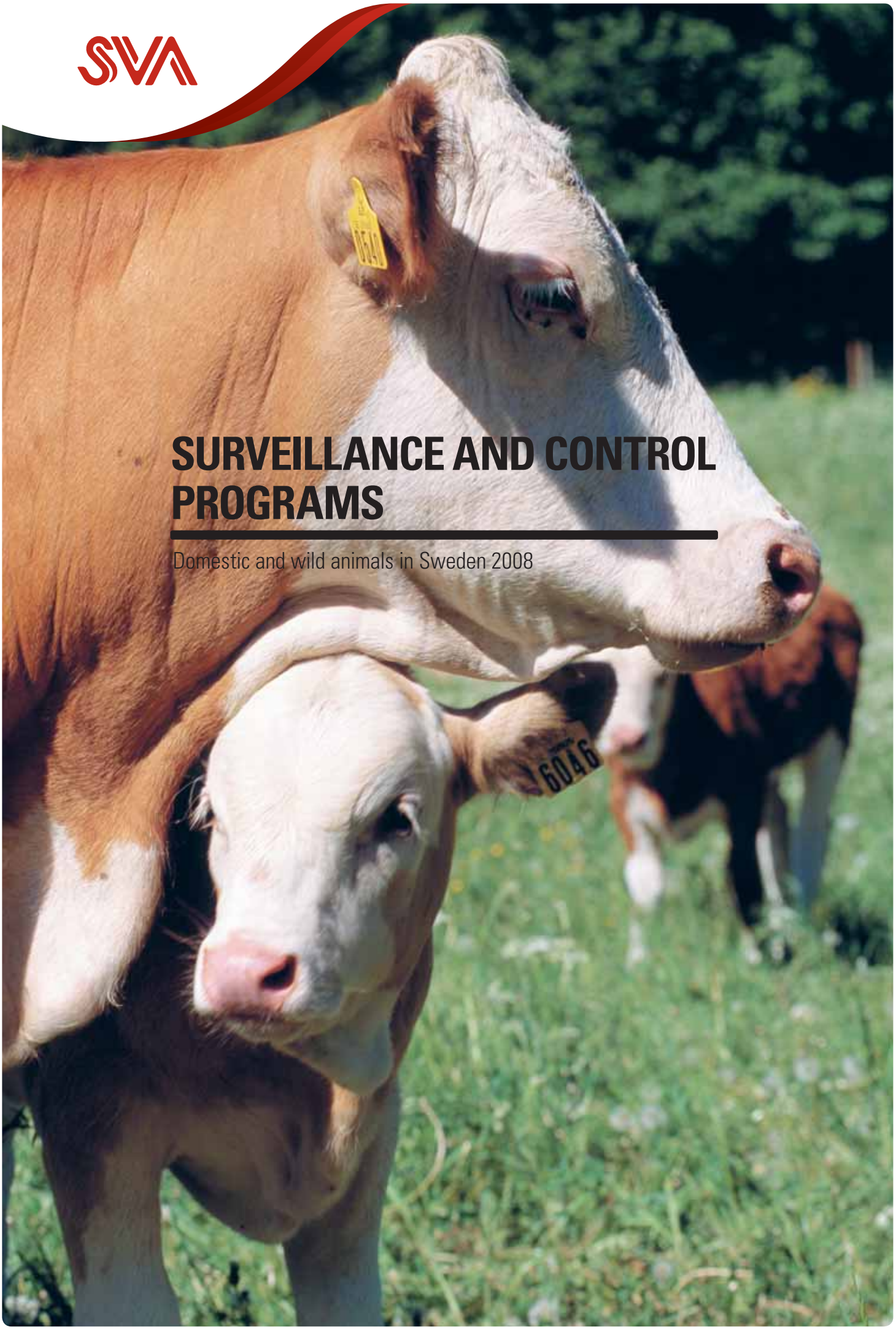

SURVEILLANCE AND CONTROL PROGRAMS

Domestic and wild animals in Sweden 2008

CONTENT

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SVA Report series 11 ISSN 1654-7098

Costs for print and distribution have been financed by the Swedish Board of Agriculture.

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Introduction

The purpose of this report is to publish the results of the Swedish surveillance and control programs 2008 for certain diseases in domesticated and wild animals.

The diseases covered by the report are all notifiable to the Swedish Board of Agriculture (SBA) and many are included in the Swedish Act of Epizootics. A non-vaccination policy is practiced in Sweden, thus vaccination against epizootic diseases is not allowed except under very specific circumstances.

In case of suspicion of an epizootic disease notification is mandatory and samples taken should be submitted to the National Veterinary Institute (SVA), Uppsala, Sweden, for analysis, or sent to another laboratory approved by SBA. All clinical suspects during 2008 have proven negative. Apart from providing most laboratory analysis mentioned in this report, SVA is also performing risk assessments and is the veterinary authority with expert knowledge in prevention and control of infectious animal diseases.

The number of Swedish herds with livestock has decreased whereas the herd size has increased during the last decades. Any disease outbreak would thus have a greater health and economical impact. Compared to many European countries, Sweden has rarely experienced any serious outbreaks of epizootic or other contagious diseases. However, because of increased movement of animals, goods and people it is a major challenge to keep up this favourable situation.

Sweden is officially stated in the EU legislation as free from bovine brucellosis, enzootic bovine leucosis and tuberculosis and has an approved disease free zone status for viral hemorrhagic septicemia, VHS, and infectious haematopoietic necrosis , IHN, in fish. Furthermore, Sweden has, by the European Commission (EC), been granted additional guarantees for infectious bovine rhinotracheitis, IBR, in cattle, Aujezky's disease, AD, in pigs and infectious pancreatic necrosis, IPN, spring viraemia of carp, SVC and renibakterios in fish. The Swedish salmonella control program has also been approved by the EC.

In addition, Sweden has a very favourable situation concerning paratuberculosis and 99,5% of the bovine herds were certified free from bovine virus diarrhoea virus, BVDV, at the end of 2008. An application, submitted to the EC in 2007, where Sweden demonstrates freedom from infection with *Mycobacterium bovis* in Swedish herded deer, is still pending.

Nevertheless, during 2007 porcine reproductive and respiratory syndrome, PRRS, was detected for the first time in Sweden. Due to early detection and prompt actions taken the disease was successfully eradicated and freedom from PRRS was again documented in 2008. As a consequence of the large bluetongue, BT, outbreak in northern Europe, the infection was introduced into the southern part of Sweden during 2008, but the number of infected herds was low and vaccination was carried out in the restricted areas. Both PRRS and BT were detected within the national surveillance programs.

The importance of thorough and reliable surveillance systems in order to meet rapid changes is emphasized, particularly in times of globalisation and climate changes.

The role of various institutions, organizations and laboratories involved in the monitoring work is listed as well as supporting animal databases.

Previous reports are found at SVAs website: www.sva.se

The livestock population

Demographic data show that most farms are located in the south and central parts of Sweden and animal husbandry is the major line of production. In the north of Sweden there are mostly small farms. The number of holdings with livestock has decreased during the last decades, whereas those remaining have increased in size. Since 1995 the average pig herd size has more than tripled. Most data relates to 2008, but some data are older. Map 1-3 give an overview of the livestock population and the number of holdings with animals in Sweden.

CATTLE

There are 22,844 herds with a total number of 1.558,381 cattle in Sweden, (Map 1).

The dairy sector is playing an important role in Swedish agriculture. The number of dairy cows has, however, decreased over a long time period. The number of cows has decreased with 26% since 1995 and in 2008 there were roughly 357,000 cows in 6,500 dairy herds with an average of 55 cows per herd. The number of suckler cows has increased somewhat since 2007 and was 196,300 in 2008. The average herd size was 16 cows per herd, which is an increase of 73% since 1995.

In total, approximately 401,000 adult cattle and 29,000 calves were slaughtered during 2008, which is a decrease compared to the previous years.

PIGS

In 2008 there were approximately 1,400 sow holds in Sweden (Map 2), which is an 83% decrease since 1995. During this period the average herd size increased almost four times, and was roughly 120 sows per herd in 2008. The number of holdings with fattening pigs has decreased with 76% from 1995 and is today around 2,000. The number of pigs has also declined markedly since 1995. The number of sows was approximately 170,000 in 2008, compared to 245,000 in 1995, with a farrowing interval of 2.2 times per year. Artificial insemination is used in over 90% of matings. Approximately 3 million pigs are slaughtered annually, at an age of six to seven months. Thus, there are constantly around 1.5 million live growers in Sweden.

SHEEP

In 2008, there were roughly 8,200 sheep holdings in Sweden with a total of approximately 251,000 ewes and rams, and 273,000 lambs, (Map 3). The number of ewes and rams has increased with almost 30% since 1995. Sheep farms in Sweden are usually small-scale enterprises but the herd size increases. The average number of adult sheep was 31 per herd, which is an increase of 58% since 1995.

Approximately 203,000 lambs were slaughtered in 2008, which is an increase from the years before.

GOATS

In the end of 2008, the approximate numbers of goats and goat holders in Sweden were 9,500 and 950, respectively. Most holders had a few goats per farm. Approximately 200 holders had ≥ 10 goats, and around 40 of those farms had ≥ 50 goats.

POULTRY

The number of holdings with broilers is slowly decreasing. In 2008 there were approximately 115 holdings. Despite of this fact the number of chickens for slaughter has increased to 76 millions.

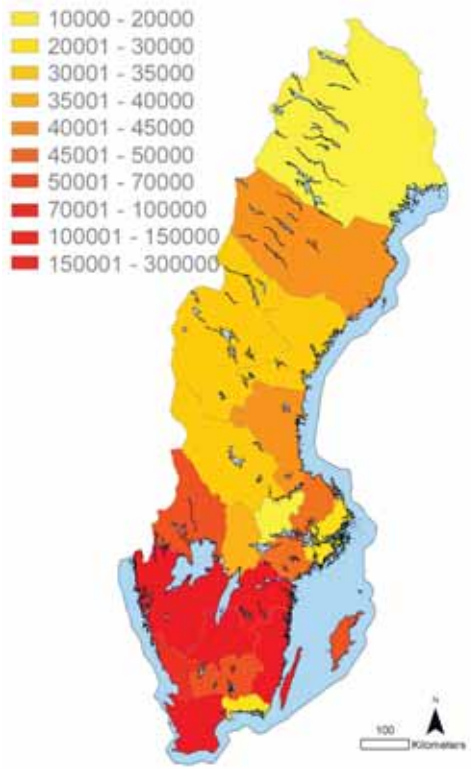
There were approximately six million adult laying hens. The number of holdings with more than 5 000 birds were 213. During 2008 the egg production increased 7%.

About 470 000 turkeys were slaughtered in 2008, which was a slight increase compared to 2007.

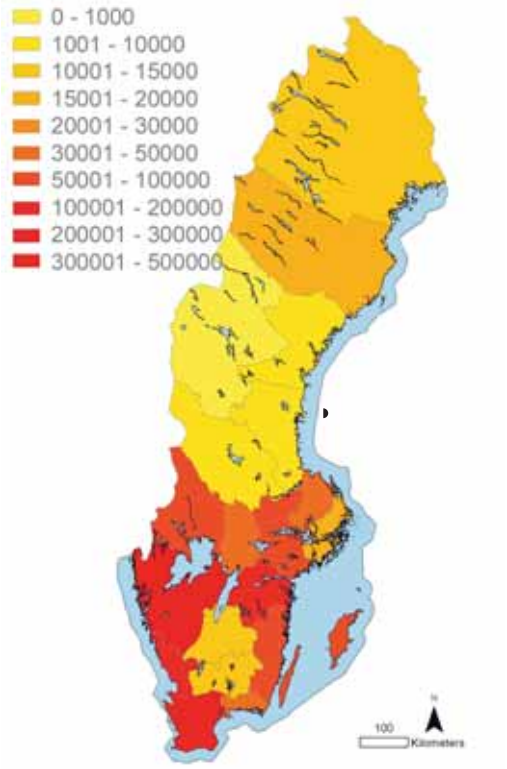
Production of geese and ducks is on a low level. The number of slaughtered animals was approximately 25 000.

THE LIVESTOCK POPULATION

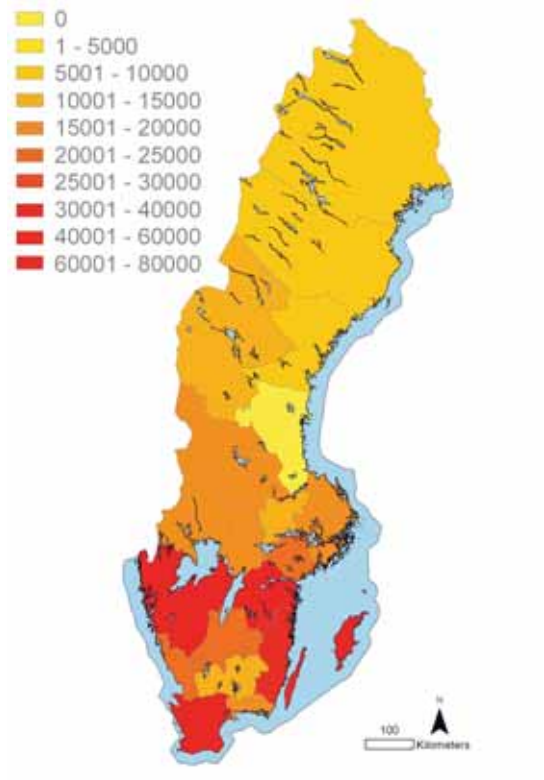
Map 1. Geographical distribution of cattle in 2008.



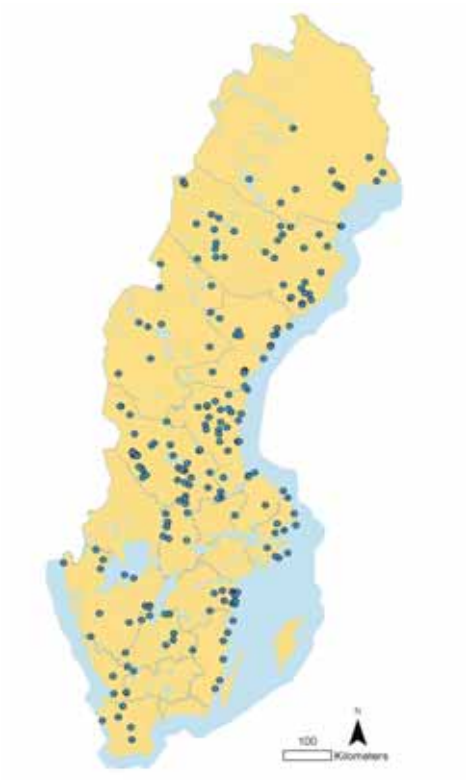
Map 2. Geographical distribution of pigs in 2008.



Map 3. Geographical distribution of sheep in 2008.



Map 4. Geographical distributions of fish farms in Sweden including places for caught of feral broodfish 2008.



FISH AND MOLLUSKS

Sweden is a very small country when it comes to aqua culture. The farms are evenly distributed over the country with a slight predominance to the middle and south parts, (Map 4). Rainbow trout is the most frequently farmed fish followed by salmon, brown trout and char. Salmon and brown trout mainly for restocking feral populations. Eels are imported from Severn in the UK through quarantine procedures for the restocking of feral populations. A minor part is farming of pike-perch and perch. The main tonnage is produced in the continental zone. Many of the farms are quite small compared to European standard, but there is a trend towards bigger units. During the last five to ten years there has been an increased foreign ownership, mainly Finnish.

During 2008 there has been an increasing interest for aquaculture of mollusks. The dominating species, blue mussel, is farmed for consumption and for improving environmental conditions. Swedish oysters have been discovered in Europe as a high quality product and consequentially farming and harvesting of natural banks have grown in interest. As Sweden is considered free of the more severe diseases in those species screening and eventually control program is discussed.

TRADE IN LIVE ANIMALS

In 2008, 123 pigs were brought into Sweden (from Norway and Finland only), 7 Bison bison, 8 cattle (from Denmark), 533 sheep (from Denmark) and 17 goats (from Switzerland).

The number of animals leaving the country during 2008 consisted of 1,144 cattle, 14,945 pigs of which 14,799 were sent to Germany for slaughter, and finally 45 sheep and goats which were sent to Denmark for slaughter. Regarding the trade in poultry no figures are available.

ANIMAL DATABASES

The central register of holdings

The Swedish Board of Agriculture is responsible for the register. Each holding is allocated a unique identification number (holding number). The register contains information on all activities concerning bovine animals, pigs, ovine and caprine animals with details on holding number, visiting address, species. Any change in the present situation shall be reported within a month after the change. The register provides the specific animal databases with information.

The central database for porcine animals (GRIS)

The Swedish Board of Agriculture is responsible for the database. It contains data on all holdings with pigs and movements of pigs between holdings. The data encompasses address and registration number of the holding as well as name and phone number of the keeper, type of production, capacity and the geographical coordinates of the holding. Regarding movements, the receiving holding is responsible for reporting the movements of the animals within seven days. The register's purpose is to allow swift and efficient tracing of contagious diseases.

The central database for bovine animals (CDB)

The Swedish Board of Agriculture is responsible for the Central Database for Bovine Animals, to which all bovine births, deaths and movements shall be reported. The keeper is responsible to report any changes within seven days of the occurrence. The purpose of the register is to allow swift and efficient tracing of a contagious disease, verification of the country of origin of a meat product, as well as control and administration of cross compliance. The system enables the scanning of animal disease forms into the data system.

The central database for sheep and goats

A central database for sheep and goats has been in operation in Sweden since 1 January 2008. Keepers may register movements in the database via the Internet, or in paper form.
Animals are registered in groups in the database when moved. Both the keeper, who dispatches the animals, and the keeper, who receives the animals, are responsible for reporting to the database, not later than 7 days after the movement.

The slaughter register (SLAKT)

The register is administrated by the Swedish Board of Agriculture, but it also provides statistics for the National Food Administration (NFA). The slaughterhouses are responsible for reporting all slaughtered animals including wild game. All discards shall be reported and information about the discards stated according to the codes of NFA. The producer's organization number or personal

code number must be reported for all species. The holding number of the supplier is compulsory information for all species except horses and wild game. Reports shall be made every week.

The register of laying hens

The register is administrated by the Swedish Board of Agriculture. All egg producers who have a capacity of at least 350 laying hens and who sell eggs for consumption shall be registered according to Directive 1999/74/EC. The register contains information about address, production method, capacity, geographic coordinates and the number of houses and sections on the holding. The purpose of the register is to allow efficient tracing of the eggs in case of a contagious disease and to ensure good food safety.

The poultry register

The register is administrated by the Swedish Board of Agriculture and includes all holdings with commercial poultry production. An exception is holdings with at least 350 laying hens, which are registered separately. The purpose of the register is to allow efficient tracing and eradication of contagious diseases. The name and address of the holding, name of animal keeper, information on all houses and sections, production method, maximum capacity, species and geographic coordinates shall be registered.

The database for dairy herds (Ko-databas)

The Swedish Dairy Association is responsible for this comprehensive database. It forms the bases for the development of different management tools used by the farmers. It is also a valuable tool for research concerning feeding, genetics etc. Approximately 90% of all dairy cows in Sweden are included in this recording programme.

Swedish Animal Health Service's registers

The Swedish Animal Health Service runs different control and monitoring programs. The holdings that are associated with any of the programs are included in the respective registers for cattle, sheep, pigs and farmed deer.

The animal health database (vet@)

The database is used by the veterinary services for the documentation of the health situation on farms, including details about health status, treatment and vaccinations of individual animals. It is based on reports from practitioners to the Swedish Board of Agriculture. All veterinarians are obliged to report their various practice activities. It is mandatory for all veterinarians to report continuously as concerns production animals. For other animals the veterinarians have the choice to report pet treatments either continuously or once a year. The purpose is to monitor the animal health situation in Sweden and use it as a base for preventive measures.

INSTITUTIONS, ORGANISATIONS AND LABORATORIES INVOLVED IN MONITORING

Swedish Board of Agriculture

The Swedish Board of Agriculture, SBA, is the Government's expert authority in the field of agricultural and food policy, and is responsible for agriculture and horticulture. This includes monitoring, analyzing and reporting to the Government on developments in these areas, and implementing policy decisions within its designated field of activities.

The SBA promotes animal health by strict animal welfare requirements and by combating and preventing the spread of contagious animal diseases and is also the chief authority for the Swedish District Veterinarians.

National Veterinary Institute

The National Veterinary Institute, SVA, is a Swedish national authority that strives for good animal and human health, a good environment and sustainable food production.

SVA is an expert authority within the field of risk assessments, prevention, diagnosis and the control of infectious diseases. SVA assists other authorities, organisations, veterinarians and the general public with support in decision-making, advice and help, as well as carrying out research in relevant areas.

Diagnostic capacity for most of the epizootic diseases and many other contagious animal diseases is available at SVA. Several control- and monitoring programs are being conducted in cooperation with animal owner organisations and relevant authorities.

National Food Administration

The National Food Administration, NFA, is the central supervisory authority for matters relating to food, including drinking-water and has a direct responsibility to the Government.

The NFA has the task of protecting the interests of the consumer by working for safe food of good quality, fair practices in the food trade, and healthy eating habits. Fair practices in the food trade imply that the consumer can rely on the labelling as regards, for example, the composition, weight, keeping qualities and origin of the food.

County Administration

Sweden is divided into 21 counties, each of which has its own County Administration and County Governor. The County Administrations function as representatives of the state in their respective counties, and as links between the inhabitants, the municipal authorities, the Central Government, the Swedish Parliament and the central state authorities. The County Administrations have important coordinating functions regarding prevention, surveillance and eradication of contagious diseases.

The Swedish Dairy Association

The Swedish Dairy Association is the national industry organization for Swedish dairy farmers and the Swedish dairy industry. The Swedish Dairy Association works on behalf of its owners, who are the seven largest dairy companies (jointly representing more than 99% of Swedish milk production), seven livestock cooperatives, two semen-producing companies, and nine breeder societies. The Swedish Dairy Association gathers, develops and communicates knowledge relating to the entire chain from cow to consumer, including issues concerning animal health. The Swedish Dairy Association is organizing the surveillance programs regarding bovine leucosis, IBR, BVD and salmonellosis in bovines.

Swedish Animal Health Service

The Swedish Animal Health Service is a veterinary organization providing animal health service to all breeders of pigs, beef and sheep in Sweden. The objective is to further a sound production of healthy animals on an economically competitive basis. Health control and health service is provided at all stages of the production chain. The Swedish Animal Health Service runs several control- and monitoring programs i.e. Maedi Visna in sheep, salmonellosis in pigs, bovine tuberculosis in farmed deer, Aujeszky's disease and PRRS in pigs and paratuberculosis in cattle. The Animal Health Service is also leading the organization of post mortem investigations for livestock.

Swedish Poultry Meat Association

Swedish Poultry Meat Association (SPMA) represents 98% of the poultry meat production of

chicken, turkey, goose and duck in Sweden, with members from the entire production-chain. The members are obliged to participate in the animal health programmes, administered by SPMA such as salmonella-, campylobacter-, and the coccidiosis and clostridiosis control.

During 2008 the members produced approximately 74 million chickens. SPMA is multi functional; the major task is the work associated with economic and political industry related matters important to its members. SPMA is receiving legislative referrals from the Swedish public authority and the EU's institutions. The organization also initiates and economically supports research.

The Swedish Egg and Poultry Association

The Swedish Egg and Poultry Association is the national organization for Swedish egg producers, hatcheries, rearing pullet companies, egg packing stations and pullet feeding companies.

The Swedish Egg and Poultry Association is responsible for the organization of surveillance programs regarding animal health and welfare and the voluntary salmonella control program. The objective is to further support a sound egg production, with a high standard of animal welfare and food hygiene /safety on an economically competitive basis.

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Paratuberculosis

BACKGROUND

Paratuberculosis (Johne's disease) is included in the Swedish Act of Epizootics since 1952 (SFS 1999:657, with amendments). Vaccination is according to this act prohibited and notification of the infection is mandatory based on clinical suspicion. Whole-herd slaughter is performed if *Mycobacterium avium* subsp. paratuberculosis is detected in a herd. The prevalence of paratuberculosis in Sweden is extremely low, but sporadic cases in cattle have occurred, most recently in 2005. Paratuberculosis has never been detected in other ruminants in Sweden.

In 1993, bovine paratuberculosis was diagnosed in an animal imported to Sweden. Before this, there had been no known cases of this disease for several decades. In the investigation made to trace the infection, 52 herds and 500 contact herds were sampled. Infection was found mainly in beef herds of the Blonde d'Aquitaine and Limousin breeds. In an extended investigation in 1995-1996, all herds that had imported cattle between 1980 and 1994 were included. In the same period, a screening of sanitary slaughtered cattle that involved culture from internal organs was made. All these investigations resulted in three confirmed cases with consecutive eradication measures taken in the herds. A control programme focusing on pedigree beef herds was initiated in 1998.

Bovine paratuberculosis has never been found in Swedish dairy herds.

AIM

The overall purpose of the surveillances and control programme is to document freedom from bovine paratuberculosis and to prevent possible spread by early detection of the infection. In the control programme, the target population is beef herds that sell animals for breeding. The control programme is managed by the Swedish Animal Health Service and financed by the Swedish Board of Agriculture. The active surveillance in dairy cattle has been financed by the Board of Agriculture and performed by the Swedish Dairy Association in cooperation with the Swedish Animal Health Service. The active surveillance in slaughterhouses, starting in 2008, is managed by the Swedish Animal Health Service and financed by the Swedish Board of Agriculture.

MATERIAL AND METHODS

Control programme

In total, the control programme for bovine paratuberculosis encompassed 584 herds during 2008 included all main breeding beef herds and a smaller number of dairy herds. In affiliated herds, yearly faecal samples are collected from all cattle from two years of age and all purchased animals from one year of age. After five years of negative results, sampling is reduced to faecal sampling of 20% of the animals in the herd, or a minimum of ten animals, every second year. The samples are pooled five and five, except for imported animals that are cultured individually. In 2008 the number of sampled herds within the control programme were 239 encompassing samples from 3236 individuals.

Screening of dairy herds

No screening of dairy herds was performed during 2008. In previous screenings, in 2001, 2003 and 2005, faecal samples were collected from 20 older cows in 200 dairy herds. The herds were selected as a stratified random sample, to achieve a representative geographical distribution. The herds selected for sampling 2005 were different from the herds sampled in 2001 and 2003.

Screening of older cows at slaughterhouses

Sampling slaughter cows was organized and initiated during 2008. Samples from the ileal wall, ileal content and ileocaecal lymph nodes were collected from cows older than six years and with signs of weight loss. In 2008, samples were collected at five different slaughterhouses in the country (Scan Linköing, Scan Skara, Skövde slkteri, KLS, Karlgrens) The sampling started in October 2008 and is planned to continue for two years with collection of 1800 individuals.

Clinical suspicions and necropsies

Animals of any ruminant species showing symptoms that lead to clinical suspicion of paratuberculosis are further investigated. Sampling includes faecal samples from live animals and post-mortem samples from dead or culled animals. The latter include samples from the ileal wall, ileal content and ileocaecal lymph nodes as well as any macroscopic lesions in the intestines. Since 2004, sampling is performed on cattle and sheep above one year of age submitted to post mortem examinations. Samples are taken as above and submitted for culture. In 2008 there were 102 cattle and 43 sheep sampled at post mortem examinations.

Other animal species

Since 1993, yearly screenings of the sheep population has been undertaken. For 10 years serology (AGID) was used, but in 2004 this was replaced by faecal culture. Serum samples were collected from the Maedi-Visna programme, the number varied between the years but an average of 2000 samples per year were analysed. Since 2004, faecal samples have been taken in 60-70 sheep herds, from the 10 oldest animals in the herd. In 2008, samples were taken from 696 individuals in 69 herds distributed throughout the country. In addition, culture is performed on suspect cases found at post-mortem investigations in wildlife.

Diagnostic tests

All cultures were performed at the National Veterinary Institute. After pre-treatment with NaOH and oxalic acid, samples were cultured on modified Lowenstein-Jensen medium supplemented with mycobactin and on Herrolds Egg Yolk medium for up to 4 months. Faecal samples from sheep were cultured for up to 6 months, on both modified L-J with mycobactin and modified Middlebrook 7H10 with mycobactin. Direct PCR was performed on samples within the control programme that had moldy overgrowth in the culture.

RESULTS AND DISCUSSION

None of the samples from the control programme were positive for bovine paratuberculosis. At the end of 2008, 513 affiliated herds had the so called A-status* as compared with 494 in 2007.

Four clinical suspicions of paratuberculosis were raised during 2008. These were two cases, one cattle and one European elk from a zoo, with chronic diarrhea and weight loss and two cases, one sheep and one cattle, with chronic diarrhea. The elk was sampled at post mortem examination, the remainders were live animals and fecal samples were examined. None of the clinical suspicions were positive on culture.

No paratuberculosis was detected in the post mortem samples from cattle and sheep during 2008.

Within the screening of older cows at slaughter, 421 individuals were sampled of which the majority of the samples were collected at Scan Linköping and Scan Skara.All these samples have been negative at culture. In the sheep surveys up to 2004, an average of one seropositive sample was found every year, but further investigations into these herds, including slaughtering of the positive animal and testing of all other animals in the herd, revealed no paratuberculosis.

No positive faecal samples have been found 2004, 2005, 2006, 2007 and 2008. Paratuberculosis has never been detected in Swedish wildlife.

The investigations undertaken show that the prevalence of paratuberculosis in Swedish ruminants remains at a very low level. However, due to the lack of sensitivity of available tests for live animals, freedom from the infection is difficult to demonstrate.

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*Herds that have undergone 5 annual whole herd samplings with negative results.

Salmonella in food-producing animals

BACKGROUND

The control of *Salmonella* in Swedish animal production was initiated more than 50 years ago. This was, among other things, prompted by a major food borne outbreak in 1953, involving more than 9000 people. All serotypes of *Salmonella* are regarded as equally unacceptable and the legislation on salmonella control includes all serotypes. The present Swedish salmonella control programme was approved by the EU in 1995 (95/50/EC) and is supervised by the Swedish Board of Agriculture and the National Food Administration.

The *Salmonella* control is governed by the Act on Zoonoses (SFS 1999:658, with amendments) and several regulations. Any suspicion of *Salmonella* in animals is notifiable, and restrictions must be put on the *Salmonella* infected holding, such as a ban on all animal movements. In case of positive samples, trace back and trace forwards investigations are made. A stamping out policy is practised whenever *Salmonella* is detected in poultry (excl. ostriches). This is followed by thorough cleaning and disinfection, and environmental sampling before repopulation is permitted. In other animal species (incl. ostriches), the on-farm eradication strategy depends on the situation and type of production. Restrictions are not lifted until cleaning procedures are completed and two whole herd samplings four weeks apart have shown negative results on culture. A separate feed legislation regulates *Salmonella* control in feed production plants, and mandatory actions in case of positive feed samples. Several regulations describe surveillance procedures in different animal species as well as on-farm eradication procedures. Preventive hygiene measures and restrictions regarding animal purchases are included in voluntary programmes that allow affiliated producers a higher level of compensation for losses caused by eradication measures in case *Salmonella* is detected. The majority of all pig producers and many of the large dairy operations as well as beef cattle breeders are affiliated to the programmes.

AIM

The overall strategy of the Swedish salmonella control programme is to prevent *Salmonella* in any part of the production chain, from feed to food of animal origin, to monitor the whole chain, and to eliminate infection/contamination with salmonella whenever found.

MATERIAL AND METHODS

Poultry

Sampling was performed at different frequencies in different stages in the production chain depending on the impact an undetected infection in the specific stage would have on the end product.

Sampling was performed by the food business operator and by the competent authority. Breeding animals were sampled during the rearing period and every second week throughout their production period. The same requirements were applied to imported breeding animals. Every batch of eggs was sampled in the hatchery. Hens for commercial table egg production were sampled during the rearing period, every 15th week during the laying period and before slaughter. Poultry for slaughter were sampled before slaughter. Depending on poultry production type faecal samples were collected or boot/sock swabs were used for sampling. In the hatchery meconium samples were collected. The number of samples was calculated so as to detect a flock prevalence of 5% with 95% confidence level.

Furthermore, the control programme for fresh poultry meat comprises analyses of neck skin samples from poultry carcasses. Neck skin samples were sampled from all slaughtered flocks and the

sampling was designed to detect a 0.1% prevalence (95% confidence interval).

Cattle and swine

No regular sampling was done on pig or cattle farms. Voluntary surveillance was performed in breeding pig herds within an industry certification programme (BIS). In case of clinical or post mortem suspicion of *Salmonella* infection, relevant samples must be taken for culture. In addition all calves up to six months of age are sampled at post mortem examination.

At each one of the high intensity slaughter houses, that slaughter approximately 90% of cattle and pigs, the number of samples were chosen to detect at least 5% (95% confidence interval) *Salmonella* infected/ contaminated carcasses. Sampling was performed daily, evenly distributed over time. In case of separate slaughter lines, each line was sampled separately. In low intensity slaughterhouses, slaughtering approximately 10% of all cattle and pigs, enough samples were taken to detect 1% prevalence (90% confidence interval). Furthermore, quantitative monitoring of the slaughter hygiene was performed in all slaughterhouses by the collection of carcass swabs. Sampling was designed to detect a 0.1% prevalence (95% confidence interval) of salmonella contaminated carcasses.

DIAGNOSTIC PROCEDURES

Poultry

Before analysis the boot/sock swabs were pooled to one or two samples. Faecal samples were pooled to one sample. During investigation or before restocking in infected premises dust samples and / or environmental swabs were used for environmental sampling. The detection method used for analysis was MSRV which is the method recommended by Community Reference laboratory for Salmonella in Bilthoven. The method is described in the current version of annex D of ISO 6579 (2002): ”Detection of *Salmonella* spp. in animal faeces and in samples in primary production stage”.

Cattle and swine

Before analysis, samples from slaughterhouses were pooled in batches of 10 to 15. For sampling of live animals, a minimum of 10 g of faeces from each individual, and 50 g from each pen of calves/young stock, was collected. At the laboratory, materials from 5 individual animals were usually pooled. In case *Salmonella* was isolated from a pooled sample, individual analysis of stored samples could be performed. Handling and preparation of lymph node samples and carcass swabs are described in detail in the Zoonosis reports from Sweden to the European Union. The bacteriological method used for analysis of samples collected within the Swedish Salmonella control programme was the NMKL 71:1999, ISO 6579 (Decision 2003/470/EC). In addition, for cattle faeces, cystein and selenite broth was sometimes used.

RESULTS AND DISCUSSION

Poultry

14 poultry flocks were detected infected with *Salmonella* during 2008. All flocks were detected through on farm sampling. Salmonella was not detected in any of the 4,686 neck skin samples taken.

Salmonella was detected in seven broiler flocks. Fig. 1. Four flocks were infected with *S.* Typhimurium phagetype NST. Three of these were detected in the samplings of the control program. One of these flocks was sampled because of a clinical salmonellosis in a child of the owner family. S. Agona was isolated from three consecutive flocks of one holding although the holding was cleaned and disinfected between the rounds.

In addition, two turkey flocks were infected with *Salmonella*: S. Typhimurium NST in the one flock and S. Reading in another. *Salmonella* was detected in five flocks of laying hens, Fig. 2. S. Typhimurium NST in three flocks, S. Livingstone in one flock and S. enterica sp. diarizonae in one flock. One of these holdings was sampled because of clinical salmonellosis in the owner family. The same phagetype was detected in the following flock.

During 2008 three holdings were associated with salmonellosis in humans. In two cases the outbreak occurred in the owner family. S. Reading isolated in the turkey flock was part of an outbreak affecting multiple animal species and humans. The other striking feature of the year was infection in consecutive flocks at two holdings.

Cattle

In 2008, Salmonella was isolated from 21 new cattle herds, see Fig 3. The following serotypes were isolated:

Fig. 1 No of notified cases (infected herds) of *Salmonella* in broilers during 1968-2008

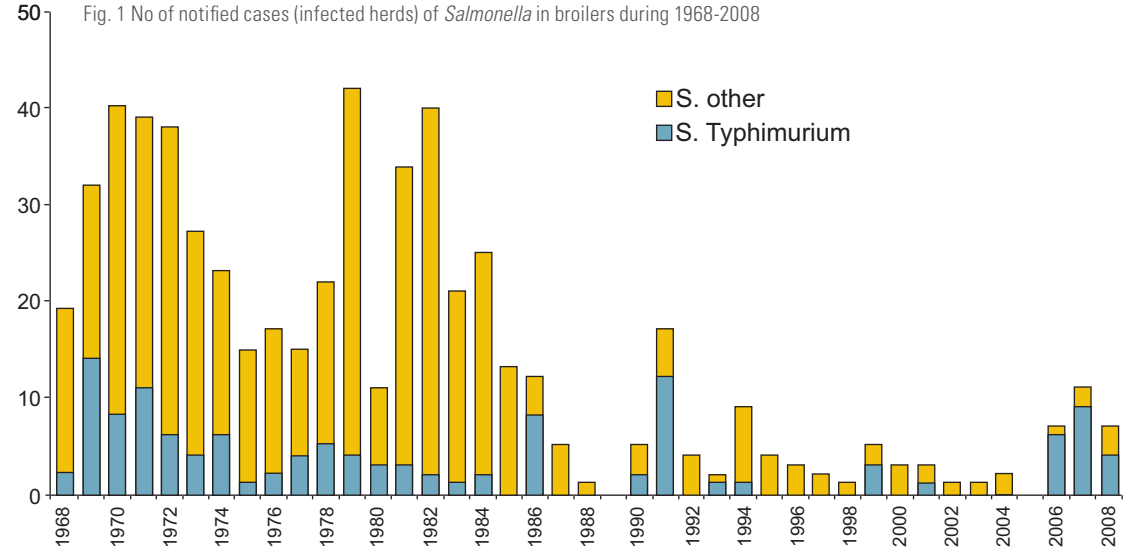


Fig. 2 No of notified cases (infected herds) of *Salmonella* in layers during 1968-2008

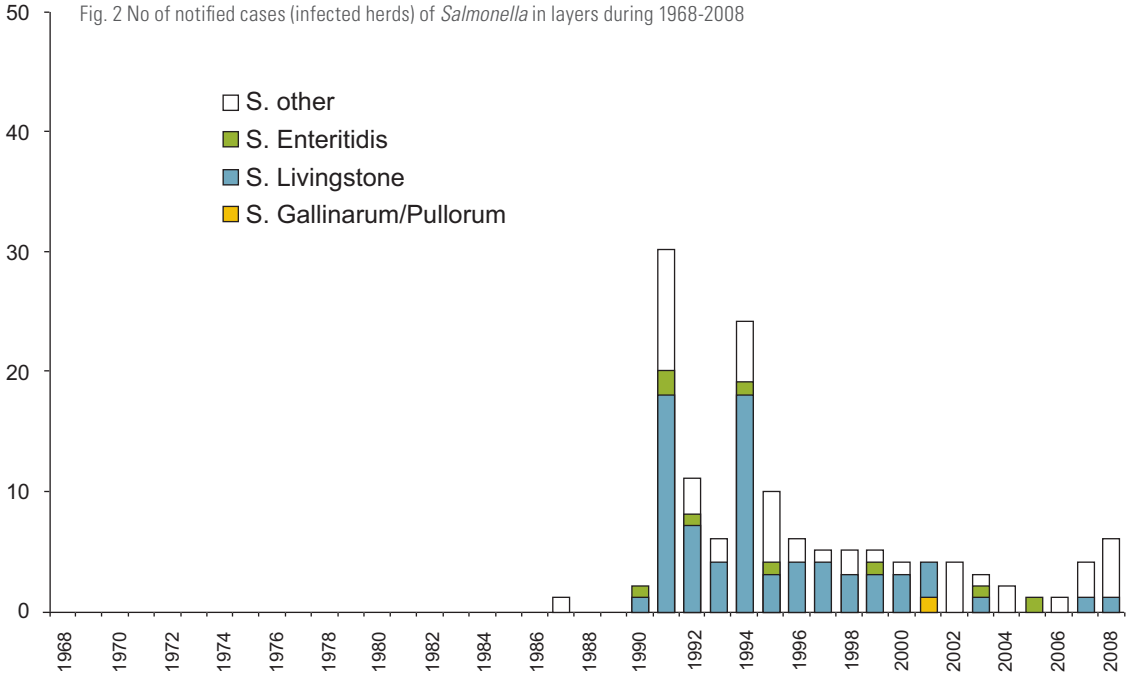
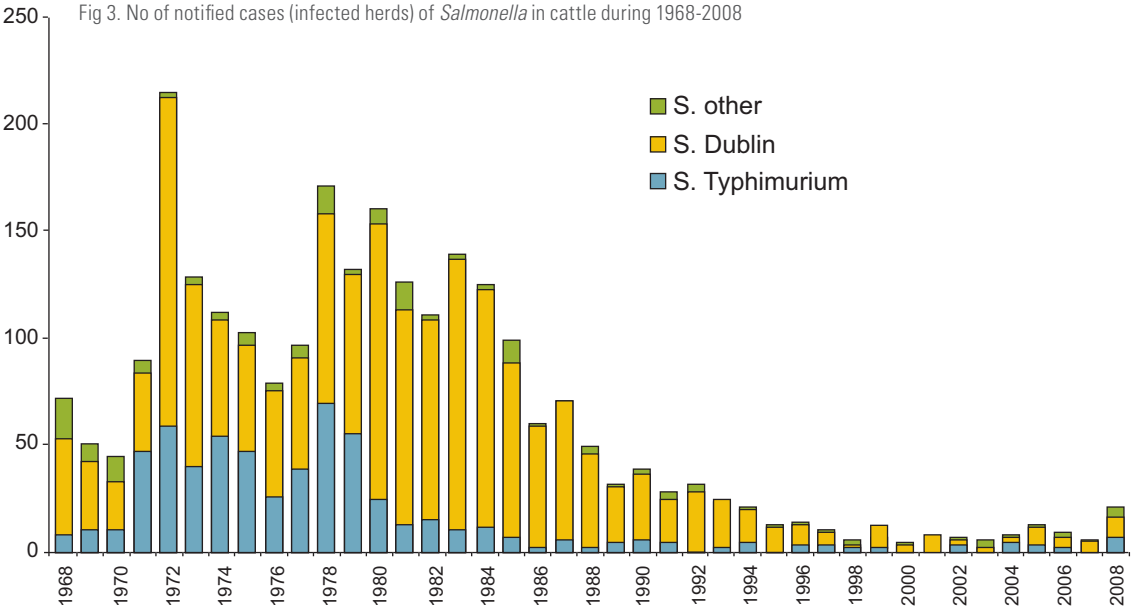


Fig 3. No of notified cases (infected herds) of *Salmonella* in cattle during 1968-2008



- 9 herds with S. Dublin
- 7 herds with S. Typhimurium
- 3 herds with S. Reading
- 2 herds with S. Enteritidis.

Eight additional farms were under restrictive measures in 2008 after an infection of *Salmonella* detected in 2006 or 2007. Four of these farms were infected with S. Dublin, one with S. Agona, one with S. Reading and two with S. Typhimurium DT 104. During 2008, six of these farms were declared free of *Salmonella*.

A total of 3320 lymph nodes from cattle were analysed from samples taken at slaughter within the Salmonella control programme (Table 1). *Salmonella* was isolated from four of these lymph Nodes: S. Dublin (1), S. Typhimurium NST (1) and 126 (2). Sampling in the original herd revealed no Salmonella in one of these herds (S. Typhimurium NST).

Salmonella was also initially isolated from nine individual animals at necropsy; S. Reading (1), S. Typhimurium NST(3), phagetype 1 (1) and NT (2), S. Enteritidis (1) and S Dublin (1). Sampling of the animals in the originating herd revealed no salmonella infection in three of these herds (S. Typhimurium NST).

Salmonella was also isolated from 12 tracings from infected herds; Dublin (7), S. Typhimurium phagetype 104 (2 and NST (1), S. Reading (1) and S.Enteritidis (1). Furthermore Salmonella was isolated at sampling on clinical suspicions in two cases; S. Reading (1) and S. Dublin (1).

Pigs

Salmonella was detected in 8 new pig herds in 2008, see Fig 4.

Salmonella was detected on three farms after an isolation in the Salmonella control program in 2008. S. Typhimurium was detected on two farms (phagetypes U277 and DT40) and S. Newport on one farm. Additional serotypes were isolated on two of these farms. The farm with U277 had also phagetype DT40. The other farm with Typhimurium was sampled because of a finding of S. Goldcoast from a lymph node of a pig. S. Goldcoast could not be isolated in the farm but three other serotypes: Typhimurium, Dublin and an untypable isolate.

Two new farms with S. Typhimurium NT and NST were detected in early 2008 after an isolation in the control programme in late 2007.

In two herds salmonella was initially isolated in the baseline study. S. Typhimurium NST U277 was detected in one herd and S. Cubana in the other herd.

S Typhimurium NST U277 was isolated from one herd sampled when tracing from a Salmonella infected herd. Five herds were under restrictive measures in 2008 after an infection of Salmonella detected in 2007. Three of these farms were infected with S. Typhimurium (104, 120 and NST) and two with S. Infantis. One herd with S. Infantis was declared free in 2008.

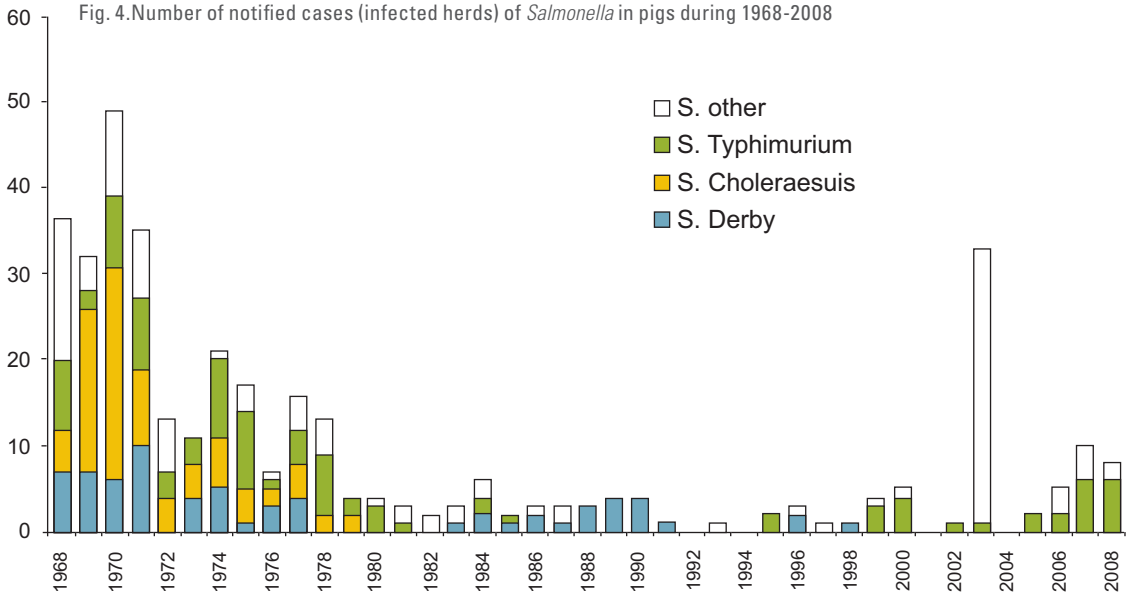
In the control programme, 5812 lymph nodes from swine were analysed (Table 1). Of these, 15 were positive. Seven of the positive samples were taken from adult swine: S. Goldcoast (n=1), S. Newport (n=2), S. Typhimurium NST U277(n=2), S. Thompson (n=1), and S. subspecies I (n=1). Eight of the positive samples were taken from fattening pigs: S. Typhimurium DT40 (n=5), DT104 (n=1), NST U277 (n=1) and another NST (n=1).

The *Salmonella* situation in Sweden has been favourable. However, the number of infected cattle herds was higher in 2008 than previous years. The year before, the number of infected swine and poultry herds was higher than in the previous years. It is still too early to conclude if these changes reflect a true increase, but it is important to follow the development and take necessary preventive measures if an increase of Salmonella is detected.

Table 1. Samples of lymph nodes taken at slaughter within the Salmonella control programme.

	No samples	No positive (%)
Cattle	3,320	4 (0,12)
Adult pigs	2,625	7 (0,27)
Slaughter pigs	3,187	8 (0,25)

Fig. 4.Number of notified cases (infected herds) of *Salmonella* in pigs during 1968-2008



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Tuberculosis (TB)

BACKGROUND

Sweden was declared officially free from bovine tuberculosis in 1958. Since then, sporadic cases have occurred in cattle, the most recent in 1978. Compulsory tuberculin testing of all cattle was abolished in 1970 and the national tuberculosis control in cattle is based on meat inspection and passive clinical surveillance. Suspect cases of infection with *Mycobacterium bovis*, *M. tuberculosis*, or other mycobacteria in the *M. tuberculosis*-complex, is compulsory notifiable in all animal species (SJVFS 1999:102 and 2002:16, with amendments). If tuberculosis is confirmed in a food producing animal, eradication measures are implemented, including depopulation of the whole herd, in accordance with the Swedish Act of Epizootics (SFS 1999:657, with amendments). When Sweden joined the European Union in 1995, the status of OTF (officially tuberculosis free) was obtained (former Decision 95/63/EC, Commission Decision 03/046/EG). Sweden fulfils the requirements for control measures in OTF member states (Council Directive 64/432/EEC, Annex A).

In 1987, *M. bovis* infection was introduced into the farmed deer population via imported fallow deer. After further investigation and eradication measures, a voluntary control programme for tuberculosis in farmed deer was introduced in 1994. In 2003, the control programme was made compulsory for all deer farms. The programme is based on regular whole-herd tuberculin testing, or whole-herd slaughter and meat inspection. Deer may only be sold for direct slaughter unless they originate from a herd that have undergone three consecutive herd tests and continue to test regularly. The most recent case was detected in 1997. TB vaccination of animals is not allowed in Sweden. During 2007, the status in Sweden was officially free of bovine tuberculosis. A scenario tree model performed in 2007 showed that a claim for freedom from tuberculosis in farmed deer is also valid.

AIM

The aim of the programme is to document freedom from bovine tuberculosis, according to Council Directive 64/432/EEC and to contribute to the maintenance of this favourable situation.

MATERIAL AND METHODS

Animals sampled

Monitoring is performed by meat inspections at slaughter of food producing animals. Veterinary officers of the National Food Administration perform the inspections. If TB is suspected, samples are collected and analysed at the National Veterinary Institute. Furthermore, tuberculin tests are performed at artificial insemination centres and at export/import of animals as required according to EU-legislation (Council Directive 64/432/EEC). In addition, sampling is performed in case of clinical suspicion or if any other reason to suspect exposure of animals to bacteria of the *M. tuberculosis*-complex.

Methods of sampling and diagnostic methods

If tuberculosis is suspected at necropsy, at meat inspection, in case of clinical suspicion or if a tuberculin test is positive, lymph nodes from five different areas (retropharyngeal, submandibular, mediastinal, mesenterial and inguinal) and organs with macroscopic lesions are collected. Histology and direct smears are performed on all materials, and fresh material is stored in a freezer until the results of these tests are available. If TB cannot be ruled out by histology or if direct smears are positive, culture is performed. For culture, lymph nodes are pooled (including at least two lymph

nodes from each region) whereas organs with pathological lesions are cultured separately. Cultures are performed solid media (Löwenstein-Jensen, Stonebrink's, Modified Middlebrook) according to the accredited method at SVA and checked once a week for eight weeks. Microscopy of all suspect colonies is performed and bacteria in the *M. tuberculosis*-complex are identified with a specific genetic probe. Positive isolates are further sub-typed. Skin fold tuberculin tests are performed according to EC 1226/2002 (amending annex B of EC 64/432) and SJVFS 2003:33. The comparative intradermal test is used, mostly at the neck site except for camelids where the auxilliary site is used. In case of a positive tuberculin test, the animal is culled and sampled as stated above. In the case of tuberculin reactors, the animals are culled and culture is performed on all samples.

RESULTS AND DISCUSSION

In total, 3 cattle were investigated for tuberculosis in 2008, all with negative results. In 2 of these cases, suspicion arose at slaughter and TB was ruled out by histopathology and direct smears. The third case was a bull that reacted to the tuberculin test and was culled and necropsied. Culture was performed on lymph nodes and organs with negative result. In addition, some other species were also investigated for tuberculosis in 2008. Following suspicion at meat inspection, 46 pigs were investigated by histology, 34 of these were cultured. All were negative for bovine TB, but 18 of the cases were positive for *Mycobacterium avium*. Furthermore, 4 sheep, 5 deer, 1 horse, 1 cat and 1 dog were investigated for tuberculosis by histology and, where relevant, culture.

The total number of registered holdings for farmed deer was close to 600. However, a large proportion of these do not keep deer after obtaining TB free status. About 260 herds were considered active, i.e. kept deer and had obtained TB free status. A total of 20 herds were still exempted from testing and allowed to perform meat inspections and necropsies for 15 years to obtain free status. Only one herd remained where eradication measures had not been completed. In this herd, the deer were slaughtered but a small group of yaks were left to be tested or slaughtered. In all, 97% of all deer farms had obtained TB free status, 3% were included in the alternative scheme to obtain free status and one herd had not completed the eradication plan.

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Ovine brucellosis

BACKGROUND

Brucellosis, which is encompassed by Directive 91/68/EEC, has never been diagnosed in Swedish sheep or goats. It is a disease from which a Member State can be declared free when appropriate supporting documentation has been presented to the Commission. Sweden was declared officially free of brucellosis in sheep and goats in 1995 (Decision 94/972/EC). Brucellosis in food producing animals is included in the Swedish Act of Epizootics (SFS 1999:657 with amendments). Vaccination is according to this act prohibited and notification of suspect cases is mandatory. Brucellosis in sheep and goats is on the OIE list of infectious diseases and current surveillance standards for brucellosis in sheep and goats are given in the EU legislation, Directive 91/68/EEC. Screening for brucellosis in sheep and goats has been regularly conducted in Sweden since 1995 with approximately 10 000 samples tested each year, representing approximately 5% of the sheep population.

AIM

The purpose of the surveillance is to document freedom from brucellosis in sheep and goats in Sweden, in accordance to Directive 91/68/EEC. The Swedish Board of Agriculture finances this surveillance, which is planned and performed by the National Veterinary Institute, SVA.

MATERIAL AND METHODS

During 2008, 12100 serum samples from 888 sheep flocks were analysed for Brucella melitensis. The serum samples were collected within the surveillance programme for Maedi/Visna. The samples were obtained by collecting 5 samples from each flock sampled for Maedi/Visna. An additional 116 serum samples from 15 goat flocks were analysed for Brucella melitensis. Those samples were collected within the Caprine Arthrit Encephalite (CAE) programme. Moreover, 6 sheep and 6 goats were tested for brucellosis due to export or import. During 2008 no herd or animal showed clinical signs causing Brucella melitensis to be suspected. All diagnostic testing was performed at the National Veterinary Institute, SVA, Department of Bacteriology. The diagnostic tests used were the buffered antigen test (Rose Bengale) with the complement fixation test for confirmation.

RESULTS AND DISCUSSION

Within the control program two samples from two different sheep herds were found positive when tested for the presence of antibodies. Both herds were further investigated, no signs indicating Brucella infection were found and additional serum samples were taken from several animals in both herds. All these subsequent samples were negative. The positive test results were interpreted as false positives. All other samples taken in 2008 were negative. In summary no herd or individual animal was diagnosed with Brucella melitensis. infection during 2008.

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Scrapie

BACKGROUND

Scrapie is since 1970 a mandatory notifiable disease under the Swedish Act of Epizootics (SFS 1999/657, with amendments). All suspicions of scrapie (ovine or caprine animals with clinical signs that are compatible with scrapie symptoms) must be reported to the authorities. The obligation to report applies for animal owners, veterinarians and everyone else who is responsible for the animals. Since 1998 scrapie surveillance has been performed in accordance with Commission decision 98/272/EC and from 2001 in accordance with Regulation (EC) No 999/2001. Scrapie has only been confirmed once in Sweden; in 1986 scrapie was suspected on clinical grounds in two ewes on a small holding consisting of 36 sheep. The ewes were euthanized and diagnosed as scrapie positive.

All remaining susceptible animals on the holding were stamped out and tested with negative results. The origin of the disease could not be established. No further cases of classical scrapie have been detected in Sweden. In 2002 a large-scale surveillance programme for TSEs in small ruminants was introduced within the EU. The surveillance programme is governed by Regulation (EC) No 999/2001, with amendments. In addition, Sweden has a national scrapie control programme, which was launched in 2003 (Regulation (EC) No 1874/2003 (EG) with amendments). In 2003 the first case of atypical Scrapie variant Nor98 was detected in Sweden and in total 17 cases have been diagnosed until the end of 2008.

SURVEILLANCE PROGRAMME FOR SCRAPIE IN 2008

The surveillance programme, in accordance with Regulation (EC) No 999/2001 and the Swedish national scrapie control programme, includes examination of the following categories of small ruminants:

- all sheep and goats with clinical signs consistent with scrapie, irrespective of age
- all sheep and goats older than 18 months, which had died or been killed on the farm, but not slaughtered for human consumption (fallen stock).

AIM

The purpose of the surveillance is to obtain data in order to exclude the possible presence of BSE in the sheep and goat population. The Swedish national Scrapie control programme goes beyond the requirements set out in Regulation (EC) No 999/2001, Annex III, and the intention is to improve surveillance in order to document freedom or very low incidence of the disease.

MATERIAL AND METHODS

The Swedish Board of Agriculture finances the surveillance programme and the National Veterinary Institute, SVA, Department of Pathology and Wildlife Diseases and Department of Virology, Immunobiology and Parasitology is responsible for doing laboratory analyses and is also appointed National Reference Laboratory, NRL (Regulation (EC) 999/2001, annex X, Chapter A, 3). In addition there are also three approved regional laboratories performing rapid tests on healthy slaughtered animals.

Clinically suspect cases

Material from brainstem and cerebellum from clinical suspect cases were examined by histopathology in accordance with Regulation (EC) No 999/2001 Annex X, Chapter C, 3.1, a) as amended. Immunohistochemistry and Western Blot are used as confirmative tests.

Surveillance of fallen stock

The samples have been examined by rapid testing as described by the manufacturer (Bio-Rad TeSeE ELISA, Bio-Rad) in accordance with Regulation (EC) No 999/2001 Annex X, Chapter C, 3.1, b) as amended. In cases of positive or inconclusive results material from the brainstem and cerebellum is prepared for confirmatory analyses with immunohistochemistry and Western Blot.

RESULTS AND DISCUSSION

Sheep

A total of 3837 samples from sheep were examined for TSE at SVA in 2008. Of these, 3825 were from fallen stock, nine from healthy animals slaughtered under restrictions within the atypical scrapie variant Nor98 eradication, and three investigated as clinical suspects. No new cases of atypical scrapie variant Nor 98 were detected during 2008 but nine flocks were still under restrictions due to cases detected 2003-2007. Flocks where atypical scrapie variant Nor 98 is detected are put under restrictions in accordance with Regulation (EC) 999/2001 so that no animals are allowed to enter or leave the holding except for slaughter. All dead animals must be sampled and samples must also be taken at slaughter of all animals >18 months from these flocks. Material from the brainstem and cerebellum from three sheep with clinical signs consistent with scrapie was examined by histopathology and immunohistochemistry, TSE was not detected.

Goats

A total of 52 samples from goats were examined for TSE at SVA in 2008. Of these, 51 were from fallen stock and one from an animal slaughtered under restrictions within the atypical scrapie variant Nor98 eradication. All analyses were negative for TSE. An additional three samples from healthy slaughtered goats were tested at approved regional laboratories performing rapid tests on healthy slaughtered animals. None of these were positive.

In summary 3892 sheep and goats were examined for TSE in Sweden during 2008, none were positive.

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Bluetongue

BACKGROUND

Bluetongue is a vector borne disease transmitted by midges (*Culicoides* spp). Until 1998 Bluetongue was considered to be restricted to areas with a tropical and temperate climate as far as 40°N and had not been detected in any of the European countries. Since then, outbreaks of different serotypes have been detected in several Mediterranean countries. In August 2006 a new serotype for Europe (BTV-8) appeared in Holland. During 2006 and 2007 this outbreak spread to a large number of countries in northern and Western Europe. In October 2007 one case was reported in Denmark and the restriction zone around the Danish case encompassed the south-west part of the county of Skåne.

In 2008, further cases were reported in all BTV-8 infected EU countries and large vaccination campaigns were planned in most of EU as soon as inactivated vaccines became available. The Swedish vaccination plan was based on an assessment of the risk of introduction and the possible consequences for Swedish livestock and wild ruminant population. According to the plan, vaccination would be initiated if the threat of virus introduction became imminent or if the infection was detected in Swedish animals during the period of vector activity.

On the 6th of September the first case of BTV8 infection in Sweden was confirmed. The vaccination campaign was launched on the 8th of September.

The control, monitoring, surveillance and restrictions on movements of certain animals of susceptible species are governed by Directive 2000/75/EG with amendments. Bluetongue is included in the Swedish Act of Epizootics (SFS 1999:657 with amendments) and notification and investigation of suspect cases is mandatory.

AIM

The vector surveillance that was initiated in 2007 was continued in 2008, to document the activity of relevant *Culicoides* spp. throughout the different seasons of the year. Moreover, a national serosurveillance programme, with the aim of detecting a prevalence of BTV infection of at least 0.5% with 95% confidence was initiated. Further, a risk based bulk milk monitoring programme including the most southern counties was performed during the period of highest vector activity. The overall purpose of these serological investigations and contingency plans was early detection and eradication of the infection.

The Swedish National Veterinary Institute has been responsible for these screenings, which have been financed by the Swedish Board of Agriculture.

MATERIAL AND METHODS

Vector surveillance

Fifteen light traps were placed in 15 different herds in the Southern half of the country and operated once a week. The vector monitoring programme was designed according to EU guidelines. During the seasonally vector free periods, the traps were moved indoors on 10 farms. During 2008, a total of 9 traps were operating within the restriction area during the outbreak.

Serosurveillance in cattle

On the 1st of May 2008, the national serological monitoring programme in cattle based on random samples of animals at slaughter and bulk milk samples in dairy herds was initiated. From the 1st of May until the 30th of November 684 serum samples and 617 bulk milk samples were taken from 428 randomly selected beef herds and 580 randomly

selected dairy herds. The dairy herds that were included in the risk based monitoring from the 1st of July until the 30th of November (see below) were excluded from the target population during this period.

On the 1st of July, the risk based monitoring programme was initiated including the most southern counties Skåne, Blekinge and Halland. Monthly bulk milk samples were taken from all dairy herds in these counties, a total of 1048 herds.

Outbreak investigations

Following a positive bulk milk test from a farm in Halland, all lactating animals in the herd were sampled and one was positive in both serology and PCR. Intensive surveillance activities were initiated in the infected herd, in the entire 2 km area around the herd and in clusters of herds that were considered at risk. When further infected areas were discovered and the restriction zone had to be substantially enlarged, further sampling activities were undertaken within the zone as well as immediately outside it. In addition to systematic surveillance in, and just outside, the infected areas, all clinical cases were investigated and the national surveillance programme continued further from the infected areas.

Diagnostic methods

Diagnostic testing was performed at SVA. Serum samples were analysed with a competitive ELISA (ID Screen® Bluetongue Competition ELISA) and milk samples were analysed with an indirect ELISA (ID Screen® Bluetongue Milk). These ELISAs test for antibodies directed against the VP7 protein. The VP7 is a major core protein possessing the serogroup-specific antigens common to the 24 serotypes. Organs and blood were analysed with real time PCR for BTV-8 (FLI, Germany).

RESULTS

Large quantities of potential BTV vectors were found in all monitoring areas. Out of all captured *Culicoides* spp. about 92% were among the potential vector species for BTV. The species distribution was similar from the various capture sites. In 2008, vector activity ceased already in mid-October in most areas. Based on the results from the monitoring and on temperature data, the seasonally vector free period was declared on the 15th of November in 2008. No captures were found in any of the indoor traps during the seasonally vector free period.

All blood samples in the active surveillance were negative until October 16th. On the 6th of September 2008, the first confirmed positive herd was identified in the monthly bulk milk surveillance. No positive samples were found in the national surveillance outside the restriction area.

In all the investigations performed inside and around the infected area, PCR positive animals were found in a total of 30 cattle and 3 sheep herds. In the majority of the herds the number of infected animals varied between one and three.

During 2008, 161 animals in 127 herds were investigated due to clinical symptoms. None of the clinical suspicions were confirmed. Out of all sampled animals in all active and passive surveillance activities, only one of the PCR positive animals showed clinical symptoms.

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Bovine brucellosis

BACKGROUND

Brucellosis in Swedish cattle was eradicated during the first half of the last century. The infection has never been diagnosed in any other animal species in Sweden. The last Swedish bovine case was recorded in 1957 (OIE) and Sweden's disease free status is officially stated in EU legislation since 1994, Decision 2003/467/EC last amended by Decision 2005/764/EC (originally in Act of Accession of Austria, Finland and Sweden and in former Decisions 94/972/EC and 95/74/EC). Brucellosis in food producing animals is included in the Swedish Act of Epizootics (SFS 1999:657, with amendments). Vaccination is according to this act prohibited and notification of suspect cases is mandatory. Bovine brucellosis is on the OIE list of infectious diseases and current surveillance standards for bovine brucellosis are given in EU legislation, Directive 64/432/EEC. Screening for bovine brucellosis has been conducted regularly in Sweden since 1988. From 1997 and onwards, approximately 3000 samples (bulk milk and/or serum samples) have been tested each year. Out of all these samples, none has been confirmed positive.

AIM

The purpose of the surveillance is to document freedom from bovine brucellosis in Sweden in accordance with Directive 64/432/EEC. The Swedish Board of Agriculture finances the surveillance, which is planned and executed by the National Veterinary Institute, SVA.

MATERIAL AND METHODS

During 2008, serum samples from 1 000 beef cattle from 774 different herds and bulk tank milk samples from 2022 dairy herds were analysed for antibodies against *B. abortus*. The samples were collected within the surveillance programmes for Bovine virus diarrhoea (BVD) and enzootic bovine leucosis (EBL) and were obtained by convenience sampling (in other words not strictly random), evenly distributed throughout the sampling period. In addition to this passive surveillance, active surveillance is performed via post mortem examination and culture of aborted foetuses. In 2008 15 foetuses were examined. Moreover, serological testing for brucellosis of cattle is performed prior to import and export, and at breeding centres. During 2008, a total of 355 animals were tested, 38 for import or export reasons and 317 at breeding centres. The number of samples exceeds this figure as some animals are tested several times at breeding centres. Furthermore, three herds were investigated due to clinical suspicion during 2008. Diagnostic testing was performed at SVA, Department of Bacteriology. The diagnostic tests used were an indirect ELISA (SVANOVIR ® Brucella-Ab I-ELISA, Svanova, Biotech, Uppsala, Sweden). For confirmation, the complement fixation tests, and sometimes the tube agglutination test, were used. If relevant material was available (e.g. aborted foetuses), culture was performed. A positive case is defined as an animal from which *Brucella* spp. has been isolated, or an animal giving a significant antibody titre.

SURVEILLANCE IN CATTLE

RESULTS AND DISCUSSION

One serum sample form the surveillance program tested positive for the presence of antibodies, but tested negative with the complement fixation test and a buffered antigen test (Rose Bengal). At the time of running the tests the individual cow was already slaughtered. The herd of origin had not, nor had had, any individuals with clinical signs indicative of Brucella infection. Serum samples were collected from ten percent of the cows within the herd and none of these were positive. The positive test result was interpreted as false positive. All other tests performed, including serum samples (one herd) and cultures (two herds) from three different herds with clinical suspicion, were negative. In summary no herd or any individual animal was diagnosed with B. abortus infection during 2008.

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Bovine spongiform encephalopathy (BSE)

BACKGROUND

BSE is a notifiable disease under the Swedish Law of Epizootics (SFS 1999:657, with amendments) and all suspicions of BSE (bovine animals not responding to treatment, with clinical signs that are compatible with BSE symptoms) must be reported to the authorities. The obligation to report applies for animal owners, veterinarians and everyone else who is responsible for the animals. Until December 31, 2000, Sweden had a surveillance program according to Decision 98/272/EC with amendments that implied that 60 cattle were to be tested every year. The target population was to be above 20 months of age with neurological symptoms or above four years of age with signs of chronic disease. No positive case of BSE was detected. Since July 1, 2001, the surveillance programme is governed by Regulation (EC) No 999/2001 as described below. During a transitional period (January 1, 2001, until June 30, 2001), all emergency slaughtered cattle and fallen stock over 30 months of age and clinically suspect cases irrespective of age were tested.

GBR

In 2003 the European Food Safety Authority (EFSA) made a re-assessment of the Geographical Bovine spongiform encephalopathy Risk (GBR) in Sweden. EFSA:s scientific report in 2004 describes the GBR of Sweden based on data covering the period 1980-2003. They conclude that the current geographical BSE-risk (GBR) level is II, i.e. "it is unlikely but cannot be excluded that domestic cattle are (clinically or pre-clinically) infected with the BSE-agent". This status was again changed on 30 May 2008 then, following a recommendation of the OIE scientific commission for animal diseases, the international committee of the OIE approved that Sweden be classified by the OIE as a country having a negligible risk for bovine spongiform encephalopathy. The Swedish system is regarded to be optimally stable, which means that the probability that cattle become newly infected with the BSE-agent is extremely low. One of the reasons for the favourable situation in Sweden could be that the industry voluntarily decided on a ban on meat and bone meal (MBM) in feedstuff intended for dairy cows as early as 1987. In June 1988 all imports of livestock and MBM from the United Kingdom were banned. In 1991, MBM was banned from feedstuff for all cattle according to Swedish legislation. A similar ban on the feeding of mammalian proteins to cattle, sheep and goats was introduced within the European Union in 1994 (Commission Decision 94/381/EC). Due to the risk of cross-contamination a total ban on use of processed animal protein in feeds for any animals farmed for the production of food was introduced within the EU, and thus also in Sweden, in 2001 (Regulation (EU) No 999/2001). The OIE Scientific Commission for Animal Diseases (Scientific Commission) has accepted the recommendation made by the ad hoc Group set up to evaluate country dossiers with respect to BSE-status and proposed that the International Committee accept Sweden to be recognised as negligible BSE risk countries in accordance with the provisions of Article 2.3.13.3. of the 2007 Terrestrial Animal Health Code.

SURVEILLANCE PROGRAMME IN 2008

The Swedish surveillance programme regarding BSE is based on Regulation (EC) No 999/2001 and consists of active monitoring and passive surveillance. Testing within the Swedish surveillance programme in 2008 included the following categories:

SURVEILLANCE IN CATTLE

Passive surveillance

- Clinical suspects. Farmers and veterinarians are responsible of reporting clinically suspect animals irrespective of age to the Swedish Board of Agriculture and to the Swedish County Administration and the animals that meet the conditions to be regarded as clinical suspects are tested for BSE at the National Veterinary Institute, SVA, Uppsala, Sweden.

Active monitoring

- All fallen stock (animals dead or killed on farm but not slaughtered for human consumption) above 24 months of age and all emergency slaughtered cattle above 24 months of age. EU Member States may decide to derogate from the requirement of monitoring in animals not slaughtered for human consumption in remote areas with a low animal density, where no collection of dead animals is organised. This has been applied in Sweden in remote areas and the bovine population in these areas does not exceed more than 10% of the total bovine population in Sweden.
- Animals with clinical signs at ante mortem inspection.
- All imported cattle over 30 months of age at slaughter regardless of country of origin. All imported animals have special ear marks to identify them as imported.
- Testing of bovine animals over 30 months of age at slaughter. Due to the first case of BSE in Sweden in 2006 the Regulation (EC) 999/2001 was amended and a full testing programme of bovine animals over 30 months at slaughter was implemented from 15th of June 2006.

AIM

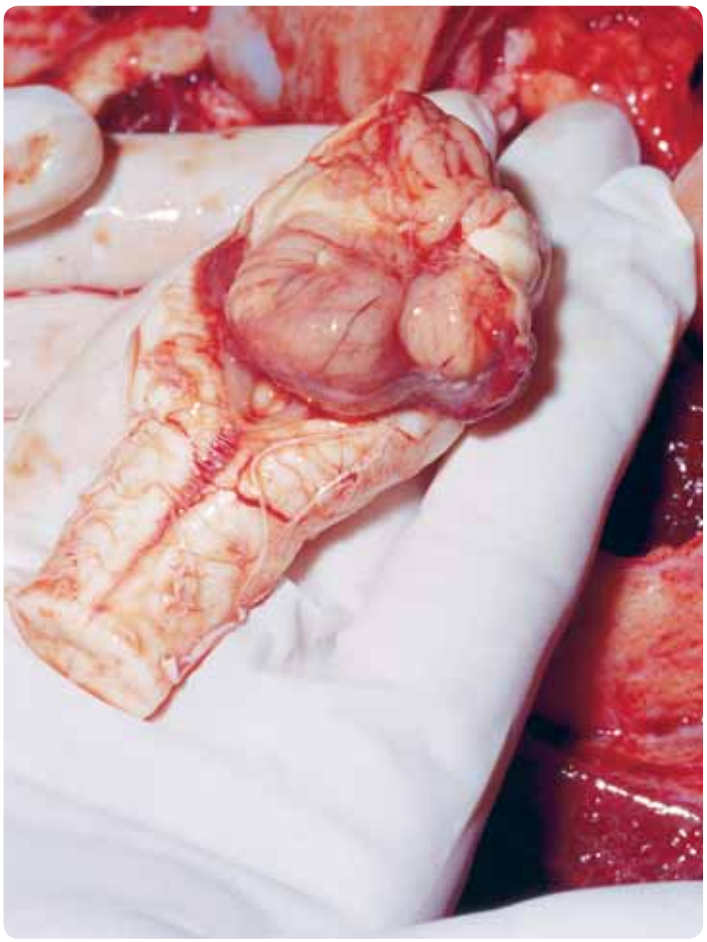
The aim of the national surveillance and control programme is to document continued low prevalence of BSE in the Swedish cattle population (in accordance with the requirements for surveillance in regulation EC/999/2001).

MATERIAL AND METHODS

The Swedish Board of Agriculture is responsible for the surveillance programme, which is carried out in cooperation with the National Veterinary Institute, SVA. SVA is appointed National Reference Laboratory, NRL (Regulation (EC) 999/2001, annex X, Chapter A, 3 with amendments) and The Department of Pathology and Wildlife Diseases as well as the department of Virology, Immunobiology and Parasitology are responsible for the laboratory analyses. Three regional laboratories in Sweden have been approved to perform rapid tests on healthy slaughtered animals.

Clinically suspect animals

The samples have been examined with histopatho-



logy and immunohistochemistry in accordance with Regulation (EC) No 999/2001 Annex X, Chapter C, 3.1, a) as amended. The material was formalin-fixed, embedded in paraffin and sectioned at 5µm. Selected sections were stained by haematoxylin eosin (HE). All parts of the test were carried out in accordance with a standard protocol and immunohistochemical staining for PrPSc was performed using a monoclonal antibody, Mab PrPres F89/160.1.5.

Risk population (fallen stock, emergency slaughter and imported animals)

The samples were examined with rapid tests at SVA in accordance with Regulation (EC) No 999/2001 Annex X, Chapter C, as amended. Unfixed brain tissue from the obex area was prepared to be tested with the ELISA (Bio-Rad TeSeE ELISA, Bio-Rad) as described by the manufacturer. In case of positive or inconclusive results the material was prepared and examined by histopathology and immunohistochemistry using the same protocol as for specimens from clinical suspects.

Healthy slaughtered animals

The samples were examined with rapid tests at SVA and three regional laboratories in accordance with Regulation (EC) No 999/2001 Annex X, Chapter C, as amended. Unfixed brain tissue from the obex area was tested with rapid test (Bio-Rad TeSeE ELISA, Bio-Rad, Idexx HerdChek BSE-Scrapie Antigen Test Kit, Idexx Laboratories, Enfer TSE Kit version 2.0 Method B, Enfer Scientific Limited, Kildare) as described by the manufacturers. In case of positive or inconclusive results the material was prepared and examined by histopathology and immunohistochemistry at the NRL using the same protocol as for specimens from clinical suspects.

RESULTS AND DISCUSSION

In 2008 SVA examined 27 862 samples for BSE and all samples were negative. Of these, 6872 were from healthy slaughter, 20 819 from fallen stock, 169 from emergency slaughter and another two animals were investigated as clinical suspects. None of those two had clinical symptoms that lead to a strong suspicion of BSE and they were tested as clinical cases although there were fairly reasonable explanations for the symptoms. Animals with diseases related to the central nervous system are also likely to have been examined as either fallen stock or emergency slaughtered animals and are thus included in those categories.

During 2008 the three regional laboratories that have been approved to perform rapid tests on healthy slaughtered animals performed 153 822 BSE-tests. Adding the 6872 tests from this category done at SVA, 160 694 healthy animals were tested at slaughter in 2008. In total 181684 animals were examined for BSE in Sweden 2008. None of these were positive (Table 2).

Table 2. Total tests performed within the Swedish surveillance programme for BSE 2001-2008

	2001	2002	2003	2004	2005	2006*	2007	2008
Fallen stock	22248	23607	22476	23489	24005	20576	16500	20819
Healthy slaughter	4433	12073	9850	10318	10095	111319	155858	160 694
Clinical signs at AM	2	0	0	0	0	0	0	0
Emergency slaughter	1393	1788	2234	1924	1169	327	297	169
Clinical suspects	29	29	16	20	8	6	9	2
BSE Eradication	0	0	0	0	0	4	0	0
Total	28105	37497	34576	36111	35277	132232	172664	181684
Total positives	0	0	0	0	0	1	0	0

*) Data from the Swedish Board of Agriculture, personal communication Lena Hult.

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Bovine virus diarrhoea

BACKGROUND

Bovine virus diarrhoea (BVD) is a notifiable disease (SJVFS 2002:16 with amendments). A voluntary surveillance and control programme with the objective to eradicate BVD without vaccination was launched by the Swedish Dairy Association in 1993 (SJVFS 1993:42) and has been running since then. The National Veterinary Institute, SVA, perform the laboratory analyses and the government together with the farmers bear the costs for sampling and testing. Since 1 June 2001 there is also a compulsory control programme (SJVFS 2002:31) requiring all cattle herds to be tested for BVD on a regular basis.

AIM

The purpose of the programme is to eradicate the disease from the Swedish cattle population without vaccination.

MATERIALS AND METHODS

The eradication programme is based on a strict non vaccination policy. Sampling depends on type of production and status of the herd. The programme relies upon the ability to distinguish infected herds from non infected herds. Herds that are free from infection are monitored to demonstrate continuous freedom and certified as being free from infection. Herds that are infected are screened and persistently infected virus carriers are identified and removed. Another important part of the programme is creating a positive attitude to biosecurity in the farming community and to protect the free herds from introducing the BVD-virus.

For screening, an indirect antibody ELISA (Svanovir® BVDV-Ab ELISA) for serum, milk and bulk milk sample is being used.

RESULTS AND DISCUSSION

All herds in Sweden were affiliated to the voluntary or compulsory programmes during 2008. The control programme has been successful. At the end of 2008, 99.5% of the herds were certified BVD-free and 0.1% or less were infected by BVD-virus.

In 2008, the total number of herds affiliated to the voluntary program was 18 741 and at the end of the year 18 650 herds were certified as free from the disease. Of the remaining herds, 16 are considered to still be infected. The other herds only have to be tested further before becoming certified free from the disease. Three herds were discovered to be newly infected by the virus during 2008.

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Enzootic Bovine Leucosis

BACKGROUND

Sweden was declared officially free from enzootic bovine leucosis (EBL) by the European Union (EU) in January 2001 (former Decision 2001/28/EC, currently Decision 2003/467/EC last amended by Decision 2005/764/EC). Before this, a voluntary control programme had started in 1990 and a mandatory eradication programme had been running since the autumn of 1995.

EBL is included in the Swedish legislation regarding notifiable diseases (SJVFS 2002:16) and the control is specifically regulated in SJVFS 1995:145 with amendments. All animals that are found EBL positive shall be slaughtered within six months. EBL is also on the OIE list of infectious diseases and current surveillance standards are given in EU legislation, Directive 64/432/EEC.

AIM

The purpose of the surveillance is to document freedom from EBL in accordance to Directive 64/432/EEC.

The Swedish Dairy Association is responsible for this surveillance, which is approved and financed by the Swedish Board of Agriculture.

MATERIAL AND METHODS

At the end of 2008, 7 384 dairy herds were affiliated to the programme, although some of these were no longer active as producers. All herds are tested with a yearly milk tank sample. Milk samples are collected within the quality control programmes of the dairies. The sampling for EBL is synchronised with sampling for BVD and IBR.

At the end of 2008, 11 382 beef herds were affiliated. The surveillance programme in beef herds is performed by sampling at least 2300 herds every year. Serum is collected from slaughtered cattle above 2 years of age in sampled herds.

In addition to above mentioned milk and blood samplings, individual blood samples are also taken in new herds joining the program to assure that they are free of EBL, and in herds having a positive sample in the surveillance program,

Diagnostic testing was performed at SVA, Uppsala, Sweden. Both milk and sera were analysed using an antibody ELISA (Svanovir BLV GP-51 ELISA).

RESULTS AND DISCUSSION

During 2008, three animals in three different beef herds were diagnosed with EBL and relevant control measures are ongoing in the herds. At the end of the year a total of 7 382 dairy herds and 11 369 beef herds were declared free of disease.

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Infectious Bovine Rhinotracheitis

BACKGROUND

Infectious bovine rhinotracheitis (IBR) was for a long period of time considered to be absent in Swedish cattle. However, examination of bulk milk samples during the early nineties showed the presence of a small number of seropositive herds. No signs of clinical disease were present in these herds. An eradication program was initiated in 1994 and the last seropositive animal was found in 1995. The EFTA Surveillance Authority and EU approved the programme in 1994 (Decision 73/94/COL and Decision 95/71/EC). Sweden had additional guarantees relating to IBR in 1995 (Decision 95/109/EC) and was officially declared free from IBR in 1998 (former Decision 98/362/EC, current Decision 2004/558/EC). In 2004, all neighbouring Nordic countries had additional guarantees relating to this disease (Decision 74/94/COL and Decision 95/71/EC). IBR is included in the Swedish Law of Epizootics (SFS 1999:657, with amendments). Vaccination is according to this law prohibited and notification on clinical suspicion is mandatory. IBR is on the OIE list of infectious diseases.

AIM

The purpose of the surveillance is to document freedom from IBR. The Swedish Board of Agriculture is responsible for this surveillance, which is coordinated by the Swedish Dairy Association.

MATERIAL AND METHODS

Within the surveillance programme dairy herds are tested with bulk milk tank sample. In farms with more than 50 cows, pooled milk samples are used. These samples are collected twice yearly within the Dairy association's quality control programme and synchronised with sampling for the Bovine virus diarrhoea (BVD) and enzootic bovine leucosis (EBL) programmes. The surveillance programme also includes serum sampling of beef cattle. In 2008 2184 samples from bulk tank milk and 2894 serum samples from 1825 different beef cattle herds were examined (1).

In addition to the testing performed within the surveillance programme further sampling for IBR were performed at several other levels during 2008;

- 561 samples were tested within an auxiliary health control at breeding centres (537 blood samples and 24 semen samples)
- Five animals were tested before export and eight after import
- 11 individuals from five different herds were tested for IBR within the active surveillance for Bluetounge. None of those had clinical symptoms that lead to a strong suspicion of IBR but as the symptoms for IBR and Bluetongue are not always easily distinguishable tests were performed for both viruses
- Three herds were investigated due to clinical suspicions, for two of these herds suspicions were raised at post mortem examination, the third herd had mainly reproductive problems. All suspicions were ruled out after further laboratory examination.

All testing was performed at the National Veterinary Institute, SVA. Milk and sera were analysed for presence of antibodies using an indirect ELISA (SVANOVIRTM IBR-ab, SvanovaR). In case of positive or intermediate reactions a blocking-ELISA IBR/BHV-1 gB Ab ELISA kit (IDEXX) was used for confirmatory testing. If necessary a serum neutralisation test could be performed. Semen was tested for detection of nucleic acids from the viral genome.

RESULTS AND DISCUSSION

In 2008 three herds were investigated due to clinical suspicions of IBR, two of these suspicions arouse at post mortem examinations and one due to clinical symptoms, further testing ruled out the suspicions. All other samples tested were also negative. In summary 5677 tests were performed for IBR in 2008 with no positive results.

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Vero-Toxin producing Escherichia Coli (VTEC)

BACKGROUND

In 1996, Vero-Toxin producing Escherichia Coli, (VTEC) O157 was isolated in Swedish cattle for the first time and human E. coli O157 infection was traced back to presence of VTEC O157 in a cattle herd. Restrictions were laid on the herd and surveillance was initiated. The same year, VTEC O157 in cattle became notifiable. However, since 1999 VTEC O157 findings in animals are only notifiable when associated with human VTEC infection. There is no surveillance programme of VTEC in animals. Prevalence studies for VTEC O157 in cattle were performed at the major slaughterhouses between 1996 and 2002. As very small changes in the prevalence were noticed during these years, it was decided to conduct such studies every third year and a prevalence study in cattle was conducted autumn 2005 – autumn 2006. A new prevalence study in cattle was initiated in August 2008 and will last for one year. From October 2007 to October 2008 a prevalence study in sheep was conducted at 9 slaughterhouses where 500 faecal and 105 ear samples were collected and analyzed. The Swedish Board of Agriculture has financed all studies. Planning, sampling and evaluation of the results have been performed by the National Veterinary Institute.

AIM

The aims of these studies are to monitor the prevalence and to study variations in geographical distribution of VTEC O157, and different subtypes of this serotype, among cattle and sheep at slaughter.

MATERIAL AND METHODS

The studies have been designed as a nationwide monitoring, with the aim to detect a prevalence of at least 0.1% with a 90% confidence interval. In each study, around 2000 cattle faecal samples have been randomly selected from the 15 slaughter-houses slaughtering approximatley 90% of all cattle in Sweden. Diagnostic analyses were performed at the Dept of Bacteriology, National Veterinary Institute, using immunomagnetic separation (IMS) followed by bacteriological culture. PCR was used to identify genes coding for verotoxin.

RESULTS AND DISCUSSION

Results from the study 2005/06 showed that 61 (3.4%) out of 1779 faecal samples were positive for VTEC O157. Of the positive samples, the majority were from older calves (16.2%), followed by young stock (3.5%) and adult cattle (1.7%). There were no positive samples from northern Sweden. Previous studies have shown an overall prevalence of around 1%, but due to an improvement in one analytical procedure the results from earlier conducted studies cannot be compared with the results obtained from 2005-2006. Also, in the earlier studies it was shown that the VTEC O157 was isolated from cattle in the south of Sweden, but very rarely in the northern two thirds of the country. There is no indication in the new study that there has been a geographical spread of VTEC O157 to the north of Sweden (Map 5).

During the period 2007 to 2008 SVA conducted a study to analyze faecal and ear samples from sheep collected at slaughterhouses for VTEC O157. The results showed that 1.8% (9 of 492) faecal samples and 1.9% (2 of 105) ear samples were positive for VTEC O157. None of the positive samples were from the northern part of Sweden.

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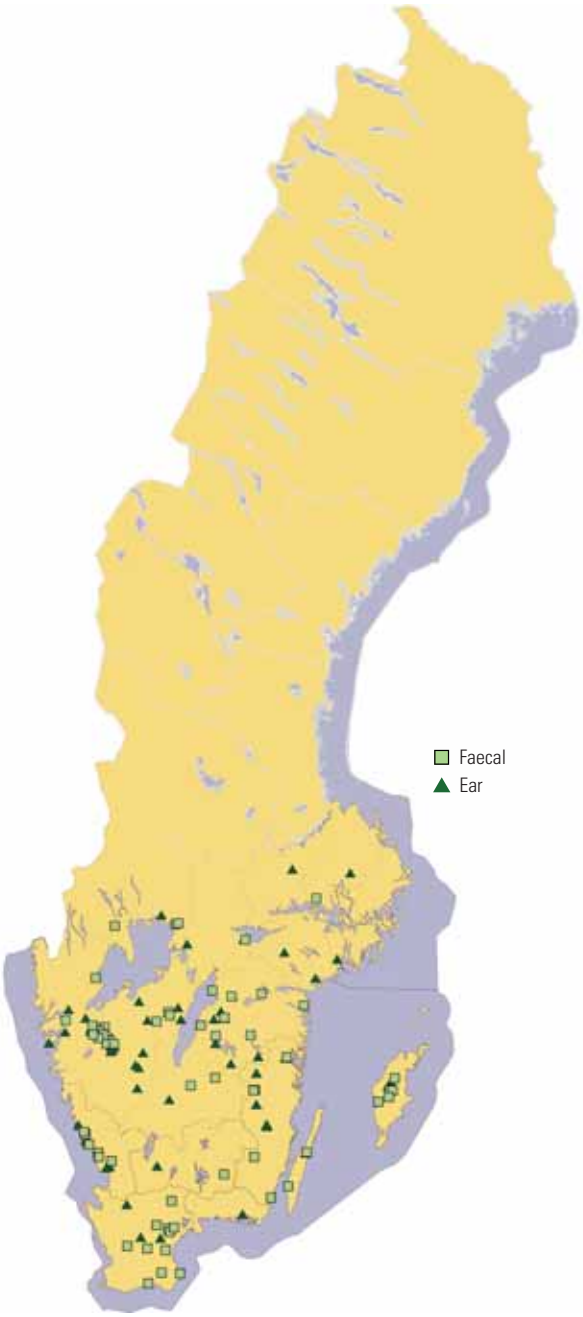

Map 5. Geographical distribution of VTEC O157 positive faecal and ear samples collected at slaughter at the major slaughterhouses in a survey conducted during 2005/2006 in Sweden.

Maedi/Visna

BACKGROUND

A lentivirus in the Retrovirus family is the causative agent of maedi/visna (M/V). The disease was first described in Iceland in 1939, and is now reported from several European countries, as well as other continents. In Finland, New Zeeland and Australia there is no occurrence of the disease. In Sweden M/V was diagnosed in 1974 by post mortem examination at slaughter. A serological screening performed at seven Swedish abattoirs in 1989 demonstrated 8,2% seropositive herds.

A voluntary control programme for M/V was launched by the Swedish Animal Health Service in 1993. The conditions applying to this programme are stated in the Swedish legislation (SJVFS 1999:25). An additional M/V programme for sheep and goats, that is not regulated within the Swedish legislation and does not require the same obligations from the farmers, was initiated by the Swedish Animal Health Service at the end of 2005. Both programmes are run in parallel.

Since 1993 more than 400 herds have been diagnosed with M/V, of which 251 herds with altogether 14 200 sheep have been culled. In a majority of the herds eradication measures have been performed.

Decision 1991/0068/EEC encompasses M/V. It is a disease from which a Member State can be declared free after appropriate supporting documentation has been presented to the Commission. M/V is included in the Swedish legislation regarding notifiable diseases (SJVFS 2002:16) stating that the disease shall be reported when it has been diagnosed.

AIM

The initial goal of the programme was to create a pool of M/V free breeding stock. This goal is now reached and in the second phase the aim will be to eradicate M/V from the Swedish sheep population.

MATERIALS AND METHODS

Farmers joining the initial programme sign a contract where they agree that all animals have to be individually identified and the farmers have to keep a record of the flock. Blood samples are collected from all sheep older than 12 months of age. If the serological examination is negative, the flock gets an M1-status. 12-16 months later, a second sampling of all individuals older than 24 months is performed and if all samples are negative for M/V antibodies M2-status is granted. This procedure is repeated 12-16 months later and a negative result grants M3-status, which means that the flock is declared free of M/V. Farmers within the programme are only allowed to bring in animals from flocks with the same or higher M/V status. In flocks where antibodies are detected, depending on the prevalence of positive animals, either a whole herd cull or eradication measures including selective slaughter is performed.

At the end of 2008 2 529 herds with in total 110 333 sheep were affiliated to the initial programme. A number of 38 000 samples from 1 000 herds were analysed within the programme during 2008. Within the new M/V programme, 2 000 samples were analysed during 2008.

Diagnostic testing was performed at the National Veterianry Institute, SVA. Sera were either analysed using an agar-gel-immunediffusion test or using an ELISA-test (Synbiotic´s Elitest MVV/CAEV).

RESULTS AND DISCUSSION

During 2008, 16 new herds with sheep positive for M/V were detected. A number of 242 herds reached M3-status during the year, making the number of herds with M3-status 2 145 at the end of 2008, with a total of 95 532 sheep. In conclusion, the intensified work with the two M/V programmes has resulted in a large increase in herds being tested. In total, almost 70% of the sheep population has been reached.

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Atrophic rhinitis

BACKGROUND

Atrophic rhinitis (AR) is a notifiable disease (SJVFS 2002:16 with amendments) caused by toxin producing strains of *Pasteurella multocida* (PMT). Since PMT is a secondary invader not capable of penetrating an intact mucosa it is dependant on other infections. Traditionally *Bordetella bronchiseptica* has been considered the most important precursor for PMT, but also other bacteria and virus may precede PMT.

When PMT penetrate the nasal mucosa the nose mussels are destroyed and inhaled air will reach the respiratory organs without being sealed or warmed, which in turn increases the risk for other infections. Further, the bone building process is affected and the snout may become obliquely in young pigs. Affected pigs will also show a retarded growth.

AR used to be a common disease, but as improvements in rearing and disease preventing measures have been made the disease have gradually faded away. The Swedish Animal Health Service effectuates a control program since 1995.

AIM

The purpose of the control program is to declare herds selling breeding stock free from infections with PMT, and thereby decrease the incidence of AR in all herd categories. Eradication of PMT is not realistic since it is an ubiquitarious bacterium that can affect all mammals.

MATERIALS AND METHODS

Diagnostic tools developed by DAKO (Copenhagen, Denmark) and evaluated at SVA during the late 80ies and early 90ies offered a possibility to combat AR in an effective way. Nasal swabs are cultivated on special media overnight. The entire microbial growth is harvested and diluted into water and the toxin of PMT is demonstrated by an ELISA system.

Nucleus and multiplying herds are controlled for presence of PMT at an annual basis. And anytime AR is suspected in a herd, it should be controlled for presence of PMT. If PMT is demonstrated the health declaration is withdrawn and restrictions on sale of pigs are effectuated until the herd is sanitised and declared free from the disease.

RESULTS AND DISCUSSION

AR used to be a rather common disease, but due to efforts made in the early 90ies and to the control program initiated in 1995 the disease is now very rare, (Table 3).

Table 3. The total number of samples and the outcome of nasal swabs analysed for PMT. The samples have been collected in all nucleus and multiplying herds, as well as in production herds suspected for AR.

Year	Samples	Positive samples	Diagnosed herds
2002	2472	0	0
2003	3020	167	2
2004	2413	29	2
2005	1975	13	3
2006	1836	2	0
2007	1878	1	0

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Aujeszky's disease

BACKGROUND

Aujeszky´s disease (AD) was described for the first time in Sweden in 1965 (1). Since then the disease has been notifiable, based on isolation of the virus. Until the 1980s the number of outbreaks in Sweden was limited to a few every year but after this the incidence was increasing (2). A national control programme was introduced in 1991 and it was supported by the government and operated by the Swedish Animal Health Service. The control programme was open to all the pig-producing herds and participation in the programme was voluntary. However, there were strong incentives to participate because towards the end of the programme the industry refused to slaughter pigs from herds that did not participate and insurance companies did not pay compensation to herds outside the programme. In 1995 all herds had at least been tested twice and declared officially AD-free. In 1996 the European Commission officially recognized the swine population in Sweden as free from AD (Commission Decision 96/725/EU with amendments). In 2008 the Swedish Animal Health Service was responsible for the surveillance programme and reported to the Swedish Board of Agriculture. The disease is included in the Swedish Act of Epizootic Diseases (SFS 1999:657 with amendments). Sweden has been granted certain additional guarantees by the European Commission regarding AD (Commission Decision 92/244/EEC, with amendments), to protect the Swedish swine health status.

AIM

The purpose of the surveillance is to document continued freedom from the disease and to contribute to the maintenance of this situation.

MATERIAL AND METHODS

In 2008, 3612 blood samples were collected from boars and sows at slaughter within the surveillance programme. The number of samples was proportionally divided between the large slaughterhouses in Sweden. In addition, 2204 samples were taken outside the surveillance programme for import and export reasons and at breeding centres. All serum samples were tested for antibodies in a blocking ELISA (SvanovirTM, PRV-gB-Ab ELISA). All analyses were performed at the National Veterinary Institute (SVA).

RESULTS AND DISCUSSION

All samples were negative for antibodies to AD. The results from the surveillance programme for AD give additional documentation of freedom from this infection in the Swedish swine population.

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Influenza (pig)

BACKGROUND

Influenza A H1N1 was isolated from Swedish pigs for the first time in 1982. The clinical signs were severe in the previously naive pig population but got milder over time. The H1N1 virus is since 1982 endemic in the country.

Influenza H3N2 is also present in the country. It was first diagnosed in a serologic screening performed 1999 (Table 4). But it is less clear when this strain was introduced since the clinical signs were not as evident as for H1N1. However, H3N2 has since 1999 occasionally been correlated to severe respiratory illness.

At present, yet another influenza type (H1N2) is spreading through Europe and has also been diagnosed in Denmark. Sweden is likely to be affected in time, but it is difficult to foresee when, or how the clinical effects will be.

Today there is no control program or regular monitoring for influenza in pigs, but SVA has managed to run serological screenings during 1999, 2002 and 2006 for the presence of serum antibodies in 1000 porcine sera. The screening in 2006 also included analyses for antibodies to H5 and H7 (avian influenza).

AIM

The aim of the screenings is to document the disease status of the country, and to try to recognize alterations in disease patterns or introduction of new types of influenza at an early stage.

MATERIAL AND METHODS

Sera collected within the control program for Aujeszky´s disease have been used in the three screenings mentioned above. The tests used are hemagglutinin inhibition tests (HI-tests). These tests are more sensitive with respect to genetic drift of the virus than ELISA-tests.

RESULTS AND DISCUSSION

The incidence of influenza is low with respect to H1N1 and H3N2. All antibody reactors against the avian strains of influenza (H5N1, H7N1) were of low magnitude (1:32 or less), and only 0.6% of the sera exceeded this magnitude with respect to the "new" porcine strain H1N2. These low reactions rather indicate unspecific reactions than presence of these influenza strains (Table 4). In herds with documented outbreaks of influenza antibodies to the relevant serovar can always be detected in serum dilutions of 1:128 or higher.

SVA has repeatedly applied for research grants to monitor influenza in pigs due to the risk for new serovars and for genetic drift within existing serovars. These applications have repeatedly been written in companionship with the Swedish Institute for Infectious Disease Control (SMI) due

Table 4. Results from the serosurvey performed 2006. The table shows the overall prevalence of seroreactors to five strains of influenza. The table also divides these reactors into low and significant reactors.

Seropositve samples	H1N1 n = 999	H1N2 n = 999	H3N2 n = 999	H5N1 n = 200	H7N1 n = 200
Overall	48.1%	7.6%	25.5%	5.5%	4.5%
Level of antibodies					
Low [1]	15.1%	7.0%	18.8%	5.5%	4.5%
Significant [2]	33.0%	0.6%	6.7%	0	0

1 Reacting in a serum dilution of 1:32 or less 2 Reacting in a serum dilution of 1:64 or higher

to the zoonotic aspects of influenza. However, prior to 2005 this has not been a prioritised field for research. At present, the control of porcine influenza is about to be improved. In a collaboration between the Swedish Animal Health Service and SVA pigs with signs of respiratory disease will more frequently be monitored for presence of influenza and/ or antibodies to the virus.

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Porcine Respiratory and Reproductive Syndrome

BACKGROUND

Porcine Respiratory and Reproductive Syndrome (PRRS) was described for the first time in USA in 1987 (1) and the virus was identified in 1991 (2). The disease is considered to be one of the most economically important viral diseases in swine production. The Swedish Animal Health Service started a surveillance program in 1998 and The National Veterinary Institute is performing the analyses. The disease was included in the Swedish Act of Epizootic Diseases in 1999 (SFS 1999:657 with amendments). During the 1990s the disease has spread throughout Europe and the first case of PRRS in Sweden was confirmed in July 2007 (3). The finding was made through routine sampling within the surveillance program mentioned above. Since the disease was not widespread at the time of detection a decision was made to combat the disease through a modified stamping out procedure. The actions taken to eradicate the disease proved to be effective and following extensive surveillance sampling during the fall of 2007 it was possible to declare that Sweden was free from the disease with high probability in the beginning of 2008 (4).

AIM

The purpose of the control program is to document freedom from PRRS and to be able to detect introduction of the disease before it has been widely spread in the population.

MATERIAL AND METHODS

After the outbreak in 2007 the surveillance program has been revised in order to enable an even earlier detection of an introduction of the disease. The program now comprises sampling in all Swedish nucleus herds, multiplying herds and sow pools twice a year and 1500 herds at slaughter once a year. In nucleus herds, multiplying herds and sow pools eight samples per herd are analysed and at slaughter three samples per herd are analysed. Serological analyses were performed at the National Veterinary Institute, SVA using Idexx HerdChek PRRS 2XR Ab ELISA (Idexx Laboratories). For confirmation the IPMA-serum neutralisation test was used.

RESULTS AND DISCUSSION

In 2008 2052 samples were taken in nucleus herds, multiplying herds and sow pools and 3724 samples were taken at slaughter within the control program and tested for the presence of antibodies to PRRS.

Seven investigations following clinical suspicion of PRRS have been undertaken during 2008. Following sampling the herds could be declared negative for PRRS. Five investigations were initiated due to positive samples in the control program. These investigations concluded the positive samples to be single reactors not due to infection with PRRS in the herds.

The results from the surveillance program for PRRS in Sweden during 2008 provide documentation of freedom from the infection in the Swedish swine population and an effective tool to detect PRRS.

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Surveillance for a selection of infectious diseases in pig herds

BACKGROUND

During 2008 serological investigations were performed regarding a selected number of pig diseases such ass wine vesicular disease (SVD), classical swine fever (CSF) and transmissible gastroenteritis (TGE). Further, aborted foetuses were investigated for brucellosis (*Brucella suis*). The National Veterinary Institute, SVA, was responsible for collection, test analysis and reporting to the Swedish Board of Agriculture. CSF has not been diagnosed since 1944 in Sweden and TGE and SVD have never been detected in Swedish pigs. Sweden is considered free from these diseases. CSF, SVD and brucellosis are included in the Swedish Act of Epizootics (SFS 1999:657) and TGE is a notifiable disease according to SJVFS 2002:16.

SURVEILLANCE IN PIGS

AIM

The aim of the survey is to document freedom from these diseases in the Swedish pig population and to contribute to the maintenance of this situation.

MATERIAL AND METHODS

The serological analyses were performed at the National Veterinary Institute, SVA. In 2008, sera for analyses were collected from the surveillance carried out for Aujeszky´s disease. This program is operated by the Swedish Animal Health Service. Approximately 3000 pig sera were chosen for analyses regarding viral diseases in pigs.

SVD

Serum samples from 3014 pigs were analysed regarding antibodies to SVD. An ELISA was used to perform the analyses and in case of a positive reaction the ELISA was used a second time. For confirmation of positive or inconclusive samples a serum neutralization test (SN) was performed.

CSF

Serum samples from 3012 pigs were analysed regarding antibodies to CSF and 32 aborted feotuses were analysed for the presence of CSFV with real-time PCR. The samples were analysed using an indirect ELISA (IDEXX® HerdChek CSFV Antibody Test Kit). In case of a positive reaction a confirming neutralization peroxidase-linked assay (NPLA) for detection of antibodies against CSFV was performed.

TGE

Serum samples from 3011 pigs were analysed regarding antibodies to TGE with an ELISA (SvanovirTM TGEV/PRCV-Ab ELISA). Positive samples were re-tested with the ELISA. No confirming tests are available. It is known that false positive samples can occur. In case of a positive sample, a new sample should be taken at least 10-14 days after the first to evaluate if the titre is rising or if the result is a false positive. If the animals are no longer available for testing the herd would be investigated.

Brucellosis

Serum samples from 3000 pigs have been tested on a yearly bases for antibodies to Brucella suis, latest in 2007, all with negative results. During 2008 material from 32 foetuses were cultured for brucellosis.

RESULTS AND DISCUSSION

All tests performed regarding SVD, CSF and TGE incl. culturing for brucellosis and PCR for CSF during 2008 give additional documentation of freedom from the mentioned infections in the Swedish commercial pig population.

SVD

For SVD, 3008 samples tested negative in the first test and 6 were regarded as positive. Five of these samples were regarded as negative in the second confirmative test. After investigation of the herd with the 6th positive sample, the herd could be judged as free from infection.

CSF

3012 samples were tested during 2008, all with negative results regarding antibodies to CSF.

TGE

All 3011 samples were negative in the ELISA-test for antibodies to TGE/PRCV within the screening programme during 2008.

Campylobacter in broilers

BACKGROUND

Campylobacteriosis is an important zoonosis in most areas of the world, with considerable socio-economic implications. Campylobacteriosis has been highlighted as the most frequently reported zoonotic disease in humans within the EU. In most European countries, the number of reported cases of campylobacteriosis increased during the 1990s. *Campylobacter* spp. can be transferred from animals to man directly after contact with animals or through consumption and handling of contaminated food products or water. A number of *Campylobacter* species have been implicated in human disease, with *C. jejuni* and *C. coli* being the most common. In many animal species, *Campylobacter* spp. occur as commensals in the gastro-intestinal tract. *Campylobacter jejuni* is predominantly found in poultry but has also been isolated from cattle, pigs and sheep. *Campylobacter* in animals is not notifiable in Sweden, except for bovine genital campylobacteriosis caused by *C. fetus* subsp. *veneralis*. However, a monitoring programme for broilers operated by the Swedish Poultry Meat Association (SPMA) commenced in 1991 and involved sampling of flocks at slaughter. An extended programme carried out in 2001-2005 was based on the provision of the Swedish Board of Agriculture SJVFS 1993:42 on organised health control and financed by the Swedish Board of Agriculture, SPMA and the European Commission. Since 2006 the programme has been financed by the Swedish Board of Agriculture and the SPMA.

AIM

The purpose of the Swedish *Campylobacter* programmes is to monitor and reduce the occurrence of *Campylobacter* in the food chain through preventive measures, starting with primary production, and in the long run to develop a *Campylobacter* free production system.

MATERIAL AND METHODS

The *Campylobacter* monitoring programme cover 99% of broiler flocks slaughtered in Sweden. All broiler flocks slaughtered at the largest abattoirs in Sweden are sampled. During 2001-2005, cloacal swabs and neck skin samples were analysed. Since 2006 sampling is performed by collecting intact caeca during slaughter.

A European baseline study on the prevalence of *Campylobacter* spp. in broiler flocks and *Campylobacter* and *Salmonella* spp. in broiler carcasses was performed in 2008. A total of 410 slaughter batches were randomly sampled at the same abattoirs as in the *Campylobacter* monitoring programme. Caecum of 10 birds and one carcass were collected from each sampled slaughter batch.

RESULTS AND DISCUSSION

The annual incidence of *Campylobacter* positive slaughter batches has progressively decreased from 20% in 2002 to 12% in 2008. During all the years, a seasonal peak of incidence has been observed in the summertime. Most of the positive batches had a high within-flock prevalence of *Campylobacter*. However, around 18% of the positive batches had a low within-flock prevalence where *Campylobacter* spp. were found in at most 50% of the cloacal samples.

The broiler producers can be divided into three groups on the basis of the delivery of *Campylobacter* positive slaughter batches. Approximately 50% of the producers seldom or sporadically deliver *Campylobacter* positive slaughter batches whereas 38% of the producers have seasonal problems with the pathogen. The remaining group of producers (12-13%) have been found to often deliver *Campylo-*

bacter positive slaughter batches. This group accounts for 40% of the *Campylobacter* load. In 2008, the 14 holdings which often have problems with *Campylobacter* were visited in order to find measures to reduce the incidence. These farms had either deficiencies in the biosecurity routines or closely situated livestock holdings or high populations of wild birds in the neighbourhood.

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Coccidiosis and clostridiosis in broilers

BACKGROUND

The Swedish programme for control of coccidiosis and clostridiosis within the broiler industry started 1999 and is regulated by the provision of the Swedish Board of Agriculture, SJVFS 1998:131. The organization responsible for the control programme is the Swedish Poultry Meat Association (SPMA).

AIM

The purposes of the programme is to control the efficacy of the coccidiostatics used for preventing coccidiosis and clostridiosis in broilers on an ongoing basis, to continuously supervise the consumption of coccidiostatics in the broiler production and finally, in the long perspective, to replace the preventive medication with coccidiostatic drugs by other methods.

METHODS USED FOR SURVEILLANCE

Field control of coccidiosis is performed by means of lesion scoring of birds in 20 farms twice a year.

Total occurrence of hepatic and intestinal disease in slaughtered broilers is reported from the slaughterhouses four times a year.

When hepatic or intestinal disease observed at the slaughterhouses is exceeding a certain level (0,5%) in a single flock, samples are taken for diagnosis and the case will be reported.

RESULTS AND ROUTINES FOR REPORTING

Results from all parts of the control programme are sent to the Department of Animal Health and Antimicrobial strategies at SVA for compilation. The SPMA decides, after consultation with a reference group, whether special investigations have to be performed or whether special measures have to be taken on the basis of reports from the field control and reports from the slaughterhouses. SPMA reports to the Swedish Board of Agriculture on a yearly basis.

STATUS

In 2008 an increase of about 50% regarding the number of reports on affected flocks (more than 0.5% infected birds in a single flock) from the slaughterhouses was observed compared to 2007. As the number of cases despite this fact was still on a low level and the scores from the field tests did not exceed the upper limit, no special measures were taken.

Poultry Health Control Programme

BACKGROUND

The Poultry Health Control Programme in its present form started in 1994 and is based on provisions issued by the Swedish Board of Agriculture (SJVFS 1995:123) The programme involves serological sampling for several infectious diseases in grandparent and parent flocks of layers, broilers and turkeys, rules concerning biosecurity, standard of the houses, management and clinical surveillance.

The serological screening within the programme is administered by the National Veterinary Institute and financed by the Swedish Board of Agriculture and the participating companies. The results of the serological investigations are compiled and reported four times a year to participating companies, their official veterinarians and the Swedish Board of Agriculture. In 2008 nine different breeding companies participated in the programme, five broiler-, three laying hen- and one turkey breeding company. Serological investigations were performed according to the same sampling schedule as previous years. Both chicken and turkey flocks were tested for *Salmonella* Gallinarum, *Salmonella* Pullorum, *Mycoplasma gallisepticum*, *Mycoplasma synoviae*, paramyxovirus type 1 and avian pneumovirus. Only turkeys were investigated for *Mycoplasma meleagridis* and investigations regarding egg drop syndrome and infectious laryngotracheitis were only performed in chicken.

All diseases within the programme are notifiable diseases according to provisions issued by the Swedish Board of Agriculture (SJVFS 2002:16 with amendments).

In addition, Newcastle disease (ND), caused by paramyxovirus type 1 is included in the Swedish Act of Epizootics (SFS 1999:657). Sweden is a Newcastle free country and has the status as a non-vaccinating country for this disease according to Com. Dec. 95/98/EEC. In 2008 an outbreak of ND occurred in one layer flock in southern Sweden (the last outbreak before this one was detected in 2006).

S. Gallinarum (causing Fowl typhoid) and *S.* Pullorum (causing Pullorum disease) were eradicated from the Swedish commercial poultry population in the beginning of the 1960's. *S.* Gallinarum has not been detected in Swedish poultry since 1984 when a backyard flock was found to be infected. *S.* Pullorum was last detected in two back yard flocks in 2001. *M. gallisepticum*, *M. synoviae* and Infectious laryngotracheitis are present among backyard poultry in Sweden. Positive serological reactions against avian pneumovirus have previously been seen among fattening turkeys in a limited area in the south of Sweden. Clinical signs, typical for this disease, have however not been observed in these flocks and during the last serological surveillance in 2007 all fattening turkey flocks tested were negative. Following an outbreak of avian rhinotracheitis, which is caused by avian pneumovirus, in 1998 some of the broiler breeding flocks are still vaccinated against the disease.

AIM

The aims of the programme are to document freedom from the diseases included, to contribute to the maintenance of the disease free situation by detecting disease introduction and to facilitate trade from the participating companies.

MATERIAL AND METHODS

In accordance with the provisions, sixty blood samples were taken from the breeding flocks included in the programme once during the rearing period and several times during the production period. The sampling and testing schemes are presented in Table 5-6. Breeding flocks vaccinated against avian pneumovirus were however not tested for this disease. In 2008 breeding flocks from three companies were included in this exception.

The blood samples were sent by mail to the Department of Virology, Immunobiology and Parasitology, National Veterinary Institute, SVA, and analysed as described below. Table 7-9 give an overview of all samples taken in breeding flocks of chickens and turkeys and methods used during 2008.

RESULTS AND DISCUSSION

The results from the serological screening in the Poultry Health Control Programme in 2008 supports the freedom from these infections of the Swedish breeding poultry population.

Salmonella Gallinarum and Salmonella Pullorum

All samples tested negative.

Mycoplasma gallisepticum

All samples tested negative.

Mycoplasma synoviae

All samples tested negative.

Mycoplasma meleagridis

All samples tested negative.

Paramyxovirus type 1

All samples tested negative.

Egg drop syndrome

In samples from 19 flocks (chicken grandparents and parents) there were a few positive samples detected. No clinical signs were seen in these flocks and after testing new samples taken in the flocks the positive samples were considered as unspecific serological reactions.

Avian pneumovirus

Positive reactions were detected in samples from one chicken parent flock. The birds did not show any clinical signs of APV and no antibodies against APV were detected in new samples taken from the flock. The conclusion is that the positive samples were due to unspecific serological reactions.

Infectious laryngotracheitis

A few positive samples were detected in two chicken parent flocks. No clinical signs were seen in these flocks and new samples taken from the flocks were negative.

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Table 5. Sampling schedule in chicken parent flocks. Number of blood samples tested at different weeks of age.

Age in weeks	16	24	36	48	before slaughter
Agent					
S. Pullorum/ *S.* Gallinarum		60			
Mycoplasma gallisepticum	60	60	60	60	60
Mycoplasma synoviae		60			60
Paramyxovirus type 1		60			
Egg drop syndrome		30			
Avian pneumovirus			60		
Infectious laryngotracheitis			20		

Table 6. Sampling schedule in chicken grandparent flocks. Number of blood samples tested at different weeks of age

Age in weeks	16	24	36	48	54	before slaughter
Agent						
S. Pullorum/ *S.* Gallinarum		60				
Mycoplasma gallisepticum	60	60	60	60	60	60
Mycoplasma synoviae		60	60	60		60
Paramyxovirus type 1						60
Egg drop syndrome		30				30
Avian pneumovirus						60
Infectious laryngotracheitis			20			

Table 7. Sampling schedule in turkey parent flocks. Number of blood samples tested at different weeks of age.

Age in weeks	20	32	44	before slaughter
Agent				
S. Pullorum/ *S.* Gallinarum		60		
Mycoplasma gallisepticum	60	60	60	60
Mycoplasma synoviae		60		60
Mycoplasma meleagridis	60	60	60	60
Paramyxovirus type 1		60		
Avian pneumovirus			60	

Table 8. Chickens. Number of grandparent(GP) and parent (P) flocks tested and total number of samples tested.

	Nr of flocks		Nr of samples		Method
Agent	GP	P	GP	P	
S. Pullorum/ *S.* Gallinarum	9	81	540	4 830	Rapid plate agglutination*
Mycoplasma gallisepticum	45	427	2 700	25 470	ELISA (Svanovir Mg antibody test, SVA-NOVA)
Mycoplasma synoviae	28	171	1 680	10 290	ELISA (Svanovir Ms antibody test, SVA-NOVA)
Paramyxovirus type 1	5	83	300	4 950	ELISA (Svanovir NDV antibody test, SVA-NOVA)
Egg drop syndrome	14	83	420	2 520	Haemagglutination inhibition test**
Avian pneumovirus	0	62	0	3 620	ELISA (Svanovir APV antibody test, SVA-NOVA)
Infectious laryngotracheitis	7	84	140	1 700	ELISA (ILT antibody test kit, Biocheck)

*Ref: OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals

**Ref: A laboratory manual for the isolation and identification of avian pathogens published by AAAP, 1998

Table 9. Turkeys. Number of breeding flocks (only parents) tested and total number of samples tested.

Agent	Nr of flocks	Nr of samples	Method
S. Pullorum/*S.* Gallinarum	6	360	Rapid plate agglutination*
Mycoplasma gallisepticum	23	1 380	ELISA (Svanovir Mg antibody test, SVANOVA)
Mycoplasma synoviae	11	660	ELISA (Svanovir Ms antibody test, SVANOVA)
Mycoplasma meleagridis	23	1 380	Rapid plate agglutination*
Paramyxovirus type 1	6	360	ELISA (Svanovir NDV antibody test, SVANOVA)
Avian pneumovirus	6	360	ELISA (Svanovir APV antibody test, SVANOVA)

*Ref: OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals

Avian Influenza surveillance programs in poultry and wild birds

BACKGROUND

The Avian Influenza surveillance programmes in Sweden in poultry and wild birds are based on Council directive 2005/94/EC and Commission decision 2007/268/EC. The latter determines the general and specific requirements and criteria regarding sampling, target populations, survey design, laboratory testing, reporting etc. for both poultry and wild birds. The programme for poultry is administered by the National Veterinary Institute, SVA, and the programme for wild birds is administered by the Swedish Board of Agriculture. Both programmes are partly financed by the European Commission in accordance with Commission decision 90/424/EC. The Board of Agriculture finances the remaining costs. The survey programmes have been carried out on a yearly basis in all member states since 2002 to determine the prevalence of avian influenza, in particular avian influenza virus subtypes H5 and H7.

In accordance with the decision the programmes shall be submitted to the Commission for approval and the Community's financial contribution shall be 50% of the costs incurred in member states up to a maximum level. All results shall be sent to the Community Reference Laboratory for Avian Influenza (CRL) for collation.

In early spring 2006 highly pathogenic avian influenza (HPAI) of subtype H5N1 was detected in wild birds for the first time in Sweden. One infected mallard was also detected in a game bird holding.

In 2008 in Europe HPAI H5N1 in wild birds was only reported from United Kingdom and Switzerland, eight birds in total. United Kingdom and Germany suffered each from one outbreak of HPAI H5N1 in poultry during the year, whereas 39 outbreaks of LPAI in poultry were reported from five countries (Germany 32).

AIM

The survey in wild birds shall contribute to the knowledge of avian influenza ecology and the threats from wildlife to animal health as well as to serve as an early warning system of avian influenza strains that may be introduced into poultry flocks from wild birds.

The aim of the survey in poultry is to detect infections of avian influenza virus subtype H5 and H7 in different species of poultry.

MATERIAL AND METHODS

Poultry

The serological analyses were performed at the Department of Virology, immunobiology and parasitology, the National Veterinary Institute, SVA. All poultry were sampled at slaughter except for the breeders and the game birds. The breeders were bled in their production period within the Poultry Health Control Programme. The game birds were bled at the holding. The samples were analysed using a haemagglutination-inhibition test described in the diagnostic manual for avian influenza as provided for in Council Directive 2005/94/EC.

If any sample turned out to be positive the holding were further investigated for any signs of ongoing avian influenza infection. Cloacal and oropharyngeal swabs from 60 birds (or all birds if less than 60) of each bird category in the holdings were then taken. The samples were analysed for the detection of avian influenza virus genome by using an M-gene realtime PCR (Spackman et al). Positive samples were further analysed for detection and identification of H5 and H7 viruses, including virus pathotyping by amplicon sequencing (Slomka et al). Virus isolation was also performed.

Within the programme sampling has been performed in game birds (mallard ducks and pheasants), layers, turkeys, breeders, geese, ducks,

ratites and small-scale broiler production. Ten blood samples from each holding were collected except for holdings with geese, ducks and mallard ducks where 40 samples from each flock were collected. In flocks with less than 10 and 40 birds respectively, all birds were sampled. In total 3268 samples were taken. Table 10 gives an overview of all poultry flocks sampled in 2004 to 2008.

In addition to the surveillance programme, samples taken on suspicions, including clinical suspicions for Newcastle disease, are analyzed for AIV.

Wild birds

The survey in wild birds consists of both active surveillance on living and hunted birds and passive surveillance on birds found dead or diseased. The surveillance was primarily targeting high risk species in accordance with Commission decision 2007/268/EC, Annex II. In total 3777 birds were sampled; 277 of them where sampled within the passive surveillance which was carried out at the SVA.

The active surveillance was performed from April until December by the SVA in cooperation with the Swedish University of Agricultural Sciences in Umeå and by Kalmar Bioscience at three different wild bird habitats in Sweden. Most of the live birds were sampled with cloacal and oropharyngel swabs. In some cases fresh faeces from the ground were collected.

From dead birds that were autopsied, swab samples (mostly both cloacal and tracheal) were used for PCR analyses. The samples were analysed by using an M-gene realtime PCR (Spackman et al). Positive samples were further analysed for detection and identification of H5 and H7 viruses, including virus pathotyping by amplicon sequencing (Slomka et al).

From the birds sampled within the surveillance performed by Kalmar Bioscience two swabs were always taken. One swab was analysed for the detection of avian influenza virus genome by using an M-gene real-time PCR (Spackman et al) at the Kalmar Bioscience. If the sample was positive the other swab from the same bird was sent to the Virological department at SVA for further testing.

RESULTS AND DISCUSSION

Poultry

All samples analysed within the survey were negative regarding antibodies to avian influenza virus subtype H5 and H7 except for samples from two holdings with farmed mallard breeders and one holding with breeder geese. The holdings were further investigated and during the investigations

Table 10. Number of flocks of different poultry categories sampled in 2004-2008.

	2004	2005	2006	2007	2008
Laying hens	60	60	60	60	65
Turkeys	26	35	26	23	23
Ducks	21	16	2	3	8
Geese	25	22	28	16	30
Broilers[1]	0	0	7	17	28
Ratites	11	7	15	10	10
Breeding hens (parents)	40	40	40	40	42
Breeding turkeys (parents)	0	5	4	4	2
Game birds (mallards)	0	0	0	7	6
Game birds (pheasants)	0	0	0	23	23

[1] Small-scale production.

there were restrictions put on the holdings in accordance with Council Directive 2005/94/EC. In one holding with farmed mallard breeders Influenza virus A subtype H4N6 was isolated. In the second holding all swab samples were PCR-negative for Influenza A virus.

Swabs from breeder geese in the third holding were found to be PCR-positive for Influenza A virus but H5 and H7 negative. No virus could be isolated and the actual subtype was never determined.

In one holding farmed mallard ducklings were found to be positive for H6N2 when sampled before export. Clinical suspicions for NDV were all negative for Influenza A virus.

Wild birds

No samples from dead wild birds were positive for influenza A viruses.

Within the active surveillance 3500 birds were sampled and no HPAIV positivebirds were detected. Samples from 46 mallard ducks (*Anas plathyrhynchos*), five widgeons (*Anas penelope*) and one common teal (*Anas crecca*) were H5 LPAIV positive. For additionally nine samples (from eight mallard ducks and one common teal) the pathogenicity could not be determined due to too little material, but as other birds of the same species were positive for H5 LPAIV on the same occasion they were most probable H5 LPAI viruses as well. The absolute majority of the H5 positive birds were detected in the autumn (Oct-Nov) in the south of Sweden. Two mallard ducks were detected positive for H7, one was determined to be LPAIV and for the other the pathogenicity could not be determined due to too little material. In addition samples from 498 birds were positive for avian influenza virus, but not for avian influenza subtype H5 or H7. The actual subtypes were not determined in these cases.

In May 2005 the first big outbreak of HPAI among wild birds was reported from China. Since then, for consecutive years, infected wild birds have been detected in Europe. There has not been any great mortality in wild birds, but the risk of spreading virus has to be considered since this virus is directly pathogenic in poultry. Preventive measures in Sweden and the rest of Europe have been focused on increasing the biosecurity in poultry holdings to prevent the introduction of the virus from wild birds. These measures are still very important but once introduced to poultry the virus is more likely to be spread in between poultry flocks via infected live animals, contaminated vehicles and products etc. When combating the disease focus should thus be on preventive measures in order to reduce transmission of virus between poultry flocks.

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Chronic Wasting Disease survey in cervids

BACKGROUND

Chronic wasting disease (CWD) is a transmissible spongiform encephalopathy (TSE) of free-ranging and farmed cervids. CWD has been recognized only in North America, except for a single case of an infected elk exported to Korea. CWD has not been reported in Europe.

Even though there is no evidence that CWD may affect humans, it is recommended that consumption of meat of products derived from infected animals be avoided. This is a precaution in view of the similarities between human and animal transmissible spongiform encephalopathies and of the yet unknown aspects of CWD. CWD is laterally transmitted. Infection may also be contracted from the environment which becomes contaminated by the shedding of prions (PrP^{CWD}), probably by faeces and saliva. CWD affects the North American mule deer (*Odocoileus hemionus)*, white-tailed deer (*Odocoileus virginianus*) and Rocky Mountain elk (*Cervus elaphus nelsoni*). Subspecies of these hosts, such as the red deer (*Cervus elaphus elaphus*), are probably also susceptible. It is not known if the European cervids are susceptible to natural infection with CWD.

A significant proportion of the meat consumed in Europe is derived from hunted cervids, cervid-game-farms and semicaptive kept reindeer. There is limited information on the import of live cervids from North America into Europe. Till now, the level of testing conducted specifically for TSEs in cervids in Europe has been very limited, and mostly applied to passive surveillance. It is insufficient to exclude the possible presence of CWD.

Regulation (EC) No 999/2001 lays down rules for the prevention, control and eradication of TSEs in animals. This Regulation, as amended by Regulation (EC) No 1923/2006 of the European Parliament and of the Council of 18 December 2006, lays down provision for monitoring programmes for TSEs in cervids. According to the Commission Decision SANCO 960/2006 all Member States had to carry out a survey to detect the presence of CWD. The survey was limited in time, and conducted during the hunting season 2007. Cervids (species of the deer family) over 18 months of age should be tested. Minimum requirements were specified. All Member States were required to take samples for CWD from clinical/sick cervids and fallen/culled cervids, as a priority, as well as from road-injured or killed animals of all cervid species. The competent authorities of the Member States would endeavour to maximise awareness of these cervids and to ensure that as many such cervids were tested for CWD as possible. Only Member States with sufficient target species, i.e. wild and farmed red deer (*Cervus elaphus*) and/or wild white-tailed deer (*Odocoileus virginianus*) populations to allow statistically required sample sizes to be achieved, were requested to test healthy slaughtered/shot cervids. The population size of the target deer species in Sweden is small and Sweden was therefore required to test only sick, fallen and/or culled animals of all cervid species.

AIM

Member States shall carry out a survey to detect the presence of CWD in cervids in accordance with the minimum requirements specified above.

MATERIAL AND METHODS

Hunters, deer farmers and other interested groups were informed by various means. A brochure with information of CWD, explaining the purpose of survey and providing instructions for the submission of material for testing was distributed. Special efforts were made to obtain males and animals with clinical disease for testing.

Sampling and laboratory testing

The head of cervids were submitted to SVA, Uppsala, Sweden, were the sampling and analyses were conducted. A sample of obex was collected and tested for each cervid. At least a portion of each sample was kept fresh or frozen until a negative result was obtained, in case bioassay would be required. Additionally, samples of brainstem which had been collected and kept frozen before the implementation of the survey were also tested. All samples were tested applying a rapid test, the Biorad TeSeE ELISA.

The following information was collected for each sample submitted for testing: species of cervid, farmed or wild, target group (traffic-dead/found dead, sick/clinical signs), sex, age (based on dentition), and geographical location.

RESULTS

The number of samples tested during the hunting season of 2007 (spilling over on 2008) for each species of cervid and each category (farmed or wild) are shown in Table 11. All 195 samples tested negative.

Table 11. Cervids tested for CWD during the hunting season 2007

Farmed	Wild
Fallow deer 10	Roe deer 100
Reed deer 5	Moose 76
	Fallow deer 2
	Red deer 2

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Echinococcus Multilocularis

BACKGROUND

Echinococcus Multilocularis (*EM*) has never been detected in Sweden. Detection of the parasite is notifiable in all animals according to SJVFS 2002:16.

Since 2004 all dogs and cats that are brought from other countries (except certain selected countries) into Sweden have to be treated with praziquantel as a preventive measure. The EU Regulation 998/2003 gives a transitional period for Sweden to keep these rules until 30 June 2010.

SURVEILLANCE FOR ECHINOCOCCUS MULTILOCULARIS IN RED FOX

Background

As a response to the finding of EM in Denmark in both foxes and intermediate hosts, an active monitoring programme of the definite host red fox (Vulpes vulpes) was implemented in Sweden. During the years 2001 – 2007 a total of 2325 foxes from all over Sweden were examined for EM (Table 12).

MATERIAL AND METHODS

During 2008, 244 hunted red foxes were received from hunters from different parts of Sweden. The hunters were compensated economically. The foxes were examined by post mortem and the bowel from each fox were put in the freezer (-80°C) for at least seven days to kill all possible viable eggs before examination. From 200 foxes feacal samples were taken and sent to the Institute for Parasitology, Zurich University for CoproAntigen ELISA (CoA-ELISA). In addition the bowel from 100 foxes were examined with sedimentation for detection of the parasite, of which 56 also were examined with CoA- ELISA.

Table 12. Number of red foxes examined for EM during 2001 - 2007.

Year	Number
2001	321
2002	313
2003	401
2004	401
2005	200
2006	300
2007	245
2008	244

RESULTS

All samples investigated were negative for EM.

DISCUSSION

So far *Echinococcus Multilocularis* has never been diagnosed in Sweden. The parasite is present in several other European countries. There is a risk of introducing the parasite with EM infected pets from these areas. How large the probability of introduction is depends on the compliance and efficiency of the antihelminthic treatment that Sweden can require over the transitional period. If Sweden no longer may retain these rules (or other similar rules) after the transitional period there will be an increased probability of introducing the parasite. In a 10 year period the estimated number of imported infected dogs would be 166. If EM is introduced into Sweden there is a high risk for serious consequences especially because the parasite will probably remain undetected for several years following introduction.

REFERENCES – RISK ASSESSMENT

Vågsholm Ivar et al 2006, An assessment of the risk that EM is introduced with dogs entering Sweden from other EU countries without and with anthelmintic treatments

Rabies

BACKGROUND

Since 1886 Sweden has been free from animal rabies. Bat rabies has never been diagnosed in Sweden. Sylvatic rabies in multiple species and bats infected with European Bat Lyssa virus (EBLV) are found regularly in several other European countries. Bat species, associated with EBLV infections in other countries, may also be found in Sweden.

GENERAL SURVEILLANCE FOR RABIES

Material and methods

During 2008, 11 dogs, two cats, one otter (*Lutra Lutra*) and one ferret were examined for rabies due to clinical suspicion. The diagnostic method used was based on the detection of antigens in brain tissue by use of a fluorescent antibody test, FAT.

Results

All animals tested were negative for rabies.

SURVEILLANCE FOR RABIES IN SWEDISH BATS

Background

Since 1998, a passive surveillance programme has been in place were dead bats have been examined for the presence of rabies virus. Annual information about the survey has been sent to different interested parties with an appeal to send in bats and with instructions how to handle the dead bats to reduce the risk of rabies infection.

In addition, in 2008 an active surveillance programme was performed for the first time in Sweden. The programme was run as a cooperation project with The Swedish University of Agricultural Sciences, The Swedish Institute for Infectious Disease Control and The Swedish Environmental Protection Agency.

MATERIAL AND METHODS

153 dead or wounded and euthanized bats were sent to the National Veterinary Institute (SVA) for rabies examination. The contributors were mostly private persons. The diagnostic method used was based on the detection of antigens in brain tissue by use of a fluorescent antibody test, FAT. The bats were sent to The Swedish Museum of Natural History, Stockholm, for species determination.

53 bats of five different species were caught in the County of Uppsala and Skåne by using mist nets. Blood samples and oral swabs were taken and the species and age were determined. After the sampling the bats were released.

For serology the FAVN-method with EBLV-1 virus was used. The swabs were analysed by real-time PCR for the detection of EBLV-1 by The Swedish Institute for Infectious Disease Control.

RESULTS AND DISCUSSION

Within the passive surveillance programme 85 bats of seven different species (Table 13) were negative for EBLV. 68 bats were in too bad condition to be examined for rabies, mostly due to decomposition.

Within the active surveillance programme the serology and PCR results were all negative.

Table 13. Bat species represented in 2007*

Brandt's myotis *Myotis brandtii*
Whiskered bat *Myotis mystacinus*
Soprano pipistrelle *Pipistrellus pygmaeus*
Noctule *Nyctalus noctula*
Northern bat *Eptesicus nilssonii*
Brown big-eared bat *Plecotus auritus*

* Determination of species was performed by The Swedish Museum of Natural History

Map 6. Distribution of bats sent in for passive surveillance.

Species

- Myotis daubentonii
- Myotis brandtii
- Myotis mystacinus
- Myotis sp.
- Pipistrellus pygmaeus
- Pipistrellus nathusii (preliminary)
- Vespertilio murinus
- Plecotus auritus
- Nyctalus noctula
- Eptesicus nilssonii

There are 18 different species of bats in Sweden, all insectivorous belonging to the family of Vespertilionidae. The Serotine Bat (*Eptesicus serotinus*), associated with findings of EBLV-1 in Europe, is found in certain habitats in the south of Sweden. Its relative, the Northern Bat (*Eptesicus Nilsonii*), is the most common bat in Sweden. It might be found all over the country. Daubenton's bat (*Myotis dabentonii*), associated with EBLV-2 infections, is common and may be found from the south up to the county of Ångermanland in the north. Six other Myotis species may also be found in Sweden. During 2008 both Northern Bats and Daubenton's bats have been investigated for rabies with negative results.

Regarding the rabies risk in pet animals there has been an increasing problem with illegal importation of pets since 2004, mostly dogs. Illegally imported dogs are probably the greatest threat to the rabies free status of Sweden even though the risk of introducing rabies is rather low.

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Wild Boars, surveillance for certain infections

BACKGROUND

The diseases screened for in the surveillance of Swedish pig herds could affect and be spread by the wild boar population of the country, and vice versa. Therefore, blood samples from hunted wild boars were, as in previous years, analysed by the National Veterinary Institute, SVA, for antibodies to the following infections: Aujeszky´s disease (AD), Classical Swine Fever (CSF), Porcine Reproductive and Respiratory Syndrome (PRRS), Swine Vesicular Disease (SVD) and Brucellosis (*Brucella suis*).

MATERIAL AND METHODS

During 2008 a total of 542 blood samples were taken from dead hunted wild boars in connection with slaughter. All serological analyses were performed at SVA, as described in the surveillance programme for certain infections in Swedish pig herds. Concerning Brucella suis the diagnostic test used was a serum agglutination test (RBT). The aim was to analyse all samples for all diseases mentioned above.

RESULTS AND DISCUSSION

All samples were negative for antibodies to CSF, PRRS and ADV.

Out of 542 samples 461 samples were negative for antibodies to Brucella suis. In 81 samples the results were inconclusive due to strong hemolysis and bad condition of the samples.

One sample out of 542 was positive for antibodies to SVD. During the year nine other wild boars were sampled in the same area with no signs of infection. The sample was considered as a singleton reactor.

The material is too small for statistical evaluation. However, together with the negative testing during the last decade and the absence of reports of clinical signs typical for the chosen diseases, it indicates that these diseases are not present in the Swedish wild boar population.

The surveillance and control programmes for a selection of infectious diseases in fish in Sweden

BACKGROUND

Sweden has two control programs, the national compulsory and the voluntary.

The national compulsory program is regulated by the Swedish Board of Agriculture and practically organized by the Swedish Fish Health Control Program. It prescribes two inspections and autopsy of 30 fish each year, and virus and BKD testing of at least 30 fish every second year. The inspections are to be performed at a water temperature below 14°C.

The voluntary program prescribes an additional inspection at a water temperature of over 14°C, and a yearly sampling for BKD in farms with breeding program. The national control program is from the end of 2008 to be in accordance with EU directive 2006/88. This directive prescribes a risk based control program with risk assessment of each farm. The structure of this has been produced by the board of Agriculture in coordination with the Fish Health Service and the National Veterinary Institute, SVA.

Several Swedish rivers have dams in their reaches due to hydropower stations. These are very effective migrations barrier for feral fish and are of a great help to protect the continental zone from existing and emerging coastal diseases. This gives a different health situation at the coast compared to the continental zone. All transport of live fish from the coastal to the continental zone is forbidden. Due to the migration barriers Sweden has a national conservatory program for salmonids. Migrating brood fish are caught at the first barrier and kept until ready to spawn. In connection with stripping, the fish are sampled for virus and BKD. After fertilization and disinfection the eggs are placed in quarantine and kept there until the results from the tests are available. The quarantines are supplied with water from the continental zone and outlets are made to the coastal. All eggs from positively tested parents are destroyed. After hatching and rearing, in freshwater emanating from the continental zone, the offspring's are released to the coastal zone.

Sweden has approved disease free zone status (2002/308/EC) for Viral hemorrhagic septicemia (VHS) and Infectious haematopoietic necrosis (IHN) and received additional guaranties (2004/453/EC) for Infectious pancreatic necrosis (IPN), Spring viraemia of carp (SVC) and Renibakterios (BKD). Sampling and diagnostics for these diseases have encompassed all Swedish fish farms since the late 80ies, and since 1994 according to EU directive 92/532 (2001/183). All testing for virus are performed by cell culture techniques and for BKD by ELISA.

Herpesvirus in Koi (KHV) is widely distributed throughout Asia since two decades and during the last five to ten years also in Europe. Clinical symptoms and high mortalities occur in Koi and common carp (*Cyprinus carpio*). Studies have shown that other cyprinid species can act as vectors. The disease can probably give rise to big consequences in feral waters with populations of common carp. KHV is therefore a disease that ought to be handled strictly and with consideration. Another aspect of this is that Koi carp has become a highly appreciated pet animal, with very high economical value. The first case of KHV in Sweden was found during early summer in 2007 in a private pond. In December 2007 KHV became a notifiable disease in Sweden.

AIM

The aim of the programmes is to document freedom from these infectious diseases in the Swedish fish population and to contribute to the maintenance of this situation.

MATERIAL AND METHODS

All analyses were performed at the SVA.

VHS, IHN, IPN

In 2008, 634 pools of samples (spleen, kidney, heart/brain) were tested by a cell culturing method. A pool consists of samples from up to ten fishes. Approximately 6 000 individuals from both continental and coastal zone were tested.

SVC

In 2008, 6 pools, 10 fish in each (spleen, kidney, heart/brain) were tested for virus by a cell culturing method.

BKD

Kidneys from 3 341 fish were tested by a polyclonal ELISA. Positive cases were verified by PCR.

KVH

98 samples from gills of koi carp were tested by PCR regarding KHV.

RESULTS AND DISCUSSION

All samples were found to be negative for VHS, IHN, SVC, IPN.

Two cases of BKD were found in brood fish.

The results from the 2007 sampling in Sweden regarding fish diseases give basic data of freedom from these infections in the Swedish aqua culture.

One case of KHV was tested positive in quarantine. The disease was eradicated; all fish were stamped out.

Post mortem examinations in foodproducing animals

BACKGROUND

During the last three decades the number of post mortem examinations has decreased with more than 50% compared to earlier figures. The main reason for the decline is that several sanitary slaughterhouses have been closed down. Other contributing factors are the reduction in the number of premises where post mortem examinations can be performed, the decrease in the number of food-producing herds and increased costs for transport of carcasses to the laboratories. During 2008 efforts has been made in finding more efficient transport systems. In 2009 a system with a collecting site for carcasses will be tested in one region.

As post mortem examinations are considered an important part in the early detection of contagious diseases a specific programme, funded by the Swedish Board of Agriculture, started in the early nineties. Since 1992 almost all post mortem examinations performed on cattle, swine, sheep, goat and farmed deer have been financed by these funds. Approximately 3000 animals have been examined yearly, and since 2003 the numbers are increasing. The quantitative aim of the programme is to perform 4000 post mortem examinations every year, which was almost achieved in 2006. The programme has been of crucial importance to keep the laboratories in southern Sweden in business. During 1998-2001 the number of examinations performed on different species did not correlate to the size of the population in each region. The highest frequency for cattle, sheep and swine was found in the Uppsala region.

AIM

The aim of the programme is to register the health situation among Swedish food-producing animals and, if present, detect infectious diseases. The Swedish Board of Agriculture finances the programme and the Swedish Animal Health Services (SvDHV) is responsible for the organization of the programme. The results presented below are from 2007.

MATERIAL AND METHODS

During 2007 post mortem examinations were performed at five different sites throughout the southern part of the country; Skara (Analycen/Eurofins), Kristianstad (AnalycenEurofins), Uppsala (SVA and SLU), Visby (Swedish Meats) and since February 2007 also Karlskoga (DVO in cooperation with SvDHV and Konvex). Large animals, such as adult cattle, could be examined at four of these sites; Uppsala, Visby, Kristianstad and Karlskoga. For farmers affiliated to the SvDHV the post mortem examinations are performed without costs for the farmers, for others a small cost is charged. Transportation of the carcasses to the laboratories is arranged and financed by the owner, which with large animals can be a problem.

The programme also includes further education of the veterinary employees at the post mortem facilities. Yearly courses are held and quarterly newsletters are produced.

RESULTS AND DISCUSSION

During 2007 a total of 2 777 post mortem examinations were performed within the programme as compared with 3 985 examinations during 2006. The distribution between species is shown in (Table 15). Out of these cases, 17 were diagnosed with a notifiable disease of which 15 were primary cases (Table 15).

For the individual farmer the programme is important for solving animal health problems at the farm, and during recent years there has been an increasing interest for performing post mortem

POST MORTEM EXAMINATIONS

Table 14. Number of examinations divided on species:

Species	Total in 2007
Swine	1429
Cattle	659
Sheep	544
Goat	17
Farmed deer	39
Horse	2
Poultry	80
Bison	7
Other	0
Total	**2777**

Table 15. Notifiable diseases

Disease	Index case	Following cases	Total
Malignant catarrhal fever (B114)	1	0	1
Lymphoma (S103)	7	0	7
Listeriosis (C611)	23	2	25
Salmonellosis (S109)	2	0	2
Black leg, Clostridium chaveoi (S105)	3	0	3
ILT (B302)	3	3	6
Total	**15**	**2**	**17**

* Please notice that PMWS is reported after investigating a herd taking both clinical data and findings at post mortem examinations into consideration. A post mortem diagnosis of PMWS might not lead to a herd diagnosis of PMWS and vice versa. Therefore PMWS is not reprted here. The Swedish Board of Agricultare has information on the number of herds diagnosed with PMWS.

examinations. However, between 2006 and 2007 there has been a decline in the number of performed post mortem examinations. This is likely partly due to a large number of post mortem examinations performed due to suspicions of PMWS in pig herds during 2006, but also due to facilities closing down leading to increasing costs and time consmption for transport for the owner. The SvDHV is currently working on finding more convenient and less costly transport systems.

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Personal communication, Jenny Lundstrom, Swedish Animal Health Service.

Post mortem examinations in wild birds and mammals

BACKGROUND

A scanning surveillance program for diseases of wildlife was established in Sweden in the 1940s. The general public, local authorities and hunters all have the opportunity to submit wild animals that have been found dead, or euthanized to the Department of Pathology and Wildlife Diseases at the National Veterinary Institute for examination. The surveillance program is funded by hunting fees and governmental funds making the examinations free of charge for the submitters. In addition, an active surveillance program for wildlife diseases was established in 2006 in order to detect and define present and emerging diseases in Swedish wild birds and mammals. Forensic investigations are also performed at the Institute, primarily for large carnivores such as brown bears (*Ursus arctos*), grey wolves (*Canis lupus*), Eurasian lynx (*Lynx lynx*), and wolverines (*Gulo gulo*). An estimated 1500 to 2000 animals or animal samples are submitted each year. For every case, a written report is sent to the submitting party and each year, a summary of disease events and results of the disease surveillance programs is compiled for the Environmental Protection Agency, and published on our website.

AIMS

The aim of the passive and active wildlife disease surveillance programs is to monitor the health situation in wild birds and mammals in Sweden. Whenever possible, disease-causing agents are identified. The disease surveillance and diagnostics provide key information for wildlife management and often serve as indicators of environmental and ecosystem health, as well as means to help protect human and livestock health.

MATERIAL AND METHODS.

The National Veterinary Institute in Uppsala is the only laboratory in Sweden where post mortem examinations of fallen wild birds and mammals are performed. The Department of Pathology and Wildlife Diseases also provides expertise and education in wildlife disease to biology and veterinary students, officers at regional authorities and public prosecutors.

RESULTS

In 2008, 1823 samples including 1084 whole carcasses of wild birds and mammals were examined at the Department of Pathology and Wildlife Diseases. Of the 1084 carcasses, 665 were mammals primarily comprised of carnivores (569) of which 364 were red foxes (*Vulpes vulpes*) and 146 were lynxes. The 361 birds included birds of prey (114), waterfowl (56) and corvids (31). Thirty-one cases examined at the Institute were diagnosed with a notifiable disease according to OIE or National legislations (Table 16).

The wildlife disease situation in Sweden remains at a low level with regard to severe infectious diseases. There is a continuous risk of introduction of new diseases from the European continent, but due to the relative isolation of the Scandinavian peninsula, Sweden today hosts healthy wildlife populations. In 2008, there was a slight increase in number of submitted hares positive for tularemia, which coincided with an increase in human cases. The number of submitted cases positive for salmonellosis decreased substantially during 2008 (8 of 569 positive) compared to 2007 (71 of 740 positive).

REFERENCE:

www.sva.se/vsop2008.

Table 16. Notifiable diseases

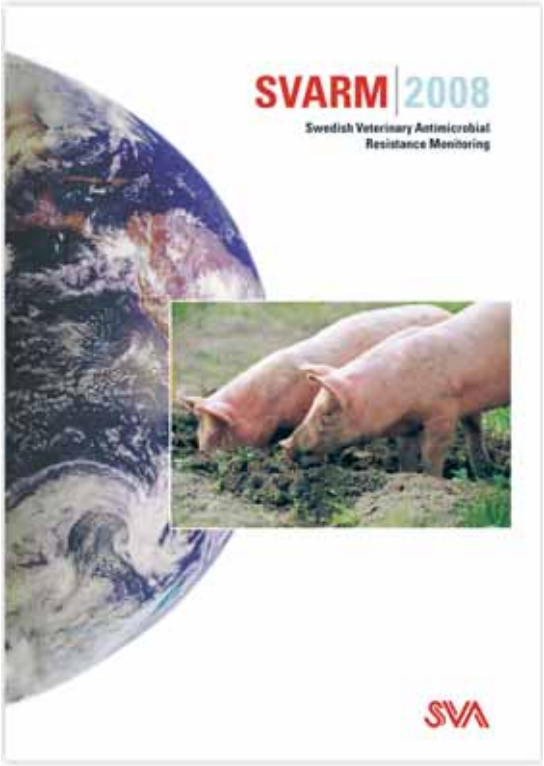
Salmonellosis 8 (7 passerines, 1 ferret)
Trichinellosis 11 (8 lynx, 1 grey wolf, 1 wild boar, 1 red fox)
Tularemia 11 (6 mountain hares, 5 european brown hares)

Antimicrobial resistance in bacteria from animals

BACKGROUND

SVA has the assignment to regularly monitor and analyze the development of antimicrobial resistance in bacteria from animals and in bacteria from food of animal origin. This is carried out in the Swedish Veterinary Antimicrobial Resistance Monitoring Programme (SVARM) which has been running since 2000. Results of SVARM, i.e. data on antimicrobial resistance in bacteria from animals and data on sales of antimicrobials for use in animals, are published in a yearly report.

The programme is organized and run at the Department of Animal Health and Antimicrobial Strategies at SVA. Integrated with SVARM is the programme SVARMpat focusing on resistance in animal pathogens from farmed animals.



SVARMpat is run in cooperation with Swedish Animal Health Service and is financed by the Swedish Board of Agriculture. The reports from SVARM are available at www.sva.se.

The objectives of SVARM are to detect trends in resistance and to provide a basis for recommendations on use of antimicrobial in animals. Details on methodology used in SVARM are available in SVARM 2008 (www.sva.se). Briefly, three types of bacteria are monitored: zoonotic bacteria, specific animal pathogens and indicator bacteria (*Escherichia coli* and *Enterococcus* spp.) from healthy animals. The rationale for monitoring indicator bacteria, i.e. commensal bacteria from the normal intestinal flora of healthy animals is that resistance among these bacteria reflects the selection pressure of use of antimicrobials in an animal population. Moreover, these bacteria can constitute a reservoir of mobile resistance genes. By using harmonised methodology for studies on indicator bacteria, data can be compared on an international level and over time. Thereby valid conclusions on trends in resistance can be made. Since 2008, indicator bacteria from food of animal origin are included in SVARM.

SUMMARY SVARM 2008

The 2008 report from SVARM shows that the situation regarding antimicrobial resistance in bacteria of animal origin remains favourable from an international perspective. But the emergence of methicillin resistant *Staphylococcus pseudintermedius* (MRSP) in dogs illustrates that the situation can rapidly change in an unfavourable direction. However combined efforts to counter this development have resulted in an overall decrease in use of antimicrobials for dogs. Prudent use of antimicrobials reduces the selection pressure for resistance and is one of the cornerstones to mitigate antimicrobial resistance.

The total amount of antimicrobials used for animals was 16 365 kg in 2008, which is similar to year 2005 and among the lower figures this decade. The amount of antimicrobials for in-feed or in-water medication has decreased by 93% since 1984 and is today but 15% of the total sales. The sales of products for medication of individual animals have remained relatively unchanged over the last decade. The sales of fluoroquinolones has decreased by 16% over the last three years which is explained by decreased use both of injectable products (mainly for food producing animals) and of products for oral medication of individual animals (mainly for dogs).

The sales of antimicrobials for dogs have decreased by 11% since 2006, measured as total number of prescriptions dispensed. Downward trends are noted for the major groups; cephalosporins (-32%), fluoroquinolones (-21%) and aminopenicillins with clavulanic acid (-9%). The findings of methicillin resistant staphylococci in 2006 attracted considerable attention, not least in the media. This in turn triggered national and local initiatives on hygiene and prescribing policies, which probably led to the observed changes in prescribers' behaviour.

Methicillin resistant *Staphylococcus aureus* (MRSA) were confirmed in three dogs and seven horses in 2008. Since first reported in 2006, there have been ten cases in dogs, one in a cat and eight in horses until the end of April 2009. So far MRSA has not been found in food producing animals in Sweden and was not detected in holdings with breeding pigs screened 2008. As from January 2008, MRSA in animals are notifiable in Sweden.

Salmonella is rare in Swedish animals and most incidents involve susceptible strains. There are no indications of increased occurrence of resistance. In 2008, 85% of the strains were susceptible to all antimicrobials tested and only six of 85 strains from food producing animals and one of 20 strains from companion animals were multiresistant. Resistance to third generation cephalosporins was not observed but fluoroquinolone resistance was confirmed in one isolate from a pig sampled at slaughter. That strain was not reisolated from pigs from the herd of origin.

Campylobacter jejuni from broilers were susceptible to all antimicrobials tested but in hippurate negative isolates from slaughter pigs, presumptive *Campylobacter coli*, fluoroquinolone resistance was common (29%). This agrees with previous data from SVARM and is possibly linked to use of fluoroquinolones in piglet producing herds. In slaughter pigs, treatment with injectable fluoroquinolones is probably uncommon and oral administration through feed or water is not authorized.

Resistance was rare in indicator bacteria, i.e. *Escherichia coli* and *Enterococcus* spp., from sheep, which is in agreement with a limited use of antimicrobials in this animal species. In pigs, resistance to antimicrobials used in pig production was not uncommon but occurrence is low in an international perspective and without obvious trends. Screening of samples from pigs show that *Escherichia coli* with transferable resistance to third generation cephalosporins is at most rare.

This year data on indicator bacteria from food is introduced in SVARM. Fifty samples of pork from retail were cultured in a pilot study. Resistance was most uncommon but the small number of samples preclude valid conclusion. In future a larger number of samples will be cultured.

Vancomycin resistant enterococci (VRE) were isolated from 28% of 107 samples of caecal content from broilers cultured on media supplemented with vancomycin. This is a similar prevalence as in 2006 and 2007, which shows that the increase in prevalence of VRE in broilers observed 2000-05 has levelled off.

Escherichia coli from clinical submissions were often resistant to ampicillin, streptomycin, tetracycline or trimethoprim-sulphonamides, irrespective of source (pig, horse, dog or cat). In addition, resistance to enrofloxacin was common (10%) in *E. coli* from urine samples from dogs. Multiresistance commonly involved these substances with prevalence ranging from 5% in isolates from horses to 14% in isolates from pigs. One multiresistant *E. coli* isolated from the genital tract of a mare was ESBL-producing.

In *Brachyspira* spp. from pigs, resistance to tiamulin occurred in *B. pilosicoli* but was not observed in *B. hyodysenteriae*. The majority of *B. pilosicoli* and *B. hyodysenteriae* were resistant to tylosin.

Resistance was rare in *Actinobacillus pleuropneu-*

moniae and in *Pasteurella* spp. from the respiratory tract of pigs as well as in *Pasteurella* spp. from the respiratory tract of calves.

Staphylococcus aureus from milk of dairy cows with subclinical mastitis were mostly susceptible to antimicrobials. Only two isolates (2%) were resistant to penicillin through beta-lactamase production.

In *Aeromonas salmonicida* subsp. *achromogenes*, *Flavobacter columnare* and *Flavobacter psychrophilum* from farmed fish, deviating high MICs to nalidixic acid, tetracycline or florfenicol in some isolates indicate acquired resistance to these antimicrobials.

Streptococcus zooepidemicus from the respiratory tract of horses were uniformly susceptible to penicillin, but resistance to trimethoprim-sulphonamides was common.

Most *Staphylococcus pseudintermedius* from dogs were resistant to penicillin. Resistance to clindamycin, erythromycin, fusidic acid, streptomycin or tetracycline was also common (between 22 and 28%). About one third of *S. pseudintermedius* were multiresistant and 14% were resistant to at least five antimicrobials.

Methicillin resistant *Staphylococcus pseudintermedius* (MRSP) in Swedish dogs were first confirmed 2006. Since, the number of confirmed cases has increased and in 2008 about 100 isolates of MRSP were confirmed at SVA. Isolates were from all parts of Sweden and mainly from dogs. As from January 2008, MRSP are notifiable in Sweden.

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