MONITORING HEALTH

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ABSTRACT

There are many different methods to measure the health status of individual animals or herds. Information gained from monitoring health can be used to make important management decisions such as what vaccines to use or whether or not to depopulate. New technologies are being applied to this field so that better diagnostic tests are being constantly developed and improved, and yet the results of these tests must be interpreted carefully because false negatives and false positive results can occur with all tests. Health monitoring can be expensive, and the cost of monitoring can only be justified if results are acted upon.

INTRODUCTION

Monitoring the health of pigs is carried out in a variety of ways from a simple walk through the barn to determine if all the pigs are eating and looking healthy, to running DNA-based laboratory tests to look for evidence of pathogens. There are limitations to all monitoring techniques and there are costs. How much time and effort is spent in this activity depends on what is done with the information.

This paper will attempt to highlight some of the recent research work performed at the University of Guelph in this area.

TECHNIQUES FOR MONITORING

Visual Inspection

There is a responsibility to inspect animals, at least on a daily basis to ensure that they have access to feed, water, a comfortable environment and that any sick or injured animal is dealt with promptly. This is the minimum level of health monitoring that must be carried out, and there are farms that struggle to achieve this level. One problem is not spending sufficient time to check each pig or not being skilled at identifying a sick animal in an early stage of distress. This work is often hindered by the environment, for example poorly lit pens or covered creep areas. A second issue is the fact that a sick or injured animal is identified and no action is taken. Every farm needs to have a protocol in place to deal with sick or disabled pigs, which likely means being able to move the pig to a well-designed hospital pen for treatment or being able to promptly euthanize the animal. Work is being conducted at Guelph by Dr. Suzanne

Millman to explore sickness behaviour in pigs and hopefully this work will lead to a better understanding of how to design and operate a hospital pen.

In addition to identifying the individual sick animal, visual inspection is a key component of herd health evaluation where one can assess the prevalence of coughing, diarrhea, uneven growth rate, or other conditions. Many farmers use a visual inspection as the main monitoring tool and as long as the animal's health appears to be at a steady state no further action is taken. However this is generally inadequate.

Production Records

Quite clearly it's difficult to improve unless you keep score. With the advent of personal computers and software, such as PigChamp, monitoring performance by means of production record analysis became relatively easy. There have been numerous studies showing the value of this approach (Wilson et al., 1986; Tubbs, 1996). Many of the disease problems that have the greatest economic impact in the swine industry are very subtle, often referred to as sub-clinical diseases. A disease like enzootic pneumonia which seldom causes mortality but can greatly reduce growth rate is a good example. Analysis of production records can be extremely useful in monitoring sub clinical disease in the grower-finisher barn. Tiffany Cottrell, a PhD student in the Department of Population Medicine at Guelph has been analyzing production data collected from August 1995 to March 2004 from six large multi-site production systems in Alberta, Manitoba and Ontario. These data represent over 6 million pigs and provide a good benchmark for the Canadian swine industry. The results of her study are presented in Table 1. These parameters can be used as the basis for determining what is "normal".

Table 1. Batch-level grower-finisher production parameters.

	Mean	Standard Deviation
Average daily feed intake (kg)	1.93	0.25
Average daily gain (kg)	0.78	0.08
Average live exit weight (kg)	111.1	4.0
Average index	108	2.8
Average starting weight (kg)	26.2	3.7
Culls plus deaths/1000 pig-days	0.28	0.38
Days on inventory (days)	126	17.4
Feed cost/pig started ($)	58.46	8.08
Fill-to-fill interval (days)	129	18.3
Gain/kg feed	0.34	0.03
Kg pork sold/m^2/yr	440	68.05
Market price/100 kg ($)	135.7	22.1
Percent mortality	2.76	2.7
Space per pig (m^2)	0.74	0.15

Slaughter Check

Recording disease data at slaughter can be useful in defining herd health status for sub-clinical conditions. The most common diseases monitored in this way include enzootic pneumonia, roundworm infestation, rhinitis and sometimes ileitis and gastric ulcers (Pointon, 1995). One limitation is that lesions can heal over time so that what you see at market may not reflect what happened in the early stages of the grower period. Before the development of reliable laboratory tests this was the most effective method available to monitor high health herds to ensure freedom of Mycoplasma hyopneumoniae (the cause of enzootic pneumonia) and toxigenic strains of Pasteurella multocida (the cause of atrophic rhinitis).

Laboratory Diagnostic Tests

These tests tend to fit into two general categories: firstly those that detect an organism directly, and secondly tests that measure the pig's response to exposure to a pathogen such as antibody production. These tests generally require a biological sample such as blood or other tissues or possibly a fecal sample. All tests can give false or misleading results. In the case of most diseases the pathogen infects the pigs and by the time the clinical signs are quite noticeable the body may have cleared the disease organism, especially in the case of a bacterial infection where antibiotics have been administered so that the submission of tissue to test for the presence of the organism may be fruitless.

On the other hand submission of a serum sample to test for antibodies generally requires a waiting period of at least 2 to 3 weeks from the time of the disease outbreak in order for the antibodies to be produced. In addition there are lots of problems with cross-reactions because of the pig's exposure to other microorganisms that may have similar properties to the pathogen. As a general rule almost all the diagnostic tests that we use in veterinary medicine need to be interpreted with caution. They tend to be more useful in determining the health status of a herd rather than an individual and they tend to be more useful if combined with other information like history of disease in the herd, vaccination programs used, and age of animal.

RESULTS OF THE SENTINEL HERD PROJECT

Beginning in the spring of 2001, we began a project to monitor the disease prevalence of Ontario pig farms. One hundred randomly selected herds were visited on an annual basis for four years. Generally, surveys were filled in, 30 blood samples were collected from sows and 30 blood samples from finisher pigs. Fifteen manure samples from finisher pigs were collected. Sera and fecal samples were processed and placed in –80°C freezers for future analysis. Generally culturing of bacteria was performed on fresh samples whenever possible. In 2003, nursery pigs were included, and nasal, tonsil and rectal swabs were taken. We have tested farms for a variety of diseases that are of economic significance including; swine influenza, atrophic rhinitis, porcine parvorvirus infection, pleuropneumoniea and porcine proliferative enteropathy (PPE or ileitis). And we have tested for microorganisms of public health significance such as *Salmonella, Toxoplasma*, *Yersinia, Campylobacter* and *E. coli*

0157:H7. The most thorough evaluation of pathogens of public health concern was conducted in 2004 and the findings are summarized in Table 2.

Table 2. Prevalence of food-safety pathogens in Ontario grower-finisher farms (2004).

Pathogen	Pigs % (n=800)	Farm % (n=80)
Salmonella	11.4	47.5
Yersinia	13.4	38.8
Campylobacter	100	100
E. coli 0157:H7	0.1	1.2
Toxoplasma	0	0

One of the diseases of significant economic importance that we investigated was porcine proliferative enteropathy. The causative agent is *Lawsonia intracellularis*. This bacteria has been difficult to culture and diagnostic tests have been only recently available. We determined the proportion of herds that were positive to *Lawsonia intracellularis* to be about 70% based on serological testing (Corzo et al., 2005). In addition we evaluated the two tests available-immunoperoxidose monlolayer assay (IPMA) from the University of Minnesota and an indirect immunofluorescence antibody test, (IFAT) from the University of Montreal. Agreement at the individual pig level was poor but we concluded they could be useful if applied at the herd level.

USING HEALTH MONITORING INFORMATION

There is no sense spending a lot of time and money on monitoring if the information is not going to be used. For example, finding the sick pig earlier and treating it, noting a rise in days to market or a drop in market weight and taking action to improve growth rate, detecting an increase in milk-spotted livers at slaughter and starting a deworming program.

In the case of using serological testing to monitor health status, an important application is in the introduction of breeding stock. To safely bring replacement gilts into a herd the ideal situation is to find a gilt supplier with exactly the same disease status as the purchaser. As mentioned earlier most of the diagnostic tests are not very reliable when used on the individual animal so it is possible to test an incoming gilt, receive a negative lab test and introduce her to the herd and still have her bring in disease. It's more reliable to test the herd of origin.

As a result of the research conducted as part of the Sentinel Herd Project we have a great deal more information regarding prevalence of disease and a better idea of how to test herds for specific diseases. This may become useful if the industry decides to institute some type of control program for a disease like Salmonellosis. The Danish have started a monitoring and eradication program for *Salmonella* (Wegener et al., 2003) but based on the widespread prevalence in Ontario this may not be feasible at present.

CONCLUSIONS

Health monitoring is important in order to maintain or improve productivity and food safety. New technology is making it easier to test for a wide range of pathogens but these tests have limitations. The ultimate goal of health monitoring is to use this knowledge to assist in developing programs to eliminate disease and to design biosecurity programs to prevent disease re-entry.

LITERATURE CITED

Corzo, C.A., Friendship, R.M., Dewey, C.E., and Blackwell., T. 2005. Seroprevalence of porcine proliferative enteropathy in Ontario pig herds. J. Swine Health Prod. In press.

Pointon, A.M. 1995. A review-evaluation of the pig health-monitoring scheme as an industry service. Proceedings of the 5th biennial conference of the Australasian Pig Science Association. Canberra. pp. 232-248.

Tubbs, R.C. 1996. Analysing production performance on a swine operation. Vet. Med. pp. 1119-1124.

Wegener, H.C., Hald, T., Lo Fo Wong, D., Madsen, M., Korsgaard, H., Bager, F., Gerner-Schmidt, P., and Molbak, K. 2003. Salmonella Control Programs in Denmark: Emerging Infectious Diseases. 9: 774-780.

Wilson, M.R., Friendship, R.M., McMillan, I., Hacker, R., Pieper, R., and Swaminathan, S. 1986. A survey of productivity and its components interrelationships in Canadian swine herds. J. Anim. Sci. 62: 576-582.