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Editors

W. Christopher Scruton

Stephen Claas

Layout

David Brown

Logo Design

Ruth Cronje, and Jan Swanson;

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Cover Design

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Making health decisions in a large production system: A decision tree approach

R. B. Baker, DVM, MS

Premium Standard Farms, Inc.

Personal philosophy

Our swine industry has undergone many changes since the “low water” market years of 1998 and 1999. Consolidation escalated and the smaller, less efficient pork production enterprises—or those unable to bear sustained negative cash flows—have continued their exit. Even integrated enterprises have suffered severe economic times with razor thin or negative margins. The eighteen month period prior to May of this year had a devastating effect on many production systems, hastening us down the road of further industry maturation. Recently, optimism has returned, but it can only be described as guarded.

The final effect of these economic pressures combined with advancing globalization is yet to be seen but one interesting consideration is the rapidity with which the industry grew and changed going from 3 million swine herds in 1950 to fewer than 100,000 today. This legacy of an industry controlled by the financial managers and builders that created it may not be the most desirable or sustainable management structure for the future. The US swine industry has yet to go through the generational leadership turnover that normally occurs in more slowly maturing commerce. The pressure from professional activist organizations is unprecedented. With all the adversity it will be a wonder if the industry continues to attract bright young managers and veterinarians. The poultry industry fails to provide a model since that sector has enjoyed consistent, continuous growth for more than 50 years. They have only recently endured their first period of faltering consumption rates. It will be interesting to see if builders make good managers in a “steady as she goes” enterprise where expansion will either be through acquisition or foreign adventures.

You may ask what any of this has to do with health management in a large system. An explanation is in order. Health decisions and the health of pigs within a system do not lend themselves to short-term numbers-driven determinations. As margins continue to shrink, pressure to hit budgets has escalated to near weekly accountability. Budgets have followed a natural progression to more aggressive targets while every effort to cut costs continues. This makes for a difficult environment in which to rationalize and gather energy around long-term health

strategies. Fear permeates the industry from top to bottom. Our destinies are in the control of market conditions.

Decision tree management

Health management is no longer a process essentially linked to the animal health industry. In the past five years there has been a global livability decline in breeding herds and growing pigs alike. Our vaccines lack efficacy—new diseases continue to emerge—and porcine arterivirus (PRRS) continues to plague us after 16 years of intensive research and management effort.

System health management and the development of a decision pathway to follow has never been a greater challenge. Veterinarians are by and large misused and for most real health issues we lack cost effective technologies and strategies. Management teams expect more and the numbers almost always bring bad news. Where is W. Edwards Deming when we need him most? Unfortunately there seems to be few of his disciples in our ever challenged industry. Professional activists hound us, bankers abandon us, many of our managers are frustrated enterprise builders, and our customers demand that we give up many important tools of the veterinary trade.

Thus the pivotal questions for our field may be:

- how do we sustain a continuous long-term health improvement program in this environment?
- what strategies are adoptable?
- how do we align with critical supplier partners?
- how do we return health control to production systems that have spiraled downward?
- how do we avoid the perpetual knee-jerk numbers-driven decision process where fear-based accountability holds onto impossible goals?
- how do we deal with emerging issues seemingly beyond our control? and
- how do we avoid the loss of our youthful braintrust before they move on to more rewarding careers and industries?

Although there seems insurmountable adversity, there is always opportunity for intelligent adaptors. Health management affects the bottom line more today than it ever has. Health is likely the last “low hanging fruit” in our ever more challenging operations. To many this fruit has been out of reach and to all an elusive prospect.

What is health decision tree-based system management? Is it choosing the right vaccines, antibiotics, other therapeutics, veterinarians, genetics, feed ingredients, or combinations of consultant advice? Is it measuring all of the health-related inputs and following a developed decision tree down to the best solution? My opinion is no. It is more a matter of combining all the available inputs into a long-term measurable health improvement strategy that remains in statistical control. This requires experience, savvy, and a good long-term plan. The decision tree must contain many paths of opportunity both offensive and defensive. We all know that our production systems for the most part lack steady performance improvement owing to poor health. Like Deming, I believe that 85% of our health issues have been the result of poor health management decisions and only 15% has actually been caused by the caretakers (Walton, 1986).

Where should the health decision tree begin? Starting at the top of the pig flow is most logical. Remember it is long-term success that we’re after. Continuous additions of unhealthy parent stock guarantee little improvement. The first issue to consider about the health of any system is the structure of the health pyramid. A health pyramid is any system in which live animals flow through the different levels. This normally flows from a genetic nucleus site down through the multiple stages of genetic improvement/multiplication sites ending at the slaughter plant. Although a simple concept it is often ignored. It may be the single most important aspect of any health improvement program. In a true health pyramid, barriers exist that prioritize the health maintenance at the top (genetic stock) and predicatively deliver the same health status quo at the slaughter level. This is maintained through functional biosecurity and straight line unilateral animal movement top to bottom. With current technology no health improvement system will have an opportunity for sustainable success unless true health pyramids are established and the top levels of those pyramids maintain high levels of disease freedom. This should include PRRS and *Mycoplasma hyopneumoniae* along with a number of other removable economically significant agents. In general, at the production level we have failed to observe this cardinal rule. Pigs flow to fill gaps in production as needed. Our stock are often multiple-sourced. Our acclimatization process reduces pig health to the lowest common denominator. We have not established functional biosecurity, have not addressed or solved disease dissemination points through our systems, and have generally dealt with health is-

ues in a non-strategic manner. The budget and numbers have ruled and naturally prevailed.

Climbing out of the health “hole” we dig for ourselves is no longer a matter of depopulation. Our cash flows are too thin. Many of us have relieved responsibility from the genetic companies of delivering high health status parent gilts. It seemed a good idea a decade ago, saving money and gaining more control. But, in general, production companies failed to improve their lot with this strategy. Over selection, lack of specialized care and management, failure to provide functional biosecurity, and bastardized health pyramids have exacerbated losses value resulting from poor health.

A system approach to health must be a dynamic and integrated plan that considers all of the following issues:

- high health genetic introduction through true health pyramids,
- disease dissemination point control,
- real-time monitoring,
- functional biosecurity,
- disease elimination strategies,
- food safety including bioterrorism,
- process verification,
- technology search/evaluation,
- parity segregation,
- creative and traditional disease control methods,
- effective communication up and down the management structure,
- creative use of consultants,
- effective isolation,
- power to stop the train preventing disease dissemination,
- an understanding of normal and abnormal variation,
- a documented strategy for dealing with adverse health events, and
- capacity to turn data and observations into real-time information.

Truly integrated health management is a critical component necessary for the survival of the North American pork industry.

High health genetic introduction through true health pyramids

As mentioned these are the heart of any sustainable health management implementation.

Large systems should maintain several depending on geographic location, pod sizes, human and transportation resources, management capabilities/crossover, and other potential health factors. It is my opinion that the top of these pyramids should be managed by genetic companies through dedicated multiplication. In general we have, as production enterprises, missed the boat with our own genetic improvement and evaluation but have excelled at disease dissemination. We have not created partnerships with our suppliers directing most of our efforts at reducing genetic cost while failing to promote dedicated win-win relationships. As margins have fallen over the past 20 years, budgeted cost and productivity levels have come to drive the industry. This “by the numbers” stress prevents functional and lasting supplier relationships. Genetic suppliers have also failed to deliver the right pig to the right place at the right time and in efforts to manage capital turned over core competencies to contractors further eroding/eliminating functional relationships with customers. Lack of dedicated service and poor health management in the early days of PRRS led to mistrust and perceived deception. There is a great opportunity to repair the health pyramid breach with dedicated service and multiplication.

Disease dissemination point control

There are numerous potential disease dissemination points in our production systems. These are any central location that can directly impact multiple pig sites. Most notable is the transport vehicle and the boar stud. Neither of these have been effectively managed through real-time evaluation. Gilt breeding projects, service personnel, semen delivery vehicles, central supply, and all pig movements are other prime candidates. Adding seasonal gilts from outside a health pyramid can easily impact large numbers of growing pigs; this is usually overlooked.

Real-time monitoring

We have not managed to do this well, mostly the result of insufficient technology. This has become a key element in boar studs—holding semen until negative PRRS PCR results are in. Holding semen is a likely contributor to the average decline in total born experienced by many US farms over the recent past. We must develop real-time methods of disease detection within our studs, transport vehicles, isolations, multipliers, and growing pig sites. This is especially important for PRRS, TGE and mycoplasma and, as we increase health expectations, a host of other disease agents. Real-time detection and characterization of influenza will become a significant intervention strategy.

Functional biosecurity

Functional biosecurity must consider all inputs to a site and be cost effective. The priority risk list starts with the pig that is the single highest health risk when introduced.

It is amazing how often this is overlooked or we rely on the so-called vet-to-vet or other minimal data to make a decision that is close to a coin toss. Semen is the second largest risk factor and often equal to the live animal when considering PRRS. Transport risk is especially real and of great significance in cold or wet conditions. It is my opinion that trucks have given us the impression that PRRS and other viral agents are often airborne which is certainly not the case. Next are the people who enter our farms and have direct contact with the pig. Supplies, water, feed and feed trucks, birds, wild or domestic animals, and other site visitors round out the list but are a much lower magnitude than the top four. Another significant risk factor is the geographic location with respect to other pig populations. When floating around at sea exposure to salt water is the norm. When in a sea of other pigs the risk of direct or indirect contact with disease agents is almost imminent. All of these risk factors must be carefully weighted but most of the effort and money should be directed at the top four. No health program will be sustainable without biosecurity.

Disease elimination strategies

There will always be failures in any health program. Preparing in advance for these occurrences will lessen the blow. All contingency plans should include opportunities for containment. Biosecurity and isolation have long been a part of these plans. PRRS and a few other viral and bacterial agents are relatively easy to eliminate but are far more difficult to keep out. Disease elimination is a key component of any continuous health improvement plan. Roll-over PRRS elimination is low cost and has a high percentage success when consistent negative replacements and negative semen are available.

Food safety and bioterrorism

This is an evolving issue and certainly a part of any health assurance game plan. Recognizing a foreign animal disease relies solely on effective monitoring and communication programs that include regular site visits by qualified veterinarians. Site security and government programs and actions are our best deterrent but we must remain vigilant. A system of reporting suspicious activity or clinical signs must be in place. Pre-harvest food safety will gain momentum with our ability to trace back to the farm of origin. COOL will soon provide this impetus. Salmonella intervention strategies will likely follow.

Process verification

Process verification and process training are especially important for biosecurity and other health programs. Transport must be 100% inspected and there is a great need for real sterilization of these vehicles between loads for food safety and disease exclusion. This is essential when eliminating disease and when common transport is used between health pyramids housing differing health

status pigs. Proper therapeutic usage, withdrawal times, vaccination administration, water and feed quality, diagnostic procedures, proper disease intervention, employee compliance, health training, and many other aspects associated with health must be continuously verified. This requires constant veterinary attendance with the animals along with continuous health-related training. Process verified programs and certification are of great value. The USDA Marketing Service has several verified options for this.

Technology search and evaluation

Keeping up with science and developing an information network has never been more important. This goes beyond traditional veterinary sources. It is important to maintain business relationships with scientists, industry peers, specific disease experts, state and federal veterinarians. We must also maintain effective real-time research reviews, search for new product opportunities, and make continuous use of legitimate field trials. Margins are too thin to accept product or technology testimonials or even to assume that a statistically valid trial in another system will hold true at home. Future service from the animal health industry will be in the product evaluation role with on-site dedicated field trial collaborators.

Parity segregation

This is becoming a very important tool for long-term health improvement and disease elimination. It appears that the severity of PRRS, mycoplasma, haemophilus, and *Streptococcus suis* are all lessened by this process. This process not only facilitates specialization of labor, facility, and nutrition; it can uniquely be used to eliminate some disease agents completely from offspring. Reversal of flow with PRRS- and mycoplasma-negative replacements is one such possibility. Parity segregation may eliminate the negative influence acclimatization has on pig offspring.

Creative and traditional disease control methods

Large systems often do not respond up to our expectations with many of the more traditional control methods such as vaccine and antimicrobial therapies/prevention. Many antimicrobial products are at risk of being removed from production medicine and the likelihood of new products is virtually nil. Strategies such as Hps, K-88 and K-99 inoculation, parity segregation, genetic disease fixes, roll-over elimination, and a host of other somewhat experimental interventions are in use. All of these must be evaluated through a field study model that demonstrates value before adoption.

Effective communication up and down the management structure

Having a voice that reaches the senior levels of our companies has never been more important. Likewise, imple-

mentation of a health improvement process requires communication of many forms from top to bottom. Assuming that health issues are understood and that potential implications of any action/reaction are always considered is foolish. The profession must develop unprecedented trust and communication within our production organizations and our actions must be both measurable and accountable.

Creative use of consultants

The influence of the traditional veterinary production consultant will likely go the way of the general practitioner of yesteryear. As our organizations grow as a result of consolidation, specialists—including production veterinarians—will enter and be a part of integrated internal technical teams. This will make the highly specialized consultant more valuable. Examples might include molecular geneticists, epidemiologists, pathologists, food safety specialists, individual disease specialists, challenge and field trial collaborators—some likely from the animal health industry.

Effective isolation

This is nothing earth shattering but still an essential component of a health pyramid. Every live animal movement step requires isolation and testing down to the parent herds. Highly specific and sensitive real-time testing for PRRS and other significant disease agents is critically needed. The isolation must be managed with functional biosecurity, must be located in site that is as secure as the destination site, and utilize dedicated transport. Like the boar stud, truck wash, breeding project, and central supply, the isolation site is a potential disease dissemination point.

Power to stop the train

Health improvement, monitoring, isolation, elimination, and all other components of an effective long-term process are jeopardized if all who work with the pigs aren't empowered to stop movements. This takes training and management empowerment. Everyone must be accountable for health improvement.

An understanding of normal and abnormal variation

If the knee-jerk decision process is ever to be cured, it will require understanding of expected variation. This requires good data and a real-time means of turning it into knowledge. Pivot tables have been successfully used and are simple to construct, yet we rarely use them effectively in production medicine.

A documented strategy for dealing with adverse health events

An effective health strategy and program requires a great deal of thought. Every conceivable outcome should be considered in advance. Of course this is impossible but

collaboration and routine meeting time should be allocated for this process. The health assurance director must allocate time and continuously develop and alter strategies. There is little reason to monitor if there is no auto-implemented strategy for all plausible outcomes.

Capacity to turn data and observations into real-time information

Although mentioned several times in this paper it deserves special prominence. This is one of our greatest challenges and one that must be prioritized. One of the greatest sources of real-time information is the postmortem exam and population observation. To remain valuable as veterinarians attendance is mandatory.

Conclusion

A quote from the 2003 PRRS Compendium makes a good conclusion for this mostly philosophical paper:

There is little doubt that our large production enterprises have created an epidemiologic environment that would facilitate the dissemination and perpetuation of PRRS and many other viral and bacterial diseases (Zimmerman, 2003).

This is the essence of our challenge as health caretakers.

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Acknowledgment

I would like to thank Bill Christianson for the many hours of brain storming and sharing his health pyramid knowledge and other epidemiologic strategies.

