DISEASE MONITORING BY MEANS OF SLAUGHTER INSPECTION DATA IN DANISH SWINE POPULATIONS

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Summary

A national system of disease monitoring in the Danish swine population based on the routinely collected slaughter inspection data from all slaughterhouses has been maintained for many years. A description of the system is given and recent developments leading to changes in the system are outlined.

Résumé

Un système national de surveillance des maladies dans la population porcine danoise, fondé sur la collecte régulière des données d'inspection dans tous les abattoirs, a été appliqué pendant de nombreuses années. Cet article fournit une description de ce système et souligne les changements récemment apportés au système.

Disease monitoring is one of the most important activities in veterinary population practice, be it at the national, regional or herd level [1]. The concept implies the continuous observation of disease occurrence in the population in question, using common methodology of epidemiological investigations [2, 3]. The applications of disease monitoring are numerous, including such important activities as :

- Detecting significant changes in disease occurrence over time and by spatial distribution,
- Enabling speedy and efficient disease control decisions to be taken,
- Providing the basis for costing, planning and research activities.

The procedures involved in disease monitoring may be described under the following steps :

- Collection of disease data,
- Collation and analysis of data,
- Interpretation and dissemination of results.

Original sources of data for disease monitoring are relatively scarce, and there is a great tendency to « recycle » data collected for a primary reason in a multitude of monitoring schemes. Reuse of data may be good for economical and practical reasons, but bad if the validity of the data for the secondary purposes is not properly secured [4]. Aggregation of disease data from the herd level through several layers all the way to international collections of disease statistics also involves « recycling » with associated risks of misinterpretation.

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Collecting primary information on the incidence of clinical disease continuously in a herd posses a number of economical and practical problems. Most often the herd manager has to be the person responsible for the data recording with associated limitations to the degree of detail and precision with which the data can be collected. Repeated collections of diagnostic specimens from the herd for laboratory diagnosis is a costly procedure. These problems point to the obvious choice of collecting samples and/or data from the common processing plants, where animals or products are being brought routinely and continuously. Proper identification of the animal to enable trace-back to the herd of origin then becomes crucial, if the data is to be used in a herd health program.

The use of slaughter cheeks at packing plants has attracted much interest in most of the pig-dense parts of the world as a means of monitoring common and economically important swine diseases [5, 6].

I - SUMMARY REVIEW OF THE DANISH PIG HEALTH SCHEME

Various aspects of the use of slaughter monitoring as an integral part of a national swine herd health program has been considered in the establishment and management of The Danish Pig Health Scheme (DPHS), which had nation-wide coverage from 1981 to 1990.

A central computerised database containing meat inspection data from all pigs killed by their herd of origin is updated monthly. The updated file was processed to detect herds for which the percentage of pigs with a variety of lesions at slaughter exceeds certain critical limits. Owners of the herds in question were subsequently offered an advisory visit from a swine extension specialist and a practicing veterinarian. We have previously given thorough descriptions of the DPHS and its underlying assumptions and programming dynamics [7, 8].

The costs of the entire DPHS, i.e. of the routine monitoring of prevalence rates of slaughter lesions and of the optional advisory visit to problem herds - has been financed collectively through a compulsory slaughter swine fee levied on every pig killed in Danish abattoirs. Generally 40-50 per cent of the approximately 150 herds detected each month were visited as the owners accepted the offer of an advisory visit.

In the following presentation, I will first summarise the principles and procedures which have been applied in the development and operation of the DPHS. Subsequently, I will review the critical evaluations of the system which have led to the present stage of transition to a completely new concept - the HEPS-(Health and Productivity Surveillance)-system.

II - PRINCIPLES AND PROCEDURES

In Denmark a central data bank comprising most of the swine slaughterhouses has been maintained since 1964.

The keystones in the system are :

- A centralised, computer-baser accounting system for co-operative bacon factories ; and
- A uniform code list of diagnoses from the meat inspection regulations to specify the lesions causing partial or total condemnation of affected carcasses.

The traditional marketing system for Danish bacon pigs implies a relatively simple flow of information. The producers ship their bacon pigs directly to the local co-operative slaughter-house

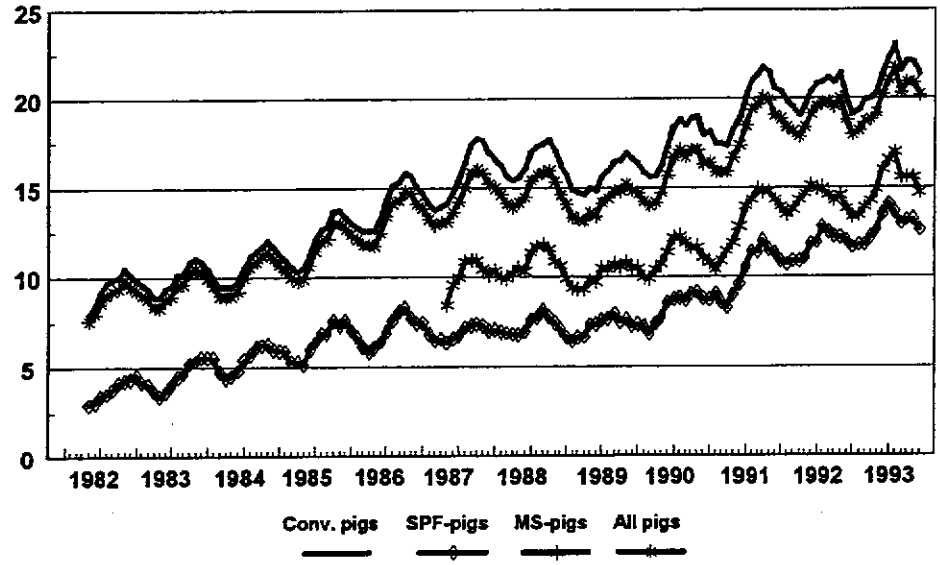
; slap-tattooing at the time of pick-up establishes a direct link between any pig carcass and its herd of origin. Losses due to partial or total condemnations are carried by the producer and deducted from the amounts paid by the co-operative.

The slaughter inspection diagnoses which are coded as two-digit numbers are made by licensed veterinarians. Data on herd identification, carcass weight and classification, sex, etc. are contained in the computer files.

The Pig Health Scheme was adopted in 1978 to help in the control of multifactorial disease problems at the herd level [9]. The primary aim has been to minimise the negative affects associated with such disease problems : Economic losses to the industry and to the producers, poor welfare of sick and mismanaged animals, decreased quality of the products, and increased use of antibiotics with associated expenses and risks of tissue residues.

The computerised parts of the program are merely extensions of the existing administrative routine in the general swine slaughter data system.

Figure 1 : Frequency of pneumonia and pleuritis lesions at slaughter for the different health categories of Danish pigs.
Data based on 95 per cent of the national production. It should be noted, that catarrhal pneumonia is not included in these frequencies, as this diagnosis is not recorded by routine meat inspection [15].



The national file of the approx. 55,000 herds delivering swine for slaughter is being updated monthly with current figures for the number of pigs delivered and the number with lesions of the various categories. Simultaneously, rates of lesions are being calculated for the slaughterhouses as well as overall. The updated file is then processed to detect those herds for which one or more of the rates of lesions exceed critical limits determined by several different criteria.

The following features are built into the computer program :

- To account for **random variation** due to small numbers :
  - Grouping of lesions into 5-6 clinically relevant main categories,
  - Use of current as well as historic data to be summed up in weighted mean rates of lesions according to an exponentially decreasing weight function,
  - The critical limits depend on herd size, partly to take account of the expected larger random variation in diseases rates in small herds. Therefore, the critical limits get more and more severe, i.e. attain lower values, for increasing herd size.

- To account for **systematic variation** due to other factors than the health status of the herd :

  . Since the observed mean rates increase with increasing herd size this bias has a positive, enhancing effect on the selection of large herds. This has another desirable effect, namely to increase the benefit/cost ratio of the program by increasing the number of pigs being covered by one herd advisory visit ;

  . Seasonal variation in the frequency of lesions at slaughter does not influence the program, as rates are compared among units only within identical time periods ;

  . Adjustment are made to account for the systematic difference in the mean rates among slaughterhouses. This means, that a lesion found at a slaughterhouse where many such lesions are recorded is less important for the herd than a lesion recorded at a slaughterhouse where more restricted numbers of such lesions are recorded.

Following all these calculations, the weighted mean rates and the critical limits for the herd in question are being compared by the computer and the herd file is « flagged » if the critical limit is exceeded for any of the groups of lesions.

For these summary statements, covering letters and farm recording forms are sent to the respective slaughterhouses. From here the swine producers receive a letter suggesting a visit at the farm to investigate the problem. If the producer responds favourably to this proposal the slaughterhouse arranges for a local practising veterinarian selected by the producer and the local swine extension specialist to meet with the producer on the farm.

During the investigation and discussion at the farm visit, a recording form is completed with summary statements about the conditions found and the suggestions made to control the problem.

Copies of the completed form are distributed to the producer, the farm advisor, the vet, the slaughterhouse, and the central office. The latter copy serves as input document to a computer file of completed farm visits intended for subsequent follow-up and statistical purposes.

At the chosen level of discrimination approx. 2,5 per cent of the herds are selected each year. Due to the favouring of large herds in the selection process these approx. 1,500 herds cover approx. 14 per cent of the national kill. Because of the further selection according to high levels of lesions, 30 per cent of all pigs with lesions originate from the selected herds.

Of course, not all producers accept the initial offer of having their herd health problems investigated in this way. Until now there has been 50 per cent acceptance, the remainder giving a variety of reasons for their negative response : alternative action already taken, going out of business shortly, etc.

III - EVALUATION AND FUTURE TRENDS

The function of the DPHS was formally evaluated using 1984 data [8]. It was estimated that meat inspection lesions originating from the respiratory tract were responsible for 72 per cent of the total number of herds being pointed out due to high frequencies of such lesions at slaughter.

In October 1986 the Danish Bacon and Meat Council carried out a questionnaire survey of producer attitudes to DPHS [10]. Questionnaires were forwarded to 1.430 randomly selected swine producers, of which 41.1 per cent replied. Of the respondents, 69,1 per cent found the DPHS acceptable, good or excellent. An inverse relationship between the herd size and degree of satisfaction was demonstrated.

Approximately 30 per cent were in favour of expanding the DPHS program. A relatively large proportion of these had previously experienced an advisory DPHS visit.

The willingness-to-pay (WTP) for the DPHS was also evaluated. Each producer was asked to specify the fee he would be willing to pay for a year's subscription to the DPHS, had the program been optional, or he could specify the

sum he should receive per year in order to remain within the current scheme. Thus, the respondent's WTP could either the positive, zero or negative. Thirty-three percent of the responding producers would be prepared to pay a yearly DPHS subscription fee (i.e. positive WTP), with an average amount stated of Dkr. 387.

The average amount stated by all respondents (i.e. positive, zero and negative WTP) was + Dkr. 91. The average actual expenses of the DPHS per herd covered in 1985-1986 amounted to Dkr. 23. Thus the benefit/cost ratio was close to 4:1. Herd owners who had previously been offered an advisory DPHS visit more often were prepared to pay than herd owners with no previous DPHS contact.

A Pilot project (DPHS-PP) was carried out from 1987 to 1988 in order to evaluate a follow-up scheme in herds pointed out by the DPHS [11]. The project was initiated March 1,1987 in order to test an intensified follow-up health scheme in problem herds, selected by the DPHS due to a high frequency of lesion detected at the routine meat inspection.

The 40 herds participating in the DPHS-PP should all meet certain in- and exclusion criteria, and among these were a limit of at least 500 pigs produced per year. The herds were subsequently randomly allocated to two groups consisting of 20 experimental and 20 control herds.

The 20 experimental herds all received a technical evaluation focusing in particular on the ventilation equipment. This was followed by a strategic meeting in which the pig producer, agronomist, practicing veterinarian and veterinarian from the Danish Bacon & Meat Council participated. At this meeting the future disease control and eradication schemes in the herd were determined. Thereafter, 6 follow-up visits were carried out in which the health schemes were evaluated and corrected.

Within the slaughter pig production the recordings included : meat inspection findings, growth rates, feed conversions and gross margin data. These results were drawn from the Efficiency Monitoring System (EMS), an optional recording system covering approximately 50 per cent of the Danish pig sector with quarterly production reports.

In integrated sow herds the above data were supplemented with further EMS recordings : pigs per sow per year, pigs per litter, litter per sow per year and pre-weaning mortality rates. Compared to a Danish average, the efficiency of the production in the period prior to the Pilot project was relatively low in the 40 herds. At the end of the project (end of 1988), 4 control herds and 1 experimental herd had ceased production.

A significant decrease in the frequency of meat inspection lesions was encountered during the project period particularly in experimental herds.

Both the experimental and control group showed a marked improvement in most parameters, when comparing the results from 7 to 20 months after the outset of DPHS-PP to the results in a period of 3 months before and after the project initiation.

Within the slaughter pig production, these improvements did not differ greatly between the experimental and control group. However, the decrease in frequency of lesions recorded at slaughter was substantially larger in experimental herds than in control herds. Also a marked regional difference could be demonstrated, in which experimental herds from the northern part of Denmark generally obtained better results than experimental herds from the eastern part of the country.

For the 28 integrated sow herds a similar pattern with regional differences was encountered.

After the last of the follow-up visits, the producers and advisors in experimental herds were forwarded a questionnaire. Among the respondents, 0.0 per cent judged the DPHS-PP as « not usable », 8.1 per cent as « not satisfactorily » 37.8 per cent as « satisfactorily », 51.4 per cent as « very satisfactorily » and 2.7 per cent as « excellent ».

As a result of these evaluations and as a consequence of the on-going changes in the structure of pig production, advisory service, veterinary herd health practice and the technological developments, the DPHS in its original form is being phased out, and a new concept -the HEPS (Health and Production Surveillance System) is being developed and introduced [12, 13]. In addition to the slaughterhouse data, this new system is based on on-farm recordings of production and health data (HEPS-h), and on the use of PCs by the vets and other advisors. A national surveillance part (HEPS-n) is built into this new system, which is based on the experience and the ground-breaking activity of the DPHS.

IV - REFERENCES

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