

2016 Group Sow Housing Seminar
Dealing with Aggression and Best Mixing Practices

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(Edited for clarity and conciseness)

Jennifer: I'm a researcher at Prairie Swine Centre in Saskatoon but I'm very happy to be back in Ontario. I did my PhD at the University of Guelph and worked at Conestoga Meat Packers so am very familiar with this location and certainly I still work with some of those producers today in group housing.

Speaking about aggression, yes, this is one of the most talked about issue in relation to group sow housing and then I'd like to say yes there's still more room for research on this but there are a lot of things we already know that we can do to reduce aggression and manage this problem in group housed sows.

(Slide 2) So a brief outline for tonight, starting with aggression in sows, when, how and why, a little background then how to reduce aggression in pens, so focusing on the feeding systems and space allowances and the design of the pen system. So that's in a general context of gestation but then focusing more specifically on the mixing time because there are two different ways of looking at aggression in groups. Certainly mixing is a very specific time and we know exactly why they're fighting and what they're fighting about but then there's a more general aggression that occurs in the pen throughout gestation that we also want to study and understand.

We will look at when do mix sows for groups and how do we manage those social groupings and then what can we do to the physical environment to reduce aggression at mixing? Also, the need for some relief pens to manage animals that are not coping well in the system.

(Slide 3) There are two main periods that we identify and you see them talked about in some research. Mixing aggression, so clearly sows are mixed and it's most intense in those first 48 hours. That occurs regardless of your management system. And then there's the ongoing aggression after that social order is established, which involves more the competition for resources. So what's the environment of the pen like and are sows actively competing for specific resources such as food, feeder access or specific laying areas and of course these are both going to vary with management a great deal.

(Slide 4) Let's go back to the basics. Why are sows fighting? Certainly in mixing we recognize they're unfamiliar individuals. Say if you're an ongoing group housing system, so they might be somewhat familiar from a past parity but they're forming a new group and we need to have some sort of dominance hierarchy which will be established.

So, as a behaviourist I like to think of it, well, how do these animals evolve to cope and what is a social group of pigs expected to do in the wild? Certainly pigs don't mix in the wild. There's a sow or a group of sows and their offspring and it's her sisters, aunts and related pigs and their offspring and they will never group with another group. The only interaction they will have with another unfamiliar animal would be with the boars. Young males would leave that group and then establish bonds with other unfamiliar groups of females. That's the only real case of mixing in the wild. Whereas in confinement, you're forming groups and we're placing them in a specific area and so they've got to deal with that but there are ways that we can help them cope.

Yes, as I say, familiarity is one of the most acknowledged traits, so the more sows are familiar with one another, the less aggression you're going to see but certainly you can influence their previous experience or there will be a genetic component and a very individual component. Some animals have a different personality type that may be a more aggressive trait, so certainly now genetics companies are looking at selecting for animals that are more adapted to group systems. And then certainly the pen design for a mixing pen. What does that look like? Certainly some barns use a specific mixing pen that has a greater space allowance, better flooring perhaps to accommodate that group formation in the first 48 hours and then they go into the gestation pen once that aggression has passed and they've established a group. Feeding at this time is important. Odors have been used and not very successfully. Group size and competition all factor into that.

(Slide 5) Looking further along gestation. They're fighting more to access resources, such as specific space, food and drink access is what sows are competing for in the longer term. So if you have a really well set up gestation system, you might not see any aggression throughout gestation if sows can get even access to resources.

There is aggression among wild pigs but during that gestation period they have unlimited space and access to resources in a broad area. They're not competing over access to a specific feeder space, so I don't really think there is a lot of aggression that would occur throughout gestation in sows in the wild.

Some of the management tools we'll be talking about are the variation in feeding system, the space allowances, pen layout and design and group size. We'll start with talking about these gestation factors and then I'll move on to specifically the mixing procedures and what we can do with mixing. During gestation the kind of resources that are available to sows are going to influence if they fight or not.

(Slide 6) So briefly going over all the different feeding systems that are out there, just a very rough estimate. There's a huge variety so we will look at the main feeding systems. It could be a floor fed system, a

shoulder stall or short stall system, electronic sow feeders, the new free access ESF system, or a free access stall system. That's actually the Prairie Swine Centre research barn that I work in on a regular basis.

(Slide 7) When we discuss these systems, often we describe these floor feeding systems and shoulder stall systems as a competitive system because the feed is spread in an open area and sows are actively competing for that feed with the dominant ones being able to displace an individual and can access more feed.

(Slide 8) And then the non-competitive systems they can't actually gain feed by competing but they can certainly gain access to the feeder this way. So there still is competition but it's not directly for feed that's available, it's for access to the feeding space or to preferred laying areas. This would include the electronic feeder systems because a sow has to actually be in the feeder to access her feed.

In a free access stall system, there's a stall there for every sow and so feed is dropped as it would be in a regular stall system. Every sow is getting her ration there and no competing with anyone to get more.

(Slide 9) One of the newer options, certainly we've got some examples here on display is what we call a free access ESF system such as the Gestal. So it's much like a free access stall system but sows have their RFID tags much like an electronic sow feeder and so many sows will be able to access that feeder and have a specific ration dropped on a daily basis. So it's kind of a hybrid between ESF and free access stalls.

(Slide 10) These systems all influence the amount of competition that happens between sows in combination with the design of your pen and the layout. But I got this article sent to me the other day from the National Hog Farmer and somebody reporting on the transition and helping staff to adjust to the transition to group sow housing. Certainly I appreciated the points in the article but they were talking about a specific system. So if you weren't really aware that this is information related to a very specific housing system, you might think that this applies to all housing systems when in fact it does not. The headline was "Before our farm transitions to group housing, it's best for all employees to mentally prepare that it will be different." So yes, not arguing with that and clearly it is a different management system. Stalls are much more regular in terms of their management. You've got your 2x7 crate and a specific sow is there and you can watch what she's eating and manage her health very readily and so all staff know what's involved in that. But moving to groups, it's a different picture.

(Slide 11) My point here is to read these articles with care and try and recognize which of these points may apply to all systems and which may apply to a very specific system. Yes, important to know which sows not to put in pens. I would say that's got to be true of all systems. There's some sows who may not be that well suited to be going into

groups and if you're new to group housing I would say primarily some older sows or lame individuals, yeah, they're going to be challenged in any group situation. Some animals are not ideal to go into groups.

In this article they said "no exception. Gilts go with gilts." I think that's a nice general rule if you can manage it in your herd flow but at Prairie Swine, our free access stall system we mix gilts and all parity sows and have no issues with that. Whereas this they were speaking specifically about a floor feeding system or a shoulder stall system, so a competitive feeding system where it's very important to have a homogeneous group where mixing different sizes and parities of sows, you're going to see some of those smaller animals at a disadvantage. So in their system, certainly a better idea to put gilts with gilts.

Group the animals by body condition and keep younger parity sows together. That's a requirement if you're having a competitive feeding system but not so much if it's one of these ESF or free access systems.

Taking into consideration breeding dates and gestation lengths. Well certainly we're going to do that regardless of the system. And then watching older parity sows that are going into pens for the first time because you cannot backflow pens or re-mix pens. So certainly, yes, I would watch your older sows carefully because some of them may not adapt to a group housing system. This is always one of the difficult points if you're transitioning to group is how to help those older sows adjust. Often it's easier to just cull a lot of the older individuals and replace them with younger sows. But in terms of back filling pens or re-mixing pens, again, depending on your system you might have a dynamic flow through your gestation pen, in which case yes, you will not have to go through a whole parity before you can make use of that space again. Again, I just wanted to highlight this because we have to interpret a lot of the information that comes through media carefully.

(Slide 12) I would say space allowance is if not the most, one of the most critical factors. What can be achieved in a renovation with the existing space that you have? Certainly I have some results from a study that looked at group gestation with too little space and you can see the actual impact a few slides later. So yeah, don't provide too little space. We still don't have all the science on this. Certainly we know 16 square feet for mature sows is too small and 24 square feet is definitely sufficient, but in between those two sizes it's very hard and it also depends on the system you're running. So there is some science lacking and it's hard to study everything. It depends on the size of the study and the number of factors you're controlling for.

If we look to Europe where they've been in groups for some time now, they have minimum space requirements of 18 square feet for gilts and 24 square feet for sows. I would say those are definitely quite adequate space allowances. For smaller groups, say less than six sows, they required 10% additional space because in that close confinement it's

hard for sows to distance themselves from an aggressor. So in a very small group of that size, you need that additional space allowance but once you get to a larger group, say over 40 sows per pen, you can go to a 10% less space. Sows will be huddled in one area, they'll have a laying area, there will be more free space available. So yeah, those recommendations are quite well established. And then we've got some good guidelines in our new code of practice.

(Slide 13) Here's the table from the back of our code of practice and it's not a requirement, it's a recommendation but I think they're very sound and they're based on science. So minimum space allowance for gilts and sows, looking specifically at partially slatted systems. And sows, say, going anywhere from 19 square feet per animal to 24 square feet and so a lot of people look at this and say, "Well, it's a range. What should I be targeting?" That again depends on your system and in general I would say with the small groups you would go with the large end of this category and with a larger group you can go with the smaller allowances typically but I think they're very solid guidelines.

(Slide 14) This was some research done in Minnesota by Johnstone and Li a couple of years ago. They'd been working with a commercial barn and they documented sow productivity and they asked the producer to make some renovations. So they made renovations but they didn't want to use any more space than they were already using with their existing stall footprint. They had compared sows that were managed in stalls in their existing barn, 326 sows in standard 24-inch stalls. They made some large pens where they took out 13 stalls on each side of the alleyway and made 13 different pens and then they had some small pens with six sows per pen and 156 sows in total.

(Slide 15) This is what the final production numbers looked like. The sows that were in larger pens had less weight gain during their gestation period. Stalls and small pens were fairly similar. Their farrowing rate was significantly reduced and there was a high number of removals from those large pens. So these sows were NIP or they had mortalities. So yes, clearly their stalls were showing their best production figures and the small pens were not doing that terribly but not that well either. This is a bad example of group sow housing.

(Slide 16) There was inadequate floor space, about 16 square feet per sow. We know that that's really not adequate. Sows have a physical space but they also have a social space and a 16 square foot limit does not really meet that. As you saw the code minimum is 19 square feet. This was a competitive feeding system. They just left the stall feed drops there and dropped them onto the solid food, so sows were competing for feed and they weren't sorted into those groups by size and parity. So clearly there were some dominant sows who were getting additional feed and some subordinates who were not, explaining the heavy dropout rate.

Again, there was no preparation of the staff for this trial. I mean I don't even think they knew it was happening. There was construction going on but they didn't receive any special training and certainly the report said that the staff were, in general, skeptical and unprepared for that. So clearly, yes, there are various reports on group sow housing but these sort of demonstrations were clearly not favoured group housing and for very obvious reasons.

(Slide 17) When we look at research on group housing and space, certainly we recognize more space is better. Everybody agrees but there's that concept of physical versus social space. Sows need that little interpersonal bubble amongst each other so they can actually avoid the dominance, move out of the way when they need to and to actively avoid a bully sow. So that's why shoulder stalls are very effective at that. In competitive feeding systems, having somewhere to avoid or hide out is very positive for some sows, the subordinate ones.

(Slide 18) Certainly in an ideal world we could give sows all the space they ever wanted right? But we're looking at a commercial enterprise and we recognize that space costs money and requires extra management and infrastructure so we need to find a breaking point above which sows are going to experience adverse effects. There's going to be a space allowance at which point you're going to see the social effects of increased aggression and then if it becomes more acute, social behavioural changes. Sometimes that doesn't have a negative impact on production but if you push that even further, you're going to see increased dropouts, sows failing to maintain condition or not maintaining their pregnancy. Those are the kind of limits we're trying to find out about so that we can establish an actionable value depending on your system, what space sows need to perform properly.

(Slide 19) Looking beyond space at the pen design. What do we need to look at there? The feeder and drinker, the ratio of sows to feeders, the placement of drinkers and feeders, the layout of alleyways so a dominant animal can't obstruct movement of animals throughout the pen, that avoiding distance. So if there are partitions, a subordinate animal can move around behind it and avoid experiencing aggression and then ability to separate your dunging, feeding and resting areas. So that's why we're trying to design a pen so all those things can happen in a very cohesive way. I'd say there's studies that suggest the quality of that space is just as important in many ways of the actual footprint, your square footage.

This is a quote from an Australian report in 1992. "Pen design is as important reducing aggression as pen space." So what do we do to pen space to try and make it a little bit more cohesive for the group?

(Slide 20) Partitions. Certainly that's one of the first things you see. You're dividing the pen space to give sows more options for isolating themselves and also they love to lie against the surface so it's

encouraging them to lie in a specific area and avoid other animals if they want to.

The type of flooring you're using. Certainly a lot of people using fully slatted systems and that can be fine in terms of manure and not having problems with manure buildup in specific areas but it's recommended that we have some solid areas for laying. There should be sloped so there's drainage and the floorings can remain dry but that certainly encourages the correct use of alleys. So if you have these bedroom areas with a solid floor, sows are going to prefer to lay there and they're going to leave the alleyways free and open for sows to move around the pen and if you've got them in the right places, ideally they won't be dunging in those areas.

At Prairie Swine we did find some slat gap covers made in Europe. There's a few different designs but you could have a slatted system and you can try and establish solid areas in specific parts of the pen and then if it doesn't work out and sows start using it as a dunging area, well you can remove those slat gap covers and say, "Okay, that's going to be a slatted area. We'll maybe try a solid area somewhere else." This is a very common problem in a lot of renovations. Say, a finisher room might be turned into a gestation room and there will be solid areas in one part of the pen and sows end up dunging in the solid and laying on the slats. So it's always a consideration when you're looking at redesigning a system.

We've been trying to do some research on rubber mats. We recognize rubber mats are very conducive to leg and foot health but are they slippery? Are sows going to chew on them? They've been great in the dairy industry in terms of improving leg and foot health but I think sows are that much more challenging in terms of keeping them down and making them work.

Another aspect of quality is improving the pen in terms of the diversity of the environment and enrichment. Enrichment is another part of the new code with one of the main goals being increasing satiety. So if you can provide fibrous feeds, say in a hopper or adding them to feeds, certainly our nutrition group is now looking at various higher fiber feeds to increase that sensation of satiety in sows. They're restricted fed on a regular basis but that's not very satisfying. Sows are always hungry for at least 60% of the time based on some behaviour studies. So if we can increase that fiber content, certainly the level of feeding satisfaction is there and that has an effect on aggression and reducing aggression which is not too surprising.

Our nutrition group is now looking at pelletized straw and different processes to process straw and then add that to the feed as a fiber source. The Europeans are requiring a specific amount of fiber be provided to sows on a daily basis, again, to kind of meet this requirement. Enrichment in general has a positive effect in terms of

encouraging more active and positive behaviours and reducing aggression and injurious behaviours, tail biting and the like.

(Slide 21) I have a few examples here. This was a Danish barn I visited a few years ago. Often these partitions don't have to be a four foot wall. It could be a short, say, two foot wall and it's easier to see across the pen, see what the animals are doing with these shorter partitions and they work quite well. Again, over there straw bags are very common and even in a slatted system they don't have any issues with it because there's a very limited amount of straw that falls on the floor.

(Slide 22) John Van Engelen, who is going to be speaking next, this is a picture from his barn. He's poured this concrete pad and the gilts are certainly preferring to lay on that solid flooring area. This is looking in to a mature sow pen, so yeah, quite a narrow alleyway. You wouldn't ideally design a group pen with a narrow alleyway like that but it's working because sows are preferring to lay in these solid bedroom areas and it's making that pen work. Whereas if it was a fully slatted pen you would expect to see sows laying out in the alley and restricting the movement.

(Slide 23) Here again there's a few different enrichments and a different straw rack. In Europe, again in that same barn, a 2x4 stick in a holder is the enrichment. Sows like finding materials that they can actually destroy so wood is good that way and we tested it at Prairie Swine Centre and haven't had any issues in terms of splinters or problems with bits of wood. They just eventually eat it up and you add some more.

This was an enrichment being used in Quebec. It's just some feeder chain and I think John's got some of that in his barn too. So yes, they've had quite a time chewing all of the plastic chunks off of that. Hopefully it's digestible and safe. That's another consideration but no harm has been done at this point I guess.

(Slide 24) This is an enrichment study at Prairie Swine Centre, so we're looking at sow preferences for different enrichments. Cotton rope, wood on a chain, so this is a decent design. We've got them now in our finisher pens, so the wood is on the chain and it contacts the floor so they can push it around and chew on it and then the wood could be replaced as needed.

(Slide 25) Group size is another main consideration. How big is your group and how are you going to manage that group? That's going to influence, again, the amount of aggression you see among sows in the group. Smaller groups, that's what we see more typically in competitive feeding systems. Group sizes anywhere from 10-30 sows. These are these static groups. Sows are in the same phase of gestation as they go into the group and then once that group is formed the same group is carried through to farrowing.

The main point in these small groups is to form a more uniform group, especially in the competitive feeding situations. So they're of similar size, parity and back fat, and they can all compete ideally at the same level and there's not going to be one sow that's displacing others for feed. Certainly you would want to check them on a regular basis and ensure that all sows are accessing feed and there's not one individual standing back at feeding time.

(Slide 26) So yes, larger groups are more commonly what we would see in the non-competitive feeding systems. Yes, a large group is not really possible with competitive feeding, so we're talking about numbers anywhere from say 45 to over 300 sows per group. Some studies that were done at Prairie Swine Centre in 2009 were looking at different groups of sows, 18 sows per pen versus 118 and they clearly found that certainly in the larger groups the sows adopted a much more tolerant behaviour. They were less aggressive. They would take two sows from a small pen and mix them into another small pen and then observe them for two hours and then put them back in the regular pen. Those individuals from a small pen were much faster to fight and then fought more often during that two hour period than sows that were from a larger group. They also did parent groupings where they would take a small pen and then take two individuals from a large pen and two individuals from a small pen and see how they interacted. Certainly two from a small pen and two from a small pen, it's like hockey teams from two small communities right? You put them together and there would be a big dustup. Whereas two sows from two large pens there was much less aggression. So yes, they studied that in quite a lot of detail and clearly that's one advantage of these larger groups and certainly we see it in cities. People just learn to avoid other people and certainly in terms of behaviour theory it's really not worth your while to dominate a whole group. If you're in the small group, sure, it might not be a lot of work to dominate the small group but if you're talking about a large group, that's going to be a lot of work. So it's just not worth their while.

With dynamic groups you're adding new groups periodically and ideally you'll have a mixing pen in a dynamic situation. They're in a pen by themselves together and then they go into the group pen as one unit. Those individuals are already familiar and they just take over one section of a larger pen and interact very little with the other sows. So that can be used very effectively in those larger group pens.

I would say, yes, keeping gilt separate if that's possible in terms of your barn flow is still recommended. We did some studies on that in Illinois in a large ESF barn and yes, with younger sows if you can keep them with younger sows in their own group they're going to be doing better than if they're mixed with older individuals.

(Slide 27) Turning now to looking at mixing aggression. There are a number of studies showing that this is where a lot of aggression occurs causing injury and lameness. Say if you're mixing before breeding, it could disrupt estrus expression, certainly in the subordinate sows and then it could have an impact on your conception rate and litter size. We recognize that implantation after breeding, that period of one to four weeks after breeding is quite a sensitive time and we have to be conscious of what we're doing as we're mixing sows in that period immediately after breeding.

At what point in the gestation cycle do we mix sows? Forming groups, the social aspect of it, the social experience of those animals in terms of how we develop our gilts and give them the training that they need to be successful in groups. Static versus dynamic groups then uniform versus diverse parities. And then some of the physical aspects of mixing pens and pen design and other tricks at mixing.

(Slide 29) We've done some research on this at Prairie Swine with actually fairly complicated jumbled barn management so that we were mixing some sows at different times of gestation and moving them around the barn in different schedules. What we would recognize that the most successful times to mix would be right at weaning, so you take them straight from farrowing and move them into their group. No transition to sows, just straight into a group. You could also mix them very shortly after insemination or you put them in stalls and you wait for that implantation to be completed, approximately 28 days and then you're mixing, so after that pregnancy check. That's the most common technique at this point.

(Slide 30) Certainly mixing four weeks after breeding that's what we typically do at Prairie Swine Centre and a lot of group gestation barns but it could be anywhere from 21-35 days roughly after insemination. Having sows in the stalls for all that period certainly allows for very close management from breeding to implantation. You could monitor estrus, feed consumption, you could build up her body conditions if she's thin out of the farrowing room, you're doing your breeding right there in the convenience of a stall and then heat checking. By keeping them in stalls any aggression due to mixing is delayed until that implantation has occurred and you're litter is there.

Certainly we recognize now that there might be an impact on piglets in terms of the prenatal environment. That movement early on in gestation seems to have some benefits in terms of litter size and reducing stillborns. I have some data and some subsequent slides. That's an area where we're trying to do some more research on and then certainly the main issues is what if stall use does become restricted? That's what we're seeing in a lot of European countries where they're cutting back more and more on the amount of time that sows can be left in stalls and so producers are having to go to some of these other options because they're limited on the amount of time they

can keep sows in stalls. That's kind of been a driver for some of this research that we're doing.

(Slide 31) Mixing right at weaning. The nice part about that is that the group formation and all that aggression is done before estrus and implantation so they're a nice happy group by the time you're doing breeding. So there's little aggression there.

There is some evidence that early mixing helps to bring sows into heat. All that social interaction gets them excited and worked up a little bit and then that sow to sow contact there's some speculation that it could help synchronize estrus among the group. But then there's clearly concerns about moving sows directly into groups. Estrus behaviour and mounting, they're getting quite wild at times and depending on your flooring you can see some injuries and lameness resulting from that. So in subordinate individuals you might have a concern that it might disrupt her return to estrus or inhibit her expression of estrus because she's subordinate.

And then you've got that added work. You've got a group of sows, you've got some in heat and some who are not and you've got to test them all. You've got to isolate them or breed them so that management aspect of it is a major factor in the con of this treatment. And then preg checking in groups, well yes, that's another job but producers seem to find that's not as bad as you think and group housed sows are really quite passive. In Quebec they had a preg checker on a wand so you didn't even have to bend over. You could just walk around the pen and check quite readily.

(Slide 32) The other time would be mixing right after insemination. This is a little bit tricky in terms of timing but it has some benefits. Certainly that mixing aggression is, again, resolved before implantation if you get them into groups soon enough after breeding and it can save on space. So this is why we've seen some producers go to this technique following a renovation because you don't need as many breeding stalls. You don't need to keep sows in stalls for four weeks, so you could save on space and just turn that area into a gestation pen and so there's less stalls and penning required and you've got a little extra space to work with.

I'd say the main concern is that you can't wait too long after breeding, so five days I would say. We've used a five-day period after insemination in a study we've just completed and that seemed to work quite well. Another study that was done previously at Prairie Swine Centre, they were mixing those post-insemination sows eight days after insemination and their farrowing rate was reduced by 5%. So that was too late and I think they had some other issues with their system at that time but certainly that eight-day mixing after insemination was probably influencing their farrowing rate.

Again, you have that preg checking in pens but producers that have ESF units or systems that have RFID detectors and the little boar pen, certainly that's very convenient and it almost replaces heat checking and finding sows that aren't there in those systems. They say they barely even need to preg check sows because the system is so effective.

(Slide 33) I'll just run through some results here. I'm running close to the limit here so we'll try to wrap things up. We did a study, the first study we did was looking at early mixing treatment, so sows mixed directly at weaning, a later mixing treatment where sows were mixed 35 days after breeding, which is our typical herd management at Prairie Swine and then they asked for another treatment where sows are mixed at weaning for 48 hours and then put in stalls for breeding and then re-mixed in the same group at 35 days with the idea that "well maybe they were familiar from that 48 hour period and then aggression later on." I can tell you that 48 period wasn't sufficient enough to make the group cohesive and so when we re-mixed them four weeks later, they were still fighting as much as the other groups.

(Slide 34) Okay so this is our pen system and rather than allowing sows to hide out in their stalls, we kicked them out and locked them out in this group area because we felt if they were in stalls it's not really representative of a group housing system. So that's a nice thing about our system, it's very flexible in terms of how we can operate it. So they were locked into those groups.

(Slide 35) Firstly those late mixed sows had significantly lower conception. So this is our typical management procedure and we didn't have great success with it. Whereas those early mixed sows mixed right out of the farrowing room had the best conception rate and those pre-socialized sows almost as good. That was a bit of a surprise to us. We had some other changes going on in the barn at the time but that result was a bit of a shock to us.

(Slide 36) Here's some of the production characteristics and certainly there were no differences of total born and born alive or mummies but certainly the number of stillborns was significantly reduced in that early mixing treatment. So this is an area of interest to us looking down the road and we're not the first study to see this in early mixed sows.

I think we'll move on from there and let the next speaker have a turn.