PRINCIPLES OF HEALTH MANAGEMENT

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ABSTRACT

The goal of this paper is to provide producers with a road map to limit the impact of diseases in swine herds. A good knowledge of key information on diseases and on how to accurately diagnose them at the farm level is the starting point for success. Table 1 summarizes some of the basic information on three major infectious agents: PRRS virus, *Mycoplasma hyopneumoniae* and porcine circovirus type 2 (PCV2). Also, to limit as much as possible the frustration and losses associated with re-breaks, regularly updated biosecurity measures should be established and observed. Air filtration will soon be part of a good biosecurity program even in commercial farms. Table 2 describes the basic elements of a sound biosecurity program for a commercial farrow-to-finish farm or a sow unit. The choice of the replacement stock health status (Table 3) and the proper acclimatization of animals to be introduced are also major concerns. Finally, management rules that can help to limit the transmission of diseases or improve the pig's natural defenses are good complementary tools to vaccination and strategic medication programs. Table 4 shows examples of such rules for PCVAD and PRRS.

INTRODUCTION

In the past 30 years, the swine industry has seen many new diseases causing significant problems: porcine pleuropneumonia, swine influenza, PRRS and more recently PCVAD. It is more and more complex to raise healthy pigs. Also, health concerns are taking a growing share of the pig production cost which may affect our competitiveness on the export market.

The goal of this paper is to give pork producers a road map to limit the impact of diseases in a herd or system. Sometimes in this quickly changing world we have to stop, and reevaluate whether or not we are on the right path. So I will use a "back to the basics" approach to address this goal.

Four principles, or themes will be reviewed and commented on.

FIRST PRINCIPLE: KNOW YOUR OPPONENT

Before trying to control diseases at the farm level, it is very important to get information about what we really have to fight. Understanding how a specific pathogen can spread, infect pigs, replicate and for how long are examples of the type of information needed. The more is

known about a disease, the better are the chances that this disease will be kept under control at a relatively low cost. Table 1 shows some basic information on three major infectious agents: PRRS virus, *Mycoplasma hyopneumoniae* and PCV2. The information in this table should not be used as definitive, carved in stone data. Indeed, many factors may interact with field situations that can result in potential timeline changes. Furthermore, what is found to be true today may not be exactly the same tomorrow. Veterinary medicine, just as human medicine, is not a static science. However, one needs to start somewhere and the data used in the table are quite representative of those that are reported in the scientific literature. These data can be useful in taking decisions on what health protocols to choose for a farm.

One should remember that we manage herds and not individuals, so the data presented here should be interpreted accordingly. For example, if a sow herd becomes affected by a new strain of PRRS virus and the idea is to get rid of it, the introduction of replacement gilts should theoretically be stopped for at least 100 days after the *last* sow was infected by the virus, and not 100 days after the beginning of clinical signs in the herd. I say theoretically because, as discussed later in the document, there is often a difference between the longest time that an animal can be carrier of an organism, and the longest time it can shed it.

Knowing the theory surrounding important infectious agents is not enough. One also has to know what's going on with them in the herd on a real-time basis. Specific and pointed diagnostic and serological monitoring programs are useful tools to follow these agents in a herd. It may allow the prediction of an outbreak long enough in advance to avoid it. Also, it can be used to record the efficacy of intervention strategies or the possible source of contamination if contamination was to occur. On the other hand, profiling herds without any specific goal may be a loss of money. I recommend an investment in diagnostic techniques only if they answer a specific question and if an action to be taken depends on the results. I don't carry out serological profiling "just to know".

SECOND PRINCIPLE: KEEP NEW BUGS AWAY

Biosecurity measures will always remain a fundamental part of a pig farm health program. Indeed, it is a loss of time and money to try controlling or eradicating diseases from a herd if this herd is continuously exposed to exogenous infectious agents. It is like baling out water from a cracked boat.

There is virtually no limit to what could be done in biosecurity. It is easy to do too much in situations where there is a low probability risk, and the opposite is also true. Doing too much needlessly increases production costs and neglecting some aspects may result in an expensive outbreak.

I describe in Table 2 the basic elements of a biosecurity program that I recommend for a commercial farrow-to-finish farm or a sow unit.

Table 1. Important information to know about PRRS virus, *Mycoplasma hyopneumoniae* and PCV2.

	PRRS virus	*M. hyopneumoniae*	PCV2
Incubation time	3 days and over	2 weeks and over	2 weeks and over
Infection source	Direct contact, nasal secretions, saliva, urine, feces, milk, semen, blood, aerosol, transplacental, fomites	Direct contact, aerosol, nasal secretion, possibly fomites	Direct contact, nasal secretions, saliva, urine, feces, milk, blood, semen[(1)], transplacental, fomites, possibly aerosol
Shedding period	99 days	200 days	42 days[(2)]
Survival outside the host	○ Less than 24 hours at 25°C on solid material ○ 9 to 11 days in water at 25°C ○ 8 days in lagoon water at 4°C ○ for months at minus 25°C	○ In liquid medium, 31 days at room temperature ○ At refrigerator temperature, 100 days ○ Survival increase with moisture and coldness	Very resistant in environment and to disinfectants
Other particularities	Partial and variable crossprotection between isolates Frequent genetic changes with this virus Fetuses are most susceptible to active infection after 60 days of conception and may become carriers until at least 150 days of age.	Antibiotics may stop growth of the organism but will usually not kill it	Genetic susceptibility / resistance of the host Triggering factors (other agent or factor) may play a role The virus is present everywhere but virulence may be different between strains Piglets may be born with the virus and become seeders of the virus

[(1)] The virus can be found in semen, but the importance of semen in the diffusion of the organism is still debated.

[(2)] For PCV2, very few studies have looked at how long an infected animal can shed the virus. It is very likely longer than 42 days, and possibly much longer.

Table 2. Basic elements of a biosecurity program for a commercial farrow-to-finish farm or a sow unit.

Gilts source	TGE, *A.pleuropneumoniae* and mange negative. PRRS negative or at least non-shedding. *Mycoplasma* negative if the herd is negative only. Non-shedding flu and non-clinical PCVAD. Site of gilt production should be at least 3 km away from any other swine facilities.
Semen source	PRRS and TGE negative. Unit under air filtration or at least 3 km away from any other swine facilities.
Quarantine	For at least 4 weeks before entering the herd. Separate building than the main unit but not too far since we don't want to be closer to another pig farm or to have to truck the gilts again.
Transport	Transport pigs in cleaned trucks (washed, disinfected, dried). Never allow a truck containing pigs from another site to get close to the farm.
Air filtration	Mechanical air filtration will be a must in the very near future in high pig density regions
Carcass disposal	Compost or incineration
Visitors	Ask for washing hands; provide boots and clothes belonging to the farm. Do not allow entering tools or materials that have been in contact with pigs or pig manure.

A common mistake is to reduce the importance of biosecurity measures in PRRS positive farms because they are already contaminated. It is true that introducing a new PRRS strain or isolate may possibly not cause as severe an outbreak as it could in a naïve herd, but since the crossprotection between isolates is incomplete, a new PRRS isolate should be considered like a new bug. Therefore, there is no reason for positive farms to minimize biosecurity protocols.

THIRD PRINCIPLE: MANAGEMENT OF REPLACEMENT ANIMALS

A lot of disease problems in our herds are the consequence of an infection pressure that is too high. This means that there is a large quantity of certain infectious agents in the environment. At some point the animals are not able to cope with this overload and they contract diseases.

One way to reduce the infectious pressure in a herd is to reduce the transmission of pathogens by the dams. This will be the case if the sows have overcome the disease and have a good immunity. Gilts are the most at risk of not having completely overcome the disease or of not having a good enough immunity. That is the reason why gilts should be properly acclimatized for the infectious agents of the receiving herd. This should be done as quickly as possible in order to maximize the chance that they will not be carriers of the infectious agents causing these diseases at farrowing. Even very clean herds may take advantage of entering gilts at a younger age. For example, *Streptococcus suis* and *Haemophilus parasuis* (Glasser's disease) are common bacteria even in these herds and there are multiple different strains. Therefore, exposing young gilts to the strains circulating in the herd may reduce the amount of bacteria and improve the immunity these gilts will transmit to their progeny.

Another possibility is to produce gilts at the farm and to close the herd. It is making sense for health concerns but has the disadvantage of making genetic improvement slower and more complex. At least, this option should be considered at some point for a limited period of time when diseases are not under control in a herd.

Also, the health status of the gilt producing herd may have an impact on the results that can be achieved (Table 3). For *Mycoplasma* positive herds, it may be profitable to purchase gilts from a positive herd. Gilts coming from this herd will not need acclimatization for *Mycoplasma* because they were already exposed, and thus immune. This way of thinking is unfortunately not as true for PRRS and swine influenza, since in their case the variations between strains can pose a problem. If gilts introduced in a given herd are infected with a PRRS strain that is very different than the one(s) present in the herd receiving these gilts, they may not be adequately protected. Besides the gilts may themselves be responsible for an outbreak in the receiving herd, because this herd is not totally immune to the strain that the gilts are shedding. Knowing if a gilt is infected or not with a PRRS strain at the time of introduction (in isolation) can be done much more easily if the gilt comes from a negative herd than if it comes from a positive herd. For this reason, even though previous PRRS virus exposure may facilitate acclimatization, I always favor a PRRS negative gilt source even for positive sow herds except in very specific situations.

Table 3. Desired health status of the gilts entering a sow herd.

	Positive destination herd	Negative destination herd
PRRS	Negative or non-shedding	Negative
Myco	Positive or Negative	Negative
Swine influenza	Non-shedding or Negative	Negative

The acclimatization protocols must be designed according to the diseases that we have to deal with in a given herd. It is not the facilities or any other part of the system that should dictate how gilts are acclimatized, but the opposite: we have to adapt our barns and our way of working to the needs of the acclimatization. For instance, we know that some animals may be carriers of *Mycoplasma* for at least 6 or 7 months, and possibly more. If we want gilts to farrow when they have cleared the infection and allow for some safety margin, we must expose them to *Mycoplasma* no later than at 1 month of age, and make sure that we are not covering them for long periods of time with therapeutic levels of antibiotics. This antibiotic coverage could delay the time that the organism would cause the disease and the immune system would get rid of the *Mycoplasma* organism. Another way of thinking would be to only introduce them in the herd at least 60 days after their second mating (parity 2 sows).

For PRRS virus, we have seen that, to date, the longest period of time where infected pigs were able to infect negative pigs placed in contact with them is 99 days. You thus have to allow more than 99 days after exposure before thinking that the gilts may not be contagious anymore. With some safety margin, most of the programs allow 120 days, which means only 3 gilts introductions per year. This can be achieved by purchasing gilts of different weights (5

to 75 kg) and ages (1 to 5 months) and operating the facility all-in all-out. Gilts are exposed in the first week using frozen or fresh serum/material from the farm. Other vaccinations or microbial exposure may take place later in this period. Gilts can be inseminated on site when they reach the desired weight and age. When the room is emptied, some gilts may be transferred directly into the farrowing crates.

A simpler protocol for PRRS virus may be to only enter 5 kg gilts and allow them to grow in the same pens as the commercial pigs. However, with this protocol the date of the PRRS virus exposure often remains unknown and sometimes exposure does not occur at all, or occurs too late. Consequently, some gilts may either be non immune to the resident virus, or actively shedding the organism at the time of introduction into the main herd. Non immune gilts that get exposed to the virus during gestation may infect their fetuses, and these pigs can be a source of virus once they are born. On the other side, gilts that are actively shedding the virus at the time of introduction into the main herd could destabilize the herd and create problems.

FOURTH PRINCIPLE: GOOD HUSBANDRY

Management will always have an impact on disease expression. It is true for all diseases but it was particularly striking for PCVAD, before vaccines became available, since it was one of the only tools to work on disease prevention.

Some management parameters like water, air and feed quality may compromise the animal resistance to diseases if they are not appropriate. Some husbandry rules can also favor virus and bacteria transmission between pigs or have a negative impact on natural defenses of the pigs against diseases. Again, a general knowledge of diseases should dictate how we manage our herds instead of relying on historical ways of raising pigs. In today's world, multiple diseases challenge many pig farms. The effect of these diseases can not only be cumulative, but synergic, which is increasing even more the pressure on the system. Pig farms may not afford for a long time to spend money solely on vaccines and medications for all these diseases. A good complementary or alternative tool can be found in what I call "dedicated management". Dedicated management is a management strategy that is designed to control, reduce or prevent a specific disease. This strategy has a cost or implies a reduction in some zootechnical parameters (ex: weaned/sow/year), but this cost is considered like an investment at the same level as a vaccine. Some of these strategies may give huge benefits because they improve the situation for many diseases at the same time.

Table 4 shows examples of dedicated management for PCVAD and PRRS.

Using these management rules, some herds have completely controlled PCVAD without any PCV2 vaccines. The age at slaughter was reduced by more than 7 days and feed conversion improved a lot. The associated costs are an increased usage of needles and milk replacer, and a deterioration of the pre-weaning mortality (2 to 3%). It should be kept in mind however that the impact of applying such management rules can vary from one farm to another.

Table 4. Dedicated management strategies to control or reduce the impact of PCVAD and PRRS.

AIAO strictly applied in farrowing rooms, nursery and finisher o Washing/disinfecting/drying between batches o Consider batch farrowing to facilitate AIAO
Hygiene o Disinfectants: Virkon or Quat + Glutharaldehyde combination (PF-300, Aseptol-2000, Virocid, Vexkill-100) o Wash boots at the end of the day with a brush and disinfect in a bath of disinfectant (new disinfectant solution made every day) o Scrape sow's manure each day in farrowing room with a shovel: 1 shovel per room.
0 to 3 day old piglets o When possible, only handle piglets on the day of birth to ensure that they receive colostrum. Leave all other procedures until processing time (3 days of age). o Identify piglets seen to receive colostrum. Use a stomach tube for those which are not seen to receive colostrum. o Make sure the environmental temperature is within the piglets comfort zone (31-35 Celsius) o Stop clipping teeth. o Even out litter size the day of birth. Aim to have an average of 11.5/litter throughout the room. Euthanize the smallest pigs to arrive at 11.5 piglets/sow.
Fostering o Stop all fostering o Only allow swapping on the day of birth, but do as little as possible. Objective: Less then 25 % piglets exchanged. Piglets sucking foster mothers should not come from more than 3 separate litters, ideally 2. o The sows and litters must not change rooms under any circumstance. One exception: a weaned sow can be used as a nurse-on mother to replace a dead or completely dried up sow with less than 3 kg piglets. o If there are very small piglets in the litter, or very large litters (13 piglets or more), place milk replacer in the crate. o Inspect all litters at day 7, and euthanize piglets weighing less than 1.7 kg.
Early Weaning (weaning of piglets at a younger age than their brothers and sisters) o Stop early weaning, if it is done, these pigs should then be moved to the nursery when cohorts are moved. Move all young pigs into the same nursery pen.

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Aborted or Premature births (4 days or more)

- Do not try to save the piglets. Euthanize them as soon as they are born. Take care not to contaminate other piglets or the installation with their blood.
- These sows cannot be used to nurse litters. Pass the first heat before rebreeding or culling.

Litter Integrity

- Whenever possible, wean intact litters into nursery pens (1 pen per litter or two litters). Keep these pigs together until slaughter.

Needles

- Sows and Boars: discard after one injection. This includes oxytocin or prostaglandin injections, vaccinations and antibiotics.
- Piglets: discard after each litter or pen, or before drawing up more product with a conventional syringe.

Castration Pliers

- Wash and heat (propane burner) between litters when castrating and docking tails.

Piglet Carts

- Use as little as possible.
- Wash and disinfect after using.

CONCLUSIONS

Controlling diseases in a swine herd may be a hard task. A good knowledge of key information on diseases and of how to accurately diagnose diseases at the farm level is the starting point for success. Also, to avoid the frustration and losses associated with disease breaks, adequate biosecurity measures have to be established, observed and regularly updated. Air filtration will soon be part of a good biosecurity program even in commercial farms. The choice of the replacement stock health status and the acclimatization of these new animals are also major concerns. Finally, management rules dedicated to limit disease transmission or to improve the natural defenses of the pigs are good complementary tools to vaccination and strategic medication programs.

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