoring**

See tables

###### **Breakpoints used in testing**

See tables

##### **Preventive measures in place**

None

##### **Control program/ mechanisms**

###### **The control program/ strategies in place**

Detection of multi-resistant Salmonella Typhimurium DT104 (MRDT104) in Cattle herds is notifiable. Animals are slaughtered under special hygienic precautions and an epidemiological investigation of the herd and its trade contacts are performed.

#### **Recent actions taken to control the zoonoses**

None

#### **Measures in case of the positive findings or single cases**

Animals are slaughtered under special hygienic precautions and an epidemiological investigation of the herd and its trade contacts are performed.

Detection of DT104 in Cattle herds is notifiable. Animals are slaughtered under special hygienic precautions and an epidemiological investigation of the herd and its trade contacts are performed.

#### **Notification system in place**

Positive findings of MRDT104 must be reported to the Danish Veterinary and Food Administration

#### **Results of the investigation**

13 isolates from clinical cases of Salmonellosis in cattle were subjected to susceptibility testing.

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

The results were similar to previous years.

### **B. Antimicrobial resistance in Salmonella in pigs**

#### **Sampling strategy used in monitoring**

##### **Frequency of the sampling**

Samples were collected daily from subclinical cases of salmonellosis in pigs.

##### **Type of specimen taken**

faecal samples

##### **Procedures for the selection of isolates for antimicrobial testing**

Only one isolate per serotype per farm was selected for susceptibility testing

##### **Methods used for collecting data**

All isolated were tested at the DTU-FOOD.

#### **Laboratory methodology used for identification of the microbial isolates**

Examination of samples from pigs was done by non-selective pre-enrichment of 22 g material in 200 ml of buffered peptone water (BPW) and incubated overnight at 37°C. A plate with Modified Semi-solid Rappaport-Vassiliadis medium was inoculated with 0.1 ml of BPW deposited on the agar

as 3 drops. Overnight incubation at 41.5°C was followed by serotyping of suspect colonies by slide agglutination.

### **Laboratory used for detection for resistance**

#### **Antimicrobials included in monitoring**

See tables

#### **Breakpoints used in testing**

See tables

### **Preventive measures in place**

None

### **Control program/ mechanisms**

#### **The control program/ strategies in place**

Detection of DT104 in pig herds is notifiable. Animals from are slaughtered under special hygienic precautions and an epidemiological investigation of the herd and its trade contacts are performed.

#### **Recent actions taken to control the zoonoses**

None

### **Measures in case of the positive findings or single cases**

Detection of DT104 in pig herds is notifiable. Animals from are slaughtered under special hygienic precautions and an epidemiological investigation of the herd and its trade contacts are performed.

### **Notification system in place**

Positive findings are reported to the Danish Veterinary and Food Administration

### **Results of the investigation**

575 isolates from subclinical cases of Salmonellosis in pigs were selected for susceptibility testing.

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

The results were similar to previous years.

## **C. Antimicrobial resistance in Salmonella in poultry**

### **Sampling strategy used in monitoring**

#### **Frequency of the sampling**

Samples were collected daily from subclinical cases of salmonellosis in broilers.

### **Type of specimen taken**

faecal samples

### **Procedures for the selection of isolates for antimicrobial testing**

Only one isolate per serotype per farm was selected for susceptibility testing

### **Methods used for collecting data**

All isolated were tested at the DTU-FOOD.

### **Laboratory methodology used for identification of the microbial isolates**

Samples from poultry were examined by non-selective pre-enrichment in BPW of paired sock samples, or homogenized organs, at a ratio of 1:9 and incubated at 37°C overnight, followed by selective enrichment by inoculation of 9.9 ml Rappaport-Vassiliadis broth with 0.1 ml pre-enrichment broth and incubation at 41.5°C overnight. The selective broth was inoculated onto Rambach agar. Presumptive Salmonella isolates were verified and typed by slide agglutination.

### **Laboratory used for detection for resistance**

#### **Antimicrobials included in monitoring**

See table

#### **Breakpoints used in testing**

See table

### **Preventive measures in place**

None

### **Control program/ mechanisms**

#### **The control program/ strategies in place**

Detection of multi-resistant Salmonella Typhimurium DT104 (MRDT104) is notifiable. Detection of MRDT104 in slaughter-poultry or table egg production flocks will lead to slaughtering and heat treatment or destruction of the flock.

#### **Recent actions taken to control the zoonoses**

None

### **Measures in case of the positive findings or single cases**

Detection of MRDT104 in slaughter-poultry or table egg production flocks will lead to slaughtering and heat treatment or destruction of the flock.

### **Notification system in place**

Positive findings are reported to the Danish Veterinary and Food Administration

### **Results of the investigation**

10 isolates from subclinical cases of Salmonellosis in broilers were subjected to susceptibility testing.

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

The results were similar to previous years.

## **D. Antimicrobial resistance in Salmonella in foodstuff derived from cattle**

### **Sampling strategy used in monitoring**

#### **Frequency of the sampling**

No isolates of *S. Typhimurium* from Danish beef were subjected to susceptibility testing.

### **Results of the investigation**

No results from susceptibility testing of beef samples were available for 2007.

## **E. Antimicrobial resistance in Salmonella in foodstuff derived from pigs**

### **Sampling strategy used in monitoring**

#### **Frequency of the sampling**

Salmonella isolates were obtained from pork sold at wholesale and retail outlets as described under "Salmonella spp. in pig meat and products thereof/ At retail"

#### **Type of specimen taken**

meat samples

#### **Procedures for the selection of isolates for antimicrobial testing**

.

#### **Methods used for collecting data**

All isolates are tested centrally at the DTU-FOOD.

### **Laboratory used for detection for resistance**

#### **Antimicrobials included in monitoring**

See tables

#### **Breakpoints used in testing**

See tables

### **Preventive measures in place**

None

### **Control program/ mechanisms**

#### **The control program/ strategies in place**

When Salmonella is detected in a sample, the Danish Food and Veterinary Administration must be notified and actions will be taken to identify the source.

All meat products with positive MRDT104 are destructed or heat treated and if Salmonella are detected in the retail, the products are withdrawn.

Meat imported for 3rd countries and the EU is randomly tested for Salmonella at either the entry point into EU or at the place of destination. If MRDT104 is detected the batch is rejected or heat-treated

#### **Recent actions taken to control the zoonoses**

None

### **Measures in case of the positive findings or single cases**

The Danish surveillance programme for multi-resistant Salmonella Typhimurium DT104 (MRDT104) has been in place since 1998. There is zero tolerance for the presence MRDT104 in all foods, and all meat products are destructed or heat-treated. If S. Typhimurium DT104 is detected in the retail, the products are withdrawn. Meat imported for 3rd countries and the EU is randomly tested for Salmonella at either the entry point into EU or at the place of destination. If MRDT104 is detected, the imported batch is rejected or heat-treated.

#### **Notification system in place**

When Salmonella is detected in a sample, the Danish Food and Veterinary Administration must be notified and actions will be taken to identify the source.

The programme mandates a zero-tolerance for this pathogen in all foods. All meat products with positive MRDT104 are destructed or heat treated and if Salmonella are detected in the retail, the products are withdrawn.

Meat imported for 3rd countries and the EU is randomly tested for Salmonella at either the entry point into EU or at the place of destination. If MRDT104 is detected the batch is rejected or heat-treated

#### **Results of the investigation**

71 isolates of Salmonella in pig meat were subjected for susceptibility testing in 2007.

## **F. Antimicrobial resistance in Salmonella in foodstuff derived from poultry**

#### **Results of the investigation**

No results from susceptibility testing of poultry meat samples were available for 2007.

**Table Antimicrobial susceptibility testing of S. Typhimurium in broilers - Gallus gallus (fowl) - before slaughter - at farm - animal sample - faeces - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - quantitative data [Dilution method]**

S. Typhimurium		Gallus gallus (fowl) - broilers - before slaughter - at farm - animal sample - faeces - Control or eradication programmes - national programmes (no Community co-financing) - official sampling																							
Isolates out of a monitoring programme		yes																							
Number of isolates available in the laboratory		10																							
Antimicrobials:	Break point	N	n	Number of resistant isolates (n) and number of isolates with the concentration (u/ml) or zone (mm) of inhibition equal to																					
				<=0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest		
<b>Aminoglycosides</b>																									
Apramycin	16	10	0																						
Gentamicin	2	10	0						10																
Neomycin	4	10	0						10																
Spectinomycin	64	10	1										7	2											
Streptomycin	16	10	1										4	5											
<b>Amphenicols</b>																									
Chloramphenicol	16	10	1																						
Florfenicol	16	10	1																						
<b>Cephalosporins</b>																									
Cefepodoxime	1	10	0																						
Ceftiofur	2	10	0						10																
Cephalothin	16	10	0																						
<b>Fluoroquinolones</b>																									
Ciprofloxacin	0.06	10	0	10																					
<b>Penicillins</b>																									
Amoxicillin / Clavulanic acid	4	10	1																						
Ampicillin	4	10	1						8	1															
<b>Quinolones</b>																									
Nalidixic acid	16	10	0																						
<b>Sulfonamides</b>																									
Sulfonamide	256	10	1																						



**Table Antimicrobial susceptibility testing of S.Typhimurium in animals**

n = Number of resistant isolates												
S. Typhimurium												
	Cattle (bovine animals)		Pigs		Gallus gallus (fowl) - broilers		Gallus gallus (fowl)		Turkeys		Gallus gallus (fowl) - laying hens	
Isolates out of a monitoring programme	yes		yes		yes							
Number of isolates available in the laboratory	13		575		10							
Antimicrobials:	N	n	N	n	N	n	N	n	N	n	N	n
<b>Aminoglycosides</b>												
Apramycin	13	0	575	8	10	0						
Gentamicin	13	0	575	7	10	0						
Neomycin	13	0	575	48	10	0						
Spectinomycin	13	5	575	96	10	1						
Streptomycin	13	7	575	248	10	1						
<b>Amphenicols</b>												
Chloramphenicol	13	2	575	66	10	1						
Florfenicol	13	2	575	41	10	1						
<b>Cephalosporins</b>												
Cefpodoxime	13	0	575	0	10	0						
Ceftiofur	13	0	575	0	10	0						
Cephalothin	13	0	575	7	10	0						
<b>Fluoroquinolones</b>												
Ciprofloxacin	13	0	575	6	10	0						
<b>Penicillins</b>												
Amoxicillin / Clavulanic acid	13	6	575	148	10	1						
Ampicillin	13	8	575	208	10	1						
<b>Polymyxins</b>												
Colistin	13	13	575	575	10	10						
<b>Quinolones</b>												
Nalidixic acid	13	0	575	6	10	0						
<b>Sulfonamides</b>												
Sulfonamide	13	9	575	270	10	1						
<b>Tetracyclines</b>												
Tetracyclin	13	8	575	268	10	2						
Trimethoprim	13	13	575	575	10	10						

**Table Antimicrobial susceptibility testing of S. Typhimurium in Pigs - mixed herds - at farm - animal sample - faeces - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - quantitative data [Dilution method]**

S. Typhimurium		Pigs - mixed herds - at farm - animal sample - faeces - Control or eradication programmes - national programmes (no Community co-financing) - official sampling																						
Isolates out of a monitoring programme		yes																						
Number of isolates available in the laboratory		575																						
		Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
Antimicrobials:	Break point	N	n	≤0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest	
<b>Aminoglycosides</b>																								
Apramycin	16	575	7								557	10	1	1	7									
Gentamicin	2	575	7					564	4		2	4	1											
Neomycin	4	575	48					520	7	1			1	46										
Spectinomycin	64	575	96										13	439	27	8	12	76						
Streptomycin	16	575	255							49	239	32	7	31	217									
<b>Amphenicols</b>																								
Chloramphenicol	16	575	66							5	399	102	3	3	6	57								
Florfenicol	16	575	41						11	462	55	6	29	4	8									
<b>Cephalosporins</b>																								
Cepodoxime	1	575	0			6	453	97	19															
Ceftiofur	2	575	0					317	242	16														
Cephalothin	16	575	7							446	97	25	6	1										
<b>Fluoroquinolones</b>																								
Ciprofloxacin	0.06	575	6	534	35		5	1																
<b>Penicillins</b>																								
Amoxicillin / Clavulanic acid	4	575	148						367	60	102	44	2											
Ampicillin	4	575	208					295	63	9			208											
<b>Quinolones</b>																								
Nalidixic acid	16	575	6							513	56	6												
<b>Sulfonamides</b>																								
Sulfonamide	256	575	270											302	3						270			



**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - at slaughterhouse - animal sample - faeces - Control or eradication programmes - national programmes (no Community co-financing) - sampling by industry - quantitative data [Dilution method]**

S. Typhimurium		Cattle (bovine animals) - at slaughterhouse - animal sample - faeces - Control or eradication programmes - national programmes (no Community co-financing) - sampling by industry																						
Isolates out of a monitoring programme		yes																						
Number of isolates available in the laboratory		13																						
Antimicrobials:	Break point	N	n	Number of resistant isolates (n) and number of isolates with the concentration (u/ml) or zone (mm) of inhibition equal to																				
				<=0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest	
<b>Aminoglycosides</b>																								
Apramycin	16	13	0																					
Gentamicin	2	13	0						13															
Neomycin	4	13	0						13															
Spectinomycin	64	13	5										1	7	1	4								
Streptomycin	16	13	8									2	3	1	2	5								
<b>Amphenicols</b>																								
Chloramphenicol	16	13	2										8	3		2								
Florfenicol	16	13	2							1	8	2			1	1								
<b>Cephalosporins</b>																								
Cefepodoxime	1	13	0					10	3															
Ceftiofur	2	13	0						7	6														
Cephalothin	16	13	0										9	4										
<b>Fluoroquinolones</b>																								
Ciprofloxacin	0.06	13	0	11	2																			
<b>Penicillins</b>																								
Amoxicillin / Clavulanic acid	4	13	6							5	2	3	3											
Ampicillin	4	13	8						5				8											
<b>Quinolones</b>																								
Nalidixic acid	16	13	0										11	2										
<b>Sulfonamides</b>																								
Sulfonamide	256	13	9												4								9	



**Table Antimicrobial susceptibility testing of S. Typhimurium in carcass - Meat from pig - chilled - at slaughterhouse - animal sample - carcass swabs - Control or eradication programmes - national programmes (no Community co-financing) - sampling by industry - Control or eradication programmes (no Community co-financing) - sampling by industry - quantitative data [Dilution method]**

S. Typhimurium		Meat from pig - carcass - chilled - at slaughterhouse - animal sample - carcass swabs - Control or eradication programmes - national programmes (no Community co-financing) - sampling by industry																					
Isolates out of a monitoring programme	yes																						
Number of isolates available in the laboratory	71																						
Antimicrobials:		Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																					
Break point	N	n	<=0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest	
<b>Aminoglycosides</b>																							
	16	71	1							69		1		1									
Apramycin								69					2										
Gentamicin	2	71	2																				
Neomycin	4	71	7					61	3				7										
Spectinomycin	64	71	9									1	60	1	1	1		7					
Streptomycin	16	71	29							9	28	5		4	25								
<b>Amphenicols</b>																							
Chloramphenicol	16	71	4							51	16												
Florfenicol	16	71	3					3	59	5	1	3											
<b>Cephalosporins</b>																							
Cefpodoxime	1	71	0			1	51	17	2														
Ceftiofur	2	71	0					43	28														
Cephalothin	16	71	0							55	14	2											
<b>Fluoroquinolones</b>																							
Ciprofloxacin	0.06	71	0	67	4																		
<b>Penicillins</b>																							
Amoxicillin / Clavulanic acid	4	71	15						46	10	11	4											
Ampicillin	4	71	25					32	14				1	24									
<b>Quinolones</b>																							
Nalidixic acid	16	71	0							63	8												



**Table Antimicrobial susceptibility testing of Salmonella spp. in food**

n = Number of resistant isolates								
	Salmonella spp.							
	Meat from bovine animals		Meat from pig		Meat from broilers (Gallus gallus)		Meat from other poultry species	
Isolates out of a monitoring programme				yes				
Number of isolates available in the laboratory				71				
<b>Antimicrobials:</b>	<b>N</b>	<b>n</b>	<b>N</b>	<b>n</b>	<b>N</b>	<b>n</b>	<b>N</b>	<b>n</b>
<b>Aminoglycosides</b>								
Apramycin			71	1				
Gentamicin			71	2				
Neomycin			71	7				
Spectinomycin			71	9				
Streptomycin			71	29				
<b>Amphenicols</b>								
Chloramphenicol			71	4				
Florfenicol			71	3				
<b>Cephalosporins</b>								
Cefpodoxime			71	0				
Ceftiofur			71	0				
Cephalothin			71	0				
<b>Fluoroquinolones</b>								
Ciprofloxacin			71	0				
<b>Penicillins</b>								
Amoxicillin / Clavulanic acid			71	15				
Ampicillin			71	25				
<b>Quinolones</b>								
Nalidixic acid			71	0				
<b>Sulfonamides</b>								
Sulfonamide			71	28				
<b>Tetracyclines</b>								
Tetracyclin			71	27				

## Table Breakpoints for antibiotic resistance testing in Animals

**Test Method Used**
**Standards used for testing**

NCCLS

Salmonella	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content microg	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest		Susceptible >=	Intermediate	Resistant <=
<b>Amphenicols</b>										
Chloramphenicol				16	2	64				
Florfenicol				16	2	64				
<b>Tetracyclines</b>										
Tetracyclin				8	2	32				
<b>Cephalosporins</b>										
Cephalothin				16	4	32				
Ceftiofur										
3rd generation cephalosporins										
Cefpodoxime				1	0.125	4				
<b>Fluoroquinolones</b>										
Ciprofloxacin				0.06	0.03	4				
Enrofloxacin										
<b>Quinolones</b>										
Nalidixic acid				16	4	64				
<b>Trimethoprim</b>										
<b>Sulfonamides</b>										
Sulfonamide				256	64	1024				
<b>Aminoglycosides</b>										
Streptomycin				16	4	64				
Gentamicin				2	1	32				
Neomycin				4	2	32				
Kanamycin										
Apramycin				16	4	32				
Spectinomycin				64	16	256				
<b>Trimethoprim + sulfonamides</b>										
<b>Penicillins</b>										
Amoxicillin / Clavulanic acid				4	2	32				
Ampicillin				4	1	32				

## Table Breakpoints for antibiotic resistance testing in Food

**Test Method Used**


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**Standards used for testing**


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 NCCLS
 

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Salmonella	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content microg	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest		Susceptible >=	Intermediate	Resistant <=
<b>Amphenicols</b>										
Chloramphenicol				16	2	64				
Florfenicol				16	2	64				
<b>Tetracyclines</b>										
Tetracyclin				8	2	32				
<b>Cephalosporins</b>										
Cephalothin				16	4	32				
Ceftiofur				2	0.5	8				
3rd generation cephalosporins										
Cefpodoxime				1	0.125	4				
<b>Fluoroquinolones</b>										
Ciprofloxacin				0.06	0.03	4				
Enrofloxacin										
<b>Quinolones</b>										
Nalidixic acid				16	4	64				
<b>Trimethoprim</b>										
<b>Sulfonamides</b>										
Sulfonamide				256	64	1024				
<b>Aminoglycosides</b>										
Streptomycin				16	4	64				
Gentamicin				2	1	32				
Neomycin				4	2	32				
Kanamycin										
Apramycin				16	4	32				
Spectinomycin				64	16	256				
<b>Trimethoprim + sulfonamides</b>										
<b>Penicillins</b>										
Amoxicillin / Clavulanic acid				4	2	32				
Ampicillin				4	1	32				

## Table Breakpoints for antibiotic resistance testing in Feedingstuff

**Test Method Used**
**Standards used for testing**

NCCLS

Salmonella	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content microg	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest		Susceptible >=	Intermediate	Resistant <=
<b>Amphenicols</b>										
	Chloramphenicol									
	Florfenicol									
<b>Tetracyclines</b>										
	Tetracyclin									
<b>Cephalosporins</b>										
	Cephalothin									
	Ceftiofur									
	3rd generation cephalosporins									
	Cefpodoxime									
<b>Fluoroquinolones</b>										
	Ciprofloxacin									
	Enrofloxacin									
<b>Quinolones</b>										
	Nalidixic acid									
<b>Trimethoprim</b>										
	Trimethoprim									
<b>Sulfonamides</b>										
	Sulfonamide									
<b>Aminoglycosides</b>										
	Streptomycin									
	Gentamicin									
	Neomycin									
	Kanamycin									
	Apramycin									
	Spectinomycin									
<b>Trimethoprim + sulfonamides</b>										
	Trimethoprim + sulfonamides									
<b>Penicillins</b>										
	Amoxicillin / Clavulanic acid									
	Ampicillin									

## Table Breakpoints for antibiotic resistance testing in Humans

Test Method Used

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Standards used for testing

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NCCLS

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Salmonella	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content microg	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest		Susceptible >=	Intermediate	Resistant <=
<b>Amphenicols</b>										
	Chloramphenicol									
	Florfenicol									
<b>Tetracyclines</b>										
	Tetracyclin									
<b>Cephalosporins</b>										
	Cephalothin									
	Ceftiofur									
	3rd generation cephalosporins									
	Cefpodoxime									
<b>Fluoroquinolones</b>										
	Ciprofloxacin									
	Enrofloxacin									
<b>Quinolones</b>										
	Nalidixic acid									
<b>Trimethoprim</b>										
	Trimethoprim									
<b>Sulfonamides</b>										
	Sulfonamide									
<b>Aminoglycosides</b>										
	Streptomycin									
	Gentamicin									
	Neomycin									
	Kanamycin									
	Apramycin									
	Spectinomycin									
<b>Trimethoprim + sulfonamides</b>										
	Trimethoprim + sulfonamides									
<b>Penicillins</b>										
	Amoxicillin / Clavulanic acid									
	Ampicillin									

## **2.2. CAMPYLOBACTERIOSIS**

### **2.2.1. General evaluation of the national situation**

#### **A. Thermophilic Campylobacter general evaluation**

##### **History of the disease and/ or infection in the country**

Since 1999, campylobacteriosis has been the single leading cause of bacterial gastrointestinal disease in Denmark. The incidence of Campylobacter in humans has a distinct seasonal distribution, with a summer peak in June-September. Consumption and handling of poultry and poultry products is believed to be the primary source of human campylobacteriosis in Denmark, though other sources also exist. Data on travel history is currently not reliably recorded in the surveillance system; therefore, the incidence of people infected outside Denmark is unknown. It is estimated that approximately one third of cases are travel related.

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

Campylobacteriosis has been the leading cause of bacterial gastrointestinal disease in Denmark since 1999, where it surpassed salmonellosis. The number of infections rose dramatically (by a factor of four) from 1991 to 2001 after which a decreasing trend can be observed. However, the number of infections in 2007 constituted an increase of 19% compared to the number of infections the year before and was the highest recorded in 5 years.

The epidemiology of Campylobacter is not understood in the same detail as for salmonella. As in other Western countries consumption and handling of poultry and poultry products is believed to be the primary source of human campylobacteriosis in Denmark, though several other sources also exist. A case-control study of sporadic infections performed in 2000-01 found the main risk factor for infection to be consumption of non-frozen chicken

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

Consumption and handling of poultry and poultry products is believed to be the primary source of human campylobacteriosis in Denmark, though other sources also exist.

##### **Recent actions taken to control the zoonoses**

The voluntary intervention strategy aimed at reducing the number of Campylobacter positive broiler flocks implemented in 2003 was continued in 2007. All broiler flocks are sampled for Campylobacter at the slaughterhouse prior to slaughter, and the samples are analysed using a PCR detection method.

## **2.2.2. Campylobacteriosis in humans**

### **A. Thermophilic Campylobacter in humans**

#### **Reporting system in place for the human cases**

Campylobacter spp. is notifiable through the laboratory surveillance system. Cases diagnosed by a clinical microbiological laboratory are reported to the Unit of Gastrointestinal Infections at SSI.

#### **Case definition**

A case is considered positive when Campylobacter has been isolated, or a clinical case with an epidemiological link to a culture confirmed case.

#### **Diagnostic/ analytical methods used**

Bacteriology, isolation of Campylobacter from faecal samples.

#### **Notification system in place**

Cases of notifiable zoonotic enteric pathogens diagnosed by a clinical microbiological laboratory are reported through the laboratory surveillance system to the Unit of Gastrointestinal Infections at Statens Serum Institute (SSI). The laboratories must report positive results to the SSI within one week.

#### **History of the disease and/ or infection in the country**

Since 1999, campylobacteriosis has been the leading cause of bacterial gastrointestinal disease in Denmark. In 2007, there were 3,868 reported cases, corresponding to an incidence of 70.9 cases per 100,000 inhabitants. This constituted an increase of 19% compared to the number of infections the year before. The incidence of Campylobacter in humans has a distinct seasonal distribution, with a summer peak in June-September. Consumption and handling of poultry and poultry products is believed to be the primary source of human campylobacteriosis in Denmark, though other sources also exist. Data on travel history is currently not reliably recorded in the surveillance system; therefore, the incidence of people infected outside Denmark is unknown. It is estimated that approximately one third of cases are travel related.

#### **Results of the investigation**

In 2007, there were 3,868 reported cases, corresponding to an incidence of 71 cases per 100,000 inhabitants

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

The incidence of Campylobacter in humans has a distinct seasonal distribution, with a summer peak in June-September. Consumption and handling of poultry and poultry products is believed to be the primary source of human campylobacteriosis in Denmark, though other sources also exist. Data on travel history is currently not reliably recorded in the surveillance system. It is estimated that approximately one third of cases are travel related

**Relevance as zoonotic disease**

Consumption and handling of poultry and poultry products is believed to be the primary source of human campylobacteriosis in Denmark, though other sources also exist.

### **2.2.3. Campylobacter in foodstuffs**

#### **A. Thermophilic Campylobacter in Broiler meat and products thereof**

##### **Monitoring system**

###### **Sampling strategy**

###### **At meat processing plant**

Monitoring for zoonotic pathogens in foodstuffs is coordinated both at the regional and at the central level of administration. Each Regional Veterinary and Food Control Authority (RVFCA) is responsible for the control carried out in its own region, and the Danish Veterinary and Food Administration (DVFA) is responsible for the regulation, control strategy and the surveillance at the overall national level.

###### **At retail**

Monitoring for zoonotic pathogens in foodstuffs is coordinated both at the regional and at the central level of administration. Each Regional Veterinary and Food Control Authority (RVFCA) is responsible for the control carried out in its own region, and the Danish Veterinary and Food Administration (DVFA) is responsible for the regulation, control strategy and the surveillance at the overall national level.

###### **Frequency of the sampling**

###### **At slaughterhouse and cutting plant**

Other: Every flock

###### **At meat processing plant**

Other: Depend on the survey

###### **At retail**

Other: Depend on the survey

###### **Type of specimen taken**

###### **At slaughterhouse and cutting plant**

Other: cloacal swabs

###### **At meat processing plant**

Other: Depend on the survey

###### **At retail**

Other: Depend on the survey

### **Methods of sampling (description of sampling techniques)**

#### **At meat processing plant**

Depend on the survey

#### **At retail**

Depend on the survey

### **Definition of positive finding**

#### **At meat processing plant**

Depend on the survey. Samples are considered positive when Campylobacter has been detected either by using the PCR method or bacteriological methods.

#### **At retail**

Depend on the survey. Samples are considered positive when Campylobacter has been detected either by using the PCR method or bacteriological methods.

### **Diagnostic/ analytical methods used**

#### **At meat processing plant**

Other: Depend on the survey

#### **At retail**

Other: Depend on the survey

### **Notification system in place**

Campylobacteriosis is not notifiable in broilers.

### **Results of the investigation**

In 2007, the monitoring data on the occurrence of Campylobacter in chilled and frozen, domestic produced and imported broiler meat was updated retrospectively, as additional information has become available. Based on these updated data, it is concluded that the proportion of Campylobacter positive samples in domestic produced, chilled broiler meat in 2007 was about the same as in 2006 and 2004.

Since the strategy was implemented in 2003, the proportion of Campylobacter positive samples has decreased slightly. In 2005, the percent Campylobacter positive samples seemed to drop noticeably. However, this decrease may not be as distinct, because at least a part of the decrease can be explained by the fact that a larger amount of samples were collected during the low prevalent months (due to seasonality in flock prevalence) in 2005, whereas in 2007, where the proportion of positive samples was higher than in 2005, more samples were collected during the high prevalent months. This uneven yearly collecting of samples was not intended and is very inappropriate when considering yearly mean values only.

The monitoring of domestic produced, fresh, chilled broiler meat produced in the two larger Danish broiler-processing plants showed a decline in the Campylobacter prevalence from 2004 to 2006.

These products were regularly sampled. The decline is believed to reflect the intervention strategy implemented in 2003. The occurrence of *Campylobacter* in 2007 was at the same level as in 2006.

In contrast to the decline over the last few years in the broiler flock prevalence and the proportion of *Campylobacter* positive samples of domestic produced, fresh, chilled broiler meat, the proportion of *Campylobacter* positive domestic produced, frozen meat has increased markedly in 2007. This may partly be explained by the uneven collecting of samples in 2007. As regards imported broiler meat, the proportion of *Campylobacter* positive chilled and frozen products remained steady in 2007 compared to 2006. The imported meat is not as influenced by season as the domestic produced meat.

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

Consumption and handling of poultry and poultry products is believed to be the primary source of human campylobacteriosis in Denmark, though other sources also exist.

**Table Campylobacter in poultry meat**

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for thermophilic Campylobacter spp.	C. coli	C. lari	C. upsaliensis	C. jejuni	Thermophilic Campylobacter spp., unspecified
<b>Meat from broilers (Gallus gallus)</b>										
<b>fresh</b>										
- at slaughterhouse	Food-DTU	single	10g or 15g	439	36					36
- at retail	Food-DTU	single	10g or 15g	695	261					261
<b>meat products</b>										
<b>raw but intended to be eaten cooked</b>										
- at retail	food-DTU	single	10g or 15g	695	261					261

## **2.2.4. Campylobacter in animals**

### **A. Thermophilic Campylobacter in Gallus gallus**

#### **Monitoring system**

##### **Sampling strategy**

The voluntary intervention strategy aimed at reducing the number of Campylobacter positive broiler flocks implemented in 2003 was continued in 2007. All broiler flocks are sampled for Campylobacter at the slaughterhouse prior to slaughter, and the samples are analysed using a PCR detection method.

##### **Frequency of the sampling**

###### **At slaughter**

Every flock is sampled

##### **Type of specimen taken**

###### **At slaughter**

Other: Cloacal swabs

##### **Methods of sampling (description of sampling techniques)**

###### **At slaughter**

10 cloacal swabs are collected from each flock/ batch at the time of slaughter. Samples are pooled.

##### **Case definition**

###### **At slaughter**

Samples are considered positive when Campylobacter has been detected using the PCR method.

#### **Other preventive measures than vaccination in place**

Generally, Campylobacter-negative flocks are allocated to the production of fresh products and Campylobacter-positive flocks for frozen product production, although not completely consistent.

#### **Control program/ mechanisms**

##### **The control program/ strategies in place**

None, the programme is voluntary

##### **Recent actions taken to control the zoonoses**

A voluntary intervention strategy aimed at reducing the number of Campylobacter positive

broiler flocks was implemented in 2003

### **Measures in case of the positive findings or single cases**

None

### **Notification system in place**

Campylobacteriosis is not notifiable in poultry

### **Results of the investigation**

In 2007, there were 26.8% Campylobacter positive flocks. This is a significant decrease compared to the years prior to implementation of the strategy, where the prevalence was greater than 38%, but at the same level as in previous years

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

Since 2001, there has been a 30% reduction in the number of human campylobacteriosis cases. This decrease coincide with an almost 25% reduction in the number of positive flocks after the implementation of the voluntary intervention programme in broilers. It is likely that the practice of allocating Campylobacter-negative flocks to the production of fresh products and Campylobacter-positive flocks for frozen product production, although not completely consistent, contributed to the reduction in human cases.

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

Consumption and handling of poultry and poultry products is believed to be the primary source of human campylobacteriosis in Denmark, though other sources also exist.

### **Additional information**

The PCR-method used in surveillance of Campylobacter in broilers does not differentiate between species of Campylobacter. However, as part of the monitoring programme for the occurrence of antimicrobial resistance in zoonotic bacteria (DANMAP), approximately one sample from one flock from each broiler holding was speciated, if positive for Campylobacter, by conventional microbiological methods. Samples consisted of 10-pooled cloacal swabs. Of the 380 samples investigated, 28.6% (109 samples) was found to be positive for Campylobacter. The species identified were *C. jejuni* (94%), *C. coli* (2%) and *C. upsaliensis* (4%).

**Table Campylobacter in animals**

	Source of information	Sampling unit	Units tested	Total units positive for thermophilic Campylobacter spp.	C. jejuni	C. coli	C. lari	C. upsaliensis	Thermophilic Campylobacter spp., unspecified
<b>Cattle (bovine animals)</b>									
<b>adult cattle over 2 years</b>									
- at slaughterhouse - animal sample - faeces - Monitoring - sampling by industry - objective sampling	Food-DTU	herd	132	93	89	4			
<b>Pigs</b>									
<b>fattening pigs</b>									
<b>raised under controlled housing conditions in integrated production system</b>									
- at slaughterhouse - animal sample - faeces - Monitoring - sampling by industry - objective sampling	Food-DTU	herd	261	205	5	200			
<b>Gallus gallus (fowl)</b>									
<b>broilers</b>									
- at slaughterhouse	Vet-DTU	flock	4527	1212					1212

## **2.2.5. Antimicrobial resistance in Campylobacter isolates**

### **A. Antimicrobial resistance in Campylobacter jejuni and coli in cattle**

#### **Sampling strategy used in monitoring**

##### **Frequency of the sampling**

The samples from animals at slaughter are collected by meat inspection staff or company personnel and sent to the DTU-FOOD for examination. The number of samples for each plant depend on the number of animals slaughtered per year. One sample represents one herd or flock. They are collected once a month (weekly for broilers). The cattle slaughter plants included in the surveillance programme account for 90% of the total production of these cattle in Denmark. Accordingly, the bacterial isolates may be regarded as representing a stratified random sample of the respective populations, so that the occurrence of resistance provides an estimate of the true occurrence in the populations.

##### **Type of specimen taken**

faecal sample

##### **Procedures for the selection of isolates for antimicrobial testing**

One isolate per herd

##### **Methods used for collecting data**

All isolated were tested at the DTU-FOOD.

#### **Laboratory methodology used for identification of the microbial isolates**

The samples were examined by direct inoculation of selective agar as well as by selective enrichment. As selective agar we used mCCD agar, which was incubated in micro-aerophilic atmosphere for 1-3 days at 42°C. Selective enrichment was done by inoculation of Preston broth at a ratio of 1:10, followed by incubation in microaerophilic atmosphere for 24 h at 42°C. Ten µl of this enrichment culture was inoculated onto mCCD agar and incubated 1 – 3 days at 42°C. Campylobacter-like colonies were identified by their catalase activity, by their ability to hydrolyse hippurate and indoxyl acetate. For isolates from cattle and pigs, also oxidase activity was tested.

#### **Laboratory used for detection for resistance**

##### **Antimicrobials included in monitoring**

See table

##### **Breakpoints used in testing**

See table

#### **Preventive measures in place**

None

## **Control program/ mechanisms**

### **Recent actions taken to control the zoonoses**

None

### **Measures in case of the positive findings or single cases**

None

## **Results of the investigation**

84 isolates of *C. jejuni* from cattle were subjected to susceptibility testing in 2007.

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

The results were similar to previous years.

## **B. Antimicrobial resistance in *Campylobacter jejuni* and coli in pigs**

### **Sampling strategy used in monitoring**

#### **Frequency of the sampling**

The samples from animals at slaughter are collected by meat inspection staff or company personnel and sent to the DTU-FOOD for examination. The number of samples for each plant has been determined in proportion to the number of animals slaughtered per year. Each sample represents one herd or flock. They are collected once a month. The pig slaughter plants included in the surveillance programme account for 95% of the total production of pigs in Denmark. Accordingly, the bacterial isolates may be regarded as representing a stratified random sample of the respective populations, so that the occurrence of resistance provides an estimate of the true occurrence in the populations.

#### **Type of specimen taken**

faecal sample

#### **Procedures for the selection of isolates for antimicrobial testing**

One isolate per herd

#### **Methods used for collecting data**

All isolated were tested at the DTU-FOOD.

### **Laboratory methodology used for identification of the microbial isolates**

The samples were examined by direct inoculation of selective agar as well as by selective enrichment. As selective agar we used mCCD agar, which was incubated in micro-aerophilic atmosphere for 1-3 days at 42°C. Selective enrichment was done by inoculation of Preston broth at a ratio of 1:10, followed by incubation in microaerophilic atmosphere for 24 h at 42°C. Ten µl of this enrichment culture was inoculated onto mCCD agar and incubated 1 – 3 days at 42°C. *Campylobacter*-like

colonies were identified by their catalase activity, by their ability to hydrolyse hippurate and indoxyl acetate. For isolates from cattle and pigs, also oxidase activity was tested.

### **Laboratory used for detection for resistance**

#### **Antimicrobials included in monitoring**

See table

#### **Breakpoints used in testing**

See table

### **Preventive measures in place**

None

### **Control program/ mechanisms**

#### **Recent actions taken to control the zoonoses**

None

### **Measures in case of the positive findings or single cases**

None

### **Results of the investigation**

104 *C. coli* isolates from pigs were subjected to susceptibility testing in 2007.

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

The results were similar to previous years.

## **C. Antimicrobial resistance in *Campylobacter jejuni* and *coli* in poultry**

### **Sampling strategy used in monitoring**

#### **Frequency of the sampling**

The samples from animals at slaughter are collected by meat inspection staff or company personnel and sent to the DTU-FOOD for examination. The number of samples for each plant has been determined in proportion to the number of animals slaughtered per year. Each sample represents one herd or flock. They are collected once a month (weekly for broilers). The broiler slaughter plants included in the surveillance programme account for 95% of the total production of broilers in Denmark. Accordingly, the bacterial isolates may be regarded as representing a stratified random sample of the respective populations, so that the occurrence of resistance provides an estimate of the true occurrence in the populations.

#### **Type of specimen taken**

faecal sample

### **Procedures for the selection of isolates for antimicrobial testing**

One isolate per flock

### **Methods used for collecting data**

All isolated were tested at the DTU-FOOD.

### **Laboratory methodology used for identification of the microbial isolates**

The samples were examined by direct inoculation of selective agar as well as by selective enrichment. As selective agar we used mCCD agar, which was incubated in micro-aerophilic atmosphere for 1-3 days at 42°C. Selective enrichment was done by inoculation of Preston broth at a ratio of 1:10, followed by incubation in microaerophilic atmosphere for 24 h at 42°C. Ten µl of this enrichment culture was inoculated onto mCCD agar and incubated 1 – 3 days at 42°C. Campylobacter-like colonies were identified by their catalase activity, by their ability to hydrolyse hippurate and indoxyl acetate. For isolates from cattle and pigs, also oxidase activity was tested.

### **Laboratory used for detection for resistance**

#### **Antimicrobials included in monitoring**

See table

#### **Breakpoints used in testing**

See table

### **Preventive measures in place**

None

### **Control program/ mechanisms**

#### **Recent actions taken to control the zoonoses**

None

### **Measures in case of the positive findings or single cases**

None

### **Results of the investigation**

94 isolates of *C. jejuni* from broilers were subjected to susceptibility testing in 2007.

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

The results were similar to previous years.

## **D. Antimicrobial resistance in *Campylobacter jejuni* and coli in foodstuff derived from cattle**

### **Sampling strategy used in monitoring**

#### **Frequency of the sampling**

No Campylobacter isolates from Danish beef were subjected to susceptibility testing.

### **E. Antimicrobial resistance in Campylobacter jejuni and coli in foodstuff derived from pigs**

### **Sampling strategy used in monitoring**

#### **Frequency of the sampling**

No isolates of Campylobacter from Danish pork were subjected to susceptibility testing.

### **F. Antimicrobial resistance in Campylobacter jejuni and coli in foodstuff derived from poultry**

### **Sampling strategy used in monitoring**

#### **Frequency of the sampling**

All food samples were collected at wholesale and retail outlets by the Regional Veterinary and Food Control Authorities (RFCA) during the course of routine inspection carried out by the authorities, or on request specifically for the DANMAP surveillance programme.

#### **Type of specimen taken**

Meat samples

#### **Methods used for collecting data**

All isolates are tested centrally at the DTU-FOOD.

### **Laboratory used for detection for resistance**

#### **Antimicrobials included in monitoring**

See tables

#### **Breakpoints used in testing**

See tables

### **Preventive measures in place**

None

### **Control program/ mechanisms**

#### **Recent actions taken to control the zoonoses**

None

**Measures in case of the positive findings or single cases**

None

**Results of the investigation**

114 isolates of *C. jejuni* from poultry meat samples were subjected to susceptibility testing in 2007.

**Table Antimicrobial susceptibility testing of C. coli in Pigs - fattening pigs - at slaughterhouse - Monitoring - official sampling - quantitative data [Dilution method]**

C. coli																								
Pigs - fattening pigs - at slaughterhouse - Monitoring - official sampling																								
Isolates out of a monitoring programme										yes														
Number of isolates available in the laboratory										104														
Antimicrobials:	Break point	N	n	Number of resistant isolates (n) and number of isolates with the concentration (u/ml) or zone (mm) of inhibition equal to																				
				<=0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest	
<b>Aminoglycosides</b>																								
Gentamicin	1	104	0			3	27	71	3															
Streptomycin	2	104	58						46															
<b>Amphenicols</b>																								
Chloramphenicol	16	104	0																					
<b>Fluoroquinolones</b>																								
Ciprofloxacin	1	104	10	34	35	23	2																	
<b>Macrolides</b>																								
Erythromycin	4	104	12				26	24	33	9	1													
<b>Quinolones</b>																								
Nalidixic acid	16	104	12																					
<b>Tetracyclines</b>																								
Tetracyclin	2	104	5				53	32	13	1														

**Table Antimicrobial susceptibility testing in C. coli**

n = Number of resistant isolates		
C. coli		
Pigs - fattening pigs - at slaughterhouse - Monitoring - official sampling		
Isolates out of a monitoring programme		yes
Number of isolates available in the laboratory		104
<b>Antimicrobials:</b>		
	<b>N</b>	<b>n</b>
<b>Aminoglycosides</b>		
Gentamicin	104	0
Streptomycin	104	58
<b>Amphenicols</b>		
Chloramphenicol	104	0
<b>Fluoroquinolones</b>		
Ciprofloxacin	104	10
<b>Macrolides</b>		
Erythromycin	104	11
<b>Quinolones</b>		
Nalidixic acid	104	10
<b>Tetracyclines</b>		
Tetracyclin	104	5

**Table Antimicrobial susceptibility testing of C. jejuni in Cattle (bovine animals) - at slaughterhouse - Monitoring - official sampling - quantitative data [Dilution method]**

C. jejuni		Cattle (bovine animals) - at slaughterhouse - Monitoring - official sampling																						
Isolates out of a monitoring programme		yes																						
Number of isolates available in the laboratory		84																						
		Number of resistant isolates (n) and number of isolates with the concentration (u/ml) or zone (mm) of inhibition equal to																						
<b>Antimicrobials:</b>		Break point	N	n	<=0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest
<b>Aminoglycosides</b>																								
	Gentamicin	1	84	0			19	48	13	4														
	Streptomycin	2	84	3						81	1			1	1									
<b>Amphenicols</b>																								
	Chloramphenicol	16	84	0							79	4		1										
<b>Fluoroquinolones</b>																								
	Ciprofloxacin	1	84	14	30	37	3						14											
<b>Macrolides</b>																								
	Erythromycin	4	84	1					46	25	12				1									
<b>Quinolones</b>																								
	Nalidixic acid	16	84	14						22	41	6		1	2	12								
<b>Tetracyclines</b>																								
	Tetracyclin	2	84	1		1	73	7	1	1														

**Table Antimicrobial susceptibility testing of *C. jejuni* in Gallus gallus (fowl) - broilers - at slaughterhouse - Monitoring - official sampling - quantitative data [Dilution method]**

<i>C. jejuni</i>																								
Gallus gallus (fowl) - broilers - at slaughterhouse - Monitoring - official sampling																								
yes																								
Isolates out of a monitoring programme	94																							
Number of isolates available in the laboratory	94																							
Number of resistant isolates (n) and number of isolates with the concentration (u/ml) or zone (mm) of inhibition equal to																								
Antimicrobials:	Break point	N	n	<=0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest	
<b>Aminoglycosides</b>																								
Gentamicin	1	94	0			10	59	25																
Streptomycin	2	94	2					92						2										
<b>Amphenicols</b>																								
Chloramphenicol	16	94	0							15	75	3	1											
<b>Fluoroquinolones</b>																								
Ciprofloxacin	1	94	8	11	52	21	2					8												
<b>Macrolides</b>																								
Erythromycin	4	94	1					3	21	56	13	1												
<b>Quinolones</b>																								
Nalidixic acid	16	94	8							13	64	8	1	1	1	6								
<b>Tetracyclines</b>																								
Tetracyclin	2	94	9				52	29	4					9										

**Table Antimicrobial susceptibility testing in *C. jejuni***

n = Number of resistant isolates				
<i>C. jejuni</i>				
	Cattle (bovine animals)		Gallus gallus (fowl) - broilers - at slaughterhouse - Monitoring - official sampling	
Isolates out of a monitoring programme		yes		yes
Number of isolates available in the laboratory		84		94
<b>Antimicrobials:</b>	<b>N</b>	<b>n</b>	<b>N</b>	<b>n</b>
<b>Aminoglycosides</b>				
Gentamicin	84	0	94	0
Streptomycin	84	3	94	2
<b>Amphenicols</b>				
Chloramphenicol	84	0	94	0
<b>Fluoroquinolones</b>				
Ciprofloxacin	84	14	94	8
<b>Macrolides</b>				
Erythromycin	84	1	94	1
<b>Quinolones</b>				
Nalidixic acid	84	14	94	8
<b>Tetracyclines</b>				
Tetracyclin	84	1	94	9

**Table Antimicrobial susceptibility testing in *C. jejuni***

n = Number of resistant isolates		
<i>C. jejuni</i>		
Meat from broilers ( <i>Gallus gallus</i> ) - fresh - at retail - Monitoring - official sampling		
Isolates out of a monitoring programme		yes
Number of isolates available in the laboratory		114
<b>Antimicrobials:</b>		
	<b>N</b>	<b>n</b>
<b>Aminoglycosides</b>		
Gentamicin	113	0
Streptomycin	114	4
<b>Fluoroquinolones</b>		
Ciprofloxacin	114	13
<b>Macrolides</b>		
Erythromycin	114	2
<b>Quinolones</b>		
Nalidixic acid	114	13
<b>Tetracyclines</b>		
Tetracyclin	114	11

**Table Antimicrobial susceptibility testing of C. jejuni in Meat from broilers (Gallus gallus) - fresh - at retail - domestic production - Monitoring - official sampling - quantitative data [Dilution method]**

C. jejuni		Meat from broilers (Gallus gallus) - fresh - at retail - domestic production - Monitoring - official sampling																						
Isolates out of a monitoring programme		yes																						
Number of isolates available in the laboratory		114																						
		Number of resistant isolates (n) and number of isolates with the concentration (u/ml) or zone (mm) of inhibition equal to																						
Antimicrobials:	Break point	N	n	<=0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest	
<b>Aminoglycosides</b>																								
Gentamicin	1	113	0			10	55	46	2															
Streptomycin	2	114	4						110					4										
<b>Fluoroquinolones</b>																								
Ciprofloxacin	1	114	13		90	8	3			1	3	9												
<b>Macrolides</b>																								
Erythromycin	4	114	2					106	5	1				1	1									
<b>Quinolones</b>																								
Nalidixic acid	16	114	13						16	81	4			1	4	8								
<b>Tetracyclines</b>																								
Tetracyclin	2	114	11				101	1		1				11										

## Table Breakpoints used for antimicrobial susceptibility testing in Animals

**Test Method Used**


---

**Standards used for testing**


---

 NCCLS
 

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Campylobacter	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content microg	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest		Susceptible >=	Intermediate	Resistant <=
<b>Amphenicols</b>										
Chloramphenicol				16	2	32				
<b>Tetracyclines</b>										
Tetracyclin				2	0.25	16				
<b>Fluoroquinolones</b>										
Ciprofloxacin				1	0.06	4				
<b>Quinolones</b>										
Nalidixic acid				16	2	64				
<b>Aminoglycosides</b>										
Streptomycin				2	2	16				
Gentamicin				1	0.125	16				
<b>Macrolides</b>										
Erythromycin				4	0.5	32				
<b>Penicillins</b>										
Ampicillin										

## Table Breakpoints used for antimicrobial susceptibility testing in Food

**Test Method Used**


---

**Standards used for testing**


---

 NCCLS
 

---

Campylobacter	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content microg	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest		Susceptible >=	Intermediate	Resistant <=
<b>Amphenicols</b>										
Chloramphenicol				16	2	32				
<b>Tetracyclines</b>										
Tetracyclin				2	0.25	16				
<b>Fluoroquinolones</b>										
Ciprofloxacin				1	0.06	4				
<b>Quinolones</b>										
Nalidixic acid				16	2	64				
<b>Aminoglycosides</b>										
Streptomycin				2	2	16				
Gentamicin				1	0.125	16				
<b>Macrolides</b>										
Erythromycin				4	0.5	32				
<b>Penicillins</b>										
Ampicillin										

## Table Breakpoints used for antimicrobial susceptibility testing in Feedingstuff

Test Method Used \_\_\_\_\_

Standards used for testing \_\_\_\_\_

NCCLS \_\_\_\_\_

Campylobacter	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content microg	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest		Susceptible >=	Intermediate	Resistant <=
<b>Amphenicols</b>										
Chloramphenicol										
<b>Tetracyclines</b>										
Tetracyclin										
<b>Fluoroquinolones</b>										
Ciprofloxacin										
<b>Quinolones</b>										
Nalidixic acid										
<b>Aminoglycosides</b>										
Streptomycin										
Gentamicin										
<b>Macrolides</b>										
Erythromycin										
<b>Penicillins</b>										
Ampicillin										

## Table Breakpoints used for antimicrobial susceptibility testing in Humans

Test Method Used

---

Standards used for testing

---

NCCLS

---

Campylobacter	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content microg	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest		Susceptible >=	Intermediate	Resistant <=
<b>Amphenicols</b>										
	Chloramphenicol									
<b>Tetracyclines</b>										
	Tetracyclin									
<b>Fluoroquinolones</b>										
	Ciprofloxacin									
<b>Quinolones</b>										
	Nalidixic acid									
<b>Aminoglycosides</b>										
	Streptomycin									
	Gentamicin									
<b>Macrolides</b>										
	Erythromycin									
<b>Penicillins</b>										
	Ampicillin									

## **2.3. LISTERIOSIS**

### **2.3.1. General evaluation of the national situation**

#### **A. Listeriosis general evaluation**

##### **History of the disease and/ or infection in the country**

Listeriosis is not a common disease in humans in Denmark, however the incidence has been increasing during recent years

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

In 2007, there were 58 cases in DENmark (an incidence of 1.1/ 100.000 population). During recent years, the number of positive cases has increased from 29 in 2003 to 58 in 2007

##### **Recent actions taken to control the zoonoses**

From January 2006 a new EU Regulation on microbiological criteria for foodstuffs<sup>1</sup> came into force. In this Regulation harmonised criteria for *Listeria monocytogenes* are introduced. The new EU criteria distinguish between products supporting growth of *Listeria* and products not supporting growth and cover all ready-to-eat foods

##### **Additional information**

There is great concern in Denmark about the increasing incidence

## **2.3.2. Listeriosis in humans**

### **A. Listeriosis in humans**

#### **Reporting system in place for the human cases**

Listeria sp. infections are individually notifiable. The physicians report individually notifiable zoonotic diseases to Department of Epidemiology at the Statens Serum Institut (SSI)

#### **Case definition**

A case is confirmed once *L. monocytogenes* has been detected in blood or cerebrospinal fluid.

#### **Diagnostic/ analytical methods used**

Bacteriology

#### **Notification system in place**

Listeria sp. infections are individually notifiable. The physicians report individually notifiable zoonotic diseases to Department of Epidemiology at the Statens Serum Institut (SSI)

#### **History of the disease and/ or infection in the country**

Listeriosis is a rare disease in Denmark.

#### **Results of the investigation**

In 2007, there were 58 cases in Denmark (an incidence of 1.1/ 100.000 population). During recent years, the number of positive cases has increased from 29 in 2003 to 58 in 2007

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

Listeriosis is a rare disease in Denmark.

#### **Relevance as zoonotic disease**

Listeriosis is a rare disease in Denmark, however due to the severity of the disease, there is great concern about the increasing incidence.

## 2.3.3. Listeria in foodstuffs

Table Listeria monocytogenes in milk and dairy products

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for L.monocytogenes	Units tested with detection method	Listeria monocytogenes presence in x g	Units tested with enumeration method	> detection limit but ≤ 100 cfu/ g	L. monocytogenes > 100 cfu/ g
Milk, cows'	DVFA	single	25	226	2	187	2	39	0	0

**Table Listeria monocytogenes in other foods**

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for L.monocytogenes	Units tested with detection method	Listeria monocytogenes presence in x g	Units tested with enumeration method	> detection limit but ≤ 100 cfu/ g	L. monocytogenes > 100 cfu/ g
<b>Fish</b>										
- at retail - Survey	DFVA	single	25	177	1	24	2	153	1	0
<b>Meat, mixed meat meat products</b>										
- at retail - domestic production - Survey	DVFA	single	25	803	4	68	2	735	3	2
<b>Fruits</b>										
- at retail - Survey (Fruit and Vegetable)	DVFA	single	25	70	0	10	0	60	0	0

#### **2.3.4. Listeria in animals**

## **2.4. E. COLI INFECTIONS**

### **2.4.1. General evaluation of the national situation**

#### **A. Verotoxigenic Escherichia coli infections general evaluation**

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

The number of registered infections increased by 10% from 2006 to 2007, however it is similar to the 2004 level.

Since the beginning of the surveillance in 1997 the incidence has increased; an increase which is primarily assumed to reflect improved diagnostics and increased awareness. However, Denmark does not have a centrally coordinated standard testing method for VTEC and the incidence through the past 10 years has been 3 to 10 times higher in counties using a diagnostic approach involving molecular detection methods.

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

Cattle is known to harbour VTEC O157 and therefore there is a potential risk for contamination in the food chain, which require alertness at all steps from stable-to-table.

##### **Recent actions taken to control the zoonoses**

None

## **2.4.2. E. Coli Infections in humans**

### **A. Verotoxigenic Escherichia coli infections in humans**

#### **Reporting system in place for the human cases**

Verocytotoxin-producing E. coli is notifiable through the laboratory surveillance system. Cases are diagnosed by a clinical microbiological laboratory and reported through the laboratory surveillance system to the Unit of Gastrointestinal Infections at SSI.

Haemolytic uraemic syndrome (HUS) is a notifiable disease.

#### **Case definition**

A case is positive when there is laboratory confirmed bacteriological findings in faecal samples.

#### **Diagnostic/ analytical methods used**

Laboratories testing samples from approximately 50% of the Danish population use molecular detection methods (PCR or dot blot hybridisation), which detect verocytotoxin genes, followed by slide agglutination and further typing methods. Most of the remaining laboratories use slide agglutination of suspect colonies, with OK-antisera against the most common VTEC and EPEC serotypes for microbiological diagnosis. At a few laboratories verocytotoxin-specific ELISA detection is used. In 2006, all VTEC isolates were real-time sub-typed using PFGE at the SSI.

#### **Notification system in place**

Verocytotoxin-producing E. coli is notifiable through the laboratory surveillance system

#### **History of the disease and/ or infection in the country**

The number of registered infections increased by 10% from 2006 to 2007, however it is similar to the 2004 level.

Since the beginning of the surveillance in 1997 the incidence has increased; an increase which is primarily assumed to reflect improved diagnostics and increased awareness. However, Denmark does not have a centrally coordinated standard testing method for VTEC and the incidence through the past 10 years has been 3 to 10 times higher in counties using a diagnostic approach involving molecular detection methods.

#### **Results of the investigation**

In 2007, there were 161 reported cases positive with verocytotoxin-producing Escherichia coli (VTEC) infections; an incidence of 3.0 per 100,000. VTEC O157 was found in 25 cases

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

So far the annual incidence in Denmark has been low and predominantly sporadic, however, it is possible that the incidence may increase in the future, partly due to improved diagnostic methodologies and increased awareness.

#### **Relevance as zoonotic disease**

Cattle is known to harbour VTEC O157 and therefore there is a potential risk for contamination in the food chain, which require alertness at all steps from stable-to-table.

**Additional information**

Denmark does not have a centrally coordinated standard testing method for VTEC. It should be noted that the incidence through the past 11 years (1997-2007) has been 3 to 10 times higher in counties using a diagnostic approach involving molecular detection methods.

### **2.4.3. Escherichia coli, pathogenic in foodstuffs**

### **2.4.4. Escherichia coli, pathogenic in animals**

#### **A. Verotoxigenic Escherichia coli in cattle (bovine animals)**

##### **Monitoring system**

###### **Sampling strategy**

VTEC is not notifiable in animals.

The National Food Institute has monitored the occurrence of VTEC O157 in cattle since 1997 through examination of faecal samples from slaughter calves. These samples were collected at the slaughterhouses as part of the DANMAP programme

###### **Frequency of the sampling**

###### **Animals at slaughter (herd based approach)**

Other: One animal per randomly selected herd

###### **Type of specimen taken**

###### **Animals at slaughter (herd based approach)**

Faeces

###### **Methods of sampling (description of sampling techniques)**

###### **Animals at slaughter (herd based approach)**

faecal samples are collected from slaughter calves at the slaughterhouses.

###### **Case definition**

###### **Animals at slaughter (herd based approach)**

An animal from which VTEC 0157 is isolated

##### **Control program/ mechanisms**

###### **The control program/ strategies in place**

VTEC is not notifiable in animals.

###### **Recent actions taken to control the zoonoses**

None

##### **Measures in case of the positive findings or single cases**

None

### **Results of the investigation**

In 2007, VTEC O157 was isolated from 7.5% of faecal samples from slaughter calves

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

Cattle is known to harbour VTEC O157 and therefore there is a potential risk for contamination in the food chain, which require alertness at all steps from stable-to-table.

**Table VT E. coli in animals**

	Source of information	Sampling unit	Sample weight	Units tested	Verotoxigenic E. coli (VTEC)	Verotoxigenic E. coli (VTEC) - VTEC O157	Verotoxigenic E. coli (VTEC) - VTEC non-O157	Verotoxigenic E. coli (VTEC) - VTEC, unspecified
<b>Cattle (bovine animals)</b>								
calves (under 1 year) <b>for slaughter</b>								
- at slaughterhouse - animal sample - faeces - Monitoring - monitoring survey - objective sampling	Food-DTU	animal	25	186	14	14		

## **2.5. TUBERCULOSIS, MYCOBACTERIAL DISEASES**

### **2.5.1. General evaluation of the national situation**

#### **A. Tuberculosis general evaluation**

##### **History of the disease and/ or infection in the country**

Eradication of bovine tuberculosis in Denmark started already in 1893. In 1953 the eradication programme was changed to a surveillance programme - since at that time only very few outbreaks were reported annually. Since 1980 Denmark has been declared officially free from bovine tuberculosis by EU, and the disease has not been diagnosed in cattle since 1988.

Deer farming began in Denmark in the early 1980 and until then bovine tuberculosis had never been diagnosed from deer. The farmed deer was primarily imported animals and in 1988 an outbreak was reported and during 1988-89 another 12 farms was diagnosed with bovine tuberculosis. In 1989 a control programme was initiated and in 1991, 1993 and 1994 tuberculosis was diagnosed from on farm each year. Since 1994 tuberculosis has not been reported from deer in Denmark.

The disease is notifiable and at suspicion the herd is put under official supervision and the herd examined using tuberculin testing. In case of a positive diagnose are all herds, that have received animals from the infected herd put under official supervision and tested using the tuberculin test.

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

Denmark has been officially free from bovine tuberculosis since 1980 and the probability of contracting bovine tuberculosis from Danish animals or foodstuff is close to zero.

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

There have been no findings of Mycobacteria in animals or foodstuff

##### **Recent actions taken to control the zoonoses**

None, the zoonosis is under control

## **2.5.2. Tuberculosis, Mycobacterial Diseases in humans**

### **A. Tuberculosis due to Mycobacterium bovis in humans**

#### **Reporting system in place for the human cases**

Human tuberculosis caused by *M. bovis* and *M. tuberculosis* is individually notifiable in Denmark. Medical clinics/ hospitals/ regional medical officers report clinical cases to the Statens Serum Institut. Laboratories voluntarily report confirmed cases.

#### **Case definition**

A confirmed case of *M. bovis* or *M. tuberculosis* is a case where the bacteria has been isolated in the laboratory.

#### **Diagnostic/ analytical methods used**

Microscopy PCR, bacteriology, resistensprofile and DNA-subtypning.

#### **Notification system in place**

Bovine tuberculosis has been notifiable in humans since May 1st 2000 according to the Danish Order no. 277 of 14/ 04/ 2000.

#### **History of the disease and/ or infection in the country**

Since bovine tuberculosis was eliminated in Denmark in 1980, almost all bacteriological confirmed cases in humans have been caused by *M. tuberculosis*.

#### **Results of the investigation**

In 2007, one case caused by *M. Bovis* were registrered.

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

During the last 10 years, no cases reported has been associated with transmission from animals or food in Denmark. The few cases (less than 13 per year) reported each year are regarded as reactivation of latent infecions aquired before the eradication of bovine TB in cattle in Denmark or as infections aquired abroad.

#### **Relevance as zoonotic disease**

As Denmark is officially free from bovine tuberculosis, the probability of contracting *M. bovis* infection from Danish animals or animal products is close to zero.

### **2.5.3. Mycobacterium in animals**

#### **A. Mycobacterium bovis in bovine animals**

##### **Status as officially free of bovine tuberculosis during the reporting year**

###### **The entire country free**

Denmark has been declared officially tuberculosis free since 1980 by the EFTA Surveillance Authority (ESA).

##### **Monitoring system**

###### **Sampling strategy**

All slaughtered animals are subject to monitoring at the slaughterhouse by the meat inspectors for the presence of TB lesions.

At semen collection centres, bulls are subject to pre-entry and annual intradermal tuberculin testing.

###### **Frequency of the sampling**

All slaughtered animals are inspected at slaughter

Bulls at semen collection centres: upon entry and annually thereafter

###### **Type of specimen taken**

Other: Meat inspection: Tubercles ect., Live bulls: Interdermal tuberculin test

###### **Methods of sampling (description of sampling techniques)**

Slaughtered animals: Meat inspectors at the slaughterhouse examine for lesions indicative for tuberculosis, collect tubercles ect.

Bulls at semen collection centres: Interdermal tuberculin testing.

###### **Case definition**

An animal is considered positive when when *M. bovis* or *M. tuberculosis* has been bacteriologically verified.

###### **Diagnostic/ analytical methods used**

At the slaughterhouse: visual monitoring of carcass for lesions followed by microbiological detection of the mycobacterium.

At semen collection centres: Interdermal tuberculin testing, followed by bacteriological verification.

##### **Vaccination policy**

No vaccination

##### **Other preventive measures than vaccination in place**

None

### **Control program/ mechanisms**

#### **The control program/ strategies in place**

In Denmark the control programmes are based on the following legislation: EU 2004/ 320/ EEC and Danish rule no. 306 of 03/ 05/ 2004

Animals at slaughter: Mandatory control programme.

#### **Recent actions taken to control the zoonoses**

None, as the disease is not present in Denmark

#### **Suggestions to the Community for the actions to be taken**

None

### **Measures in case of the positive findings or single cases**

Denmark would as a minimum implement the measures as laid down in Council Decision 2004/ 320/ EEC in case of positive findings or if suspicion of tuberculosis in bovine animals arise.

### **Notification system in place**

Tuberculosis caused by *M. bovis* or *M. tuberculosis* of all species are notifiable. Cases are to be notified to the Veterinary Institute, DTU

### **Results of the investigation**

511,600 animals was examined at the slaughterhouse and none were found positive.

No bulls were found positive at the semen collection centres,

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

The last case of TB in cattle was diagnosed in 1988.

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

There have been no findings of *M. bovis* in animals or foodstuffs.

## **B. Mycobacterium bovis in farmed deer**

### **Monitoring system**

#### **Sampling strategy**

All slaughtered animals are monitored by the meat inspectors at the slaughterhouse for the presence of lesions indicative for tuberculosis.

#### **Frequency of the sampling**

All slaughtered animals are inspected at slaughter.

### **Type of specimen taken**

Other: Tubercles ect.

### **Methods of sampling (description of sampling techniques)**

At slaughter: Visual monitoring of carcass for lesions, collection of tubercles ect. for microbiological testing.

### **Case definition**

An animal is considered positive when *M. bovis* or *M. tuberculosis* has been bacteriologically verified.

### **Diagnostic/ analytical methods used**

No positive results were reported in other routine tests in Denmark.

### **Vaccination policy**

No vaccination

### **Other preventive measures than vaccination in place**

None

### **Control program/ mechanisms**

#### **The control program/ strategies in place**

In 1989, a controlprogramme for farmed deer was initiated according to the Danish Order no. 28 of 14/ 01/ 97

#### **Recent actions taken to control the zoonoses**

None, as the disease is not present in Denmark for the time being. Since 1994, *Mycobacterium bovis* has not been detected in deer

### **Measures in case of the positive findings or single cases**

Denmark would as a minimum implement the measures as laid down in Danish Order no. 306 of 3/ 5/ 2000 in case of positive findings or if suspicion of tuberculosis in bovine animals arise.

### **Notification system in place**

Tuberculosis caused by *M. bovis* or *M. tuberculosis* of all species are notifiable. Cases are to be notified to the Danish Veterinary and Food administration

### **Results of the investigation**

*M. bovis* was not indentified in deer

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

the last case of tuberculosis in deer was diagnosed in 1994.

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

There have been no findings of *M. bovis* in animals or foodstuffs.

**Table Tuberculosis in other animals**

	Source of information	Sampling unit	Units tested	Total units positive for Mycobacterium spp.	M. bovis	M. tuberculosis	Mycobacterium spp., unspecified
<b>Pigs</b>							
<b>fattening pigs</b> <b>raised under controlled housing conditions in integrated production system</b> - at slaughterhouse - Control or eradication programmes - national programmes (no Community co-financing) - official and industry sampling	Vet-DTU	animal	21391000	0			
<b>Cattle (bovine animals)</b> - at slaughterhouse - Control or eradication programmes - national programmes (no Community co-financing) - official and industry sampling	Vet-DTU	animal	511600	0			

## **2.6. BRUCELLOSIS**

### **2.6.1. General evaluation of the national situation**

#### **A. Brucellosis general evaluation**

##### **History of the disease and/ or infection in the country**

Brucellosis has been eradicated in Denmark since 1959 and in 1980, Denmark was declared officially free from Brucellose.

The disease have not been diagnosed in cattle since 1962. However in pigs the disease are diagnosed every now and then, last time in 1999. It is assumed that the source of infection originates for infected hare populations found especially in the middle and eastern Jutland. Brucellose has never been observed in sheep and goats.

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

As bovine brucellose was eradicated in 1962, ovine and caprine brucellose has never been recorded and porcine brucelloses is very rare. The probability of contracting brucellose from Danish animals or animal products is close to zero.

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

There have been no findings of Brucellose in animals or foodstuff

##### **Recent actions taken to control the zoonoses**

None, the zoonosis is under control

## **2.6.2. Brucellosis in humans**

### **A. Brucellosis in humans**

#### **Reporting system in place for the human cases**

Brucella is not a notifiable disease in Denmark

#### **Case definition**

Laboratory confirmation of a clinical case

#### **Diagnostic/ analytical methods used**

Serological analysis of blood or bone marrow using ELISA, or PCR assays for specific DNA and species specification.

#### **Notification system in place**

Brucella is not a notifiable disease in Denmark

#### **History of the disease and/ or infection in the country**

Few cases are reported every year. Often no information on travel association is available.

#### **Results of the investigation**

In 2007, no information concerning Brucellosis in humans was provided before deadline of the reporting

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

Brucellosis is not common in Denmark, less than 20 cases are recorded annually. However the disease is not notifiable in humans, hence the incidence is unknown

#### **Relevance as zoonotic disease**

As Denmark is officially free from brucellosis in cattle, sheep and goats, the probability of contracting Brucella infection from Danish animals or animal products is close to zero.

### **2.6.3. Brucella in foodstuffs**

### **2.6.4. Brucella in animals**

#### **A. Brucella abortus in bovine animals**

##### **Status as officially free of bovine brucellosis during the reporting year**

###### **The entire country free**

Since 1980, Denmark has been declared officially free from Brucellosis according to the EU directive 97/ 175/ EEC.

##### **Monitoring system**

###### **Sampling strategy**

Cattle are only tested serologically based on clinical indications. Abortion clusters in cattle are notifiable.

Breeding bulls are tested serologically.

Animals for import and export are tested serologically.

###### **Frequency of the sampling**

Bulls are subject to serological testing pre-entry to bovine semen collection centres, and annually thereafter

Animals for import and export are tested serologically.

###### **Type of specimen taken**

Other: Blood, fetuses, depending on strategy

###### **Methods of sampling (description of sampling techniques)**

In case of abortion: Bacteriological examination of abortion material and/ or serological analysis of the animal.

Breeding bulls: Blood samples.

###### **Case definition**

An animal showing significant antibody titre to Brucella spp. or an animal from which Brucella spp. has been isolated.

The herd is the epidemiological unit

###### **Diagnostic/ analytical methods used**

Abortions: Bacteriology and serology (Antibody ELISA).

Breeding bulls: Serology (Antibody ELISA)

Clinical indications: serology (Antibody ELISA)

Import and export animals: serology (Antibody ELISA)

## **Vaccination policy**

Vaccination of animals against *Brucella* spp. is prohibited in Denmark

## **Other preventive measures than vaccination in place**

None

## **Control program/ mechanisms**

### **The control program/ strategies in place**

In case of abortion: Bacteriological examination of abortion material and/ or serological analysis of the animal.

Bulls are subject to serological testing pre-entry to bovine semen collection centres, and annually thereafter

In connection with clinical indications, for import and export, animals are tested serologically.

### **Recent actions taken to control the zoonoses**

None, the disease is not present in Denmark.

### **Suggestions to the Community for the actions to be taken**

None

## **Measures in case of the positive findings or single cases**

Herds, that have received animals from a herd with a positive diagnose, will be put under official veterinary supervision and blood samples are send to the Veterinary Institute, DTU for testing.

In the positive herds, slaughtering of animals that might retrieve the disease will take place. Sanitary actions will be taken at the farm and, at the earliest, one month after the Regional Veterinary and Food Control Authorities have approved the disinfection of the premises new animals may be put into the stables

Fields and other areas where the infected animals have been must not be used for new animals for 1 year. This includes areas where manure from infected animals has been spread out.

## **Notification system in place**

Brucellosis spp. in all species has been notifiable since 1959

## **Results of the investigation**

5218 animals tested in 2007, all of which were negative.

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

Bovine brucellosis was eradicated in 1962, and since then no herds have been observed with clinical symptoms. The last single animal case was found in 1970.

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

There have been no findings of Brucellosis in animals or foodstuff

### **Additional information**

From January 1st 1980, the annual routine monitoring of tankmilk samples stopped, because Denmark was officially brucellosis free according to EU directive 97/ 175/ EEC.

## **B. Brucella melitensis in sheep**

### **Status as officially free of ovine brucellosis during the reporting year**

#### **The entire country free**

Denmark is declared officially brucellosis.

### **Monitoring system**

#### **Sampling strategy**

Monitoring is performed by testing for Brucella antibodies in blood samples from sheep and goats, which are submitted as part of a voluntary control programme for lentivirus.

#### **Type of specimen taken**

Blood

#### **Methods of sampling (description of sampling techniques)**

In case of abortion: Bacteriological examination of abortion material and/ or serological analysis of the animal.

Monitoring: Blood samples

#### **Case definition**

An animal showing significant antibody titre to Brucella spp. or an animal from which Brucella spp. has been isolated.

The herd is the epidemiological unit

#### **Diagnostic/ analytical methods used**

Abortions: Bacteriology and serology (Antibody ELISA).

Clinical indications: serology (Antibody ELISA)

Import and export animals: serology (Antibody ELISA)

### **Vaccination policy**

Vaccination of animals against Brucella spp. is prohibited in Denmark

### **Other preventive measures than vaccination in place**

None

### **Control program/ mechanisms**

### **The control program/ strategies in place**

Monitoring for Brucella in goats are carried out as part of a voluntary control programme for lentivirus.

### **Recent actions taken to control the zoonoses**

None, the disease is not present in Denmark

### **Suggestions to the Community for the actions to be taken**

None

### **Measures in case of the positive findings or single cases**

Isolation of herds, that have received animals from the infected herd. Blood samples are send to the National Veterinary Institute for testing. Slaughter of all susceptible animals within the infected herd and disinfection of the premises.

### **Notification system in place**

Brucellosis spp. in all species has been notifiable since 1959. Positive cases must be reported to the Danish Veterinary and Food Administration

### **Results of the investigation**

In 2007, 3487 goat and sheep samples were examined and found negative.

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

Caprine brucellosis has never been recorded in Denmark

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

There have been no findings of Brucellosis in animals or foodstuff

## **C. Brucella melitensis in goats**

### **Status as officially free of caprine brucellosis during the reporting year**

#### **The entire country free**

Denmark is declared officially brucellosis.

### **Monitoring system**

#### **Sampling strategy**

Monitoring is performed by testing for Brucella antibodies in blood samples from sheep and goats, which are submitted as part of a voluntary control programme for lentivirus.

#### **Type of specimen taken**

Blood

### **Methods of sampling (description of sampling techniques)**

In case of abortion: Bacteriological examination of abortion material and/ or serological analysis of the animal.

Monitoring: Blood samples

### **Case definition**

An animal showing significant antibody titre to *Brucella* spp. or an animal from which *Brucella* spp. has been isolated.

The herd is the epidemiological unit

### **Diagnostic/ analytical methods used**

Abortions: Bacteriology and serology (Antibody ELISA).

Clinical indications: serology (Antibody ELISA)

Import and export animals: serology (Antibody ELISA)

### **Vaccination policy**

Vaccination of animals against *Brucella* spp. is prohibited in Denmark

### **Other preventive measures than vaccination in place**

None

### **Control program/ mechanisms**

#### **The control program/ strategies in place**

Monitoring for *Brucella* in goats are carried out as part of a voluntary control programme for lentivirus.

#### **Recent actions taken to control the zoonoses**

None, the disease is not present in Denmark

#### **Suggestions to the Community for the actions to be taken**

None

### **Measures in case of the positive findings or single cases**

Isolation of herds, that have received animals from the infected herd. Blood samples are sent to the National Veterinary Institute for testing. Slaughter of all susceptible animals within the infected herd and disinfection of the premises.

### **Notification system in place**

Brucellosis spp. in all species has been notifiable since 1959. Positive cases must be reported to the Danish Veterinary and Food Administration

### **Results of the investigation**

In 2007, 3.487 samples from sheep and goats were analysed, all were negative.

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

Ovine brucellosis has never been recorded in Denmark

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

There have been no findings of Brucellose in animals or foodstuff

**Table Brucellosis in other animals**

	Source of information	Sampling unit	Units tested	Total units positive for Brucella spp.	B. melitensis	B. abortus	B. suis	Brucella spp., unspecified
<b>Pigs</b>								
<b>breeding animals raised under controlled housing conditions in integrated production system</b>								
<b>boars</b>								
- at AI station - Control or eradication programmes - national programmes (no Community co-financing)	Vet-DTU	animal	17032	0				
- at farm - animal sample - blood - Clinical investigations - suspect sampling (Due to fertility problems)	Vet-DTU	animal	231	0				
<b>mixed herds unspecified</b>								
- Control or eradication programmes (Samples are collected in connection with Export) (Samples are collected in connection with import)	Vet-DTU	animal	7157	0				
	Vet-DTU	animal	197	0				
<b>Cattle (bovine animals)</b>								
<b>breeding bulls</b>								
- at AI station - Control or eradication programmes - national programmes (no Community co-financing)	Vet-DTU	animal	2721	0				
<b>adult cattle over 2 years</b>								
- at farm - animal sample - blood - Control or eradication programmes - national programmes (no Community co-financing) (Due to fertility problems)	Vet-DTU	animal	204	0				
<b>unspecified</b>								

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- Control or eradication programmes - national programmes (no Community co-financing) (Samples are collected in connection with export)	Vet-dtu	animal	2293	0				
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**Table Bovine brucellosis in countries and regions that do not receive Community co-financing for eradication programme**

Region	Total number of existing bovine		Officially free herds		Infected herds		Surveillance				Investigations of suspect cases								
	Herds	Animals	Number of herds	%	Number of herds	%	Serological tests		Examination of bulk milk samples		Information about abortions			Epidemiological investigation					
							Number of bovine herds tested	Number of animals tested	Number of bovine herds tested	Number of animals or pools tested	Number of notified abortions wherever cause	Number of isolations of Brucella infection	Number of abortions due to Brucella infection	Number of animals tested with serological blood tests	Number of suspended herds	Number of positive animals		Number of animals examined serologically	Number of animals positive serologically
DANMARK (1)	24883	1545000	24883	100	0	0	0	0	0	0	0	0	0	204	0	32	0	32	0
Total	24883	1545000	24883	100	0	0	0	0	0	0	0	0	0	204	0	32	0	32	0

(1) : The serological test is known to crossreact and in the following microbiological testing all samples were negative

## **2.7. YERSINIOSIS**

### **2.7.1. General evaluation of the national situation**

#### **A. Yersinia enterocolitica general evaluation**

##### **History of the disease and/ or infection in the country**

Infections with *Y. enterocolitica* have been steadily decreasing since 1985, where more than 1,500 human cases were reported.

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

Over the past five years, the annual number of human infections has been fairly stable around 250 cases per year. Overall, infections with *Y. enterocolitica* have been steadily decreasing since 1985, where more than 1,500 human cases were reported. This decline coincide with introduction of improved slaughtering routines at the slaughterhouses.

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

The primary source of yersiniosis in Denmark is believed to be pork and pork products. From 1999-2004, caecal contents were sampled from randomly selected pig herds at slaughterhouses and tested for *Y. enterocolitica*. Between 10,4% and 17,0% of the herds was positive.

##### **Recent actions taken to control the zoonoses**

None

##### **Additional information**

There are no official monitoring programmes in regard to *Y. enterocolitica* in the animal production.

## **2.7.2. Yersiniosis in humans**

### **A. Yersiniosis in humans**

#### **Reporting system in place for the human cases**

*Yersinia enterocolitica* is notifiable through the laboratory surveillance system. Cases diagnosed by a clinical microbiological laboratory are reported to the Unit of Gastrointestinal Infections at SSI.

#### **Case definition**

A confirmed case of yersiniosis is a case where *Yersinia* sp. has been isolated in the laboratory.

#### **Diagnostic/ analytical methods used**

Acute diarrhea: Faecal samples, bacteriology

Reactive arthritis and erythema nodosum: Bloodsample, antibodies.

#### **Notification system in place**

*Yersinia enterocolitica* is notifiable through the laboratory surveillance system

#### **History of the disease and/ or infection in the country**

In the early 1980's the number of human *Yersinia* cases increased to 1500 cases in 1985. Thereafter, a decline began and continued until 2000. Since then, the annual number of human cases have been stable around 250. The decline coincide with the introduction of improved slaughtering routines.

#### **Results of the investigation**

In 2007, there were 215 reported infections with *Yersinia enterocolitica* (3.9 cases per 100,000 inhabitants), which is similar to 2005. Since 2000, the annual number of infections has been almost unchanged. From 1985 to 2000 the number of cases dropped from more than 1,500 to around 250 cases with *Y. enterocolitica* annually. The infections are believed to be mostly domestically acquired and many patients are children; the median age of patients was 16 years, somewhat higher than in preceding years. The primary source of human yersiniosis in Denmark is presumed to be pork and pork products.

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

Although the incidence have decreased in recent years, the disease is still the third most commonly recorded foodborne zoonotic disease in Denmark. The majority of isolates are serotype O:3 and generally, the infections were domestically acquired.

#### **Relevance as zoonotic disease**

Yersiniosis is an important zoonotic disease in Denmark. The primary source of yersiniosis in Denmark is believed to be pork and pork products.

### **2.7.3. Yersinia in foodstuffs**

### **2.7.4. Yersinia in animals**

## **2.8. TRICHINELLOSIS**

### **2.8.1. General evaluation of the national situation**

#### **A. Trichinellosis general evaluation**

##### **History of the disease and/ or infection in the country**

Since 1930, *Trichinella* spp. have been observed in domesticated pigs and the last human cases caused by Danish produced meat was recorded in the 1930'. Prior the 1930, the infection was common, especially at rubbish tips where 10% of the free range pigs was infected. During 1900, large parts of the pig industry went through major changes from outdoor management to indoor management with little or no contact with potential infected material. In 1904, Copenhagen introduced monitoring for *Trichinella* of all pigs at rubbish tips and in 1906, Denmark introduced surveillance of all pigs for human consumption. In 2006, the EU directive 2075/ 2005 came into force.

in 2007, Denmark was assigned the status as a region where the risk of *Trichinella* in odmestiv swine is officially recognised as negligible (EU regulation 2075/ 2005)

## **2.8.2. Trichinellosis in humans**

### **A. Trichinellosis in humans**

#### **Description of the positive cases detected during the reporting year**

In 2007, one imported case of trichinellosis was reported

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

Trichinella is not notifiable in humans, hence the true incidence is unknown. However, trichinella has not been recorded in domestic animals since 1930

### **2.8.3. Trichinella in animals**

#### **A. Trichinella in pigs**

##### **Officially recognised regions with negligible Trichinella risk**

In July 2007 Denmark was officially recognised as a region with negligible Trichinella risk

##### **Monitoring system**

###### **Sampling strategy**

###### **General**

All pigs slaughtered at Danish export approved slaughterhouses are examined for Trichinella spp. in accordance with EU regulation 2075/ 2005. Further, it is compulsory to examine slaughtered wild boars.

###### **For regions with negligible Trichinella risk**

As a result of this status the future monitoring programme for Trichinella can be risk based which means that slaughter pigs reared under controlled housing conditions in integrated production does not have to be tested for Trichinella. All other categories of pigs and other species, domestic or game, that can become infected with Trichinella will be examined in accordance with the methods laid down in the Regulation No 2075/ 2005. Further, pork exported to 3. market countries will be tested for Trichinella unless the importing country accept the new monitoring programme.

In addition, a monitoring programme for Trichinella in wildlife will be initiated from 2008; and 300 foxes and 50 other carnivores will be examined annually.

###### **Frequency of the sampling**

###### **General**

All pigs are sampled at slaughter

###### **For regions with negligible Trichinella risk**

Slaughter pigs reared under controlled housing conditions in integrated production does not have to be tested for Trichinella.

All other categories of pigs and other species, domestic or game, that can become infected with Trichinella will be examined in accordance with the methods laid down in the Regulation No 2075/ 2005.

Further, pork exported to 3. market countries will be tested for Trichinella unless the importing country accept the new monitoring programme.

In addition, a monitoring programme for Trichinella in wildlife will be initiated from 2008; and 300 foxes and 50 other carnivores will be examined annually.

###### **Type of specimen taken**

###### **General**

Meat sample

**For regions with negligible Trichinella risk**

Meat sample

**Methods of sampling (description of sampling techniques)**

**General**

Digestion method (Directive 2075/ 2005/ EEC)

**For regions with negligible Trichinella risk**

Digestion method (Directive 2075/ 2005)

**Diagnostic/ analytical methods used**

**General**

Digestion method (Directive 2075/ 2005/ EEC)

**For regions with negligible Trichinella risk**

digestion method according to EU regulation 2075/ 2005

**Table Trichinella in animals**

	Source of information	Sampling unit	Units tested	Total units positive for Trichinella spp.	T. spiralis	Trichinella spp., unspecified
<b>Pigs</b>						
<b>fattening pigs</b>						
raised under controlled housing conditions in integrated production system						
- at slaughterhouse - animal sample - meat - Control or eradication programmes - national programmes (no Community co-financing)	DVFA	animal	21391000	0		

## **2.9. ECHINOCOCCOSIS**

### **2.9.1. General evaluation of the national situation**

#### **A. Echinococcus spp. general evaluation**

##### **History of the disease and/ or infection in the country**

Surveillance and control of Echinococcus is carried out by the meat inspectors according to the Danish Act no. 432 of 09/ 06/ 2004. Mandatory meat inspection covers all known potential intermediate host species. All carcasses intended for human consumption are inspected for incidence of hydatid cysts.

Echinococcus granulos infection in animals is notifiable, however it has never been detected in Denmark. Echinococcus multilocularis infection in animals is notifiable. It was detected in wild foxes in 2000, but since 2001, all foxes tested have been negative.

In 2007, no samples were tested

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

As Echinococcus have only been detected very few times in Denmark, the risk of acquiring echinococcus in Denmark must be considered very low.

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

There have been no findings of Echinococcus spp. in animals or foodstuff

## **2.9.2. Echinococcosis in humans**

### **A. Echinococcus spp. in humans**

#### **Reporting system in place for the human cases**

Echinococcus is not a notifiable disease in humans

#### **Case definition**

A clinical case with laboratory confirmation.

#### **Diagnostic/ analytical methods used**

Abdominal CT scanning, serology and histopathology.

#### **History of the disease and/ or infection in the country**

The incidence of human Echinococcus spp. is unknown in Denmark, since the disease is not notifiable.

#### **Results of the investigation**

In 2007, a total of 9 cases of *E. granulosus* and 3 cases of *E. multilocularis* was reported, all were imported.

#### **Relevance as zoonotic disease**

The risk of acquiring echinococcosis in Denmark is considered very low, as Echinococcus spp. have never been recorded in domesticated animals, and have not recorded in wild animals since 2000, where there were a few findings in foxes.

## 2.9.3. Echinococcus in animals

Table Echinococcus in animals

	Source of information	Sampling unit	Units tested	Total units positive for Echinococcus spp.	E. granulosus	E. multilocularis	Echinococcus spp., unspecified
<b>Cattle (bovine animals)</b>							
- at slaughterhouse - Control or eradication programmes - national programmes (no Community co-financing) (Visual examination by the meat inspectors)	DVFA	animal	511600	0			
<b>Pigs</b>							
<b>fattening pigs</b> <b>raised under controlled housing conditions in integrated production system</b>							
- at slaughterhouse - Control or eradication programmes - national programmes (no Community co-financing) (Visual examination by the meat inspectors)	DVFA	animal	21391000	0			

## **2.10. TOXOPLASMOSIS**

### **2.10.1. General evaluation of the national situation**

#### **A. Toxoplasmosis general evaluation**

##### **History of the disease and/ or infection in the country**

Toxoplasmosis is not a notifiable disease in Denmark. *Toxoplasma gondii* is endemic in Denmark with the domestic cat as the final host.

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

Toxoplasmosis is not a notifiable disease in Denmark. *Toxoplasma gondii* is endemic in Denmark with the domestic cat as the final host. From 1999-2006, newborn babies were screened for congenital toxoplasmosis. On average 15-20 newborns were diagnosed each year. This surveillance stopped in 2007

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

The main source of infection is believed to be cysts in the muscles and organs from toxoplasmosis infected animals, especially pig, lam and game, and to a lesser extent beef and chicken.

During pregnancy the following risk factors have been outlined:

Eating of raw or undercooked meat

Bad hand- and kitchen hygiene

Eating of unwashed raw vegetables and fruit

Cleaning the cat litter box

Unpasteurized milk

##### **Recent actions taken to control the zoonoses**

None

## **2.10.2. Toxoplasmosis in humans**

### **A. Toxoplasmosis in humans**

#### **Reporting system in place for the human cases**

Toxoplasma gondii infection is not notifiable in Denmark, and the incidence of toxoplasmosis in humans is unknown. However, From 1999 to 2006, Denmark had a nationwide neonatal screening system for congenital toxoplasmosis. this screening stopped in 2007

#### **Case definition**

A case is considered positive for toxoplasmosis after laboratory confirmation based on serology.

#### **Diagnostic/ analytical methods used**

Serology, antibody detection of IgM antibodies

#### **Notification system in place**

Toxoplasmosis is not a notifiable disease in Denmark

#### **History of the disease and/ or infection in the country**

Approx. 25% of all pregnant woman have antibodies against the disease before pregnancy.  
Approx 0,5-1% of the inhabitants are infected annually and around one out of 5000 are born with congenital toxoplasmosis.

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

Toxoplasma gondii is endemic in Denmark.

#### **Relevance as zoonotic disease**

Toxoplasmosis is an important zoonotic disease in Denmark, because of the severity of infections in newborns and immunocompromised individuals.

Surveys have shown that the infection is common in Denmark and during pregnancy, the women should avoid the following risk factors:

Eating of raw or undercooked meat

Poor hand- and kitchen hygiene

Eating of unwashed raw vegetables and fruit

Cleaning the cat litter box

Unpasteurized milk

### **2.10.3. Toxoplasma in animals**

## **2.11. RABIES**

### **2.11.1. General evaluation of the national situation**

#### **A. Rabies general evaluation**

##### **History of the disease and/ or infection in the country**

Rabies is notifiable for humans and all animals species in Denmark.

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

The classic sylvatic rabies virus, namely lyssa virus type 1, has never been reported in Denmark, nor has it been reported from closely surrounding areas for a many years. It is, however, endemic in Greenland, where arctic foxes transmit the disease to sledge dogs and other animals.

Since 1985, the European bat lyssa virus (EBL) has been observed almost every year in the Danish bat population. Latest in 2007

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

An increased interest in the potential risk of exposure of cats to EBL from bats was raised during 2005. It is known that cats can be experimentally and fatally infected with EBL but EBL has never been detected in cats submitted for diagnosis in Denmark. In summary, the risk of exposure of humans from cats is considered very low.

##### **Recent actions taken to control the zoonoses**

None

## **2.11.2. Rabies in humans**

### **A. Rabies in humans**

#### **Reporting system in place for the human cases**

Individual cases are immediately reported to the Statens Serum Institut according to the Danish Order no. 432 of 09/ 06/ 2004. If a domestic animal source is suspected, the Regional Veterinary and Food Control Authorities are informed.

#### **Case definition**

A clinical case that is laboratory confirmed.

#### **Diagnostic/ analytical methods used**

The final diagnosis must be based on virus isolation or a biopsy of the brain. Blood sample or skin biopsy from the neck can in all likelihood carry the diagnosis.

#### **Notification system in place**

Rabies in humans is notifiable and must be reported immediately to the Statens Serum Institut.

#### **Results of the investigation**

No human cases of rabies were reported in 2007

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

The classic sylvatic rabies virus, namely lyssa virus type 1, has not been recorded in animals in Denmark since 1982, nor has it been reported from closely surrounding areas for many years. It is, however, endemic in Greenland, where arctic foxes transmit the disease to sledge dogs and other animals.

Since 1985, the European bat lyssa virus (EBL) has been observed almost every year in the Danish bat population, latest in 2007.

#### **Relevance as zoonotic disease**

The risk of exposure for humans is very low, however since EBL is found in the Danish bat population, people being in contact with bats should be aware of the risk.

**2.11.3. Lyssavirus (rabies) in animals****Table Rabies in animals**

	Source of information	Sampling unit	Units tested	Total units positive for Lyssavirus (rabies)	Unspecified Lyssavirus	European Bat Lyssavirus - unspecified	Classical rabies virus (genotype 1)
<b>Bats</b>							
wild	Vet-DTU	animal	22	2		2	
<b>Foxes</b>							
wild	Vet-DTU	animal	3	0			

## **2.12. Q-FEVER**

### **2.12.1. General evaluation of the national situation**

### **2.12.2. Coxiella (Q-fever) in animals**

#### **A. C. burnetii in animal - Cattle (bovine animals) - at farm - animal sample - blood - Clinical investigations - suspect sampling**

##### **Monitoring system**

###### **Sampling strategy**

Suspicious sampling eg abortion

###### **Type of specimen taken**

Other: blood and tissue samples

###### **Methods of sampling (description of sampling techniques)**

blood samples, tissue samples of afterbirth

###### **Diagnostic/ analytical methods used**

Antibodies -ELISA

##### **Results of the investigation**

2007 - Diagnostic analysis

Blood samples N= 514, pos=80

Tank milk samples N=798, pos=428

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

Since 1989, blood samples from cattle, mainly for export markets, have been tested for antibodies against *C. burnetii* at the National Veterinary Institute. Between 0% and 4 % of the examined animals were positive from 1989-2003 (Table 8). However, the last three years the percentage of positive samples from cattle meant for export has increased to 7-11%, however there is no explanation for this increase. Since 2005 more focus has been put into diagnose of suspicious samples, and 15.0% and 27.5% of these samples were positive in 2005 and 2006, respectively. Further, a newly developed fluorescent in situ hybridisation method (FISH) was used to analyse tissue samples from diagnostic cases of afterbirth in 2006. Fourteen samples were analysed, two samples were positive.

From 2007, tank milk samples were used of diagnostic testing as a supplement for the bloodsamples.

**Table Coxiella burnetii (Q fever) in animals**

	Source of information	Sampling unit	Units tested	Total units positive for Coxiella (Q-fever)	C. burnetii
<b>Cattle (bovine animals)</b>					
<b>dairy cows</b>					
- at farm - animal sample - milk - Monitoring - sampling by industry	Vet-DTU	herd	754	428	428
- at farm - animal sample - blood - Monitoring - sampling by industry	Vet-DTU	herd	58	16	16

### **3. INFORMATION ON SPECIFIC INDICATORS OF ANTIMICROBIAL RESISTANCE**

### **3.1. ENTEROCOCCUS, NON-PATHOGENIC**

#### **3.1.1. General evaluation of the national situation**

### **3.1.2. Antimicrobial resistance in Enterococcus, non-pathogenic isolates**

**Table Antimicrobial susceptibility testing of *E. faecium* in Gallus gallus (fowl) - broilers - at slaughterhouse - Monitoring - official sampling - quantitative data [Dilution method]**

		<i>E. faecium</i>																							
		Gallus gallus (fowl) - broilers - at slaughterhouse - Monitoring - official sampling																							
Isolates out of a monitoring programme	yes																								
	Number of isolates available in the laboratory	64																							
		Number of resistant isolates (n) and number of isolates with the concentration (u/ml) or zone (mm) of inhibition equal to																							
Antimicrobials:	Break point	N	n	<=0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest		
<b>Aminoglycosides</b>																									
Gentamicin	512	64	0													64									
Kanamycin	1024	64	1													14	37	11	1	1					
Streptomycin	128	64	8													56								8	
<b>Amphenicols</b>																									
Chloramphenicol	32	64	0						7	33	23			1											
Florfenicol	8	64	0							64															
<b>Glycopeptides (Cyclic peptides, Polypeptides)</b>																									
Vancomycin	4	64	1						63						1										
<b>Ionophores</b>																									
Salinomycin	4	64	48						1	15	48														
<b>Macrolides</b>																									
Erythromycin	4	64	19				21	3	15	6	4	4	3	8											
<b>Orthosomycins</b>																									
Avilamycin	8	64	4						34	24	2	2	2	2											
<b>Oxazolidines</b>																									
Linezolid	4	64	0						13	49	2														
<b>Penicillins</b>																									
Ampicillin	4	64	4						50	10	4														
Tetracyclines	2	64	7					57					1	1	5										

**Table Antimicrobial susceptibility testing in *E. faecium***

n = Number of resistant isolates				
<i>E. faecium</i>				
	Gallus gallus (fowl) - broilers - at slaughterhouse - Monitoring - official sampling		Pigs - fattening pigs - at slaughterhouse - Monitoring - official sampling	
Isolates out of a monitoring programme	yes		yes	
Number of isolates available in the laboratory	64		153	
<b>Antimicrobials:</b>	<b>N</b>	<b>n</b>	<b>N</b>	<b>n</b>
<b>Aminoglycosides</b>				
Gentamicin	64	0	153	0
Kanamycin	64	2	153	47
Streptomycin	64	8	153	63
<b>Amphenicols</b>				
Chloramphenicol	64	0	153	0
Florfenicol	64	0	153	0
<b>Glycopeptides (Cyclic peptides, Polypeptides)</b>				
Vancomycin	64	1	153	3
<b>Ionophores</b>				
Salinomycin	64	0	153	0
<b>Macrolides</b>				
Erythromycin	64	19	153	72
<b>Orthosomycins</b>				
Avilamycin	64	2	153	0
<b>Oxazolidines</b>				
Linezolid	64	0	153	0
<b>Penicillins</b>				
Ampicillin	64	4	153	1
<b>Tetracyclines</b>				
Tetracyclin	64	7	153	102



**Table Antimicrobial susceptibility testing in *E. faecalis***

n = Number of resistant isolates				
<i>E. faecalis</i>				
	Gallus gallus (fowl) - broilers - at slaughterhouse - Monitoring - official sampling		Pigs - fattening pigs - at slaughterhouse - Monitoring - official sampling	
Isolates out of a monitoring programme	yes		yes	
Number of isolates available in the laboratory	57		148	
<b>Antimicrobials:</b>	<b>N</b>	<b>n</b>	<b>N</b>	<b>n</b>
<b>Aminoglycosides</b>				
Gentamicin	57	0	148	13
Kanamycin	57	0	148	33
Streptomycin	57	2	148	45
<b>Amphenicols</b>				
Chloramphenicol	57	0	148	16
Florfenicol	57	0	148	0
<b>Glycopeptides (Cyclic peptides, Polypeptides)</b>				
Vancomycin	57	0	148	0
<b>Ionophores</b>				
Salinomycin	57	2	148	0
<b>Macrolides</b>				
Erythromycin	57	13	148	60
<b>Orthosomycins</b>				
Avilamycin	57	0	148	0
<b>Oxazolidines</b>				
Linezolid	57	0	148	0
<b>Penicillins</b>				
Ampicillin	57	0	148	0
<b>Tetracyclines</b>				
Tetracyclin	57	23	148	132

**Table Antimicrobial susceptibility testing of *E. faecalis* in Pigs - fattening pigs - at slaughterhouse - Monitoring - official sampling - quantitative data [Dilution method]**

		<i>E. faecalis</i>																						
		Pigs - fattening pigs - at slaughterhouse - Monitoring - official sampling																						
Isolates out of a monitoring programme		yes																						
Number of isolates available in the laboratory		148																						
		Number of resistant isolates (n) and number of isolates with the concentration (u/ml) or zone (mm) of inhibition equal to																						
<b>Antimicrobials:</b>		Break point	N	n	<=0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest
<b>Aminoglycosides</b>																								
Gentamicin		512	148	13													132	1	2	10	1	1	2	
Kanamycin		1024	148	33													114	1			1	1	32	
Streptomycin		128	148	49													99	3	1	1	1	4	40	
<b>Amphenicols</b>																								
Chloramphenicol		32	148	16						2	60	70				9	7							
Florfenicol		8	148	0							147	1												
<b>Glycopeptides (Cyclic peptides, Polypeptides)</b>																								
Vancomycin		4	148	0							146	2												
<b>Ionophores</b>																								
Salinomycin		4	148	0							148													
<b>Macrolides</b>																								
Erythromycin		4	148	60				22	59	7	1					59								
<b>Orthosomycins</b>																								
Avilamycin		8	148	0							148													
<b>Oxazolidines</b>																								
Linezolid		4	148	0						44	104													
<b>Penicillins</b>																								
Ampicillin		4	148	0							148													
Tetracyclines		2	148	132						15	1			3	19	110								



## Table Breakpoints for antibiotic resistance of *Enterococcus*, non-pathogenic in Animals

Test Method Used \_\_\_\_\_

Standards used for testing \_\_\_\_\_

NCCLS \_\_\_\_\_

Enterococcus, non-pathogenic	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content microg	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest		Susceptible >=	Intermediate	Resistant <=
<b>Tetracyclines</b>				2	1	32				
<b>Amphenicols</b>										
Chloramphenicol				32	2	64				
Florfenicol				8	4	32				
<b>Aminoglycosides</b>										
Streptomycin (1)				128	128	2048				
Gentamicin				512	128	2048				
Kanamycin				1024	128	2048				
<b>Macrolides</b>										
Erythromycin				4	0.5	32				
<b>Glycopeptides (Cyclic peptides, Polypeptides)</b>										
Vancomycin				4	2	32				
<b>Ionophores</b>										
Salinomycin				4	2	16				
<b>Orthosomycins</b>										
Avilamycin (2)				8	2	16				
<b>Oxazolidines</b>										
Linezolid				4	1	8				
<b>Penicillins</b>										
Ampicillin				4	2	64				
<b>Streptogramins</b>										
Quinupristin/ Dalfopristin (3)				4	0.5	16				

(1) : For *E. faecium* breakpoint is 128 and for *E. faecalis* is 512

(2) : For *E. faecium* breakpoint is 16 and for *E. faecalis* is 8

(3) : Breakpoint only valid for *F. faecium* no breakpoints is reported for *E. faecalis*.

## Table Breakpoints for antibiotic resistance of *Enterococcus*, non-pathogenic in Food

Test Method Used \_\_\_\_\_

Standards used for testing \_\_\_\_\_

NCCLS \_\_\_\_\_

Enterococcus, non-pathogenic	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content microg	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest		Susceptible >=	Intermediate	Resistant <=
<b>Tetracyclines</b>				2	1	32				
<b>Amphenicols</b>										
Chloramphenicol				32	2	64				
Florfenicol				8	4	32				
<b>Aminoglycosides</b>										
Streptomycin (1)				128	128	2048				
Gentamicin				512	128	2048				
Kanamycin				1024	128	2048				
<b>Macrolides</b>										
Erythromycin				4	0.5	32				
<b>Glycopeptides (Cyclic peptides, Polypeptides)</b>										
Vancomycin				4	2	32				
<b>Ionophores</b>										
Salinomycin				4	2	16				
<b>Orthosomycins</b>										
Avilamycin (2)				8	2	16				
<b>Oxazolidines</b>										
Linezolid				4	1	8				
<b>Penicillins</b>										
Ampicillin				4	2	64				
<b>Streptogramins</b>										
Quinupristin/ Dalfopristin (3)				4	0.5	16				

(1) : For E. faecium breakpoint is 128 and for E. faecalis is 512

(2) : For E. faecium breakpoint is 16 and for E. faecalis is 8

(3) : Breakpoint only valid for F. faecium no breakpoints is reported for E. faecalis.

## Table Breakpoints for antibiotic resistance of *Enterococcus*, non-pathogenic in Feedingstuff

Test Method Used \_\_\_\_\_

Standards used for testing \_\_\_\_\_

NCCLS \_\_\_\_\_

Enterococcus, non-pathogenic	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content microg	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest		Susceptible >=	Intermediate	Resistant <=
<b>Tetracyclines</b>				2	1	32				
<b>Amphenicols</b>										
Chloramphenicol				32	2	64				
Florfenicol				8	4	32				
<b>Aminoglycosides</b>										
Streptomycin (1)				128	128	2048				
Gentamicin				512	128	2048				
Kanamycin				1024	128	2048				
<b>Macrolides</b>										
Erythromycin				4	0.5	32				
<b>Glycopeptides (Cyclic peptides, Polypeptides)</b>										
Vancomycin				4	2	32				
<b>Ionophores</b>										
Salinomycin				4	2	16				
<b>Orthosomycins</b>										
Avilamycin (2)				8	2	16				
<b>Oxazolidines</b>										
Linezolid				4	1	8				
<b>Penicillins</b>										
Ampicillin				4	2	64				
<b>Streptogramins</b>										
Quinupristin/ Dalfopristin (3)				4	0.5	16				

(1) : For *E. faecium* breakpoint is 128 and for *E. faecalis* is 512

(2) : For *E. faecium* breakpoint is 16 and for *E. faecalis* is 8

(3) : Breakpoint only valid for *F. faecium* no breakpoints is reported for *E. faecalis*.

## Table Breakpoints for antibiotic resistance of *Enterococcus*, non-pathogenic in Humans

Test Method Used \_\_\_\_\_

Standards used for testing \_\_\_\_\_

NCCLS \_\_\_\_\_

Enterococcus, non-pathogenic	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content microg	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest		Susceptible >=	Intermediate	Resistant <=
<b>Tetracyclines</b>				2	1	32				
<b>Amphenicols</b>										
Chloramphenicol				32	2	64				
Florfenicol				8	4	32				
<b>Aminoglycosides</b>										
Streptomycin (1)				128	128	2048				
Gentamicin				512	128	2048				
Kanamycin				1024	128	2048				
<b>Macrolides</b>										
Erythromycin				4	0.5	32				
<b>Glycopeptides (Cyclic peptides, Polypeptides)</b>										
Vancomycin				4	2	32				
<b>Ionophores</b>										
Salinomycin				4	2	16				
<b>Orthosomycins</b>										
Avilamycin (2)				8	2	16				
<b>Oxazolidines</b>										
Linezolid				4	1	8				
<b>Penicillins</b>										
Ampicillin				4	2	64				
<b>Streptogramins</b>										
Quinupristin/ Dalfopristin (3)				4	0.5	16				

(1) : For *E. faecium* breakpoint is 128 and for *E. faecalis* is 512

(2) : For *E. faecium* breakpoint is 16 and for *E. faecalis* is 8

(3) : Breakpoint only valid for *F. faecium* no breakpoints is reported for *E. faecalis*.

## **3.2. ESCHERICHIA COLI, NON-PATHOGENIC**

### **3.2.1. General evaluation of the national situation**

#### **A. Escherichia coli general evaluation**

##### **History of the disease and/ or infection in the country**

E coli is not a notifiable disease in Denmark. Monitoring of zoonotic pathogens in foodstuffs is coordinated both at the regional and at the central level of administration. Each Regional Veterinary and Food Control Authority (RVFCA) is responsible for the control carried out in its own region, and the Danish Veterinary and Food Administration (DVFA) is responsible for the regulation, control strategy and the surveillance at the overall national level. Every year specific monitoring projects are conducted. Findings related to E coli are not reported to the central databases at the NFI.

The DANMAP programme monitors resistance in Escherichia coli from cattle, pigs, broiler, beef, pork and broiler meat.

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

The results were similar to previous years (Antimicrobial resistance)

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

The results were similar to previous years (Antimicrobial resistance)

##### **Recent actions taken to control the zoonoses**

No changes

### **3.2.2. Antimicrobial resistance in Escherichia coli, non-pathogenic isolates**

#### **A. Antimicrobial resistance of E.coli in food**

##### **Sampling strategy used in monitoring**

###### **Frequency of the sampling**

All food samples were collected at wholesale and retail outlets by the Regional Veterinary and Food Control Authorities (RFCA) during the course of routine inspection carried out by the authorities, or on request specifically for the DANMAP surveillance programme.

###### **Type of specimen taken**

Primarily cuts of fresh meat.

###### **Methods of sampling (description of sampling techniques)**

The food samples were collected according to the guidelines for microbiological examination of foods from the Danish Veterinary and Food Administration (Vejledning om mikrobiologisk kontrol af fødevarer, ISBN: 87-90978-46-3).

##### **Laboratory methodology used for identification of the microbial isolates**

The material was inoculated directly onto Drigalski agar and incubated at 37°C overnight. Yellow colonies that were catalase positive and oxidase negative were identified according to the following standard criteria: indole, citrate, methyl red and Voges-Proskauer reaction.

##### **Laboratory used for detection for resistance**

###### **Antimicrobials included in monitoring**

See tables

###### **Breakpoints used in testing**

See tables

##### **Preventive measures in place**

non

##### **Control program/ mechanisms**

###### **The control program/ strategies in place**

none

##### **Measures in case of the positive findings or single cases**

non

##### **Notification system in place**

E. coli is not a notifiable disease in Denmark.

### **Results of the investigation**

Results from susceptibility testing of E. coli isolates from food were not available for analysis at the time of reporting.

## **B. Antimicrobial resistance of E.coli in animal**

### **Sampling strategy used in monitoring**

#### **Frequency of the sampling**

Bacterial isolates included in the monitoring programme are collected from animals at slaughter.

Samples are collected at slaughter once a month for pigs and cattle and weekly for broilers. The number of samples for each slaughter plant has been determined in proportion to the number of animals slaughtered per year. Each sample represents one herd or flock.

#### **Type of specimen taken**

Facial samples from pigs and cattle, cloacal swabs from broilers.

#### **Methods of sampling (description of sampling techniques)**

The samples from animals at slaughter are collected by meat inspection staff or company personnel and sent to the DTU-FOOD for examination.

#### **Procedures for the selection of isolates for antimicrobial testing**

The broiler, cattle and pig slaughter plants included in the surveillance programme account for 95%, 95% and 98%, respectively, of the total production of these animal species in Denmark. Accordingly, the bacterial isolates may be regarded as representing a stratified random sample of the respective populations. The observed prevalence of resistant isolates provides an estimate of the true occurrence in the populations.

#### **Methods used for collecting data**

All isolates were tested at the DTU-FOOD. Results were entered into the central database.

### **Laboratory methodology used for identification of the microbial isolates**

The material was inoculated directly onto Drigalski agar and incubated at 37°C overnight. Yellow colonies that were catalase positive and oxidase negative were identified according to the following standard criteria: indole, citrate, methyl red and Voges-Proskauer reaction.

### **Laboratory used for detection for resistance**

#### **Antimicrobials included in monitoring**

See tables

**Breakpoints used in testing**

See tables

**Preventive measures in place**

none

**Control program/ mechanisms**

**The control program/ strategies in place**

none

**Measures in case of the positive findings or single cases**

none

**Notification system in place**

E. coli is not a notifiable disease in Denmark.

**Results of the investigation**

114 isolates from broilers, 98 isolates from cattle and 150 isolates from pigs were collected for susceptibility testing in 2007.

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

The results for 2007 were similar to 2006.

**Table Antimicrobial susceptibility testing of E. coli in Cattle (bovine animals) - at slaughterhouse - Monitoring - official sampling - quantitative data [Dilution method]**

E. coli		Cattle (bovine animals) - at slaughterhouse - Monitoring - official sampling																							
Isolates out of a monitoring programme	yes																								
Number of isolates available in the laboratory	98																								
Antimicrobials:	Break point	N	n	Number of resistant isolates (n) and number of isolates with the concentration (u/ml) or zone (mm) of inhibition equal to																					
				<=0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest		
<b>Aminoglycosides</b>																									
Apramycin	16	98	0													93	5								
Gentamicin	2	98	0							96	2														
Neomycin	8	98	1							94	1	2													
Spectinomycin	64	98	0												95	2	1								
Streptomycin	16	98	3													93	2	1	2						
<b>Amphenicols</b>																									
Chloramphenicol	16	98	0													3	44	51							
Florfenicol	16	98	0													1	40	56	1						
<b>Cephalosporins</b>																									
Cefpodoxime	1	78	0					2	37	36	3														
Ceftiofur	1	98	0							98															
Cephalothin	32	78	0													9	53	15	1						
<b>Fluoroquinolones</b>																									
Ciprofloxacin	0.03	98	0	98																					
<b>Penicillins</b>																									
Amoxicillin / Clavulanic acid	8	98	1													32	57	8	1						
Ampicillin	8	98	4							2	45	45	2												
<b>Quinolones</b>																									
Nalidixic acid	16	98	0														98								
<b>Sulfonamides</b>																									
Sulfonamide	256	98	0																			92		6	
<b>Tetracyclines</b>																									
Tetracyclin	8	98	7													90	1	1	1						

**Table Antimicrobial susceptibility testing of E. coli in animals**

n = Number of resistant isolates												
E. coli												
	Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Turkeys		Pigs - fattening pigs - at slaughterhouse - Monitoring - official sampling		Gallus gallus (fowl) - broilers - at slaughterhouse - Monitoring - official sampling	
Isolates out of a monitoring programme	yes								yes		yes	
Number of isolates available in the laboratory	98										114	
<b>Antimicrobials:</b>	<b>N</b>	<b>n</b>	<b>N</b>	<b>n</b>	<b>N</b>	<b>n</b>	<b>N</b>	<b>n</b>	<b>N</b>	<b>n</b>	<b>N</b>	<b>n</b>
<b>Aminoglycosides</b>												
Gentamicin	98	0							150	0		
Neomycin	98	1							150	3	114	0
Spectinomycin	98	0							150	30	114	3
Streptomycin	98	3							150	51	114	8
<b>Amphenicols</b>												
Chloramphenicol	98	0							150	6	114	0
Florfenicol	98	0							150	0	114	0
<b>Cephalosporins</b>												
Cefpodoxime	78	0							149	2	114	1
Ceftiofur	98	0							150	1	114	2
Cephalothin	78	0							149	1	114	4
<b>Fluoroquinolones</b>												
Ciprofloxacin	98	0							150	0	114	16
<b>Penicillins</b>												
Amoxicillin / Clavulanic acid	98	1							150	5	114	2
Ampicillin	98	4							150	29	114	12
<b>Quinolones</b>												
Nalidixic acid	98	0							150	0	114	12
<b>Sulfonamides</b>												
Sulfonamide	98	6							150	36	114	20
<b>Tetracyclines</b>												
Tetracyclin	98	7							150	42	114	9

**Table Antimicrobial susceptibility testing of E. coli in Pigs - fattening pigs - at slaughterhouse - Monitoring - official sampling - quantitative data [Dilution method]**

E. coli		Pigs - fattening pigs - at slaughterhouse - Monitoring - official sampling																						
Isolates out of a monitoring programme	yes																							
Number of isolates available in the laboratory	150																							
Antimicrobials:	Break point	N	n	Number of resistant isolates (n) and number of isolates with the concentration (u/ml) or zone (mm) of inhibition equal to																				
				<=0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest	
<b>Aminoglycosides</b>																								
Apramycin	16	150	0												143	7								
Gentamicin	2	150	0					148	2															
Neomycin	8	150	3					146	1				1	2										
Spectinomycin	64	150	30										102	12	6	15	12	3						
Streptomycin	16	150	51										92	7	18	17	16							
<b>Amphenicols</b>																								
Chloramphenicol	16	150	6										5	87	51	1	4							
Florfenicol	16	150	0										4	85	57	4								
<b>Cephalosporins</b>																								
Cefpodoxime	1	149	2			8	83	49	7	1	1													
Ceftiofur	1	150	1					148	1	1														
Cephalothin	32	149	1										46	79	20	3	1							
<b>Fluoroquinolones</b>																								
Ciprofloxacin	0.03	150	0	150																				
<b>Penicillins</b>																								
Amoxicillin / Clavulanic acid	8	150	5										50	67	28	4	1							
Ampicillin	8	150	29						7	59	53	2					29							
<b>Quinolones</b>																								
Nalidixic acid	16	150	0												149	1								
<b>Sulfonamides</b>																								
Sulfonamide	256	150	36														114						36	
<b>Tetracyclines</b>																								
Tetracyclin	8	150	42										107	1			3	39						



## Table Breakpoints used for antimicrobial susceptibility testing in Animals

### Test Method Used

### Standards used for testing

NCCLS

Escherichia coli, non-pathogenic	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content microg	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest		Susceptible >=	Intermediate	Resistant <=
<b>Amphenicols</b>										
Chloramphenicol				16	2	64				
Florfenicol				16	2	64				
<b>Tetracyclines</b>										
Tetracyclin				8	2	32				
<b>Cephalosporins</b>										
Cephalothin				32	4	32				
Ceftiofur				1	0.5	8				
3rd generation cephalosporins										
Cefpodoxime				1	0.125	4				
<b>Fluoroquinolones</b>										
Ciprofloxacin				0.03	0.03	4				
Enrofloxacin										
<b>Quinolones</b>										
Nalidixic acid				16	4	64				
<b>Trimethoprim</b>										
<b>Sulfonamides</b>										
Sulfonamide				256	64	1024				
<b>Aminoglycosides</b>										
Streptomycin				16	4	64				
Gentamicin				2	1	32				
Neomycin				8	2	32				
Kanamycin										
Apramycin				16	4	32				
Spectinomycin				64	16	256				
<b>Trimethoprim + sulfonamides</b>										
<b>Penicillins</b>										
Amoxicillin / Clavulanic acid				8	2	32				
Ampicillin				8	1	32				

## **4. INFORMATION ON SPECIFIC MICROBIOLOGICAL AGENTS**

## **4.1. HISTAMINE**

### **4.1.1. General evaluation of the national situation**

### **4.1.2. Histamine in foodstuffs**

## **4.2. ENTEROBACTER SAKAZAKII**

### **4.2.1. General evaluation of the national situation**

### **4.2.2. Enterobacter sakazakii in foodstuffs**

### **4.3. STAPHYLOCOCCAL ENTEROTOXINS**

#### **4.3.1. General evaluation of the national situation**

#### **4.3.2. Staphylococcal enterotoxins in foodstuffs**

## 5. **FOODBORNE OUTBREAKS**

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

### **A. Foodborne outbreaks**

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

In Denmark, local foodborne outbreaks are typically investigated by the Regional Veterinary and Food Control Authority (RVFCA) in collaboration with the medical officer; often also with the participation of the regional clinical microbiology laboratory. Larger outbreaks involving more than one region are typically investigated by the SSI, the National Food Institute, and the Danish Food and Veterinary Administration (DVFA). These institutions may also aid in the investigation of local outbreaks. In 2006, a new Danish Alert Unit for Food was established at the DVFA (see below) and in 2006 this unit co-ordinated the collaboration between the National Food Institute, the SSI and the DVFA. Representatives from these institutions meet regularly to discuss surveillance results, compare the occurrence of zoonotic agents in animals, food and feedstuffs with that in humans, and review major outbreaks. The formal responsibility of investigating food- or waterborne outbreaks is currently divided between three ministries based on the outbreak source: the Ministry for the Interior and Health for infectious diseases; the Ministry of Family and Consumer Affairs for food and animal related diseases; and the Ministry of the Environment (along with the municipality) for water related diseases.

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**Danish Alert Unit for Food**

To secure unambiguous and coordinated instructions concerning the handling of food crises it is necessary to gather an overall picture of the situation as well as to perform creative thinking to produce the best solutions. This is one of the main reasons for the establishment of The Danish Alert Unit for Food in 2006 at The Danish Veterinary and Food Administration.

The purpose with the establishment of the unit is furthermore to place the responsibility at one spot, establish one channel of commands and thus secure a coordinated, effective and quick handling of food crises nationally and internationally.

**Tasks:**

- Coordination of the work with food borne outbreaks both national and regional
- Withdrawals and recalls of products not in compliance with the food safety requirements
- Contingency plans for food and for civil preparedness in the Danish Veterinary and Food Administration
- Early warnings of the public in emergency situations
- Civil emergency response and early warnings
- The Alert Food hot line for acute queries outside normal opening hours
- The Unit is the Danish Contact Point of the Rapid Alert System for Food and Feed
- Chair in Central Crisis Management Group for food borne diseases.
- Education and practice in preparedness planning
- Cooperation with other authorities in crises

The unit mainly has competences concerning coordinating and procedural issues in food crises situations. The professional knowledge in each case is still situated in other offices in the Danish Veterinary and Food Administration.

### **Description of the types of outbreaks covered by the reporting:**

Definition of Food borne outbreaks:

1) two or more human cases of the same disease or infection suspected of originating from the same source

2) a higher number of cases than expected (the endemic level) within an area in a limited period

Type of outbreaks:

Family outbreaks

General outbreaks

Hospital outbreaks

Causative agents:

Salmonella

Campylobacter

VTEC

Listeria

Yersinia

Shigella

### **National evaluation of the reported outbreaks in the country:**

#### **Descriptions of single outbreaks of special interest**

In Denmark large waterborne outbreaks are very rare, but one such took place in the middle of January when semi-purified sewage from a sewage treatment facility was accidentally led into the drinking water system of part of a town south of Copenhagen. Close to 6000 persons living in the area and a number of companies were prohibited from using the water for several weeks while investigations took place; following these, the water systems were chlorinated in the middle of February. The contamination event was then known to have affected the addresses of 453 individuals. In a questionnaire study, two thirds of those responding reported gastrointestinal illness. Stool samples of 139 individuals living in the town were analysed and 77 patients tested positive. Norovirus were found in 29 patients and Campylobacter (*jejuni*, *coli* and *lari*) in 23, but a number of other infectious agents were also detected including, different types of diarrheagenic *E. coli*, different salmonella serotypes, giardia and Blastocystis hominis.

In February and March an outbreak with Verocytotoxin-producing *E. coli* O26:H11 occurred. There were 20 laboratory confirmed cases, 19 of which were small children, but the outbreak was believed to have affected many more persons. The outbreak strain was positive for vtx1 and eae, but negative for vtx2 and symptoms of cases were generally quite mild. Through the use of a case-control study and of a comparative study of shopping lists of affected families obtained from supermarket computer systems using credit card information, the source of the outbreak was found to be a particular organic cured beef sausage. The batch of 19000 sausages were recalled (but was sold out at the time) and the presence of the outbreak strain in the sausages confirmed microbiologically.

In August, a large outbreak with *Shigella sonnei* took place. Though shigella is not a zoonosis, this foodborne outbreak was unusually large by Danish standards and deserves mention here. A total of 172 laboratory confirmed cases were part of the outbreak. A large number of the cases

were infected via the salad buffets in their workplace canteens, which were served by the same catering company. A cohort study performed among employees in one of those companies, along with other epidemiological evidence, showed that the source of the outbreak was baby corn imported fresh from Thailand. An investigation was also launched by the Thai authorities; contaminated baby corn had also been exported to Australia where cases also appeared.

As in 2006 and 2005 where the outbreak database was also in use, norovirus accounted for the majority of registered outbreaks. Again, these outbreaks predominantly were a result of contamination events associated with workplace lunch buffets, restaurants and private parties. Several of these outbreaks followed gastrointestinal symptoms in persons handling the food.

The proportion of outbreaks caused by salmonella was smaller than in previous years. Furthermore the relative number of outbreaks and investigated clusters of disease caused by salmonella serotypes other than *S. Enteritidis* and *S. Typhimurium* was higher than before. One such was took place in the autumn of 2007 and was caused by *S. Weltevreden*. It comprised 19 laboratory confirmed cases. This outbreak was traced to the consumption of alfalfa sprouts grown from contaminated imported seeds. Part of the batch of seeds was exported on to Norway where cases also appeared; cases also appeared in Finland .

**Foodborne Outbreaks: summarized data**

	Total number of outbreaks	Number of possible outbreaks	Number of verified outbreaks
Bacillus	2	0	2
Campylobacter	6	0	6
Clostridium	6	0	6
Escherichia coli, pathogenic	3	0	3
Foodborne viruses	22	0	22
Listeria	0	0	0
Other agents	10	0	10
Parasites	0	0	0
Salmonella	7	0	7
Staphylococcus	1	0	1
Unknown	0	0	0
Yersinia	0	0	0

**Verified Foodborne Outbreaks: detailed data****B. cereus**

Value

Code	715
Subagent Choice	Bacillus; B. cereus
Outbreak type	General
Human cases	3
Hospitalized	unknown
Deaths	unknown
Foodstuff implicated	Herbs and spices
More Foodstuff	A Parsley sauce with milk, butter and flour
Type of evidence	Laboratory detection in implicated food
Setting	Household
Place of origin of problem	Household, domestic kitchen
Origin of foodstuff	Unknown
Contributory factors	Inadequate chilling
Outbreaks	1
Comment	

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**B. cereus**

Value

Code	764
Subagent Choice	Bacillus; B. cereus
Outbreak type	Household
Human cases	3
Hospitalized	0
Deaths	0
Foodstuff implicated	Unknown
More Foodstuff	
Type of evidence	Laboratory detection in implicated food
Setting	Household
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	

**Campylobacter spp., unspecified**

Value

Code	727
Subagent Choice	Campylobacter; Campylobacter spp., unspecified
Outbreak type	General
Human cases	6
Hospitalized	1
Deaths	0
Foodstuff implicated	Milk
More Foodstuff	unpasteurised
Type of evidence	Laboratory detection in implicated food, Laboratory detection in human cases
Setting	Household
Place of origin of problem	Farm (primary production)
Origin of foodstuff	Domestic
Contributory factors	Cross-contamination
Outbreaks	1
Comment	The unpasteurised milk was contaminated after taking a sample from the milk tank

## Denmark 2007 Report on trends and sources of zoonoses

**Campylobacter spp., unspecified**

Value

Code	768
Subagent Choice	Campylobacter; Campylobacter spp., unspecified
Outbreak type	General
Human cases	2
Hospitalized	0
Deaths	0
Foodstuff implicated	Broiler meat (Gallus gallus) and products thereof
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Intra community trade
Contributory factors	Cross-contamination
Outbreaks	1
Comment	Probably a cross contamination of salad with meat juice from the chicken

## Denmark 2007 Report on trends and sources of zoonoses

**Campylobacter spp., unspecified**

Value

Code	722
Subagent Choice	
Outbreak type	General
Human cases	3
Hospitalized	0
Deaths	0
Foodstuff implicated	Broiler meat ( <i>Gallus gallus</i> ) and products thereof
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Household
Place of origin of problem	Unknown
Origin of foodstuff	Domestic
Contributory factors	Cross-contamination
Outbreaks	1
Comment	Cross contamination of a carrot salad with meat juice from the chicken during processing in the kitchen

## Denmark 2007 Report on trends and sources of zoonoses

**Campylobacter spp., unspecified**

Value

Code	680
Subagent Choice	
Outbreak type	General
Human cases	11
Hospitalized	2
Deaths	0
Foodstuff implicated	Broiler meat ( <i>Gallus gallus</i> ) and products thereof
More Foodstuff	Chicken kebab imported from Thailand
Type of evidence	Laboratory detection in human cases, Analytical epidemiological evidence
Setting	Canteen or workplace catering
Place of origin of problem	Unknown
Origin of foodstuff	Imported from outside EU
Contributory factors	Cross-contamination
Outbreaks	1
Comment	In total, 71 people was exposed. A retrospectiv cohorte investigation showed green salad as the highest risk factor. The salad was washed just after meat juice from the chicken was poured into the same sink

Denmark 2007 Report on trends and sources of zoonoses

**Campylobacter spp., unspecified**

Value

Code	712
Subagent Choice	
Outbreak type	General
Human cases	5
Hospitalized	0
Deaths	0
Foodstuff implicated	Turkey meat and products thereof
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Temporary mass catering (fairs, festivals)
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	in total 15 people was exposed

Denmark 2007 Report on trends and sources of zoonoses

**Campylobacter spp., unspecified**

Value

Code	709
Subagent Choice	Campylobacter; C. jejuni
Outbreak type	General
Human cases	unknown
Hospitalized	unknown
Deaths	unknown
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Canteen or workplace catering
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	Number of cases is unknown, but 140 people were exposed

## Denmark 2007 Report on trends and sources of zoonoses

**C. perfringens**

Value

Code	769
Subagent Choice	
Outbreak type	Household
Human cases	2
Hospitalized	0
Deaths	0
Foodstuff implicated	Unknown
More Foodstuff	
Type of evidence	Laboratory detection in implicated food
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	

**C. perfringens**

Value

Code	728
Subagent Choice	
Outbreak type	General
Human cases	35
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	
Setting	Canteen or workplace catering
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	In total, 100 people was exposed

**C. perfringens**

Value

Code	765
Subagent Choice	
Outbreak type	General
Human cases	11
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	Laboratory detection in implicated food
Setting	Household
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	Unknown
Outbreaks	1
Comment	In total, 21 people was exposed

**C. perfringens**

Value

Code	746
Subagent Choice	
Outbreak type	General
Human cases	29
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	Laboratory detection in implicated food
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	in total, 60 people was exposed

**C. perfringens**

Value

Code	707
Subagent Choice	
Outbreak type	General
Human cases	65
Hospitalized	0
Deaths	0
Foodstuff implicated	Broiler meat (Gallus gallus) and products thereof
More Foodstuff	chicken meat with asparagus and patty shells
Type of evidence	Laboratory detection in implicated food
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	In total, 86 people was exposed

**C. perfringens**

Value

Code	721
Subagent Choice	
Outbreak type	General
Human cases	26
Hospitalized	0
Deaths	0
Foodstuff implicated	Bovine meat and products thereof
More Foodstuff	Chili con carne
Type of evidence	Laboratory detection in implicated food
Setting	Canteen or workplace catering
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Unknown
Contributory factors	Inadequate chilling
Outbreaks	1
Comment	In total, 113 persons was exposed

## Denmark 2007 Report on trends and sources of zoonoses

**E.coli, pathogenic, unspecified**

Value

Code	732
Subagent Choice	
Outbreak type	General
Human cases	45
Hospitalized	0
Deaths	0
Foodstuff implicated	Cereal products including rice and seeds/pulses (nuts, almonds)
More Foodstuff	boiled wheat salad with raw fennel and black olives from glass
Type of evidence	Laboratory detection in implicated food, Laboratory detection in human cases
Setting	Canteen or workplace catering
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Unknown
Contributory factors	Inadequate chilling
Outbreaks	1
Comment	in total, 580 persons exposed

## Denmark 2007 Report on trends and sources of zoonoses

**Enterotoxigenic E. coli (ETEC)**

Value

Code	716
Subagent Choice	
Outbreak type	General
Human cases	8
Hospitalized	0
Deaths	0
Foodstuff implicated	Unknown
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Canteen or workplace catering
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	In tota, 270 persons was exposed

## Denmark 2007 Report on trends and sources of zoonoses

**VTEC O26:H-**

Value

Code	688
Subagent Choice	
Outbreak type	General
Human cases	18
Hospitalized	0
Deaths	0
Foodstuff implicated	Bovine meat and products thereof
More Foodstuff	organic sausage
Type of evidence	Analytical epidemiological evidence, Laboratory detection in human cases
Setting	Unknown
Place of origin of problem	Processing plant
Origin of foodstuff	Domestic
Contributory factors	Unknown
Outbreaks	1
Comment	

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	681
Subagent Choice	
Outbreak type	General
Human cases	10
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	
Setting	Canteen or workplace catering
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Unknown
Contributory factors	Infected food handler
Outbreaks	1
Comment	Employee in the kitchen was sick the day before preparing the cold dishes for the buffet. In total, 20 people was exposed

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	682
Subagent Choice	
Outbreak type	General
Human cases	59
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	
Setting	Canteen or workplace catering
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Unknown
Contributory factors	Infected food handler
Outbreaks	1
Comment	In total 114 people was exposed.

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	706
Subagent Choice	
Outbreak type	General
Human cases	31
Hospitalized	0
Deaths	0
Foodstuff implicated	Other foods
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	734
Subagent Choice	
Outbreak type	General
Human cases	14
Hospitalized	0
Deaths	0
Foodstuff implicated	Vegetables and juices and other products thereof
More Foodstuff	Broccoli salad
Type of evidence	
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Not relevant
Contributory factors	Infected food handler
Outbreaks	1
Comment	Based on the Kaplan criteria this is considered a Norovirus outbreak

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	754
Subagent Choice	
Outbreak type	General
Human cases	19
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	Norovirus GG.II.4 variant 2066B In total 50 people was exposed

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	755
Subagent Choice	
Outbreak type	General
Human cases	18
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	Norovirus GG II.4 variant 2006B In total 42 people was exposed

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	756
Subagent Choice	
Outbreak type	General
Human cases	42
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	School, kindergarten
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	In total 108 persons was exposed

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	774
Subagent Choice	
Outbreak type	General
Human cases	25
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	Based on the Kaplan criteria this is considered a Norovirus outbreak

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	679
Subagent Choice	
Outbreak type	General
Human cases	18
Hospitalized	0
Deaths	0
Foodstuff implicated	Unknown
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Household
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	In total 38 people was exposed

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	686
Subagent Choice	
Outbreak type	General
Human cases	145
Hospitalized	0
Deaths	0
Foodstuff implicated	Tap water, including well water
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Unknown
Place of origin of problem	Water treatment plant
Origin of foodstuff	Not relevant
Contributory factors	Cross-contamination
Outbreaks	1
Comment	The water was contaminated with sewage. In total 550 people was exposed

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	691
Subagent Choice	
Outbreak type	General
Human cases	18
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	
Setting	Canteen or workplace catering
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	In total 50 people was exposed

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	708
Subagent Choice	
Outbreak type	General
Human cases	9
Hospitalized	0
Deaths	0
Foodstuff implicated	Fruit, berries and juices and other products thereof
More Foodstuff	Rasberries
Type of evidence	Laboratory detection in human cases
Setting	Household
Place of origin of problem	Household, domestic kitchen
Origin of foodstuff	Unknown
Contributory factors	Inadequate heat treatment
Outbreaks	1
Comment	Birthday cake with frozen rasberries

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	718
Subagent Choice	
Outbreak type	General
Human cases	39
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	
Setting	Canteen or workplace catering
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	Based on the Kaplan criteria this is considered a Norovirus outbreak

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	720
Subagent Choice	
Outbreak type	General
Human cases	8
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	
Setting	Camp, picnic
Place of origin of problem	Household, domestic kitchen
Origin of foodstuff	Domestic
Contributory factors	Infected food handler
Outbreaks	1
Comment	

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	739
Subagent Choice	
Outbreak type	General
Human cases	36
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Not relevant
Contributory factors	Infected food handler
Outbreaks	1
Comment	Based on the Kaplan criteria this is considered a Norovirus outbreak

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	752
Subagent Choice	
Outbreak type	General
Human cases	78
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	
Setting	Canteen or workplace catering
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Domestic
Contributory factors	
Outbreaks	1
Comment	In total 300 people was exposed

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	753
Subagent Choice	
Outbreak type	General
Human cases	25
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Household
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	Norovirus GGII.B In total 60 persons was exposed

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	757
Subagent Choice	
Outbreak type	General
Human cases	19
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Household
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	775
Subagent Choice	
Outbreak type	General
Human cases	39
Hospitalized	0
Deaths	0
Foodstuff implicated	Crustaceans, shellfish, molluscs and products thereof
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Other setting
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Domestic
Contributory factors	
Outbreaks	1
Comment	A party at a village hall, in total 75 people was exposed

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	771
Subagent Choice	
Outbreak type	General
Human cases	100
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	
Type of evidence	
Setting	School, kindergarten
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	Unknown
Outbreaks	1
Comment	highschool prome, some students and teachers were sick before the party and some got sick although they did not eat at the party. In total 200 people was exposed

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	750
Subagent Choice	
Outbreak type	General
Human cases	40
Hospitalized	0
Deaths	0
Foodstuff implicated	Unknown
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Household
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	Unknown
Outbreaks	1
Comment	

Denmark 2007 Report on trends and sources of zoonoses  
**norovirus (Norwalk-like virus)**

Value

Code	782
Subagent Choice	
Outbreak type	General
Human cases	45
Hospitalized	0
Deaths	0
Foodstuff implicated	Unknown
More Foodstuff	
Type of evidence	
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	In total 82 persons was exposed

**Histamine**

Value

Code	698
Subagent Choice	
Outbreak type	General
Human cases	4
Hospitalized	0
Deaths	0
Foodstuff implicated	Fish and fish products
More Foodstuff	
Type of evidence	
Setting	Canteen or workplace catering
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	

**Histamine**

Value

Code	749
Subagent Choice	
Outbreak type	General
Human cases	4
Hospitalized	0
Deaths	0
Foodstuff implicated	Fish and fish products
More Foodstuff	Tuna
Type of evidence	Laboratory detection in implicated food
Setting	Household
Place of origin of problem	Household, domestic kitchen
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	

## Denmark 2007 Report on trends and sources of zoonoses

**Other**

Value

Code	762
Subagent Choice	
Outbreak type	General
Human cases	2
Hospitalized	0
Deaths	0
Foodstuff implicated	Vegetables and juices and other products thereof
More Foodstuff	Cucurbitacin (squash)
Type of evidence	
Setting	Household
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	

**Other**

Value

Code	763
Subagent Choice	
Outbreak type	General
Human cases	3
Hospitalized	0
Deaths	0
Foodstuff implicated	Vegetables and juices and other products thereof
More Foodstuff	Cucurbitacin (squash)
Type of evidence	
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	

## Denmark 2007 Report on trends and sources of zoonoses

**Other**

Value

Code	724
Subagent Choice	
Outbreak type	Household
Human cases	2
Hospitalized	0
Deaths	0
Foodstuff implicated	Vegetables and juices and other products thereof
More Foodstuff	Cucurbitacin (squash)
Type of evidence	
Setting	Household
Place of origin of problem	Household, domestic kitchen
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	

## Denmark 2007 Report on trends and sources of zoonoses

**Other**

Value

Code	761
Subagent Choice	
Outbreak type	General
Human cases	3
Hospitalized	0
Deaths	0
Foodstuff implicated	Vegetables and juices and other products thereof
More Foodstuff	Cucurbitacin (squash)
Type of evidence	
Setting	Household
Place of origin of problem	Household, domestic kitchen
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	

## Denmark 2007 Report on trends and sources of zoonoses

**Other**

Value

Code	772
Subagent Choice	
Outbreak type	General
Human cases	6
Hospitalized	0
Deaths	0
Foodstuff implicated	Vegetables and juices and other products thereof
More Foodstuff	Lectin
Type of evidence	
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	

## Denmark 2007 Report on trends and sources of zoonoses

**Other**

Value

Code	770
Subagent Choice	
Outbreak type	General
Human cases	32
Hospitalized	0
Deaths	0
Foodstuff implicated	Unknown
More Foodstuff	
Type of evidence	
Setting	Unknown
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	this is a virus outbreak

## Denmark 2007 Report on trends and sources of zoonoses

**Other**

Value

Code	719
Subagent Choice	
Outbreak type	General
Human cases	18
Hospitalized	0
Deaths	0
Foodstuff implicated	Other foods
More Foodstuff	
Type of evidence	
Setting	Other setting
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	om total 90 persons was exposed. They participated in a course running over several days

## Denmark 2007 Report on trends and sources of zoonoses

**S. sonnei**

Value

Code	726
Subagent Choice	
Outbreak type	General
Human cases	200
Hospitalized	0
Deaths	0
Foodstuff implicated	Vegetables and juices and other products thereof
More Foodstuff	baby corn imported from Thailand
Type of evidence	Laboratory detection in human cases
Setting	Canteen or workplace catering
Place of origin of problem	Unknown
Origin of foodstuff	Imported from outside EU
Contributory factors	
Outbreaks	1
Comment	Amp - sulfo - strep and cefalotin resistant Belong to subgroup D

**DT 120**

Value

Code	729
Subagent Choice	
Outbreak type	General
Human cases	41
Hospitalized	0
Deaths	0
Foodstuff implicated	Pig meat and products thereof
More Foodstuff	
Type of evidence	Laboratory detection in human cases, Laboratory detection in implicated food
Setting	Temporary mass catering (fairs, festivals)
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	

**PT 21**

Value

Code	767
Subagent Choice	
Outbreak type	General
Human cases	9
Hospitalized	0
Deaths	0
Foodstuff implicated	Broiler meat ( <i>Gallus gallus</i> ) and products thereof
More Foodstuff	
Type of evidence	Laboratory detection in human cases, Laboratory detection in implicated food
Setting	Canteen or workplace catering
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	In total, 13 persons was exposed

**S. Enteritidis**

Value

Code	740
Subagent Choice	
Outbreak type	General
Human cases	11
Hospitalized	0
Deaths	0
Foodstuff implicated	Eggs and egg products
More Foodstuff	
Type of evidence	Laboratory characterization of isolates
Setting	Household
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	

**S. Heidelberg**

Value

Code	697
Subagent Choice	
Outbreak type	General
Human cases	13
Hospitalized	6
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	sausages, other pork meat (grilled) and salads
Type of evidence	Laboratory detection in human cases
Setting	Other setting
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	Private party at a sports club. In total, 50 persons was exposed

**S. Senftenberg**

Value

Code	703
Subagent Choice	
Outbreak type	General
Human cases	3
Hospitalized	0
Deaths	0
Foodstuff implicated	Herbs and spices
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Unknown
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	Same PFGE profile as in an outbreak in UK

**S. Typhimurium**

Value

Code	692
Subagent Choice	
Outbreak type	Household
Human cases	1
Hospitalized	1
Deaths	0
Foodstuff implicated	Pig meat and products thereof
More Foodstuff	Pizza with ham, bacon, sausage, cheese and tomatosauce
Type of evidence	Laboratory detection in human cases
Setting	Household
Place of origin of problem	Take-away
Origin of foodstuff	Unknown
Contributory factors	
Outbreaks	1
Comment	In total, 4 persons was exposed

**S. Weltevreden**

Value

Code	743
Subagent Choice	
Outbreak type	General
Human cases	19
Hospitalized	0
Deaths	0
Foodstuff implicated	Vegetables and juices and other products thereof
More Foodstuff	Bean sprouts
Type of evidence	Laboratory detection in implicated food, Laboratory detection in human cases
Setting	Unknown
Place of origin of problem	Unknown
Origin of foodstuff	Intra community trade
Contributory factors	
Outbreaks	1
Comment	Some of the bean sprouts was exported to Norway. In Norway they also had an outbreak with S. Weltevreden

## Denmark 2007 Report on trends and sources of zoonoses

**S. aureus**

Value

Code	766
Subagent Choice	
Outbreak type	General
Human cases	6
Hospitalized	0
Deaths	0
Foodstuff implicated	Cheese
More Foodstuff	
Type of evidence	Laboratory detection in implicated food
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Unknown
Origin of foodstuff	Domestic
Contributory factors	
Outbreaks	1
Comment	