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An analysis of grow-finish mortality

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Introduction

Many studies have investigated pre-weaning mortality and mortality in sows. However, only a few have focused on mortality in grow-finishing pigs[1,2,3]. Some have investigated mortality in pigs in test stations[1], and others were conducted on European farms with traditional management systems[2]. Consequently, the results may not apply to multisite production systems in the US. Moreover, most studies on mortality in grow-finishing pigs were designed to discern risk factors for increased overall mortality rates[4,5] without considering the age at which pigs die during the grow-finishing period.

The studies

We conducted two studies in a large multisite production system with the major objective being to describe patterns of mortality during the grow-finishing period. One of these studies has been accepted for publication in SHAP and brief excerpts of the paper are given here. These studies were conducted in a three-site production system consisting of 12 sow barns housing 2,240 sows each, five similar nursery complexes, and 14 grow-finishing complexes. The grow-finishing facilities had 46 pens per barn. Each nursery complex consisted of 24 barns with a capacity of 1,360 pigs per barn. Each grow-finishing complex consisted of eight barns with a capacity of 1,150 pigs per barn (9,200 pigs per complex). Nursery facilities were managed all-in—all-out (AIAO) by barn, and grow-finishing facilities were managed AIAO by complex.

The system was infected with *M. hyopneumoniae*, *A. pleuropneumoniae* serovar 3, and PRRS virus. Sows were vaccinated before breeding for PRRS and usually for influenza (H1N1). The same vaccines were used for the incoming gilts. Pigs in the nursery unit were vaccinated against *M. hyopneumoniae* twice, at 6 and 8 weeks of age. No other vaccination programs were employed during the study period.

Mortality was investigated retrospectively in all 14 grow-finishing complexes between January 1996 and January 2000 (4 years), including 146 closeouts comprising 1,345,127 placed pigs. A closeout consisted of all grow-finishing pigs placed into one complex before it was emptied (approximately 9,200 pigs). The barns within a complex were usually placed within 1 week, and the first groups of finishing pigs were marketed as early as week 13, but in most closeouts, at about week 15.

Overall mortality during the entire grow-finishing period was calculated as an incidence density and expressed as the number of deaths per 1,000 pig weeks. Weekly mortality was calculated as the number of pigs that died during a week divided by the average inventory of pigs during that week.

The major findings of these studies are as follows:

- Two distinct episodes of mortality were characterized: early mortality occurring during the first 10 weeks of the grow-finishing period (W1–W10), and late mortality from 11 weeks until the end of the finishing period (W11–end). Weekly mortality rates remained constant during the first weeks of the grow-finishing period, but increased in the last weeks. In addition, weekly mortality showed much more variation in the second half of the grow-finishing period.
- A peak in late mortality consistently occurred each year in September to December for groups placed in June, July, and August. The seasonal pattern for early mortality was less pronounced. However, groups placed during fall had a higher early mortality, corresponding with a higher mortality in younger grow-finishing pigs during the late fall and early winter.
- There was no correlation between the incidence of early mortality within a group and that group's late mortality. That is a group is equally likely to start well and then "crash" versus the opposite.
- Preliminary analysis indicates no repeatable effect of mortality within a barn or complex over time. Also, we have detected no significant association between location of a barn and mortality within.

Implications

The implications of this work are many. First, it is very likely that the diseases are different in pigs dying early versus those dying late. Necropsy data on approximately 600 pigs of varied ages that died during the summer of

1999 indicated that pneumonia was the most frequent lesion, followed by gastric ulcers. Paul Yeske recently described a herd where respiratory disease was thought to be the predominant disease associated with an increase in late mortality[6]. These mortality data are consistent with the clinically described phenomenon of the "20 week wall" which has been presumed to be caused by *M. hyopneumoniae* in combination with other respiratory pathogens.

The repeatable seasonal pattern in late mortality is profound in our opinion. In a separate study, not described here, no risk factor accounted for more of the variability in finishing mortality than week of the year. Schoder et al[2] also found a higher risk of mortality in grow-finishing pigs in the month of September. Older studies that investigated pneumonia lesions in slaughter pigs[8,9] showed a higher prevalence during the winter, and they ascribed the higher prevalence to more adverse weather conditions during that period. But a precise explanation for the seasonal pattern is currently not available. Consider the many risk factors that have not changed in a major way at this system over the years—the pathogens, pig flow, pig care personnel, genetics, the reward structure, biosecurity protocols. If not these factors, what might account for the profound seasonal influence? Why is mortality lowest in summer and highest in late fall?

- Higher ambient temp in summer causes more air changes per unit of time thereby decreasing pathogen load in the barns;
- Temperature variability is lowest in mid summer, possibly resulting in least temperature fluctuation in the buildings and less "stress" on pigs;
- Absolute humidity is highest in mid summer, possibly leading to higher humidity in the barns, larger particle size and fewer airborne pathogens; and
- Daylight is longest in summer and perhaps there is an association with hours flight or the trend in daylight hours and survivability.

The lack of a barn or complex effect is interesting and revealing. We had been anticipating to find that certain complexes would have higher mortality. This was not the case. We also expected to find that high mortality would occur in clusters, suggesting transmission of pathogens between adjacent barns. This also was not the case in our preliminary analysis. One implication of these observations, if they are found to be correct in our final analysis, is that lateral spread of pathogens between barns does not seem to be a major cause of mortality. Similarly, a barn with low mortality does not seem to be at higher risk of increased mortality if it is located adjacent to a barn with high mortality. Why then does one barn have high mortality and the adjacent barn does not, despite a common source, common management, feed, etc.?

One possibility is that incidence of mortality within any particular group is a random event. Certainly if the fans fail, feed is not delivered, or a barn manager fails to treat sick pigs, a barn will have increased problems. But in general, the probability of any one barn having high mortality may be a reflection of the system's health and management, and may not be locally influenced to a large degree.

A second implication is for trial design. Barn may be a reasonable experimental unit for most trials and we may not need to use the complex.

Conclusion

As an industry, we must continue to ask "why," propose possible explanations, and conduct field trials to pursue the answer. You might think of these step-by-step improvements as making continuous incremental improvement in the system. And then, every once in a while, we have a breakthrough. These breakthroughs can be thought of as innovations. Think of the innovations we have had in our last 20 years that have turned the industry upside down.

1980s

- PigCHAMP and other record programs allowed us to measure and measuring is key to improving.
- All-in—all-out allowed us to start increasing group sizes in finishing.
- Lean genetics and lean growth—slashed costs and dramatically increased value.
- <21 day weaning increased sow productivity and facility output.

1990s

- Artificial Insemination increased facility and labor utilization and rate of genetic improvement.
- Production contracts allowed fewer owners to control more pigs, increasing consolidation in the industry.
- Integration/coordination, in conjunction with contracts, have changed the ownership structure of the industry.

2000s

- What will be the innovations that we will look back on 10 years from now?
    - Will one be segregated production?
    - Will we re-examine pig flow and re-capture the health and productivity that we used to enjoy?

We believe these findings are important steps in the learning process. But the studies described here are from one system only and are not necessarily generalizable. We as an industry need to conduct ongoing prospective and retrospective studies to better understand the impact of our systems on pig health and productivity. Opportunities exist for major improvement—first one there reaps the rewards.

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