
Sponsors

University of Minnesota

College of Veterinary Medicine

College of Agricultural, Food and Environmental Sciences

Extension Service

Swine Center

Editors

W. Christopher Scruton

Stephen Claas

Layout

David Brown

Logo Design

Ruth Cronje, and Jan Swanson;

based on the original design by Dr. Robert Dunlop

Cover Design

Shawn Welch

The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, color, creed, religion, national origin, sex, age, marital status, disability, public assistance status, or sexual orientation.

Managing swine health at an industry level: Current strategies for old and new diseases

Kernkamp Lecture

Jan Dahl, DVM, Head of Veterinary R&D

National Committee for Pig Production (NCP), Danish Bacon and Meat Council (DBMC)

Objective

This paper describes strategies that the swine industry and the veterinary authorities in Denmark use to manage swine diseases. Both strategies for handling List A diseases and endemic diseases will be discussed, and the rationale behind the strategies will also be evaluated.

Danish pig production

Denmark exports 85% of its production, a volume that makes pork the number one export item and Denmark a major exporter on the international pork market. The annual production is 24 million pigs, which originate from 12,000 herds. Between 1 and 2 million pigs are exported as weaners or 30kg pigs to other parts of Europe, mainly Germany. The rest are slaughtered in Denmark. Average herd size is approximately 250 sows, a size that is increasing. However, owing to environmental legislation, the largest herd size for a farrow-to-finish herd is 250 sows plus offspring, or 1,200 sows for a farrow-to-wean herd. Fifty percent of the finishers are produced in farrow-to-finish herds, and 50% are sold at weaning or when weighing 30kg.

Ninety-five percent of the production is slaughtered at the cooperative slaughterhouses Danish Crown and Tican, organised under the Danish Bacon and Meat Council. Since the producers own the slaughterhouses, the bulk of the Danish pig production is vertically integrated.

Why does the industry worry about diseases?

List A diseases are a serious threat to an industry that is as dependant on export as the Danish swine industry. The industry is also interested in the control of endemic diseases although it will not necessarily aim at eradicating the diseases from the national herd. This is due to the fact that most diseases will harm the economy of the individual farmer and therefore reduce the number of pigs produced and slaughtered in Denmark.

Since most of the production will be sold on the international market, the farmers don't see each other as competitors. Because of the cooperative structure, the farm-

ers have an interest in fully utilizing the capacity of the slaughterhouses. A reduction in supply to the slaughterhouse will not increase payment to the individual farmer—on the contrary, it will reduce the payment for the delivered pigs because of reduced profits made by the slaughterhouses. It should be noted that profits are transferred directly back to the pig producers.

Exotic diseases

In this part of the paper strategies for keeping exotic diseases out of Denmark will be described. The term exotic diseases are here defined as List A diseases, or diseases for which the government has a handling policy.

Strategies used to keep exotic diseases out of Denmark

Risk analyses have shown that importation of live pigs and trucks that return to Denmark after having exported live pigs to other countries are the most hazardous events in terms of the risk of introducing exotic diseases into Denmark.

The industry employs a number of different strategies to mitigate these risks.

The import of live pigs into Denmark is very small, on average about 100–200 pigs per year. The majority of these are boars imported by international breeding companies that operate in Denmark.

The DBMC pays for a voluntary quarantine of these pigs. During the quarantine period, the pigs will be tested several times for different List A diseases and relevant List B diseases. Imported pigs will be marked with red ear tags to ensure that they don't enter the slaughter line at any slaughterhouse authorised for export. The red ear tag system is enforced by law, and the industry has offered the government to sell the ear tags. Consequently, the only place the farmers can buy the ear tags is from the DBMC. This sale is a non-profit activity for the DBMC, but it enables the industry to keep track of imported pigs, and to offer the voluntary quarantine to importers. So far, the farmers have complied one hundred percent with this program.

Empty trucks that return to Denmark after having delivered pigs abroad are cleaned and disinfected on entry to Denmark at two central facilities. The cleaning is compulsory, and the DBMC performs random checks at the border in close collaboration with the authorities. The expenses for the cleaning are paid for by the DBMC and the cattle industry.

Staff from the DBMC will perform random checks of returning trucks to see whether they comply with the rules. This check is done in close collaboration with the police and border authorities.

Strategies used to reduce the spread of exotic diseases after entry

In order to minimize spread in the event that an exotic disease is introduced to Denmark, the most critical factors will be to find the first case as quickly as possible, and to track down all contacts to and from the affected herd as quickly as possible.

International experience has shown that exotic diseases can affect herds for a long period before the disease is diagnosed. In many cases, the first suspicion has come from the slaughterhouse when pigs have been delivered for slaughter, and the farmer has not called a veterinary for consultation even though mortality has been substantial.

In Denmark, farmers cannot have antibiotics (including antibiotic growth promoters) of any kind on the farm without a visit from a veterinarian at least every 35 days. This regulation is mainly an instrument to reduce antibiotic usage, but it is also an important part of the surveillance of exotic diseases since it means that a vet will visit all herds once a month. Although the industry doesn't necessarily agree with the frequency of the visits, it agrees to the general principle that all herds should be visited by a vet during a given time period.

Herds infected with exotic diseases will receive compensation from the government and from the EU. This compensation will not cover the total costs of the farmer, and in order to ensure that the farmers or vets are willing to report any suspicious events on the farms, the DBMC guarantees a full compensation for the farmer, not only for the value of the herd, but also for the production loss incurred by the farmer.

Animal movement database

All movements of farm animals in Denmark are recorded in a central database. The database is managed by the veterinary authorities, but paid for and strongly supported by the industry. In the case of an outbreak, all movements to and from the herd can be found within seconds. Since access to the database is public, there is easy access for all parties involved in the case of an outbreak.

This database is also used for research into the spread of endemic diseases.

GIS

All Danish herds are registered in a GIS system, with data on type of production, number of animals of different age groups, and disease status with regard to endemic diseases. The veterinary authorities administer the system, but the industry has a duplicate of the system (and actually developed the system for the authorities). All the animal industries and the veterinary authorities have voluntarily agreed to share responsibility for the system; whenever new information regarding a herd comes to the knowledge of one of the parties, the system is updated immediately.

In the case of an outbreak, GIS maps with suspected herds and the neighbouring herds would be produced and used for the planning of stamping out and for surveillance zones. The industry will provide staff for stamping herds out and for making inventories of the stock. The fact that all parties have access to the GIS database demonstrated its potential in a recent, simulated outbreak. Owing to a break down of a computer system, one of the parties could not provide GIS maps to the field staff, but another party immediately took over and provided the maps.

Strategies used for new and old endemic diseases in the Danish swine industry

The National Committee for Pig Production (NCPP) is responsible for activities regarding research and control of diseases in the primary production. The committee is part of the DBMC, and is funded by the Council. The committee has a research budget of approximately 10 million US\$ per annum.

The applied strategies are stamping out on the national level, SPF-declaration, stamping out of individual herds, and control by management and immunological methods.

Stamping out on the national level

The NCPP has established a fund for stamping out newly introduced diseases that don't fall under governmental jurisdiction.

If a new disease is diagnosed in a herd, all relevant information regarding the spread of the disease, diagnostic possibilities, and economic impact will quickly be evaluated by the NCPP staff, and opinions will be collected from Danish and international experts. If it is concluded that there is a limited risk that an uncontrolled and significant spread has already occurred, and it is possible to diagnose herds positive or negative with sufficient sensitivity and specificity, the fund can pay for stamping out the herd immediately. The process can be initiated swiftly,

and within 24 hours of the diagnosis, the stamping out procedure can be implemented.

In the most recent decade, the fund has been activated twice. In the late 1990s, a nucleus herd was infected with *Yersinia enterocolitica* serotype 9. This serotype cross-reacts with *Brucella suis* and jeopardizes the serological surveillance for *B. suis*. Since the herd was a nucleus herd delivering boars to the AI centres, there was a risk that the AI centres could be placed under restrictions owing to suspicious sero-reactions. Most of the AI centres in Denmark are owned by the industry, and if several of the AI centres would be shut down, it would have a dramatic effect since more than 70% of all sows are inseminated. Owing to this threat to the industry, the fund paid for stamping out the herd, and for restocking.

Salmonella choleraesuis was diagnosed in one herd in 1998, and in another herd in 1999. Choleraesuis had not been diagnosed in Denmark for more than 30 years. The fund paid for the immediate depopulation of the two herds.

When the first case of PMWS was found in Denmark in 2000, it was discussed whether the fund should be activated. Owing to international experience and the lack of good diagnostic possibilities, it was decided not to activate the fund. It was also believed that there were probably more positive herds and, more importantly, it was not possible to screen a large number of herds effectively to find out whether more herds were affected.

The SPF system

The Danish SPF system was initiated in 1968. Initially, herds included in the system had to be free from the following diseases:

- *Actinobacillus pleuropneumoniae* (all serotypes except 6 and 12)
- *Mycoplasma hyopneumoniae*
- Toxin-producing *Pasteurella multocida*
- *Brachyspira hyodysenteriae*
- *Sarcoptes scabiei*
- *Haematopinus suis*

Over the years, the system has changed from a rather rigid definition to a declaration system in which former SPF herds can remain if a declaration of the diseases is available. New diseases have also been included in the declaration. Consequently, herds can be declared free from, or infected with PRRS or PMWS, for example. The PRRS declaration includes both the Danish wild-strain and the vaccine strain.

All herds in the system are checked for the diseases. Breeding and multiplying herds are visited once a month by a veterinary or a technician from the NPPC, who makes a

thorough clinical investigation, looks at production results, and takes blood samples to be analyzed for relevant diseases.

All Danbred herds comply with these rules. The Danbred system is controlled by the DBMC, and more than 80% of all the breeding materials sold in Denmark are Danbred genes. PIC, which is also active in the Danish market, has adopted most of the rules that are in place for Danbred herds.

The health status of the breeding and multiplying herds can be found on the Internet, in a database open to the public. Consequently, all buyers of gilts and boars have easy access to information pertaining to the herd.

Sow herds and finisher herds with a health status are controlled clinically at least every three months by the veterinary practitioner and once a year blood samples are taken.

Apart from declaring freedom from diseases, the system is also a declaration of the bio-security level of the farm. Physical bio-security will be inspected and documented by the veterinarian, including entrance areas, bird proofing, rodent control and other relevant factors. If a herd buys pigs from an uncontrolled source, the herd will lose the SPF-status immediately. Transport of pigs to and from the herd has to be by a carrier approved and controlled by the DBMC.

Close to 4,000 herds are registered in the system, but since many of the finisher herds buy SPF-pigs and comply with the rules without being registered as an SPF-herds, it is likely that more than half of the pigs produced originate from the SPF system.

Stamping out on the herd level

The NCPP has developed protocols for cleaning and disinfection of herds after total depopulation. This has been very effective for many of the SPF diseases. It is a prerequisite for this methodology that there is a documented source for new stock. The SPF system ensures the health status of new breeding stock.

Before a new SPF herd is established, or a herd is repopulated with SPF stock, an analysis of the risk of introducing SPF diseases from neighbouring herds will be carried out.

The GIS system is used for this purpose. A map will be supplied from the DBMC at the request of the vet or the farmer. On the map, the producer will be able to identify the size and health status of all herds in the area (an example of a GIS map is shown in Figure 1).

Presently, the GIS system will automatically generate a "survival" probability for remaining free from *Mycoplasma hyopneumoniae*. The reinfection risk for PRRS and AP serotypes are not generated automatically yet, but

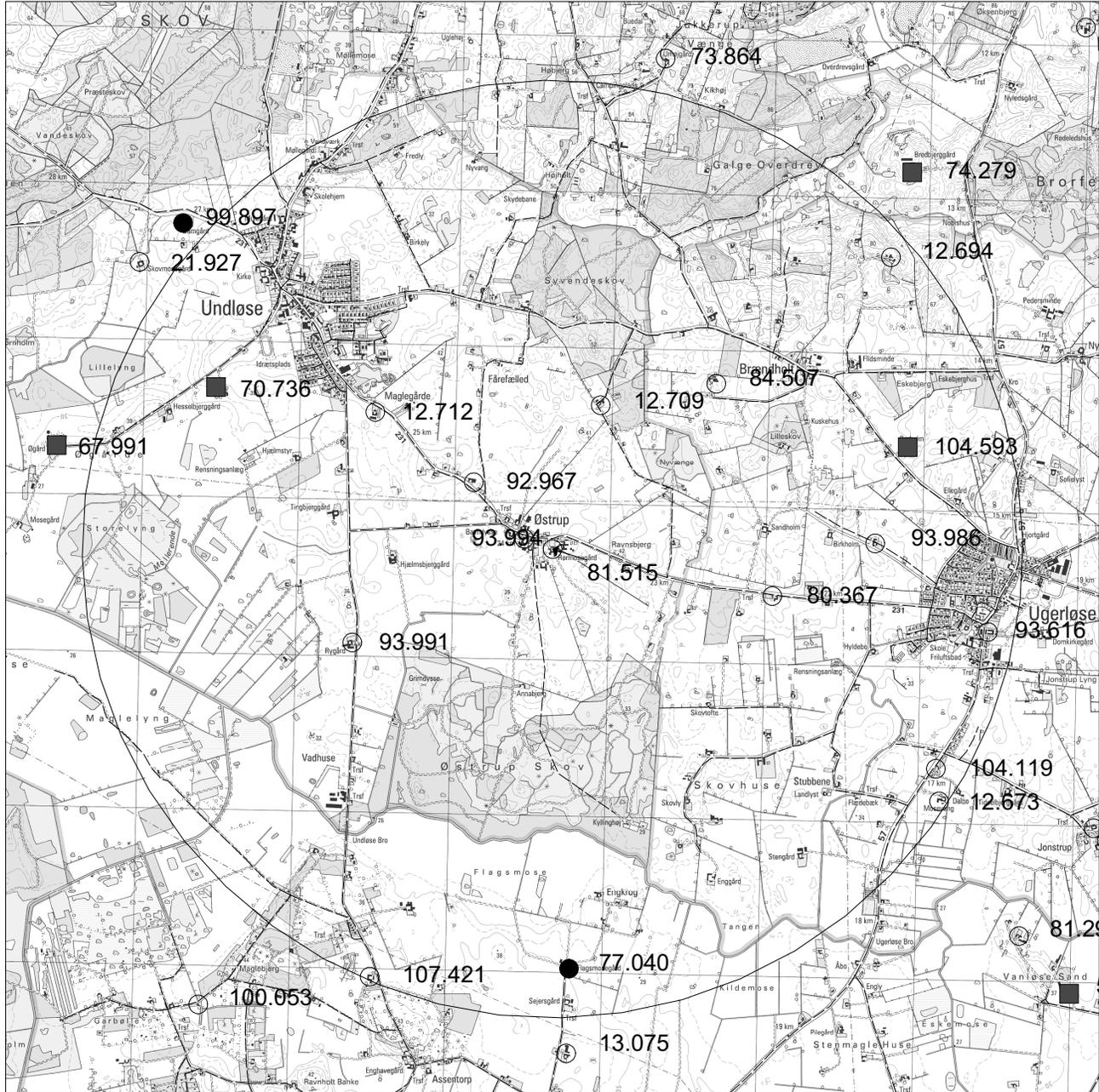
Figure 1. GIS map: Herds within a 3km distance from chosen herd

DANSKE SLAGTERIER, Axelborg

Udskrevet 22.6.2004

Central besætning: CHR-nr 81515, Tom Holst Nielsen

Optegnet radius 3 km.



| Besætninger efter SPF-status | |
|------------------------------|---------|
| ■ BLÅ | (3415) |
| ■ GRØN | (1) |
| ● NEDLAGT?/NY | (758) |
| ■ RESANERING | (39) |
| ■ RØD | (220) |
| ○ alle andre | (13995) |

General Session

it is planned to include the estimates in the future. The risk estimates have been found in epidemiological investigations by using the GIS-system, and are based on health status of, distance to, and size of neighbouring herds. So far the producer and the vet will have to do an informal, semiquantitative estimation of the risk for AP and PRRS based on the information of the health status of these herds.

Over the years, protocols for eradicating diseases without total depopulation have been developed for several of the diseases. Scabies, swine dysentery and *Mycoplasma hyopneumoniae* can now be eradicated without total depopulation, using medication in combination with partial depopulation. The success rate is more than 90%. PRRS can also be eradicated from the herd with a fairly high success rate. AP is more difficult to eradicate without total depopulation, but protocols have been developed with a success rate of 50–70%.

Reinfected herds can regain their SPF status by using these protocols and an intensive sampling scheme over the following year.

Control of diseases by management, feeding, and immunological methods

In close collaboration with the other research departments under the NCPP (nutrition, management, and breeding), and with the University, and the Danish Institute for Food and Veterinary Sciences, the Department for Veterinary R&D conducts research into the management of new and old diseases. The main focus has been on *Lawsonia*, post-weaning diarrhea, and respiratory diseases, including PRRS.

In 2000, the first Danish herd was diagnosed with PMWS; since then research into PMWS has had the highest priority in the Department for Veterinary R&D.

Based on the results, protocols for handling the diseases are developed under the responsibility of the Department of Veterinary R&D, and the results are distributed in a hard copy or on the Internet to producers.

Control of diseases by antibiotics

Use of antibiotics is very restricted in Denmark. Prophylactic treatment is not permitted, and antibiotic growth promoters are banned. Antibiotics can be used as a metaphylactic in groups or flocks in which the disease has been diagnosed or in which there is a high risk of disease outbreaks. When metaphylactic treatment is used, it is the responsibility of the veterinarian and the producer to make a plan to improve feeding, management, and hygiene to avoid future problems. This plan has to be written down, and progress must be evaluated.

Veterinarians are only allowed to hand out small quantities of antibiotics for emergency treatment. All other antibiotics have to be delivered from a pharmacist on pre-

scription. The reason for this is that the government wishes to keep veterinary advice and sales of antibiotics apart. Consequently, there is no economic incentive for the veterinarian to prescribe large quantities of antibiotics.

Antibiotics are by prescription only. There is no over-the-counter sale of antibiotics.

The prescribed antibiotics are registered in a central database, Vetstat (www.dfvf.dk), through which the veterinary authorities are able to monitor the use of antibiotics in each herd, and the quantity of antibiotics prescribed by the veterinarian to the individual herd. The authorities use these data to point out herds with an unusual pattern of antibiotic usage. Such herds are visited by a special task force that investigates illegal use of antibiotics. The restricted use of antibiotics has resulted in a very low level of usage compared with other large pig producing countries. Findings of antibiotic residues are extremely low. The level of antibiotic residues found in pork is well below 0.01%, and a relatively low level of resistance in swine pathogens, zoonotic bacteria, and indicator bacteria is seen (<http://www.dfvf.dk>).

The Department for Veterinary R&D

The NCPP finances a large portfolio of research activities related to health, management, nutrition, and genetics; this research is conducted by NCPP/DBMC staff. The philosophy behind this strategy is that the distance from problem to research and implementation of results should be as short as possible.

The department of Veterinary R&D employs a staff of 20, including clinicians, epidemiologists, risk analysts, statisticians, and animal health economists.

Results are communicated effectively to advisors, vets, and producers through meetings, seminars, and published reports. All results can also be found on the Internet where information is easily accessible.

The scientific staff is encouraged to give presentations at meetings around the country and to write articles in farmers' magazines. The staff is financially encouraged to do so.

References

Most of the references used for this paper are in Danish. For more information about specific areas, please contact the author.

The Danmap report (PDF file available from <http://www.dfvf.dk>).

