Managing for Herd Health

in Alternative Swine Systems: A Guide

Practical Farmers of Iowa and Iowa State University Extension

With support from the USDA Sustainable Research and Education (SARE) Program and the Value Chain Partnerships for a Sustainable Agriculture project of the Leopold Center, Practical Farmers of Iowa, and Iowa State University.

Contents

"Something is being lost." This statement has come out more than once from the farmers and veterinarians who contributed to this guide, *Managing for Herd Health in Alternative Swine Systems*. The kind of management that makes these systems succeed is becoming rare as the number of hog farmers in Iowa has dropped by two-thirds in just the last decade, the greatest losses among small and moderate-sized operations. Yet there are producers and veterinarians who not only retain the old husbandry skills but are bringing 21st century science into the picture. Take this guide as an invitation to join them.

If the guide were computer software, it would be version 1.0. There will be updates, corrections, and ideas for revisions. So check with a vet to confirm what you read here. And as changes are made, the current version of chapters will be posted on the Farming Systems Program website at *www.pfi.iastate.edu/pigs.aspx* (or reach it through the Programs section of the Practical Farmers of Iowa website at *www.practicalfarmers.org).* There you will also find a place for entering your own comments and suggestions. Or contact us directly (515-294-5486, dnexner@iastate.edu). We would like to hear from you!

As this herd health guide was being created, a companion guide focusing on managing for production was also being written at Iowa State University. The *Niche Pork Production Handbook* deals with management topics not covered here (*www.pnmwg.org*).

The acknowledgements on the following page show many people contributed to this guide. Veterinarians were particularly important in sections on biosecurity, vaccinations, and disease details. Both vets and producers had a hand in the **case study examples**. These appear alongside the main text and provide real-life illustrations of points raised. Finally, producers get much of the credit for the "**words of wisdom (WoW)**" quotes that also appear throughout the text. These are lessons learned, sometimes the hard way, and although they may be humorous are worth keeping in mind.

Rick Exner, editor

Practical Farmers of Iowa

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Acknowledgement and Thanks

This herd health guide is a product of *The Research Alliance for Farrowing: The Weak Link in Alternative Swine Systems*, a project carried out from 2003-2007 with support from the North Central Region SARE Program (Sustainable Agriculture Research and Education) of the United States Department of Agriculture under a cooperative agreement with the University of Nebraska. Since 1988, SARE has advanced farming systems that are profitable, environmentally sound and good for communities. (www.sare.org)

The need for the *Research Alliance for Farrowing* (RAF) project was first voiced by farmers participating in the Pork Niche Market Working Group (PNMWG), a diverse collection of marketing businesses, organizations, academics, and producers working to advance value-added opportunities. Those farmers identified the early life of their pigs as a stage whose health problems were cutting into their success and preventing additional farmers from adopting alternative systems. The roots of the RAF project and of this herd health guide are in PNMWG, which is led jointly by Practical Farmers of Iowa and the Leopold Center for Sustainable Agriculture. The Leopold Center has also aided the RAF project through its Value Chain Partnerships for a Sustainable Agriculture, funding project evaluation and production of some of the case studies appearing in this herd health guide. Finally, encouragement and ideas have come from a parallel project on herd health and farmer records funded by the National Research Initiative (NRI).

RAF undertook intensive evaluation of a number of alternative swine systems. It also worked to develop discussion about alternative systems among veterinarians. At a project workshop for vets in 2004, Iowa State University veterinarian Patrick Halbur recognized the need for a herd health guide for alternative production systems. In what became a three-year process, drafts of this guide have received comments and invaluable contributions from ISU vets, field veterinarians, and producers. Special credit is due Dr. George Beran, whose deep understanding of the human-pig relationship always brought us back to the basics, and Dr. Kurt Van Hulzen, who contributed much practical and current knowledge. The people named below have contributed ideas or text or have reviewed drafts of this guide.

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Principles & Strategies for Success

Swine success comes in many forms. What do successful producers have in common? They have strategies that work for them. A strategy pulls together practices into a package that works. As a pork producer, you have herd health strategies, production strategies, marketing strategies, and more. And of course, these strategies have to interlock, to work together.

When you are around farmers who have been doing this for a while, you begin to pick up the strategies that they believe are key to success. They have put the pieces together in a way that things work on their farms. And those pieces are based on basic principles. In this herd health guide, you are going to read a lot about the pieces – the practices – but keep in mind that success is more than a collection of practices; it is strategies based on principles, in other words practices-with-a-purpose.

What are some fundamental principles of herd health? In the last four years of working with producers and vets, we have heard the following enough to place them on the level of principle:

- **"Control exposure of swine to both normal and pathogenic microbes."** Controlling exposure is absolutely key to success in alternative systems. You need to have control over exposure to the world outside the farm. A disease outbreak can even be triggered by introducing a healthy animal in the wrong way, to say nothing of infected livestock and contaminated people and equipment. Also control exposure of young pigs to organisms already on the farm until their immune systems are ready. That includes exposure to pigs older than they are.

- **"Maximize the natural resistance of your swine through environment and stress control."** Sanitation is more than public relations. Manure harbors what was ailing the animals plus whatever the flies have added. Beyond that, it can contribute to an air quality that promotes respiratory problems. If the manure gets ahead

Alternative swine systems is taken here to mean production systems that differ from a typical, "conventional" operation both in the inputs used and in the way the system integrates with the overall farm. There is likely to be tight integration, with crops providing bedding and relying on swine manure/bedding that is returned to the field. Swine pasture may rotate with other crops. Alternative swine systems often differ in a third way, being tied to a specific premium market. These markets usually determine some production practices. Typically this includes the avoidance of antibiotics for animals serving that market. It may also include practices to assure animal comfort and restrictions on synthetic wormers. That said, swine operations take many, many forms for many reasons, and there is no strict definition for alternative swine systems. We hope swine producers will find value in this guide no matter what their operations look like.

of the bedding, animals may lack a dry sleeping area where they can maintain body temperature. Poor sanitation lowers animals' vitality and resistance to disease, killing profits if not animals. And are you ready for this? Bond with your pigs! If they get riled up every time they see you, it contributes to stress levels that are measurable in the blood – theirs and yours. Stress depresses the immune response as well.

- **"Enhance the disease resistance of your pigs with timely vaccinations and other practices."** In your operation there is a constantly changing balance between pathogens and the resistance that your pigs have to those microbes. You want to enhance that resistance without overwhelming the animal. You protect newborn pigs from pathogens and parasites as much as possible, but you expose their mothers to some pathogens prior to farrowing to maximize resistance. That way newborn pigs acquire temporary, "passive" immunity to those diseases with their first mother's milk (colostrum). You build immunity in the sow through vaccinations and by the feed-back of manure from the farrowing and production areas of the operation to gestating sows and gilts. Gestating stock also benefit from back-feeding placentas and mummified fetuses from the farrowing barn.

WoW: "When you take out the antibiotics, the management has to come up."

You can probably think of additional principles of herd health, but these three say a lot. They remind us that the farmer in an alternative swine system is relying on a low-stress, "high-health" environment in which pigs have a head start on disease. This is particularly important because antibiotics and some other treatments are not available as rescue devices in many alternative systems. Of course any producer has the option if not obligation to rescue seriously sick animals with antibiotics or wormers, but treated animals must be removed from the system and marketed conventionally.

So, given the basic principles of herd health, what are some successful strategies that build on the strengths of alternative swine systems? Here are some candidates; you may have additional strategies.

All-in-all-out (AIAO) Everybody, including the runts, is out the door before the disease organisms have time to build up or transfer from another group of pigs. Then clean up and allow a cool-down period.

Closed herd — If you can manage it, this strategy is one of the best ways to stop a run of herd health problems. Keep your herd genetics up with artificial insemination of disease-free semen.

Separation by age — This goes with AIAO. Work the young stock first, then move on to older animals. Sound fences will keep that little wandering pig from bringing down your whole separation strategy.

Separation of units — Sunlight is a great disinfectant. The more separation the better; some producers even work with a neighbor to farrow off-site.

Stockmanship — Stockmanship and husbandry skills are a strategic advantage of the producer on a sustainable farm. Use your management skills to create a low-stress, "high health" environment for the pigs. Think dry, clean, and, where appropriate, draft-free.

Partner with a vet — Your farm is more complex than most, and your herd health issues may be too. In addition, a vet probably can't just prescribe an antibiotic or other "silver bullet" for you. The vet needs to know you and your farm before problems arise so that he or she can help you work with your whole system.

Some of these principles and strategies may seem to depend on control and barriers, bringing to mind conventional, confinement swine systems. In some ways, the design of conventional systems does make it easier to separate pigs from the outside and from animals of different ages. Alternative livestock systems, because they are more integrated into the whole farm environment, present unique challenges in applying some herd health basics. But it isn't impossible to manage for these principles and strategies in alternative swine systems. Successful producers are meeting that challenge, and this guide shows that.

WoW: "The sun is your friend."

Have a Plan and Implement It

There are many, many practices you can use to further your herd health strategies. Decide which ones you are going to implement. It won't hurt to put it on paper; that may help your thought process, and it gives those around you the opportunity for input. This is the time to get a vet involved if they aren't already. If you draw up your plan when things are going OK in the swine operation, the plan will describe how you intend to keep it there. If your plan comes out of a crisis, it is the road map for getting back to normal and a set of strategies for maintaining things that way. Plans can be changed, but having a written plan helps you know what there is to change. And remember, we all have great plans, but successful plans are the ones that get implemented.

WoW: "Having the vet walk the operation on a regular basis is worth more than all the feed additives."

Review of Managing for Herd Health in Alternative Swine Systems

Part of this swine herd health guide is laid out in the way that you are likely to have questions – by age and type of animal. Each of these overlaps with the others because topics like vaccination, diagnostics, and parasites are not restricted to a single type of pig.

The text of this section previews specifics found in later chapters of this guide. Following this management section is a chapter on biosecurity, pig flow, and introduction of new stock. After that are sections focused on breeding stock, on farrowing, on nursery and grower/finisher pigs, and on vet and diagnostic services. Along the way are examples illustrating points made in the chapters. Also, scattered throughout are quotes from other producers to stimulate your thinking. In addition, near the back of this guide you will find: a table of the most significant swine diseases in alternative systems; a summary of recommended diagnostic tests and vaccinations by pig life stage; results from the NRI on-farm swine health study of alternative systems in Iowa; and a listing of additional references and resources.

Biosecurity, Pig Flow, and Introduction of Stock

Biosecurity

You want to maintain your herd free of specific bacterial, viral, and parasitic diseases. Make the most of isolation; isolation from outside the farm and isolation of different groups of pigs on the farm from each other. It's easy to see potential contamination in the trailer used to haul pigs to market, the feed truck, the new load of feeder pigs or gilts, or the curious visitor. Your own farm may not seem like another source of disease, but it can be just that.

- Pigs coming onto your farm are a risk. Make it a calculated risk (see the text below on livestock introduction) or find alternatives.

- Nursery pigs do not have the immune system to handle all the organisms on your farm, so isolate them from older animals other than their sows. This is another reason to keep the age range of the nursery group tight. Make the most of the passive immunity available through the sow's colostrum, which you can enhance through vaccination and feed-back of feces and placentas during gestation. (See the sections on breeding herd and nursery pigs.)

- There is a reason veterinarians put on clean coveralls and disposable boots when they come to your farm. Anyone from off the farm entering your swine pasture, barn, hoop, or swine yard should do the same. Farmers too should have a separate pair of coveralls and boots for dropping pigs off at the sale barn/collection point as well as for visiting areas of high swine traffic.

- If possible locate your swine facilities and pastures away from neighbors' swine units and from roads highly traveled by trucks that have been on other swine farms.

- If you have feed delivered, know where the truck has been prior to coming to your farm. Seriously consider on-farm grinding.

WoW: "Your chore boots should never leave the farm."

- Rats, mice, birds, and even cats can carry swine diseases. You may conclude that rodent control makes cats worth the hazard as long as they don't visit other operations. But cats mostly just make the rodents harder to find. Avoid leaving feed bins and feed wagons uncovered. Clean up feed spills promptly. Bird mesh is standard in conventional curtained buildings, and it can also be installed in hoops and barn windows.

- Do not feed any food scraps or garbage.

We have summarized several tried-and-true strategies for increasing herd health through managing the movement of livestock. A review of these is an opportunity to expand on the reasons for each:

Closed Herd

The pig is the primary source of all infections, so closing your herd to outside introductions is one way to minimize introducing disease. PRRS (Porcine Reproductive and Respiratory Syndrome) is a recent reminder that disease can get into your system by many routes. That includes animals you bring onto the farm – gilts, boars, and feeder pigs. That is the reason a number of alternative swine farmers are going to a "closed herd" in which animals do not routinely enter the system. This isn't to say multi-site systems are a bad idea; you just need to define what is "in the system" and what is outside it.

How do you maintain and improve your genetics in a closed herd? Artificial insemination (AI) is an indispensable tool. AI gives you access to almost any genetics you want to utilize. You can even breed some animals for production and others for maternal characteristics that you want to add to your breeding herd. While there are things to know about AI, it is not rocket science. True, it may mean you spend more time observing your sows and gilts. Most farmers moving to a closed herd consider this an acceptable investment for the increased breeding control and biosecurity. Be sure you purchase semen that is certified free of PRRS.

Additionally, you can improve genetics by selecting within your herd. For example:

- One of the most heritable and most important traits is the behavior of the sow. A good sow, with strong maternal traits will raise more pigs. A good sow has nine pigs,

and raises eight. Since this trait is passed on to your gilts, select your gilts from your best sows. Strong maternal traits in your gilts will improve your "pigs out the door" quicker than selection based purely on genetics.

- Select the fastest growing gilts in your herd. The rate of growth is a highly heritable trait, compared to the number born alive. You will have more pigs out the door in a shorter time than if you purchased gilts that have superior genetics but lack the maternal traits needed to raise most of their pigs.

- Gilt selection should begin in their first week of age. By identifying gilts with an ear notch, you can track which gilts came from your best sows. You can also track the age of the gilt to determine which gilts are growing the fastest. The largest gilts in a group may not be the fastest growing, they may just be older. Identification of the gilts will let you quickly determine the age and how fast the gilt grew.

All-in-All-Out (AIAO)

AIAO gives your animals isolation on the calendar. You farrow a large enough group of sows/gilts together that you can fill your nursery and finishing facilities with just those offspring, or maybe you purchase a similarly-sized group of feeder pigs. (Buy them all from one source, and don't mix them with farm-born pigs.) When that group is ready for market, they all go out the door, and you clean the place up.

First, Close the Herd

Tom and Irene Frantzen, Alta Vista, IA

Tom and Irene Frantzen's farm has evolved over two decades from a fairly diverse conventional operation to a more complex and integrated all-organic system. Tom took the swine herd organic in 1999 and has worked hard to develop the pool of pork producers for the Organic Meat Company (a wholly-owned subsidiary of the CROPP Co-operative). His practice originally was to buy boars and buy open gilts from a single source. Tom and a nearby organic producer shared the boars until 2002.

Production was "terrible," according to Frantzen, and herd health was the major reason. The operation's animals tested positive for both bad strains of swine flu (H_1N_1 and H_3N_2) and for PRRSV (Porcine Reproductive and Respiratory Syndrome Virus), and these diseases were chronically active. As you would expect, there were problems with death loss and uneven litters.

The gilts tested negative for PRRS before they joined the farm's swine herd, however. In hindsight it is clear that every batch of new, PRRS-naive animals caused a flare-up of PRRS that was already present on the farm.

When Tracy Harper began consulting for CROPP Co-op, she told Tom that it was such a classic case she didn't even want to see his lab work. Frantzen says that Harper told him if he closed the herd his problems would stop. By the beginning of 2004, the Frantzen herd was closed.

Closing the herd has led to additional changes that Frantzen calls positive. When he closed the herd, he had on hand a good supply of boars and sows. However, by mid-2006 he was keeping back his own gilts and boars to breed the same herd they came out of. This inbreeding sacrifices hybrid vigor and over time reduces production. Tom had heard that artificial insemination (AI) was difficult (especially with gilts), but in July 2006, after attending a PFI workshop by Harper, he took the plunge. By the end of the year, the operation was at nearly 100 percent AI. Tom says he gets good litters and – most important for the Co-op – he knows exactly when the pigs will be marketable. The change in his routine to check sows more frequently for heat has been worth it. "AI puts me in control," says Tom Frantzen.

- If you have surfaces that you can steam clean, so much the better.

All-in-All-Out – Making it Work
John and Bernie Kenyon, Mallard, IA

John and Bernie Kenyon started farming in 1979 north of Mallard, IA. Their family now includes five children. The operation consists of ridge-till row crop production and a farrow-to-finish hog operation. The initial hog operation was a conventional one and very common for the time, with Cargill feeding floors for finishing pigs, open lot gestation, and raised deck farrowing crates in a heated Morton building.

Several years later hog prices hit an all-time low during the winter of 1998 and throughout most of 1999. At this time John and Bernie had to make a decision. "Do we get out or do we get bigger?" The Kenyons decided to maintain their operation at a size that was comfortable for them and began raising hogs for Niman Ranch in 2000. However, they knew that they would have to make some changes, not only to their facilities but also in the way that their hogs were raised.

So John and Bernie decided to cut their herd back to one group and farrow only two times per year; late April and early November. They also determined that to make this system work more efficiently, they would start pasture farrowing and convert their raised deck farrowing house into a deep-bedded, free-stall farrowing house. Both of these steps were done partly to meet the standards of Niman Ranch Pork Company. Recently they built a hoop building they will use as a farrow-to-finish structure. Through a full year no pasture lot or building is farrowed in more then once. And all facilities are managed as all-in-all-out (AIAO).

The Kenyons finish the majority of their hogs on a Cargill feeding floor and in their new hoop building. The pigs are placed in the Cargill pens by age and size, while the hoop building is used as a farrow-to-finish facility during half of the year and as a finishing building during the other half. Again, all facilities are managed as AIAO.

John and Bernie also decided to make changes to their breeding program, which is now all artificial insemination (AI). With the help of Dr. Kurt Van Hulzen they have improved their vaccination program and currently vaccinate the market hogs for *Mycoplasma* pneumonia, *Salmonella*, ileitis and *Erysipelas*, the last three done orally.

By switching to an AIAO system, closing the herd by using AI, and improving their vaccination program, the Kenyons feel that they have been able to maintain both good herd health and herd production while still meeting Niman Ranch's antibiotic-free standards.

- Hoophouses should be scraped down to the dirt and a layer of ag lime spread before new bedding is added. Some producers only completely clean out the hoops once a year, simply removing wet spots and re-bedding for the other batch. Of course if you clean out a hoop in winter, re-bed immediately to prevent the ground from freezing.

- Leave the cleaned facility empty for at least two weeks to further reduce the pathogen load.

- Holding back the runts and putting them with the next group of pigs is exposing those pigs to the sickest animals of the previous batch. If you keep tail-enders, do so in a spot well away from other production facilities. Visit them last in your round of chores.

- You are going to have many other questions as you move to AIAO. How big a group of sows should I breed to fill my facilities? How many boars do I need? What is the ideal farrowing window? How do I set up a production schedule and work back from there to breeding dates and weaning dates? Any swine vet or Extension swine specialist will have extensive production

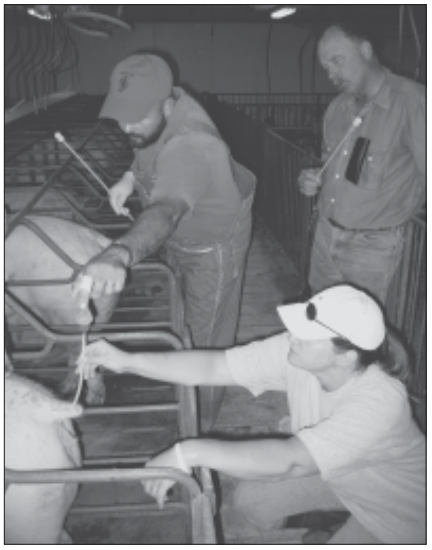
knowledge of pig flow, record keeping and analysis, and business planning. See also the forthcoming *Niche Pork Production Handbook* from Iowa State University Extension (http://www.pnmwg.org).

Separation by Age

There are production reasons to have age and size uniformity in a group of pigs, but there are herd health reasons as well. How do you manage a nursery group when some animals are young enough to have passive immunity from the sow's colostrum and others are vulnerable? Or if some are too young to vaccinate while others are at the stage it should be done? Additionally, maternal antibody decay is organism dependent [1] . That is why timing of vaccination is so critical. If you make up a nursery group or a finishing group from batches of different aged pigs, then the older pigs, which have had time to acquire germs and parasites, share those all at once with the younger pigs. Keep grower pigs away from gilts and dry sows as well.

Production experts suggest a maximum age span of 7-14 days for a group of pigs, and this is also desirable for the health of the herd. There is evidence a one-week spread is best, although that may be difficult to manage practically. However, limiting your sows' exposure to a boar to a maximum of 30 days after they wean, is an easy thing to incorporate that will help reduce the age spread of the pigs. In a 30-day period, a weaned sow will have two opportunities to be bred. Her first opportunity will be 4 to 7 days after weaning. A majority of the sows will cycle in this period. This will be the first group to farrow, and their pigs can be grouped together. The second period the sow has in which to be bred will occur approximately 25 to 30 days after weaning (18 to 21 days after her first cycle). If she does not get pregnant during either opportunity, she is likely not going to get bred. Also, sows that do not get bred within the two cycles after weaning have significantly smaller litters. Leaving a boar in for more than 30 days only results in a bigger spread in your baby pigs, which means more stress and a higher pathogen load.

AI workshop, Research Alliance for Farrowing project.



[1] For example, passive immunity to PRRS lasts about five weeks. Passive immunity to swine influenza persists 9-12 weeks. Every time baby pigs double their weight, their passive antibody levels are reduced by half.

Even if you raise your own gilts, they may have a lower gastrointestinal parasite load or lower parasite immunity than the sows that have been around for years. You can alleviate the infection potential by treating sows and gilts with a wormer one week before they farrow. (Certified organic swine producers can treat breeding stock only before the third trimester.) In any event, you want to avoid a situation in which naive animals are hit immediately with a parasite load from their mother or their environment. Your strategy as an alternative producer is to expose pigs gradually to parasites and microbes as their growing immune systems strengthen.

Separation of Units and Multiple Sites

Separation might seem impractical on a diversified farm where cropping and different livestock enterprises carry on in close proximity, where one hoophouse is 10 feet from the next, or where Cargill-type pens are lined up side-by-side along a concrete pad. Again, you can make sunshine and fresh air work for you. Ten feet of separation is far better than none at all. If you don't fill every Cargill pen, you can break that nose-to-nose contact down the line.

Make sure that a fence is really a fence. This isn't easy with pigs, but all it takes is one little pig wandering all over the operation to share every germ around. There is another equally sinister side when this becomes common, and that is cross-fostering. The wandering pigs find a nursing sow, displace her newborns, and move in. They live high on the hog on milk they don't need, while the sow's piglets starve to death in the straw. At the very least, make sure that nursing

Off-Site Farrowing
Tom and Irene Frantzen, Jerry and Judy Eichenberger, Alta Vista, IA

Managing a closed swine herd does not mean you can't cooperate with neighbors. You just need arrangements that protect the pigs. Tom Frantzen and Jerry Eichenberger, Alta Vista, have such an arrangement. Jerry farrows about half of the pigs that Tom finishes.

Tom explains the real reason they got started was not for herd health reasons but because Tom's time and facilities were stretched. Sows weren't getting bred, and litters were small. Having Jerry farrow now allows Tom to better manage the sows he does have. He has put up a hoophouse facility for breeding and gestation where he can stall-feed sows individually for body condition. His farrowing barn is in use only four times a year now, allowing cool-down periods that reduce disease pressure.

Although Jerry has a background in hogs, he also has a job in town and is not looking to increase his risk. Tom makes it easier for Jerry by owning the sows, which he purchases from an SPF herd, and by providing the organic feed. Jerry provides the farrowing facility and his labor. Eichenberger also owns his own trailer for delivering feeder pigs to the Frantzen farm. He is paid by the delivered pig.

Tom Frantzen notes that "the big hog set-ups *never* farrow and finish on the same site." He believes in some ways it would be better if he could farrow completely off-site as well. However, the one-way flow of pigs from Jerry to Tom has helped to keep the Eichenberger operation relatively free of health problems. The arrangement has allowed changes on the Frantzen farm that have also reduced disease and increased production. As Frantzen says, "I'd rather manage fewer sows with more information."

sows and their litters are securely fenced. A problem like this is minimized with a two-week farrowing window.

As mentioned above, some alternative systems are using multiple sites to help ensure biosecurity. In some cases two farmers accomplish this by working together. One only farrows; the other finishes. The finisher never steps foot in the farrowing-only operation, and vice versa. Together they accomplish something that would take a much larger single operation. Wherever you set the boundaries, do not allow employees to own or contact pigs outside of the system, and establish procedures for movement within the system.

WoW: "Don't let the vet (or feed man, or renderer) wear their boots onto the farm."

Introducing Breeding Stock

If you are not running a closed herd, there are times when animals enter your system. These animals can upset the balance of pathogens and resistance on the farm. Obviously they can bring in disease. But even a clean animal can present problems, because it doesn't necessarily have immunity to the microbial strains found in your operation. At the least, that means that the introduced animal will have to be exposed to, and fight off, each of these pathogen strains. At the worst, bringing a naive animal into a herd that is PRRS-positive may trigger a new flare-up of the disease.

- ❍ Communicate with the source herd veterinarian prior to receiving stock.

- ❍ Purchase from herds tested and known to be free of PRRS virus, infectious ileitis, Mycoplasma pneumonia, swine influenza viruses (SIV, all three

Mix Groups at Your Own Risk
Brice and Melanie Hundling, Breda, IA

Brice and Melanie Hundling are a recently married couple farm near Breda, IA. Brice decided to return home after graduating from Iowa State University in the fall of 2003. He looked into a number of options before deciding to put up hoop buildings to finish hogs for different niche markets. Brice currently has three hoop buildings and one open-front building and has purchased and finished hogs for two different niche market groups, Niman Ranch and Pioneer Pork. He also helps his father with his Berkshire farrow-to-finish operation that markets hogs to Eden Natural.

However in order for Brice to be able to have his buildings full throughout the year, he has had to purchase pigs from multiple feeder pig suppliers. Brice has had pigs from three different suppliers on the farm at one time and has even mixed groups of pigs from two different suppliers in one hoop building. If pigs from different suppliers were mixed, they were always mixed after the pigs weighed 120 lbs, Brice figuring that the pigs were past their most vulnerable stage.

During Brice's first year raising hogs for Niman Ranch he purchased two groups of feeder pigs from two different suppliers. The group started off well, but soon he began to notice that pigs were becoming gaunt and even appeared to go "backwards." After treating a number of the pigs with antibiotics and losing some, he decided to have diagnostic work done. Brice contacted Dr. Kurt Van Hulzen, who posted pigs and sent samples to ISU. The results showed that the pigs were positive for PCV2. However, at that time there was not a good vaccine on the market to protect against PCV2, so Brice was told to do the best he could to control the other vectors that were causing the pigs to die. (PCV2 does not kill pigs by itself but depletes the immune system and allows for other, secondary pathogens to infect the animal, usually resulting in extreme weight loss and eventual death.) Mortality in these groups was extremely high, resulting in significant financial loss. Depending on the diseases present, mixing losses as high as 40% are not uncommon.

(Mixing, continued on next page.)

(Mixing, continued from previous page.)

Today Brice vaccinates for the following diseases to help reduce infections that could be caused by secondary diseases associated with PCV2. All pigs are vaccinated for: *Haemophilus*, *Erysipelas*, *Bordetella* type A & D, *Pasteurella* type A & D, and *Salmonella*. Brice also vaccinates for *Circovirus* when the limited vaccine is available. One of the feeder pig suppliers does vaccinate for *Mycoplasma* pneumonia before the pigs are shipped.

Remember, older pigs spread disease to younger pigs. By commingling pigs of different ages or different sources, you increase the risk of problems. Once you get a disease established on your farm, continuous flow will keep that disease alive. To break that cycle, you have to eventually let the farm/barn/pen sit empty. To help "clean up" his farm after the outbreak, Brice went all-out by hoop (moved all animals out of the hoop before putting new pigs in).

Brice enjoys finishing hogs and looks at it as a major part of his beginning farm operation. He understands that having and occasionally mixing pigs from different feeder pig suppliers is not the best practice. AIAO pigflow is the direction he is heading as soon as he can find a supplier large enough to fill his hoops.

types), infectious rhinitis (*Bordetella* and *Pasteurella*), APP (*Actinobacillus pleuropneumonia*, all serotypes), and that do not show high levels of ascarid parasite eggs by fecal test.

❍ At least three weeks before arrival, gilts and boars coming into a breeding herd should be vaccinated for:

❍ ileitis (*Lawsonia intracellularis*) six weeks prior to entry;

❍ SIV, swine influenza virus, (CH1N1, rH1N1, H3N2);

❍ *Mycoplasma hyopneumoniae*;

❍ PCV (Porcine circovirus).

Vaccinations for SIV, Mycoplasma, and PCV are given two times per year to the whole breeding herd; for example, pre-breeding or pre-farrowing. Follow label instructions.

❍ At a minimum vaccinate new stock for porcine parvovirus (PPV), *Erysipelothrix rhusiopathiae*, *Leptospira canicola*, *L. grippotyphosa*, *L. hardjo*, *L. icterohaemorrhagiae*, and *L. pomona*. These can all be given with one shot. Other vaccinations will depend on your farm's health status. Follow the label directions but generally give two injections of each vaccine. Do not exceed two injections per week. Complete all vaccinations at least 3 weeks prior to exposure to the main herd.

❍ Isolate new breeding stock for a minimum of 60 days at a separate site a minimum of 300 yards (preferably 2 miles) from any other pigs.

❍ Observe the new animals for clinical signs of disease.

❍ Have blood tests and worm examinations 2 weeks after arrival in isolation, and again before moving into the herd. If ascarid parasite eggs are present, deworm the entire group while in isolation.

- Tend to the new animals after you have chored the other pigs. That keeps you from being a carrier of any disease present in the new animals.

- Feed-back placentas and manure from the farm's farrowing site. Feed-back most effectively exposes stock to gastrointestinal pathogens. The most focused approach is careful diagnosis of the diseases on the farm and development of an autogenous vaccine specific to those strains.

- During the 60-day isolation, if vaccinations are complete run the new animals with or across the fence from cull sows for two weeks. This exposes the new stock to your system's disease complement without risking your most valuable animals. However, because the cull sows have broad immunity they may not carry every disease on the farm.

- Keep new and main herd gilts and sows separated during the first month of gestation. This gives you additional time to spot any problems and puts off the stress of integration until after the embryos have firmly attached to the uterus.

Introducing Nursery and Feeder Pigs

Use the all-in-all-out approach, keeping introduced animals separate from all others and moving them all together off the farm to market. Vaccination protocols should be implemented based on your farm's health status and the source of the new pigs. Standard vaccinations: erysipelas, *Mycoplasma*, Circovirus (PCV2), and *Salmonella choleraesuis*. If you have the option, bring the new feeder pigs to a farm that doesn't already have hogs.

Managing PRRS in Alternative Systems

Kurt Van Hulzen, D.V.M.

There is no silver bullet to eliminating or controlling PRRS. The swine industry has been dealing with this disease for decades, using various strategies in various production systems, often with mixed/marginal results. Smaller, niche-type production systems seem to have an advantage due to their smaller populations and longer time between farrowings. The results of the NRI study later in this guide show only one-third of niche producers surveyed were PRRS-positive, even in pig-dense areas and outdoor production systems. The bullets below are good starting points, realizing that these points cannot be implemented on all farms.

- Closed herd
- Good biosecurity
- Isolate incoming animals with a testing protocol before entry into the herd.
- AIAO by group with a tight age spread (2 weeks).
- Segregate groups with as much distance between them as possible.
- Good relationship with a veterinarian
- Adequate diagnostic testing

Breeding Herd

Management

Whether or not you call the sows by name, you know you have a lot invested in your breeding herd. Those pigs are working for you, so keep them happy. Many breeding herd problems (for example, poor conception rates because we don't use enough boars) are created by management and can thus be fixed with changes in management.

Here are general management techniques to follow in breeding and gestating environments to ensure good swine herd health:

- Keep swine in clean, comfortable buildings with good lighting and ventilation.

- Help breeding stock deal with heat by providing plenty of fresh drinking water. Expect boar performance to go down after a spell of heat stress. In hot weather, periodically hose animals down, use automatic sprinklers on a timer, or provide water for wallows. Place wallows in the sun so the animals go out, get wet, then return to the shade to keep cool. It is evaporative cooling that cools the pigs, not the fact that they have water on them all the time. Water is sprayed and allowed to evaporate (cooling the pig) before more water is added. Allow adequate space for animals.

- Hogs can be rotated onto pasture following cattle, but they should not be housed on pasture for at least one year following other hogs.

- Mycotoxins in feed will sap your operation. Corn with insect damage and small grains are particularly vulnerable to molds. Distillation and food industry byproducts actually concentrate mycotoxins in screenings and mids. Most feed testing labs provide a one-week turnaround on results. If you plan to buy a truckload of byproduct, request that it be tested before delivery.

- Ceilings and walls should not be moist because molds may be toxic, cause allergic reactions in pigs, and suppress immunity. Spider webs often are an indicator of poor ventilation that can lead to humidity and molds.

WoW: "Better to spend money on a breeding facility than a finishing facility."

- Keep facilities free of rodents and pests, i.e. rats, mice, birds, cats, dogs, and feed or garbage that could attract rodents, raccoons, and non-farm cats and dogs.

From a biosecurity standpoint, it is best to maintain a closed herd with no boars or breeding stock brought into the herd, thus reducing disease and parasite exposure. To enable a closed herd, artificial insemination (AI) can be used for breeding sows and gilts.[1] Controlling pig flow begins at breeding, by grouping sows to farrow at the same time. This makes it possible to group pigs of the same age, reducing their exposure to disease and making it easier to treat them.

Sows should not be kept beyond their usefulness, whether that is three parities or ten. Reproductive performance usually peaks about the seventh parity. Use your records to track breeding history and litter size.

Keys for reproductive management include:

- Keep your sows and gilts in good condition. Sows and gilts that lack body condition will be harder to get bred and have significantly smaller litters. Sows that are over-conditioned will also have more problems with farrowing, and they often will have a higher death loss due to decreased milk production and laying on pigs. Sow and gilt condition is one of the most critical influences in the productivity of the herd.

- If possible, have a designated breeding area. Whether you are hand breeding or using AI, having an area set up for breeding will make the process easier and more effective.

- Heat check twice daily. For AI, use proper sanitation procedures. Wipe the vulva clean with a paper towel.

- Do not house boars and sows together. If they are together all the time, you can't control the mating (in a natural service system). Even if they are in the same airspace separated by a fence, you'll see what is called "refractory heat." Animals won't stand to be mated, and heat detection will be very difficult.

- For AI, take the female to the male to breed. Heat detection is easy when you bring the sow who hasn't seen (or

WoW: "Smaller groups of farrowing sows: I have found that groups of 10 sows or less in more confined farrowing areas with no more than 5-7 days age spread from oldest to youngest works best."

[1] National Hog Farmer Magazine, Oct. 15, 2004.

smelled) the boar for 12-24 hours to the boar, and the "surprise" factor may make her more receptive. Sows "lock up" almost instantly if they are in heat.

- ❍ You may breed the same sow for one to three days, but be aware that litter size tends to be lower for sows bred three times. Breeding in a pen, where the sow has room to move around, may let you better "read" when she is receptive and accomplish two good services in 24 hours.

- ❍ If sows are group housed, do not mix them between 3 days before and 35 days post breeding to avoid stress and allow embryos to attach.

- ❍ Swine magazines regularly run articles on artificial insemination. Many genetics companies provide information, for example the Online AI Manual of Swine Genetics International. [2] Universities also have put AI information on the Web.

Depop-Repop

If calamity does strike and you get a bad disease on your farm, it may not be easy to get rid of it. For disease control, it may be best to depopulate the herd infected with a specific disease and then repopulate with healthy stock. Commonly referred to as depop-repop, this procedure entails getting rid of all the animals in the sow herd, cleaning and disinfecting the building and facilities over a three-month period, and then buying clean, disease-free sows or gilts.

What diseases can you work through, and for what diseases will it be necessary to use a depop-repop strategy? What will such a strategy cost? It is all based on economics. There are models in the industry that

Depop – or Stepping Back?
Dick & Sharon Thompson, Rex & Lisa Thompson, Boone, IA

Richard (Dick) and Sharon Thompson raise pigs with their son Rex and his wife Lisa on a diversified farm in Boone County. Richard described how they came to make a change in the swine operation. A year or two back "nothing was working right," according to Dick. Some sows had pigs that were too big, some were too little. Young pigs were dying too.

The pig size problem was related to limit-feeding the sows ground corn. In gestation some sows got more than others, so some were over-conditioned while others were under-conditioned. "That's why people buy automatic feeders," comments Dick. When the sows were moved to the farrowing pens, they got self-feeders of the same ground corn, and then they really pigged out on the rich ration.

Thompson says that the operation didn't do a true depopulation. They followed advice they had heard from ISU Extension Swine Specialist Dave Stender to "not buy someone else's problem," and they kept some of their own sows. They didn't sterilize the farrowing barn either, but they did move the sows out of it. "We didn't have a second site," but they put the sows down in the farthest-south row of pens and let the barn just sit for the first time in 25 years.

(Depop-repop continued on next page.)

[2] http://www.swinegenetics.com/ai_manual.htm

(Depop-repop continued from previous page.)

"It isn't that we were so smart," says Dick, but they were forced to use the self feeders that were in the south row. So instead of letting the sows over-condition themselves on ground corn, they filled the self-feeders with a mix of ground ear corn and ground oats, both raised and stored on the farm. Thompson had been told that this ration would not give the gestating and lactating sows enough energy. But when the first litters came out of the south row, the pigs and sows looked great, says Dick.

Now they let the sows self-feed this fiber-rich mix through gestation and nursing. This ration has also cleared up the occasional constipation in farrowing sows. Nursing pigs begin to eat a little as well.

The Thompsons now make sure the sows are vaccinated before farrowing in addition to vaccinating pigs at castration and at 40 lbs. Death loss is way down, reports Dick.

The Thompsons did not strictly follow herd depopulation, but they made a "break" in production that took pressure off them and off the system, a break that allowed them to find a different approach.

tell us what a specific disease is costing in lost productivity, but it is best if the producer has good enough records to document it on their own farm. This is another time to consult with your vet.

Sanitation

Many swine diseases are transferred by fecal-oral route, and a sow is carrying that fecal material on her skin. Before sows are moved into the farrowing facilities, you can simply hose them down and let them air dry. [3] Some producers move sows onto a hog cart in order to hose them down. The pens that sows move to should be kept clean and dry.

Vaccination

To prevent disease, the usage and timing of vaccines is critical, as is the timing of planned exposure and alternative solutions that include probiotics or herbs. Most vaccination programs are not different for antibiotic-free systems and conventional ones. And most vaccination programs are farm-specific. On antibiotic-free farms, vaccinations are additional "insurance," since any rescue antibiotics will push those pigs to a different market.

Sows and gilts should be immunized prior to farrowing to improve piglet health. The animals should be vaccinated to assure transfer of protective maternal antibodies to their pigs as an aid in preventing neonatal diarrhea. Consult with your vet on a vaccination program. Typical vaccinations are:

- Enterotoxigenic strains of *Escherichia coli* producing heat-labile toxin or having the K99, K98YP, or F41 adherence factors;

[3] Cleaning sows before farrowing is particularly useful in herds with a history of *Clostridium*.

- *Clostridium perfringens* type C bacterin and toxoid. (The *E. coli* and *C. perfringens* are given in one shot.);

- *Pasturella multocida* type A and D and *Bordetella bronchiseptica* in herds with rhinitis.

For reproductive health, sows and gilts should also be vaccinated to prevent reproductive failure caused by porcine parvovirus (PPV), *Erysipelothrix rhusiopathiae*, *Leptospira canicola*, *L. grippotyphosa*, *L. hardjo*, *L. icterohaemorrhagiae*, and *L. pomona* (also in one shot). These should be given after farrowing, before re-breeding. Most producers vaccinate sows at weaning. Boars should also receive these vaccinations twice per year.

Sows and boars that were brought onto the farm should have received vaccinations for: ileitis (*Lawsonia*); SIV, swine influenza virus; *Mycoplasma hyopneumoniae*; and PCV (Porcine circovirus) before introduction. Give them a booster shot twice a year or per label directions

Feedback

The breeding herd can be further immunized through exposure by the process referred to as feedback. Feces and/or bedding from farrowing boxes or nests can be fed into pens where the breeding stock is housed (especially feces from scouring pigs), no less than four weeks prior to farrowing to produce maximum colostral antibodies. This interval allows time for antibodies to form and be transferred to colostrum. Mummified fetuses, placentas, and feces from the farrowing area can also be fed every other day for a total of three feedings. Material used for feedback should not be saved or frozen.

In this way, the gestating sows' resistance stays current with the shifting populations of microbes on your farm. Feedback is a simple and inexpensive way to accomplish the same thing you could do by taking samples, culturing them in a lab, and creating an "autogenous" vaccine specific for the pathogens on your farm. While feedback is effective for gastrointestinal pathogens, autogenous vaccines are used to combat respiratory or systemic diseases. Because they use killed organisms, in some cases autogenous vaccines may provide a margin of safety,

Wow: "The old refrigerator you keep vaccines in may cycle colder at night and get below freezing."

Nose-to-nose Inoculation

Introduced gilts can be immunized to low-level pathogens on the farm by running them across the fence from, or with, cull sows. Refer to the earlier section on introduction of stock.

Diagnostics

Diagnostics can improve your herd health. When you use diagnostics you can see what diseases and parasites you currently have in your herd. So what do you test for?

Wow: "Whitewash with hydrated lime."

Sows and gilts should have fecal tests conducted prior to farrowing to check for parasite load. If an infectious disease does break out in the breeding herd, your vet will take blood tests on 10-15 sows to test for PRRSV, parvovirus, H1N1 and H3N2 SIV. Two to three fresh fetuses and placentas should also be submitted for bacteriology, PRRSV PCR, histopathology, and porcine circovirus stains. At the Iowa State University Veterinary Diagnostic Laboratory, samples submitted would routinely be tested for the above organisms plus *Leptospira canicola*.

Parasites

WoW: "Rotate worm-ers."

In systems where allowable, sows in the breeding herd should be treated for parasites one week before farrowing with an injectable ivermectin-type product to kill internal and external parasites. In organic systems, ivermectin is the only synthetic wormer permitted under the National Organic Standards, and only for breeding stock. During the last third of gestation, when ivermectin is also prohibited, a natural wormer may be effective. [4]

Organic farmers may want to fecal test a sampling of sows and gilts pre-farrowing. If many ascarid parasite eggs are found in the samples, the entire breeding herd should be tested. If the entire breeding herd is nearly ascarid free, it may be feasible to remove any infected hogs and to insure replacement only with clean breeding animals into the organic herd. If fecal samples turn out negative, don't stop

[4] PFI on-farm research has not shown natural wormers to be effective, but there are many treatments, dosages, and methods of administration yet to be tested. The more powerful natural wormers carry a risk of injury to livestock if overdosed. Consider sanitation and management your first line of defense against internal parasites.

sampling. Fecal samples should be a routine part of your monitoring program.

Fecal examination of sows and treatment during gestation can protect baby pigs from early exposure, since the eggs need to incubate (embryonate) a minimum of 7-10 days outside the sow before they become infectious. Once pigs of any age ingest infectious eggs, a minimum of 1½-2½ months will be required for the eggs to hatch, the larvae to migrate through many tissues of the body, and newly mature roundworms to inhabit the intestines and produce millions of fertile eggs.

Sanitation is important for parasite control, especially in organic systems. Clean (steam cleaning is ideal), disinfect, and dry the facilities one week before sows are moved in. One example of a disinfectant is 1 pound of lye per 10-20 gallons of hot water. Most commercial disinfectants are acceptable for use on organic farms if diluted after use.[5] Follow cleaning with new bedding that has not come into contact with manure.

Dr. George Beran (r) measures out a botanical oil for an alternative wormer trial.

[5] Check with your certifier or the website of the National Organic Program (www.ams.usda.gov/NOP) for permitted materials.

Farrowing

Management

Many problems are created by management and can thus be fixed with changes in management. For example, diseases that continually cycle from exposed stock to new, naive animals can be stopped by farrowing in batches and AIAO (all-in-all-out) movement of pigs.

In their first hours of life your pigs are most susceptible to microbes and other stress, and they are most likely to benefit from the high-health environment that you create. Pigs are born without body fat reserves, so if they have to shiver to maintain temperature it costs them dearly. The little pigs also have little body mass in proportion to their surface area, making them vulnerable to heat loss from drafts and radiative cooling. Even a ½-mph draft on a newborn pig reduces its Effective Environmental Temperature (EET) by nearly ten degrees.

EET is a function of both the management and construction of the farrowing environment. Fehr and Huhnke calculated that "a nursery that has no drafts, warm walls, dry straw on the floor, and an air temperature of 70ºF. could have a similar effective temperature as a nursery that has drafts, cold walls, a wet concrete floor, and an air temperature of 95ºF." [1] Humidity and moisture are also threats to young pigs. Humidity encourages mold and combines with dust and ammonia to make pigs more susceptible to respiratory diseases. Moisture robs bedding of its insulating value. The table below shows the effect of different environmental conditions on EET. Your best management tool is observation. If young pigs are shivering or piled under the heat lamp, take heed. Ditto if they are spread out far away from the heat.

Farrowing is a critical time for your piglets. If practical given the location of farrowing, disinfect the umbilical cords while they are still wet [2], and make sure piglets are in contact with

WoW: "Lots of bedding is one of the cheapest medicines."

[1] Fehr, R.L., and R.L. Huhnke. 1992. Energy conservation in ventilating and heating swine buildings. Pork Industry Handbook, PIH-92. Iowa State University Extension.

[2] Disinfect navels especially if there is a history of *Streptococcus* infections. Iodine is one effective dip, and there are a variety of others. Alcohol is not very effective.

Air Speed	Change in Effective Temperature [§]
0.5 mph	- 7 F
1.1 mph	- 12 F
3.4 mph	-18 F
Floor Type	**Change in Effective Temperature [§]**
Straw	+ 7 F
Concrete Slats	- 9 F
Wet, Solid Concrete	-9 to -18 F
[§] Based on 45-lb pigs. Source: Mount.[3]	

fresh, clean bedding. It is especially important that piglets also be protected from exposure to diseases until they have received colostrum and the antibodies from the colostrum are in circulation. These antibodies start circulating in the blood approximately 2 hours after nursing. The piglets are most receptive to colostrum in the first three hours after birth. Also, the suckling response must be established in the first 4-6 hours.

Just as we don't like to lie in a dirty bed, the mother sow and her young prefer a clean, dry place to lay. Therefore, while sows and piglets are in farrowing pens the pen and bedding should be kept dry and clean of manure. Lime can be sprinkled over the dunging area to suppress disease-causing bacteria and absorb moisture.

By three days of age baby pigs should be given 200 mg of iron dextran. This is also the typical time for docking tails, but many markets prohibit the practice. If pigs are not crowded or otherwise stressed, tail biting usually is not a problem.

Piglets can be mingled when they jump over the bars at the entrances to their nursing pens. Many farmers commingle

[3] Mount, L.E. 1975. *The assessment of the thermal environment in relation to pig production.* Livestock Production Science. 2(4): 381-392.

into a group lactation setting at about 7-10 days of age. The key concept is to keep farrowing groups together until after weaning to minimize stress and cross-contamination.

Provide sows plenty of feed and water during lactation to maintain body condition. Pigs may be weaned after 6-8 weeks depending on guidelines set by pork markets. This weaning interval is longer than the typical period in conventional production. Nursing longer allows the pigs to gain strength and develop their immune systems. Monitor the nursing sows for loss of condition and provide them plenty of feed and water. Runts should be culled before weaning and/or moved to a separate building or facility. If possible, wean pigs by removing the sows, not the pigs. Allowing pigs to remain in familiar surroundings reduces weaning stress that can depress pigs' immune system and appetite.

Vaccination

Vaccination of suckling/nursery pigs is commonly initiated after 2-3 weeks of age to avoid inactivation by the maternal antibodies. Vaccinations are timed to stimulate the pig's own immune response as the early passive immunity diminishes. See the Nursery and Grower section for recommended vaccinations.

Wow on ideal age grouping: "32 hours for farrowing groups."

Diagnostics

If suckling pigs break with diarrhea and/or other symptoms of disease, get your veterinarian involved. The vet may be able to diagnose the problem immediately, especially if he or she knows something about your swine system. If not, help your vet arrange for 1-2 pigs in the early stage and 1-2 pigs in the late stage of the disease to be necropsied to look for:

- *E. coli* and *Clostridium perfringens* A and C (These three can cause scours at any age.)
- *Coccidia* (can cause scours by five days), and
- *Salmonella* species.

Also, virology of necropsy samples should be done for TGEV, rotavirus, and PRRSV. If the pigs exhibit pneumonia, indicated by labored breathing or "thumping," nasal discharge, and/or coughing, send in a sample of 1-2 early-stage

and 1-2 late-stage pigs. Samples should be necropsied for *P. multocida*, *S. choleraesuis*, HPS, *Actinobaccillus* species, and *Bordetella*. Virology should also be done for PRRSV.

Although frozen samples of aborted and very young pigs may serve, fresh is best. The quality of diagnostic testing is directly correlated with the quality of samples submitted.

Parasites

In systems where applicable, sows in the breeding herd should be treated for parasites one week before farrowing with an injectable ivermectin-type product. In organic systems, where ivermectin is prohibited during the last third of gestation, a natural wormer may be effective.[4] If fecal samples show nursing sows are infected with parasites, sows and pigs should be moved to a clean unit or pasture at less than 2 weeks of age, before the eggs that were shed embryonate.

[4] PFI on-farm research has not shown natural wormers to be effective, but there are many treatments, dosages, and methods of administration yet to be tested. The more powerful natural wormers carry a risk of injury to livestock if overdosed. Consider sanitation and management your first line of defense against internal parasites

Nursery and Grower

Management

Many problems are created by management and can thus be fixed with changes in management. For example, poor economic performance may be improved by something as simple as adjusting feeders.

Nursery pigs are still sensitive to cold temperatures. Limit drafts and use bedding as a blanket. Populate units with enough pigs to generate warmth. By the time pigs enter a finishing unit, humidity is as much a concern as cold.

Overheating becomes an issue as finishing pigs grow. Pigs keep cool by panting and by sprawling on cool surfaces that can conduct away body heat. Add new bedding to keep a layer between the pigs and composting bedding below. On cement, remove the bedding. Make use of the wind, but remember that pigs don't sweat. Fans enhance the wind only at temperatures below the 102º body temperature of the pig. Provide plenty of fresh drinking water. In the hottest weather, hose pigs down, use automatic sprinklers, or provide water for wallows. Crowding contributes to heat stress.

Pig flow continues to be important in this period. Pigs that farrowed within a two-week period should remain together, enabling all-in-all-out management. Continue to avoid contact with pigs of other ages and groups, including the breeding herd.

As in the farrowing building, the nursery should:

- ❍ Be clean and dry bedded
- ❍ Have an intact floor
- ❍ Be well lighted
- ❍ Control for pests

Alternative swine systems are all about creating positive herd health conditions. Most of the environments in your operation lend themselves to that; take advantage.

Wow: "Keep it acid on the inside of the pig and basic on the outside."

Wow: "In the winter, cold and dry is 100x better than warm and moist."

- Sunlight is a great disinfectant. Fresh air is a strategic advantage of alternative systems; use it as "insulation" between units. Within units, avoid both humidity build-up and drafts.

- Bedding keeps manure out of contact by livestock and makes their environment more comfortable. Figure on at least a pound of bedding per pound of gain in a finishing hoop.

- Scatter agricultural limestone after scraping concrete pads and after cleaning bedding out of hoops and barns. Lime makes the environment more alkaline, suppressing gastrointestinal pathogens. Where possible, powerwash and use an acceptable disinfectant between groups of pigs.

- In contrast, acidify feed. This encourages the growth of *Lactobacillus* bacteria, which colonizes the gut lining, promotes motility, and competes with harmful enteric microbes. Acidified feed also inhibits intestinal parasite larvae from maturing.[1] You may be able to purchase acidified feed, or you can make your own. Start with a couple of gallons of cider vinegar per ton. If you are near a dairy plant, waste buttermilk or whey can be a great option.

- Over-crowding increases stress. Your market niche may have specific space requirements for gestation, farrowing, and grower pigs. But you will probably still see a health benefit from going beyond those minimums. Even if your market does not specify animal density, you still should avoid the upper limits of what your facilities can hold. Some producers have found that "backing off" actually resulted in increased production.

- In winter, a population that is right for large pigs may be inadequate for 30-pounders when they first enter a new unit. Instead of starting with a high population to maintain heat, consider temporary hovers or shelters made of

[1] Acidification of swine feeds, especially in nursery and grower pigs, provides two effects to suppress internal parasites. Any infectious eggs in the swine feed, including those of large roundworm (ascarid), *Trichuris*, and modular worm (*Oesophagostomum*) are inhibited from incubating to infectious stages. These parasites, including coccidian (*Balantidium*), if present in early infections of the intestines, may also be inhibited from final development by acidified feed.

hay bales. That way the group won't be overcrowded when the pigs have grown.

Runts should be raised separately, especially in all-in/all-out systems. Dead pigs should be removed immediately. Dry sows should not be kept in close proximity to grower pigs. All this will help improve the herd health of your system.

For growing and finishing hogs on pasture, the pasture should not have had pigs on it for a year, because you don't want to infect them with diseases or parasites from a previous group of pigs. In a pasture system, hogs can fit into a crop rotation. After hogs are removed from the pasture, the remaining vegetation should be mowed. A light disking will help aerate the soil and expose parasite eggs to the sun. This will accelerate inactivation of the eggs, pathogenic bacteria, viruses, and mycoplasma.

For growing and finishing hogs in hoop buildings, the exposure to disease is minimized if bedding is dry on the surface. In this situation, worm eggs and bacteria shake down, and the moist, composting area under the dry surface inactivates many of these pathogens. Therefore, manure should regularly be removed or covered with new, dry bedding. This can be as simple as cutting the twine on another bale, letting the animals spread the bedding themselves.

In open-front buildings, manure should not build up, and the bedding area must be clean and dry. To prevent direct contact between groups of pigs with an age difference of more than three weeks, an empty pen can be left between groups. Loose pigs carry and spread pathogens from animal to animal, so fences should be kept tight.

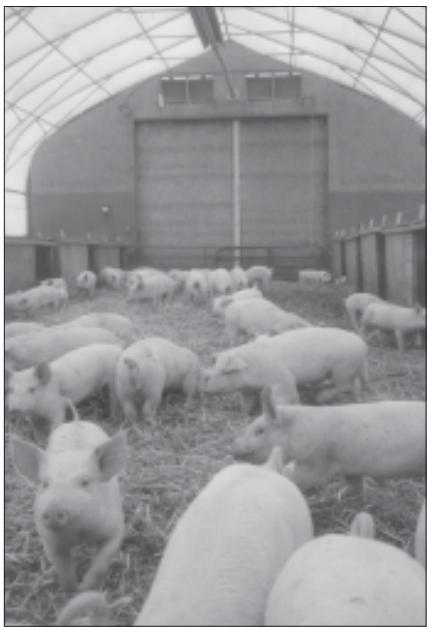
Vaccination

To prevent disease, the usage and timing of vaccines is critical, as is the timing of planned exposure and alternative solutions like probiotics or herbs.

Nursing pigs should be vaccinated with:

- Rhinitis vaccine (*Pasteurella multocida* type A and D) at weeks 1 and 3 if symptoms such as poor growth, twisted snouts, "bullnose," and/or nasal discharge suggest that problems exist;

WoW: "'When you put too many hogs in a hog house, they will die off to what fits.' – I.W. Brogan, a wise farmer and neighbor."



WoW: "Look for abnormal signs in pigs... If they are dog sitting, they might have pneumonia, pleurisies, or salt poisoning. The latter is due to lack of water... Eyes that are red and puffy could signify *E. coli* or insects. Tearing could mean plugged lacrimal ducts, bacterial infections, or be an indicator of air quality." – R.B. Baker, D.V.M.

- *Mycoplasma hyopneumoniae* vaccine. This can be as early as three weeks of age but typically is at 4-6 weeks for the first dose, with the booster two weeks later;

- Erysipelas vaccine. This is done around 8 weeks, when the maternal antibodies diminish;

- A live oral ileitis (*Lawsonia intracellularis*) vaccine in the nursery or finisher if ileitis has been a problem in the herd;

- Live oral *Salmonella choleraesuis* vaccine if septicemic or enteric salmonellosis has been diagnosed recently.

Your vet will be current on the most effective vaccines, which change on a regular basis.

Diagnostics

Nursery pigs should be tested for ascarid (roundworm) eggs, which they may have picked up from their mother or the environment. Fecal samples may be collected in self-sealing plastic bags. (Turn the bag inside-out and place it over your hand like a mitten to grasp the sample, pulling the bag right-side-out over the sample.) Loose stools are most likely to contain parasite eggs. After pigs have left the nest, it is more difficult to tell which pigs a sample came from. Take a number of fecal samples and store below 50 degrees if you cannot submit them immediately to a veterinarian. Any local vet can do fecals. Also, diagnostic labs require that samples be submitted by a vet.

If nursery pigs break with diarrhea and/or other symptoms of disease, get your veterinarian involved. The vet may be able to diagnose the problem immediately, especially if he or she knows something about your swine system. If not, help your vet to arrange for 1-2 pigs in the early stage and 1-2 pigs in the late stage of the disease to be necropsied to look for *E. coli*, *Clostridium perfringens* A and C, *Lawsonia* (ileitis), and *Salmonella* species. Also, necropsy samples should be analyzed for TGEV, rotavirus, and PRRSV. If the pigs exhibit pneumonia, indicated by labored breathing or "thumping," nasal discharge, and/or coughing, 1-2 pigs in both the early and late stages of the disease should be necropsied for *P. multocida*, *S. choleraesuis*, HPS, *Actinobaccillus* species, and *Bordetella*. A virological assay should also be done for PRRSV. However, some diseases are age related. For

example, *E. coli* is seldom a problem in 100-lb pigs, while mycoplasma pneumonia seldom strikes baby pigs.

Parasites

The effects of worms can be quite severe in young pigs and include liver damage, appetite suppression, stunting, and pneumonia and other secondary diseases that are sometimes difficult to connect with the parasite infections that led to them. Be alert for thumping and harsh cough in suckling and nursery pigs. Postmortem examination may be made on any of these that die, checking for pneumonia and white spots on the liver.

Intestinal parasite larvae are inhibited from maturing when feed is acidified. Wormers acceptable to your market, administered at weaning, may also be effective. Especially in organic systems, growing pigs should be tested for parasites at 2-3 months. If fecal samples show eggs are present in "moderate" or "high" numbers, consider using a wormer acceptable to your marketing program before moving pigs to a grower area or pasture.[2]

Two days following treatment, the facilities should be cleaned and disinfected, or pigs should be moved to a new location. To avoid recontamination during disinfection, pigs can be moved into a disinfected trailer to avoid recontamination from other pigs. It is a good procedure to do fecals regularly to identify when pigs are being exposed and to work with your vet to develop a deworming strategy.

Wow: "Just prior to weaning and post weaning, my dad and I always sprinkled rolled oats on the feeding floor. It was like candy to the pigs and healthy for them."

A Tip from a Neighbor – Acidification of Creep Feed
Vic and Cindy Madsen Farm, Audubon, IA

Vic and Cindy Madsen farm near Audubon, Iowa, raising 160 acres of certified organic crops. They market hogs through Niman Ranch Pork Company and direct-market sales. They have finished hogs in hoophouses since 1997.

In 2005, Vic mentioned to Ron Rosmann, his neighbor in the next county, that he had a persistent problem with scours in young pigs. When the pigs went to creep feed, they would seem to overeat and then scour. Even 4-5-week-old pigs that had started to consume some creep feed would scour.

Rosmann told Vic that someone in his Organic Valley (now Organic Prairie) Co-op recommended using apple cider vinegar to acidify feed. This is a practice that Vic Madsen now uses as well. To each ton of creep feed and the first couple of feed batches after weaning, he adds two gallons of five percent apple cider vinegar. Then he continues with one gallon per ton until the pigs reach 75 pounds. He simply pours the vinegar into the small "bag" box on the side of the grinder, where the supplement goes in. Vic reports he is happy with the effect on scouring, and he suspects that acidification has had a positive effect on feed consumption as well.

[2] PFI on-farm research has not shown natural wormers to be effective, but there are many treatments, dosages, and methods of administration yet to be tested. The more powerful natural wormers carry a risk of injury to livestock if overdosed. Consider sanitation and management your first line of defense against internal parasites.

Diagnostics and Veterinary Services

Diagnosing Problems and Responding

"If you have livestock, you're going to have dead stock" is how one producer puts it. Occasional mortalities, while they may provide hints as to weaknesses in your system, are impossible to eliminate completely. An entirely different situation is at hand when significant numbers of stock show the same symptoms at the same time. Careful observation is the key to early detection of symptoms. Take a cough for example. What percentage of pigs are coughing? Is it dry or productive? Do they cough only when they first get up or continually? These types of observations will help determine what interventions can be used (e.g., expectorants for productive coughs).

Of course you need to know what is affecting the pigs. Even if symptoms are classic for a known disease, a necropsy will provide the certainty you need to respond. Cutting open a dead pig is not rocket science, and with a little training you can learn quite a bit from a look inside. But a vet has a more practiced eye, and you also need a vet to submit tissue samples to your state diagnostic laboratory [1] and to help you interpret the report.

If the first time you see that vet is when he/she comes out to do the necropsy, you have a second problem. It means the vet doesn't know your farm and probably doesn't know you. Why is that a problem? Because fixing disease in an alternative swine system isn't going to be like writing out a prescription for an antibiotic and then parting ways. You need a vet who knows your farm, who knows what you do and don't do, and who therefore understands how to help you manage your system for herd health.

The necropsy is often only the first step in a vet's diagnosis of your disease issue. Decision trees to focus on the causative organism(s) are today supplemented by lab tests that evaluate tissues at the molecular level. Blood tests of your sow herd will reveal what diseases they have been exposed

[1] In Iowa, this is the Veterinary Diagnostic Laboratory at Iowa State University's Department of Veterinary Medicine.

Vets' Circle discussion before a field day.

Initial Results from the USDA National Research Initiative (NRI) Project, *Enhancing Small Farm Prosperity: An Integrated Research, Education and Outreach Program for Niche Pork Production*

A parallel project to the SARE project that produced this herd health guide, the NRI project is focusing on production records and herd health. Here are initial findings.

The NRI study surveyed niche pork producers and found that:

- In 52% of the operations, there is a continuous flow of pigs through the system.
- Twenty-three percent reported mixing tail-end pigs with the next group of animals.
- Forty percent of producers surveyed do not isolate incoming animals.

These practices have the potential to facilitate the introduction of new diseases and continuous cycling of disease within a herd.

The "intensive diagnostics" component of the project has worked with 26 producers and their vets to submit tissues from healthy and diseased pigs to the ISU Veterinary Diagnostic Lab. Diseases encountered:

- Parasites were identified in 70% of sows, 52% of nursery pigs, and 83% of finishers, chiefly *Coccidia*, whipworms, and ascarids (roundworms). These data will be further evaluated in the context of flooring types, as parasites are expected to be more of a problem in animals raised on solid floors or dirt.
- Clinical Ileitis (*Lawsonia*) has been identified in ¼ of the herds so far.
- Inclusion body rhinitis will cause sneezing and decreased growth, primarily in suckling pigs, and was identified in 20% of the herds.
- PRRS has been identified in only one-third of niche herds, a much lower rate than in conventional production systems and surprising given the above management statistics.
- Similar to conventionally raised pigs, Post-Weaning Multisystemic Wasting Syndrome, caused by Porcine Circovirus 2 (PCV2), is a common cause of wasting in late nursery and grow/finish pigs and has been identified in one-third of niche herds.
- Pneumonia is the most economically significant disease in conventionally reared pigs, where PRRSV, SIV and *Mycoplasma* are common primary causes. *Mycoplasma* has been detected in one-third of participating niche herds, and more than half of animals from the niche systems have been exposed to swine influenza virus.

to in the past. And often the tissue tests and blood tests come back inconclusive. "Some of this disease organism present, some of that, some of the other." This is where a vet familiar with the farm will help you plug the holes where disease is entering and help you adjust multiple other practices. For example, your pigs cough all through the finishing phase, but you vaccinated for mycoplasma at eight weeks of age. With diagnostics your vet determines it is mycoplasma causing the cough and knows pigs can get infected as early as five weeks of age. So the vaccination is moved to three weeks of age (two weeks prior to exposure).

If you don't already have a relationship with a vet, you aren't the only one. Due to changes in the swine industry, there are fewer independent large-animal veterinarians practicing. Also, some swine producers believe that none of the vets in their area has a good understanding of alternative systems. There is also the feeling that a penny saved on vet bills is a penny earned. If this is you, misfortune is waiting to happen on your farm.

Do not be one of those producers! Whatever it takes, get a working relationship going with a vet or take advantage of your vet's services. There are increasing numbers of veterinarians around who are knowledgeable or at least willing to learn about production systems like yours. Practical Farmers of Iowa or your marketing group will help you find veterinarians you can work with.

Communication Yields Happy Ending
Dan and Lorna Wilson & family, Paullina, Iowa

Dan and Lorna Wilson farm near Paullina with three of their children, at least one of whom plans to remain with the farm. Until three years before we talked to them, Dan's brother Colin and wife Carla were also farming with them. Dan describes himself as a third-generation hog farmer. He and brother Colin flirted with conventional confinement in the 1980s but decided they preferred pasture farrowing. In the 1990s they added a Swedish-style deep-bedded farrowing building and, in 2002, a double-walled greenhouse hoop for farrowing. The Wilsons were among the first swine producers to begin selling to Niman Ranch in 1998.

Several years ago despite the progressive changes on the farm, all was not well. The farm had previously been diagnosed PRRS-positive, and so the Wilsons vaccinated their sows for PRRSV. But in 2001, the vaccine seemed to lose effectiveness, and a single new blood sample came back positive for PRRSV. They had pigs dying, general unthriftiness, and maladies like scours, pneumonia, and strep that could be secondary infections associated with PRRS. To make matters worse, personnel changes at the local veterinary clinic led to them seeing as many as four different vets, none of whom had much connection to the farm.

These vets prescribed antibiotics for the strep and pneumonia, not appreciating that those inputs didn't fit with either the Niman market or the Wilsons' philosophy. As it was, they were treating half their animals just to keep them alive, missing a big part of the premium market. The two Wilson families knew that they needed outside help. They met and drew up a list of possible resources.

On the list was a veterinarian named Kurt Van Hulzen. He had attended a Practical Farmers of Iowa field day on the farm and stayed afterward to socialize and ask questions. His communication style was one reason the Wilsons turned to him. "We saw him as objective and as someone we could freely talk to," says Lorna Wilson. He was outside the situation enough to be objective, but familiar enough with the farm to be truly useful. Dr. Van Hulzen also notes that, in addition to conveying his veterinary "industry knowledge," one of his functions is to learn from producers what works on their farm so he can communicate it to others. But back to the crisis.

The first of many "walk-throughs" produced a written summary of action items from Dr. Van Hulzen. Topping that list were: getting started on a regular records system; whole-herd diagnostics (a representative sample of live pigs went to Ames); checking the feed particle size and feeder adjustment; and a different dosage for their mange treatment. The vaccination schedule was on the list as a second priority. Note that two of the four top priority items were not directly related to herd health but to overall herd management.

(Communication, continued on next page.)

Wow: "If you are building an outdoor run alley out of boards, I found it worked better for the hogs to build it solid instead of leaving a space between the boards. The alternating lines of light and shadow would make the hogs hesitant to walk through it."

Dan Wilson, Dr. Kurt Van Hulzen, Lorna Wilson, and Torray Wilson (l-r).

Wow: "The most severe test of a marriage is sorting pigs and loading sows."

(Communication, continued from previous page.)

The Wilson swine enterprise is a profit center again, and Kurt Van Hulzen is given the credit. From the Wilsons' standpoint, the most valuable changes have been:

1) The record keeping. "It has helped us pinpoint the weak spots, batch by batch," explains Lorna.

2) The vaccination protocol. Based on the ages when different diseases were breaking and the results of the diagnostic lab work (showing no PRRS), Van Hulzen revised the vaccination schedule, focusing particularly on ileitis and *Salmonella*. He also utilized newer combination vaccines that the Wilsons did not know of.

3) "A million little things" relating both to management and herd health. Dan gives the example of a production calendar to help make sure things are done on schedule.

The Wilsons refer to Van Hulzen as "our accountability person." The written reports that follow his walk-throughs always contain a check list of "to-dos." "He will confront you if you don't get things done," says Lorna appreciatively. Van Hulzen can be direct, if necessary, because of the relationship that has developed between him and the Wilsons. "Kurt also gave us a little bit of energy. He'd say 'I believe you guys can do this!'"

Wow: "For a sorting pen, remember a pig will always want to go out the way he came in. Build your exit alley so you use the same entrance by way of a swinging door. The pig thinks he has escaped, only to find out too late that he is going up the alley to the livestock trailer."

Dr. Van Hulzen says he makes a point of showing the economic outcome of changes. He sees no real problem in adapting basic herd health fundamentals to sustainable swine systems. He also notes that "Eighty percent of what I do is management," not strictly herd health. He and some other veterinarians have fallen into the role of management consultant because there is a need, because they are on the farm regularly, and because people are accustomed to paying for the service. Integrated swine operations provide their own staff management consultants. There are also excellent public sector management consultants, for example, in the Extension Service, but their resources are stretched thin.

Van Hulzen calls himself a consulting vet, as distinct from a local veterinarian. He and the Wilsons also work with a local vet for some laboratory diagnostics and other services. In this three-cornered collaboration, Kurt combines technical knowledge and an understanding of the Wilsons' system, the local veterinarian is handy for specific services, and the Wilsons hold up their end, posting "every dead pig" (their instructions) and emailing digital photos of suspicious cases to Dr. Van Hulzen.

The system that has evolved is one that involves producers as active partners in maintaining herd health and productivity, that furnishes business opportunities to a local veterinarian, and that allows Kurt Van Hulzen to drive 1,000 miles per week while providing meaningful assistance to the Wilsons and to other farmers. It is an example of the kind of problem solving that comes naturally with good communication.

Vaccinations and Tests

Vaccination in Perspective

R.B. Baker, D.V.M., Senior Clinician, Veterinary Diagnostic and Production Medicine, Iowa State University

The use of vaccines is widely accepted as an economically viable tool for disease prevention in both human and animal medicine. There are many disease agents that have been quelled since the first vaccines were conceived in the late 19th century. Many advances have been made since that era, but the number of unconquered disease pathogens in the pork industry continues to escalate with re-emerging and newly emerging disease agents. The value or success of a vaccine often depends on the disease agent more than modern vaccinology methods. Many agents do not make good vaccine candidates because of the wide variety of methods employed by these microbes to successfully avoid or alter the immune response.

Pseudorabies is a good example. The industry had remarkable vaccine success reducing the impact of disease, but because the virus was capable of life-long infection (carrier state), our vaccines could not prevent spread of the virus or prevent infection. Eradication was accomplished by development of a differential test and marker vaccines, which allowed detection of infected versus vaccinated animals. This combination finally allowed complete eradication of Pseudorabies from commercial pigs.

The limitations of modern vaccines are apparent. They do not prevent infectious agents from entering our farms and only limit the expression of disease. In some cases vaccines may actually exacerbate disease severity and increase mortalities. Swine influenza is the best example of this. As long as the vaccine virus antigens are antigenically similar to field isolates these vaccines are highly effective. Unfortunately influenza viruses are very adept when it comes to altering their genetic code. As the field viruses change

(Vaccines, continued on page 4.)

	APP, *Actinobacillus* sp.	Ascarid roundworms	*Bordetella bronchiseptica*	*Clostridium perfringens*	Coccidia	*E. coli*	*erysipelas, Erysipelothrix rhusiopathiae*	HPS, *Haemophilus parasuis*	Ileitis, *Lawsonia intracellularis*	*Leptospira canicola*	*Leptospira grippotyphosa*	
Breeding Stock Before Introduction												
Test for	II-8	II-8	II-8						II-7			
Troubleshoot												
Vaccinate/Treat									II-8 III-5			
Breeding Stock After Introduction												
Test for		II-8										
Troubleshoot												
Vaccinate/Treat		II-8					II-8		III-5	II-8	II-8	
Breeding Stock – Sows												
Test for		III-6										
Troubleshoot										III-6		
Vaccinate/Treat		II-6 III-6 IV-4	III-5	III-5		III-4	III-5		III-5	III-5	III-5	
Breeding Stock – Boars												
Test for												
Troubleshoot												
Vaccinate/Treat							III-5		III-5	III-5	III-5	
Newborn												
Test for												
Troubleshoot	IV-4		IV-4	IV-3	IV-3	IV-3		IV-4				
Vaccinate/Treat			V-3				V-4		V-4			
Nursery												
Test for		V-4										
Troubleshoot	V-4	V-5	V-4	V-4	IV-3	V-4		V-4	V-4			
Vaccinate/Treat		V-5	V-3				V-4		V-4			
Grower/Finisher												
Test for												
Troubleshoot	V-4	V-5	V-4	V-4		V-4		V-4	V-4			
Vaccinate/Treat									V-4			
Nursery/Grower/Finisher at Introduction												
Test for												
Troubleshoot												
Vaccinate/Treat							II-9					

Section and page numbers in the table refer to text in the guide. This is background information and may not apply completely to your situation. Please check with your veterinarian before taking action.

	Leptospira hardjo	*Leptospira icterohaemorrhagiae*	*Leptospira pomona*	*Mycoplasma hyopneumoniae*	*Pasturella multocida*	PCV, porcine circovirus	PRRSV, porcine reproductive and respiratory syndrome virus	PPV, porcine parvovirus	Rhinitis, *Pasteurella multocida* and *Bordetella bronchiseptica*	Rotavirus	*Salmonella choleraesuis*	SIV, Swine Influenza Virus, H1N1 and H3N2	TGEV, Transmissible Gastroenteritis Virus
				II-7	II-8		II-7		II-8			II-7	
				II-8 III-5		II-8 III-5						II-8 III-5	
	II-8	II-8	II-8	III-5		III-5		II-8				III-5	
						III-6	III-6	III-6				III-6	
	III-5	III-5	III-5	II-8 III-5	III-5	II-8 III-5		III-5	III-5			II-8 III-5	
	III-5	III-5	III-5	II-8 III-5		II-8 III-5		III-5				II-8 III-5	
					IV-4		IV-3 IV-4			IV-3	IV-3 IV-4		IV-3
				V-4	V-3				V-3		V-4		
					V-4		V-4			V-4	V-4		V-4
				V-4	V-3				V-3		V-4		
				V-5	V-4		V-4			V-4	V-4		V-4
				II-9		II-9					II-9		

(Vaccines, continued from page 1.)

(sometimes rapidly) things can go badly for vaccinated pigs or suckling piglets nursing vaccinated sows.

The take home message is; a vaccine or vaccines will not replace biosecurity or good management practices. To be cost effective, vaccination programs must be developed based on individual product effectiveness and diagnostic knowledge of the agents present on the farm and surrounding geographic area. It is extremely rare that a vaccine offers a complete “insurance” opportunity. Many times a vaccine may only have a short need of use. This is especially the case with certain bacterial diseases. Just like the viruses, many of the bacterial agents affecting swine do not make good vaccines. The vaccines often lack effectiveness, and once herd immunity through natural exposure “catches up,” there is little need to continue the vaccination program.

Only through knowledge of each specific agent’s natural life cycle along with the assistance of good diagnostics can a vaccine strategy be logically determined. Veterinarians are uniquely trained to provide vaccine advice on which products to use, what age groups should receive them, their effectiveness, and how long a vaccine should remain on a farm. The vaccine list compiled in this section of the guide is incomplete and will soon be outdated. Consult your veterinarian for current advice.

Quick View Pathologies Table

Disease	Cause	Ages affected	Transmission	
Porcine Reproductive and Respiratory Syndrome: PRRS	PRRS virus. Many strains with immune variation.	"In gestation: stillborn or weak pigs. Baby pigs: thumping breathing, pneumonia. Weanlings: depressed growth, weakness. Growers: Other diseases enhanced, depressed. Adults: lower fertility, abortion, lack milk."	"Infected swine shed to ½ year Virus spreads from pig to pig contact; contaminated environments. May be airborne"	
Postweaning Multisystemic Wasting Syndrome: PMWS	Circovirus Type 2: PCV 2. Found worldwide.	"Mostly nursery pigs when colostral antibodies wane. Increased susceptibility to other diseases. Older swine: chronic wasting, poor growth. Many show no illness. Persistent shedding."	Direct contact; possibly in semen. Environmental contact. Persists in infected swine.	
Porcine Proliferative Enteritis. Ileitis.	Bacterial: *Lawsonia intracellularis*	Increasing prevalence in weanling pigs: diarrhea, bloody and necrotic enteritis (inflamation of intestines). Grow-finish and young breeders in conventional production, younger (3-6 week of age) in antibiotic free production.	Oral contact with infected feces.	
Swine Dysentery: Bloody Scours.	Bacterial: *Brachyspira hyodysenteriae*	All ages. Early signs: soft feces, fever, maybe death. Develop to bloody, mucoidal diarrhea. Dehydrate weak, gaunt, emaciation.	Oral contact with infected feces.	
Pleuropneumonia	Bacterial: *Actinobacillus pleuropneumoniae*	Primarily under 6 months. Sudden onset, rapid spread. Pneumonia with thumps, bloody froth, nasal discharge. Fever. Adults may abort. Usually short course.	Nose to nose contact. Coughing spreads airborne.	
Enteric Colibacillosis	Bacterial: Enterotoxigenic strains of *E. coli*	Nursing and nursery pigs: profuse, watery diarrhea, dehydration, acidosis. Death.	Oral contact with infected feces. Spreads rapidly.	
Swine Influenza. Pig Flu.	Type A influenza virus CH1N1, rH1N1, H3N2	Affects all ages; rapid spread in herd. Depression, fever, anorexia, cough, weakness, mucus from eyes and nose. Rapid recovery, but stunting, low fertility.	Nose-to-nose and airborne contact. Outbreaks most common in cold weather. Carrier state to three months. May cycle in larger herds.	
Mycoplasmal Pneumonia	Caused by *Mycoplasma hyopneumoniae.* Often incorrectly called virus pneumonia.	All ages. In well maintained herds largely subclinical or low grade cough. In close confinement, slow growth, poor feed use.	Nose-to-nose and airborne contact. More severe in poor ventilation and poor husbandry.	
Porcine Parvovirus Infection	Caused by parvovirus, usually infecting bred gilts, and their fetuses before 10 days gestation, fetal death.	All ages infected-most sows infected before second gestation. Fetuses infected after 70 days usually survive.	Boars shed through semen. Transmission oronasal and transplacental.	
***Streptococcus suis* Infection**	Bacterial: *Streptococcus suis.* Over 35 serotypes and many subtypes; serotype 2 predominates and increasing.	Most healthy pigs carry. Piglets infected during farrowing or nursing. All non-infected swine are susceptible.	"Direct or environmental exposure. Fomites and flies transmit."	
***Clostridium perfringens* Type C Enteritis**	Bacterial; *C. perfringens* Type C	Baby pigs, usually first week. Sudden onset of bloody diarrhea. Death.	Oral contact with infected feces. Contaminated environment.	
Leptospirosis	Bacterial: *Leptospira pomona, canicola, grippotyphosa, hardjo, icterohaemorrhagiae*, common, and *bratislava* uncommon.	Chronic infection is sows lowers fertility. Infection during gestation-abortion	Oral exposure to urine. Infected sows shed long time. Rodents carry.	
***Salmonella* Infection. Occurs very widely**	*Salmonella cholerasui*;many other Salmonella infections inapparent.	Baby pigs & growers – clinical infections. Other serotypes affect all ages, multiply rapidly, subclinical.	Oral from infected feces, contaminated environments.	
External Parasites: Mange and Lousiness	"Mange mite: Sarcoptes scabies Hog Lice: Haematopinus suis"	All ages. Spread through herds following entry. Mites cause intense itching and crust especially in ears. Lice suck blood, invade ears, flanks.	Introduced into herds with infected stock. Contaminated environments.	
Internal Parasites: Ascarids and whipworms major	"*Ascaris suum*: large roundworm *Trichuris suis*: whipworm"	Young pigs: ascarids retard growth, white spots on liver, difficult breathing. Whipworms cause diarrhea, unthriftiness.	Ascarid embryonated eggs ingested; larvae migrate in body, mature in intestine. Whipworm embryonated eggs ingested. Mature and embed in large intestine.	

	Occurrence	Seriousness	Human Hazard	Prevention	Treatment
	Throughout U.S., Canada, Europe.	The major swine disease at this time in the U.S.	Virus not infectious to people. Infected swine more susceptible to other transmissible diseases.	Ensure incoming stock free. Test on arrival and 2 months. Wash and disinfect. Vaccines can reduce losses. Herd-specific autogenous vaccination.	No effective therapy. Depopulate/repopulate nuresery. Test and remove. Herd closure. All in-all out and segregated early weaning control spread.
	Spreading in U.S.	Most serious in nursery pigs: anemia, diarrhea, death. Older pigs more chronic, poor weight gain.	Virus not infectious to people. May be intercurrent infection (simultaneous with another disease).	Biosecurity and sanitation. Control stress: pig density, temperature, air. Vaccinate pigs at 3-6 weeks; may vaccinate sows.	No specific treatment. Control concurrent disease. Isolate infected pigs and disinfect pens.
	A common infection	Mostly mild, but increased with no antibiotic use.	Not infectious to people.	Live, avirulent vaccine in water at 6 week or earlier is highly effective.	No treatment in herds with no antibiotic use. Antibiotics if isolate.
	A common infection	A serious disease with deaths and sequelae (aftereffects), long shedding	Not infectious to people	Closed herd. Biosecurity. Cleanliness and sanitation. Keep free of mice/rodents.	No treatment in herds with no antibiotic use. Antibiotics if isolate.
	Widespread. Tends to be milder in chronic infected herds.	Serious with high morbidity and mortality. Chronic depressed growth.	Not infectious to people.	Closed herd. Biosecurity. Survivors remain carriers. SEW and AIAO. Sanitation. Vaccine effectiveness limited.	No specific treatment without antibiotics.
	Widespread.	Sudden death in severe infections. Others recover.	Porcine pathogenic strain different from human.	Vaccinate sows with specific type vaccine 2-3 weeks pre-farrow. Control pig environment. Acidify feed and water.	Antibiotics if isolate. Restore fluids and electrolytes
	Widespread in Midwestern U.S. and much of the world.	Usually rapid spread and recovery: Death from secondary infection.	Low transmissibility of classic virus; bird strains may mix with swine strains and infect people.	Closed herds and biosecurity. Keep free of stress, crowding. Diet is important. Vaccinate sows 1-2 weeks before breeding, pig vaccines have limited effect.	No effective treatment. If secondary infections, may isolate and treat.
	Very widespread.	Most severe at initial entry. Dry cough may occur in adults when roused.	Not infectious to people.	May vaccinate sows 2 weeks pre-farrowing or growers at 3-6 weeks. SEW and AIAO. Closed herds.	Control density. Antibiotics if isolate and treat.
	Very widespread.	Fetal infection with mixed number of dead fetuses at farrowing.	Not infectious to people.	Avoid infected boars or gilts. Effective inactivated vaccine usually combined with Leptospira: sows 5 & 2 weeks pre-farrow, pigs at weaning.	Diagnose by fluorescent antibody or virus isolation from fetuses. Serological tests.
	Very widespread.	Most swine herds infected. Becoming more serious as clinical disease.	Human cases uncommon, but serious, meningitis, septicemia, endocarditis.	Commercial or autogenous vaccines if herd problems, 7 & 21 days old. Most infections subclinical.	Meningitis, arthritis with swollen joints, endocarditis treated with antibiotics if isolated.
	Common in Midwest U.S. tends to reoccur on same farm.	Nursing pigs: usually fatal septicemia (blood infection).	Rarely reported enteric disease or gas gangrene.	Vaccinate sows with type-specific bacterin-toxoid 5 & 2 weeks pre-farrow, pigs within 2 hours of birth.	Ineffective in sick pigs. Antitoxin halts acute spread.
	Uncommon unless ponds accessible, or infected rodents.	Often inapparent except abortion in initial infection in sows.	Definite hazard or contact with infected urine or water.	Vaccinate susceptible sows 5 & 2 weeks pre-farrow. Depopulate swine and wildlife.	Not commonly done in swine. Antibiotics in livestock and people.
	Very common infections, carriers and cycle in herds.	Disease in swine mostly *S. cholerasuis*; swine are source of human infections.	*S. cholerasuis* uncommon, serious in people. Other types: enteritis to sepsis.	Swine spread by contact, stress enhances. Sanitation and disinfection with AIAO. Effective oral vaccine 6-8 weeks old.	In swine, isolate and antibiotics. Cleanliness, sanitation and cooking protect people.
	Common where sanitation and environment not attended.	Depress growth and feed intake. Severity corresponds to extent of infestation.	Nuisance only.	Avoid introduction. Control with good husbandry.	Effective parasiticides. Depopulate and increase cleanliness.
	Common where sanitation and environment not attended or infected stock are brought in.	Cause unthriftiness, poor growth rate. May be diarrhea.	Ascarid larval infection in people uncommon. Whipworms do not infect people.	Avoid introduction. Control swine environment. Use AIAO, SEW.	Effective anthelmintics. Depopulate and increase cleanliness.

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Alternative Herd Health Materials in Use [§]

Material	Possible Action	Possible Use
Acidified feed & water	similar to probiotics plus suppress internal parasites	all growth stages
Chicken egg antibodies	Antibodies from inoculated eggs	specific gastrointestinal diseases
Oil of oregano	Carvacrol and thymol are antimicrobial	protects gut from gastrointestinal disease organisms
Fermented liquid feed	Lowers gut pH, promotes *Lactobacillus*	
Mannan oligosaccharides	Mannan inhibits *E. coli* & *Salmonella*, cytokine release may strengthen immune response	
Milk products	Lactose is converted to lactic acid, lowers gut pH	to suppress *E. coli* and others
Prebiotics	Nondigestible nutrients stimulate specific gut bacteria	
Probiotics	Beneficial microbes like *Lactobacillus*. Protect gut from gastrointestinal disease organisms	nursery, grower
Zinc oxide, magnesium oxide, copper	antimicrobial	protects gut from gastrointestinal disease organisms

[§] These materials have not necessarily been thoroughly tested, or the results of testing may have been variable. Some producers have found them useful in certain situations, while others have not or have decided their cost outweighs the benefits.

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ATTRA - National Sustainable Agriculture Information Service.
- *Hog Production Alternatives*
  http://attra.ncat.org/attra-pub/summaries/hog.html
  This publication addresses the two different directions in which hog production is currently moving: 1) contracting with large-scale vertical integrators (producers/packers/processors linked from farrowing to packing to the retail counter), and 2) sustainable production of a smaller number of hogs sold through alternative markets. The aspects of sustainable hog production discussed in this publication include alternative niche marketing, breed selection, alternative feeds, waste management, odor control, health concerns, and humane treatment.
- *Considerations in Organic Hog Production*
  http://attra.ncat.org/attra-pub/summaries/omhog.html
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- Treatments for diarrhoea in animals include antibiotics, antisecretory drugs, adsorbents and fluid therapy. Fluid therapy, especially by the oral route, is rational, is effective in both bacterial and viral diarrhoea, and should be the treatment of first choice.

Canadian Research and Development Centre for Probiotics.
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- http://www.ingentaconnect.com/content/cup/ahr/2005/00000006/00000001/art00002;jsessionid=ehpiagpj54d9b.alice?format=print
- New vaccination strategies include the oral immunization of piglets with live avirulent *E. coli* strains carrying the fimbrial adhesins or oral administration of purified F4 (K88) fimbriae. Other approaches to control this disease include supplementation of the feed with egg yolk antibodies from chickens immunized with F4 or F18 adhesins, breeding of F18- and F4-resistant animals, supplementation with zinc and/or spray-dried plasma, dietary acidification, phage therapy, or the use of probiotics.

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