The Animal Welfare
Science Centre

www.animalwelfare.net.au

"Australian research on group housing of gestating sows"

Paul Hemsworth

ANIMAL WELFARE SCIENCE CENTRE

THE UNIVERSITY OF MELBOURNE

MONASH University

State Government Victoria Department of Primary Industries

THE OHIO STATE UNIVERSITY

Group housing of gestating sows

Consider research presently underway in Australia and the rationale for and implications of this research.

Animal use decisions

Recognize that several considerations affect an individual's decision on the acceptability of a specific animal use:

1. an individual's attitude to the animal,
2. an individual's attitudes to society's obligations to the animal (ie moral views),
3. broader risks and harms, such as environmental, economic and social effects,
4. philosophical, religious and cultural beliefs about this particular animal use, and
5. what science may tell us about the impacts of the use on the animal.

Housing

While there is a focus in intensive animal production on housing systems, research indicates that the design of the housing system is probably more important for animal welfare than is generally recognized.

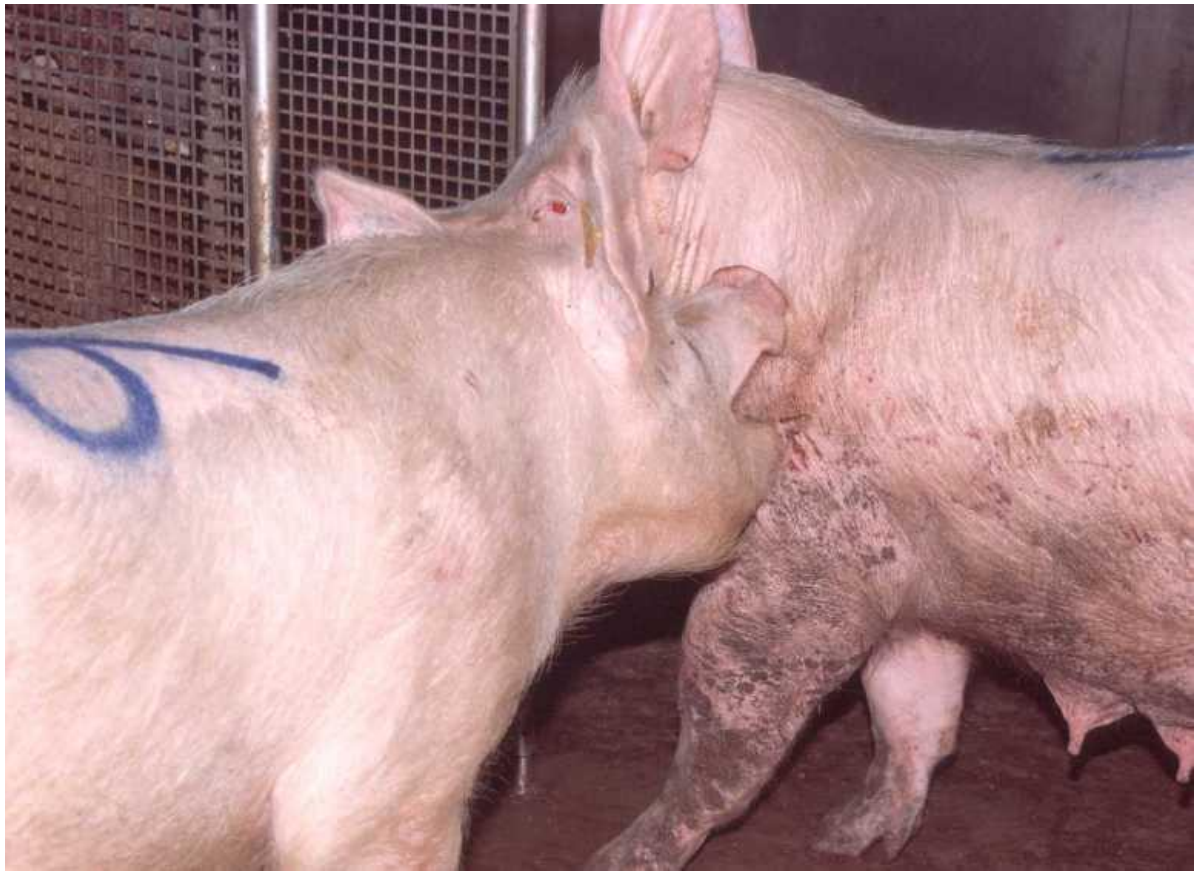
Sow aggression

- There are few rigorous recommendations in the scientific literature on the design features of sow group housing that reduce sow aggression and stress.
- In the wild, a presumed adaptive function of intraspecific aggression is dispersion of animals and therefore unfamiliarity or 'social strangeness' is likely to be a major factor responsible for this intra-specific aggression in sows.

Sow aggression and stress

- Design features of group pens that are likely to affect sow aggression and stress include:
  - Space
  - Group size
  - Provision of feeding stalls
  - Time of mixing
  - Individual sow characteristics (and thus group composition)
    - Genetic & Experiential contributions?

Space and group size



Space

Effects of space allowance and pen design in group-housed pregnant gilts

Parameter	Treatments				
	Space		**Pen design**		
	1.97 m^2	**0.98 m^2**	**Stalls + floor fed**	**Stalls + stall fed**	**No stalls + floor fed**
Lesions	15.8	13.4	15.7	11.1	17.0
Cortisol (free, nmol l^{-1})	2.4^{x}	$\mathbf{3.5^{y}}$	$\mathbf{3.2^{b}}$	2.5^{a}	$\mathbf{3.1^{b}}$
Immune responsiveness	147.1^{b}	$\mathbf{111.0^{a}}$	131.1^{ab}	154.6^{bc}	101.4^{ac}

Within rows, significant differences are indicated by different superscripts; ^{a,b} $P<0.05$ and ^{x,y} $P<0.01$.
From Barnett et al. (1992)

Improved welfare

Housing –space

Effects of overcrowding of breeding female pigs on aggression and injuries

	Floor space (m^2/pig)			
	2.0	2.4	3.6	4.8
Total interactions (/pen in 46h)	816^c	435^b	484^b	315^a
Attack:Retreat ratio	1.08^b	0.93^a	0.97^a	0.99^a
Total skin lesions (number/pen)	129.4^c	72.4^b	57.0^a	53.1^a

^{abc,} $P < 0.05$

From Weng et al. (1998)

Improved welfare?

Group size

Effects of group size on pregnant gilts

Parameter	Treatments – Group size				
	10 (1.2m^2)	5 (2 m^2)	10 (2 m^2)	20 (2 m^2)	40 (2 m^2)
Lesions	53.2^{yq}	31.6^{xa}	40.7^{pb}	35.3^{x}	39.6^{p}

Within rows, $^{ab, pq, xy}$ denote significant differences P<0.05, 0.01 and 0.001, respectively.
From Taylor et al. (1997)

Improved welfare?

Current APL-funded research

Project 1 - "The effects of group housing during gestation on sow welfare and reproduction"

PART 1

A factorial design examining 2 factors:

1. **Floor space**
   6 levels - 1.4 to 3.0 m^2/sow of floor space

2. **Group size**
   3 levels - 10, 30 and 80 sows per group

Total of 3120 sows used.

Current APL-funded research

Project 1 - "The effects of group housing during gestation on sow welfare and reproduction"

Measurements

- **Aggression** – days 1, 3, 7 and 21 of gestation
- **Plasma cortisol** – days 1, 7 and 50 of gestation
- **Haemotalogy** (neutrophils and lymphocyctes) - days 1, 7, and 50 of gestation
- **Injury and locomotion** – days 1, 7 and 50 of gestation
- **Reproduction** (pregnancy rate, farrowing rate, litter size), body weight and backfat.

APL Project 2193, AWSC & Rivalea collaboration

Current APL-funded research

Project 2 - "Evaluation of space requirements for breeding pigs at different parities"

A factorial design examining 2 factors:

1. **Floor space**
   2 levels - 1.4 and 2.8 m^2/pig of floor space (group size of 8)

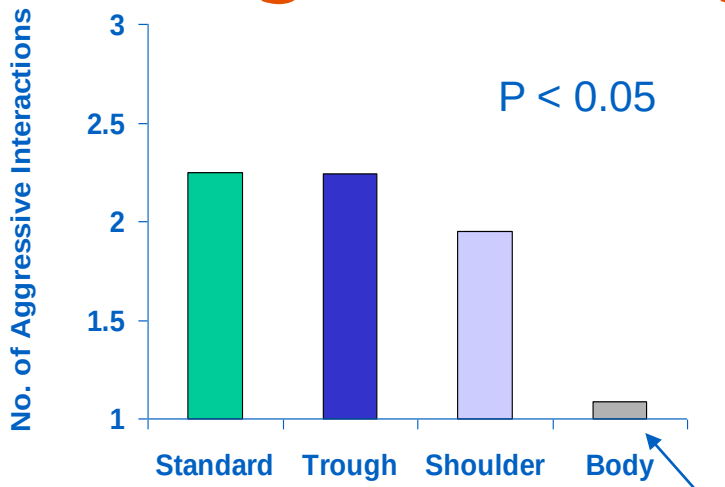
2. **Parity**
   2 levels – gilts and 3 & 3+ parity

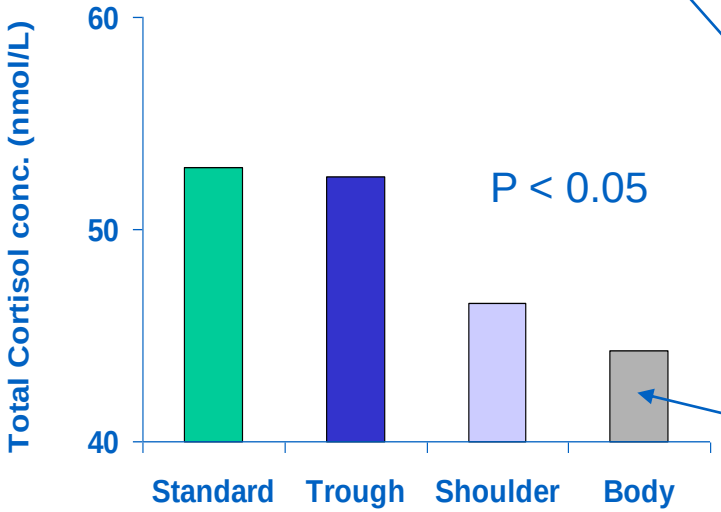
Total of 192 gilts and sows used.

Feeding stalls and time of mixing

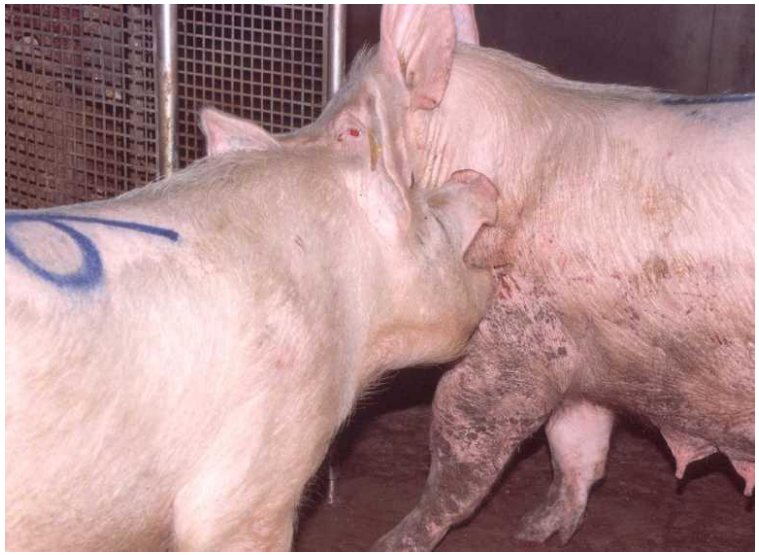
Feeding stalls in groups

From Barnett (1997)





Type of feeder



Improved welfare

Feeding stalls in groups

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Within rows, significant differences are indicated by different superscripts; ^{a,b} $P<0.05$ and ^{x,y} $P<0.01$.
From Barnett et al. (1992)

Improved welfare

Time of mixing post-mating

Aggression around mixing (means ± SED presented)

Variables	Ecoshed 0	Ecoshed 35	SED
Aggression			
Bouts (/sow)	1.42	0.96	0.207
Time (s/sow)	10.1^{b}	4.6^{a}	1.402
Bouts (/4 h) - scan observations	427^{b}	226^{a}	74.6

Within rows, significant differences are indicated by different superscripts; ^{a,b} $P<0.05$

Hemsworth et al. (2006)

Time of mixing post-mating

Effect of housing on haematology and stress physiology (means ± SED presented)

	Stalls	Ecoshed 0	Ecoshed 35	SED
Haemotology				
Neutrophils (% of WBC)	50.4^{b}	43.8^{a}	45.0^{a}	2.05
Lymphocytes (% of WBC)	35.7^{d}	44.6^{e}	42.2^{e}	1.82
Neutrophil : lymphocyte ratio	1.62	1.24	1.46	0.221
Stress physiology				
Salivary cortisol concentrations (nM)*	2.28^{d}	3.60^{e}	2.70^{de}	0.039

Within rows, significant differences are indicated by different superscripts; ^{a,b} $P<0.05$. ^{de} $p<0.001$

Hemsworth et al. (2006)

Time of mixing post-mating

Effects of stage of gestation at mixing on aggression in sows

Variables	Mixing: Pre-implantation	Mixing: Post-implantation	P value
Aggression post-mixing			
Duration of aggression (s)	77.0	56.3	0.66
Aggression at feeder (/sow/15 h)			
Initiated	0.97^{y}	0.60^{x}	0.01
Received	0.96	0.64	0.19

Within rows, significant differences are indicated by different superscripts; ^{x,y} P<0.01

Strawford et al. (2008)

Current APL-funded research

Project 1 - "The effects of group housing during gestation on sow welfare and reproduction"

PART 2

1. **Stalls for the entire gestation**
2. **Groups with partial feeding stalls for the entire gestation**
3. **Stalls for 35 days of gestation followed by groups with partial feeding stalls**

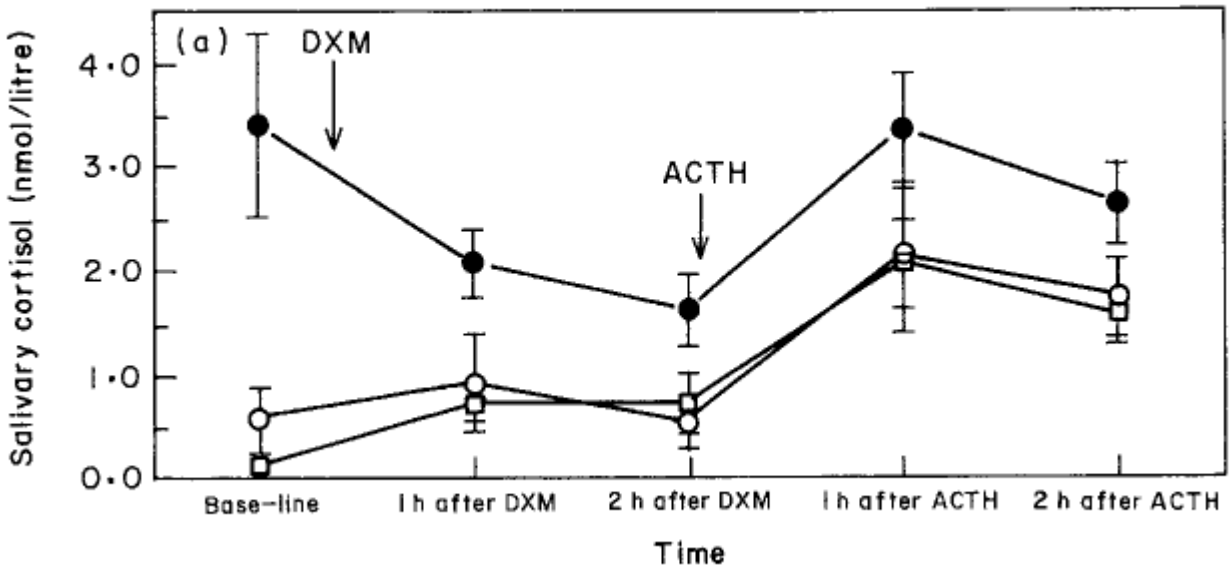
Total of 720 sows used.

Feeding stalls in groups

APL Project 2193

Individual sow characteristics

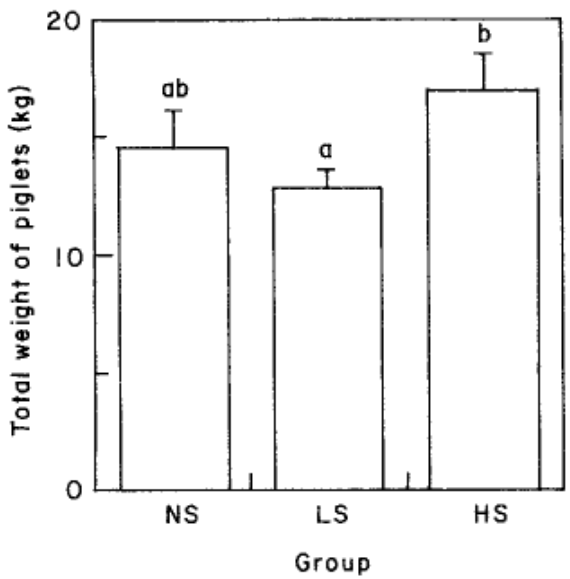
Individual sow characteristics



Changes with time in salivary cortisol levels (nmol/litre) during the DXM suppression and ACTH challenge experiment .
Group means are plotted for the Non Success (O), Low Succes, (●) and High Success (□) groups.

From Mendl et al. (1992)

Individual sow characteristics

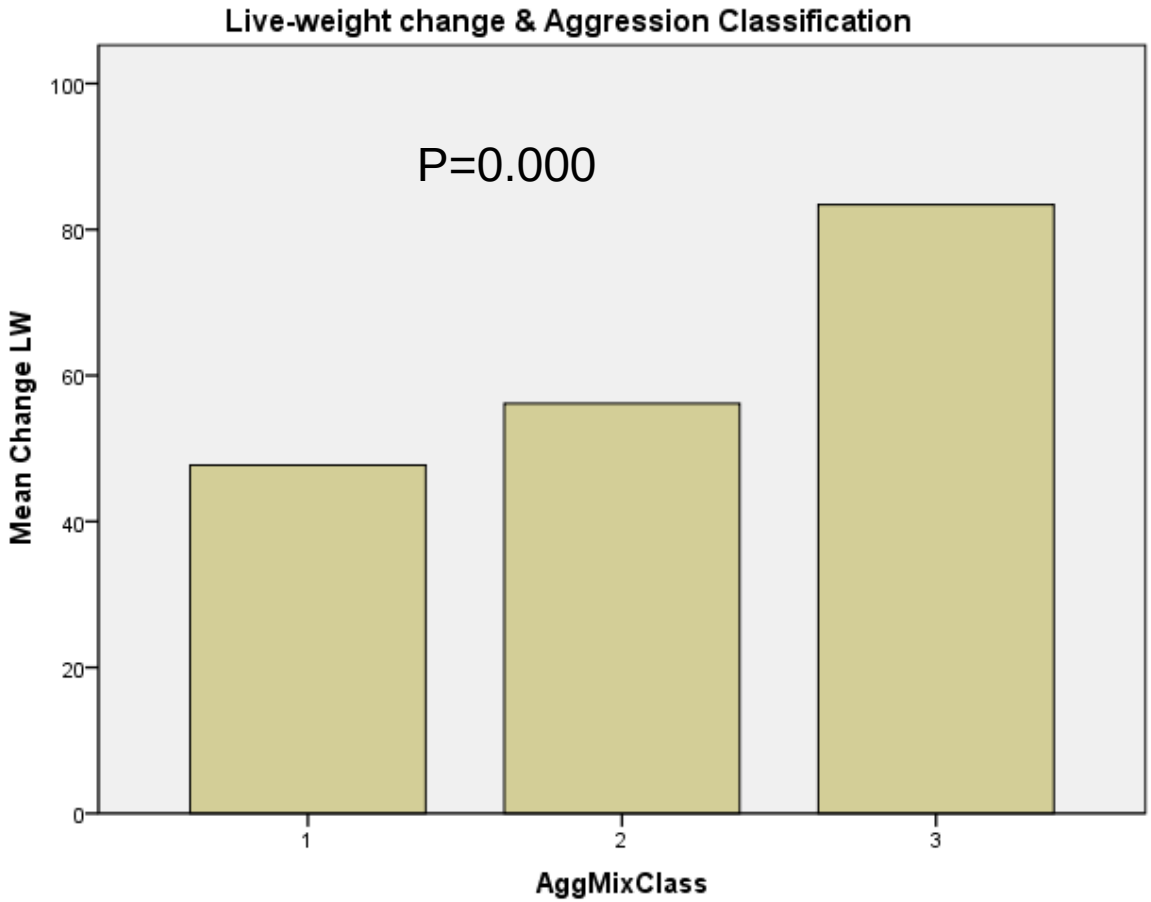


Total weight of piglets born alive after the first pregnancy.

Group means are plotted for the Non Success (O), Low Succes, (●) and High Success (□) groups.

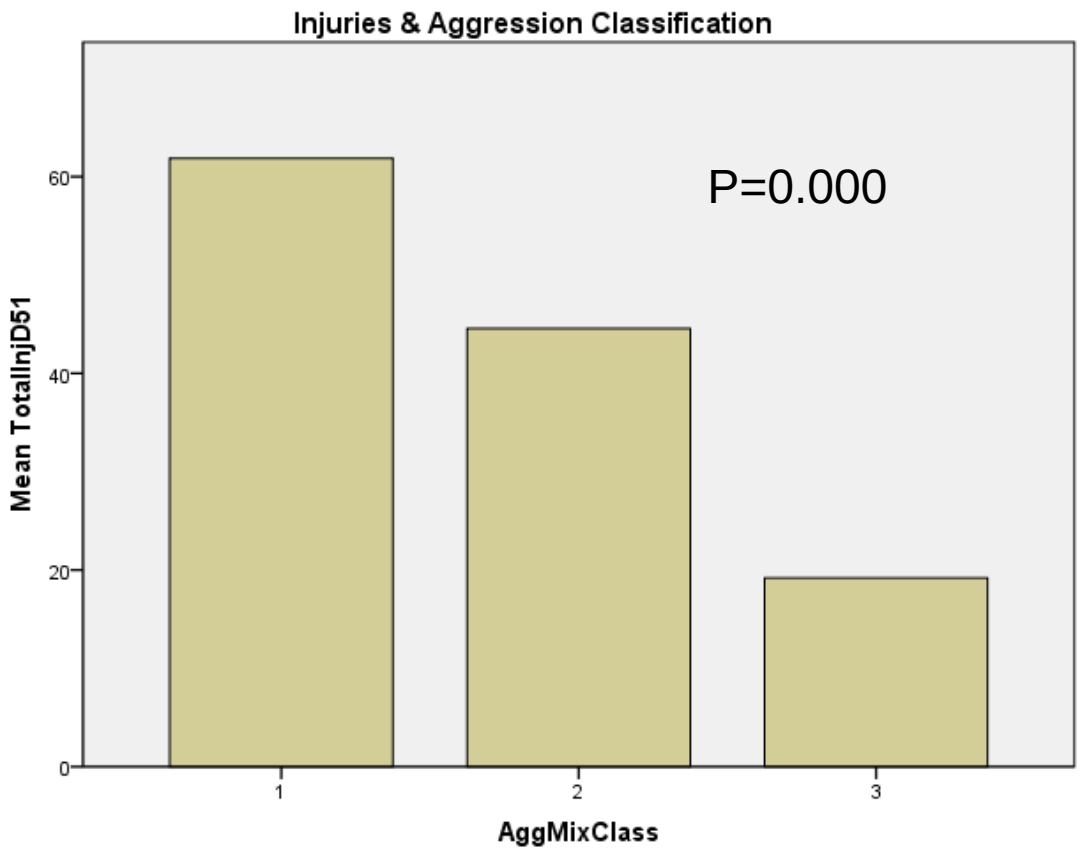
From Mendl et al. (1992)

Individual sow characteristics



Rep 4, APL Project 2193

Individual sow characteristics



Rep 4, APL Project 2193

Current APL-funded research

"Effects of aggressive characteristics of individual sows and mixing strategies on the productivity and welfare of group-housed gestating sows"

Part 1

Examining several **potential measures of aggressive behaviour** particularly in terms of (1) their repeatability and (2) whether they are predictive of aggressive at mixing and around feeding of individual sows in the group.

Part 2

Examine the use of boars, straw enrichment and nutrition supplements on sow aggression in groups.

APL Project 2303, AWSC & Rivalea collaboration

Sow aggression and stress

- Design features of group pens that are likely to affect sow aggression and stress include:
  - Space
  - Group size
  - Provision of feeding stalls
  - Time of mixing
  - Individual sow characteristics (and thus group composition)
    - Genetic &/or Experiential factors

Conclusions

- This type of research will provide fundamental knowledge to the Australian pig industry on basic principles of mixing pregnant sows.
- This knowledge is essential as the industry moves to more use of group housing systems for breeding females.
- Furthermore, this knowledge is required to develop and defend science-based recommendations on sow housing during gestation.

Thanks

Reducing pain associated with husbandry procedures in piglets

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425 Werombi Road
Camden, NSW, 2570

THE UNIVERSITY OF SYDNEY

Research objectives

To prevent, or substantially reduce, the pain associated with invasive husbandry procedures

- sheep — mulesing, castration, tail docking
- cattle — castration, dis-budding
- pigs — castration, tail docking, teeth clipping, ear notching

AWSC 2002 - welfare issues documented across 11 industries.

<u>Issues relevant to piglet routine husbandry procedures</u>

'Very important' - tail docking

'Important' - castration, clipping teeth

- Routine husbandry procedures are painful
- Pain management is rarely adopted in commercial production
- Consumers are questioning the ethics of applying invasive procedures in production animal husbandry

Need for ‘farmer friendly’ pain management

Local topical anaesthesia Tri-Solfen®

- Applied during or immediately post procedure
- Low cost, practical and easy to apply
- Effective pain relief

Topical anaesthesia (Tri-Solfen®, Bayer Australia)

- Multifunction topical anaesthetic / antiseptic / haemostatic gel agent

- - commercially available 2005

Constituents:

- Local anaesthetics - Lignocaine (40.6 g/L) & Bupivacaine (4.5 g/L)
- Adrenaline (24.8 mg/L)
- Antiseptic - cetrimide (5.0 g/L)
- in a gel base (Bayer Animal Health, Gordon Australia)

Topical anaesthesia (Tri-Solfen®)

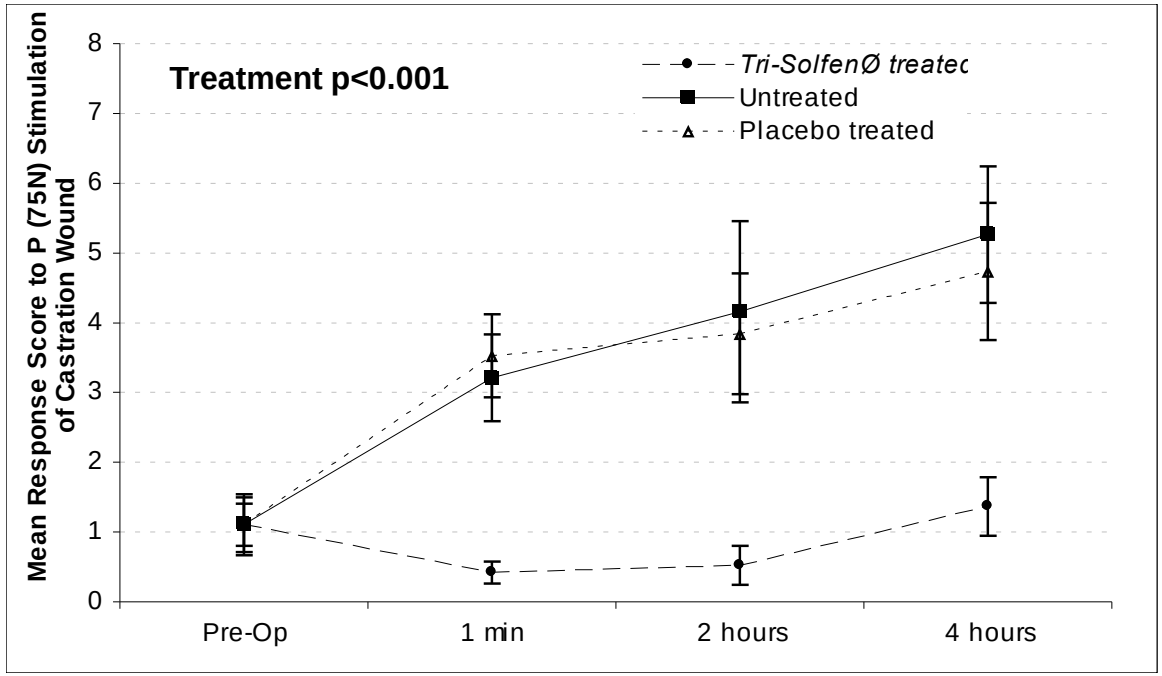
- Several studies have examined the efficacy of topical anaesthesia:
  - for wound pain alleviation (up to 24 hours)
  - wound healing (up to 1 month)
  - recovery post-mulesing (up to 24 hours)

Lomax S, Sheil M, Windsor PA (2008). Impact of topical anaesthesia on pain alleviation and wound healing in lambs after mulesing. *Aust. Vet J* **86**: 159-168.

Quantitative sensory testing

Primary hyperalgesia developed within the first minute after castration in untreated and placebo lambs

Very little development of primary hyperalgesia in Tri-Solfen treated lambs



Lomax S, Dickson H, Sheil M, Windsor PA (2010). Topical anaesthesia alleviates short-term pain of castration and tail docking in lambs. *Aust. Vet J* **88**: 67-74.

Piglet experiment

Treatments

- Castration
- Castration & Tri-Solfen
- Sham castration

Measurements

- Behavioural response
- Cortisol response (saliva)
- Wound sensitivity testing

- Castration, tail docking & ear notching are painful procedures
- Castration is the subject of protest and boycotts in Europe

- GAIA (Global Action in the Interest of Animals) (Belgium)
  - Farmers Union HQ & Federation of Agriculture targeted

VIDEO: Swiss castration method 15 Aug 2009

Switzerland is one of Europe's leading countries with regard to the piglet castration discussion. Physical castration without the use of anaesthetics will be forbidden as from January 1, 2010. Last year, a special expert committee, called ProSchwein, examined alternative production systems on how to raise male pigs. The committee advised on two systems: immunovaccination or castration after anaesthetics using isoflurane. The following film provided by Swiss company Agrocomp, shows Pignap, a Swiss castration method using isoflurane.

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Thank you

Benchmarking ProHand Implementation

What are the benefits for pigs & people?

Graeme Pope
Principal Industry Consultant – Pigs; RSSA
ProHand Facilitator

Benchmarking ProHand Implementation

What is PROHAND?

- A two-part, computer-based training program which aims to modify the beliefs of stock people about the sensitivity of pigs to their handling and the productivity & welfare consequences of routine adverse *('negative')* handling

- Teaches "Maximise Positive" and "Minimise Negative" routine handling …*when appropriate*

Benchmarking ProHand Implementation

What is PROHAND?

Stockperson attitude & beliefs to move/handle pigs → *Routine behaviour* → *Pigs fear response* → *Production & welfare outcomes*

Benchmarking ProHand Implementation

Potential benefits of adopting PROHAND pig handling principles on-farm?

- Greater understanding of pig-human interface (part 2)
- Improved sow productivity (+1.0 piglet/sow/year)
- Improved progeny growth performance (+5% ADG)
- Improvement in physical ease of handling pigs
- More predictable pig movements (OH&S impact)
- Improved stock person job satisfaction
- *All leads to an improved animal welfare outcome!*

Benchmarking ProHand Implementation

SA PROHAND delivery experience 2009-10

- PROHAND program content reviewed/updated in late 2008 and re-launched by AWSC/APL ready for industry delivery in March, 2009
- In SA, 12 courses delivered at regional venues since April, 2009
- Used TAFESA, high schools & PIRSA facilities as training venues
- Total 152 x SA stockpeople have completed PROHAND program between April, 2009 – June, 2010 (plus 21 x abattoir version)
- In SA, PROHAND delivery jointly supported by SA Pig Industry Fund & APL

Benchmarking ProHand Implementation

Tracking PROHAND implementation? …
What's industry feedback? …

- All trainee's complete *Training Feedback Sheets* on Day #1

- But …no previous formal evaluation of PROHAND on-farm benefits when applied across a *range of commercial production settings (before-then-after PROHAND?)* and was needed to maintain impact!

- So …APL funded PROHAND Benchmarking Project, delivered in March/April, 2010

- Questionnaire designed with five questions and 44 responses, all answerable on a qualitative response scale (before-and-after?) (*never-sometimes-always* or *strongly agree-neutral-strongly disagree*)

Benchmarking ProHand Implementation

Questionnaire results

- Received 81 completed questionnaires
- Statistical analysis of questionnaire results was conducted by Monash University using Principal Components Analysis (PCA), followed by an Oblimin Rotation
- Final Project Report now available through APL

Benchmarking ProHand Implementation

Questionnaire results

- *Question #1 – Where on-farm do you mainly move & handle your pigs?*

(indicates pig age/size; group sizes when moving; likely frequency of pig-human interactions, pig movements & handling; opportunities for changes in routine handling; implications of 'negative' handling)

- Trainees worked 30% mating, 16% weaners, 33% farrowing, 23% dry sow, 23% grower/finisher & 34% across all sections of farm

- *Note* - wide range in PROHAND trainee's industry experience (varied b/w 3 months to 35 years!)

Benchmarking ProHand Implementation

Questionnaire results

- *Question #2 – What changes have you made to your routine pig handling behaviour since completing PROHAND?*
- Provided 19 different responses as possible *'indicators of change'* … e.g. *"I use less shouting & banging to make pigs move"; "I give pigs more time to explore their surroundings before I pressure them to move"; "I ask for assistance more frequently from my workmates when moving pigs"* … etc
- Trainees asked to respond on scale *Never – Occasionally - Always*

Benchmarking ProHand Implementation

Analysis of Questionnaire results

- Principal Components Analysis (PCA) helps interpretation of results by providing a basis for combining responses to similar items into a single 'composite score', for subsequent analysis

- *Example* – Question #2 provided 19 different possible responses *(never-occasionally-always),* which through PCA were summed and provided two 'composite variables' – *"Improved Handling Techniques from ProHand"* and *"Reduced Negative Handling following ProHand"*

Benchmarking ProHand Implementation

Analysis of Questionnaire results

- So …two (2) main indicators on-farm *behavioural change* *<u>was</u>* *being implemented* after PROHAND training with the highest mean (combined) responses *(to Question #2)* were *Improved Handling Techniques* and *Reduced Negative Handling*

Benchmarking ProHand Implementation

Questionnaire responses

- Some examples of responses indicating *Improved Handling Techniques (first composite variable)* after PROHAND training

… "I allow single pigs to re-join their pen mates before moving the whole group forward again; I avoid crowding pigs into a restricted space when appropriate; I reduce group sizes if practical when moving pigs; I report things like broken gates or floors to my manager so they can be fixed, to help me and others when shifting pigs inside the sheds; I use stock boards more thoughtfully now when moving pigs; I talk more quietly to reassure pigs of my presence; I ask for assistance more frequently from my workmates when moving pigs; I think more about how I can make it easier and less stressful for the pigs while I'm moving them; I leave lame, sick or injured pigs behind when removing groups of pigs from pens" …

Benchmarking ProHand Implementation

Questionnaire responses

- Some examples of responses indicating *Reduced Negative Handling (second composite variable)* after PROHAND training

… "I apply less negative handling to those pigs at the rear of a moving group of pigs; I am less aggressive now when I remove pigs in large groups from shelters (see shelter picture); I think more about what pigs are experiencing & thinking when they are being moved; I use more positive routine behaviours overall; I use less negative behaviours overall; I've slowed down my movements when moving pigs; I use less shouting & banging to make pigs move; I give pigs more time to explore their surroundings before I pressure them to move; I use other goads (e.g. prodders) less often now to make pigs move" …

Handing pigs in Shelters versus Traditional sheds?

Frequency?... Opportunity?... Load out for sale?

Benchmarking ProHand Implementation

Analysis of Questionnaire results

Question #4 – What benefits or effects have you seen on-farm from making changes to your routine pig handling behaviour?

- Provided 17 different responses as possible *'benefits or effects'* …e.g. *"I enjoy working with pigs more now"; "I feel less frustrated and physically tired after a day's work"; "We save time now when moving pigs within the piggery"* … etc

- Main indicator PROHAND *benefits or effects were being seen on-farm* were summed as *Improved Working Conditions*

Benchmarking ProHand Implementation

Questionnaire results

- Some examples of *Improved Working Conditions* responses *(a composite variable)* after PROHAND training

… "I respect pigs more now; I enjoy working with pigs more now; Our pigs seem to be less excitable & stressed now when we move them; I am more relaxed working on the job now; I feel less frustrated & physically tired after a day's work; I get along better with my workmates now; We talk more now about what else we could improve around the piggery'; We save time now when we're moving pigs within the piggery; Most staff at the farm seem to like pigs more now" …

- *Consider impact (above) on farm staff retention rates?*

Benchmarking ProHand Implementation

Summary

- Finally, to determine if *significant change* had followed ProHand training, each *'composite variable'* score was compared to the score of *'no change'* using t-tests

- Respondents did see *significant improvements* in …

1. *Improved handling techniques from ProHand*
2. *Reduced negative handling following ProHand*
3. *Improved working conditions on-farm*
4. *Working with pigs is now easier*

Benchmarking ProHand Implementation

Questions & Comments?

Loose-housing of lactating sows

Piglets requirements for space and thermal conditions

Knut E. Bøe,

Guro Vasdal, Inger Lise Andersen

Norway in the world

Agriculture in Norway

Agriculture in Norway

Aquaculture

Norwegian pig production – overview

- Sows are Norwegian Landrace x Yorkshire
- Boars may be Duroc, Landrace or DL

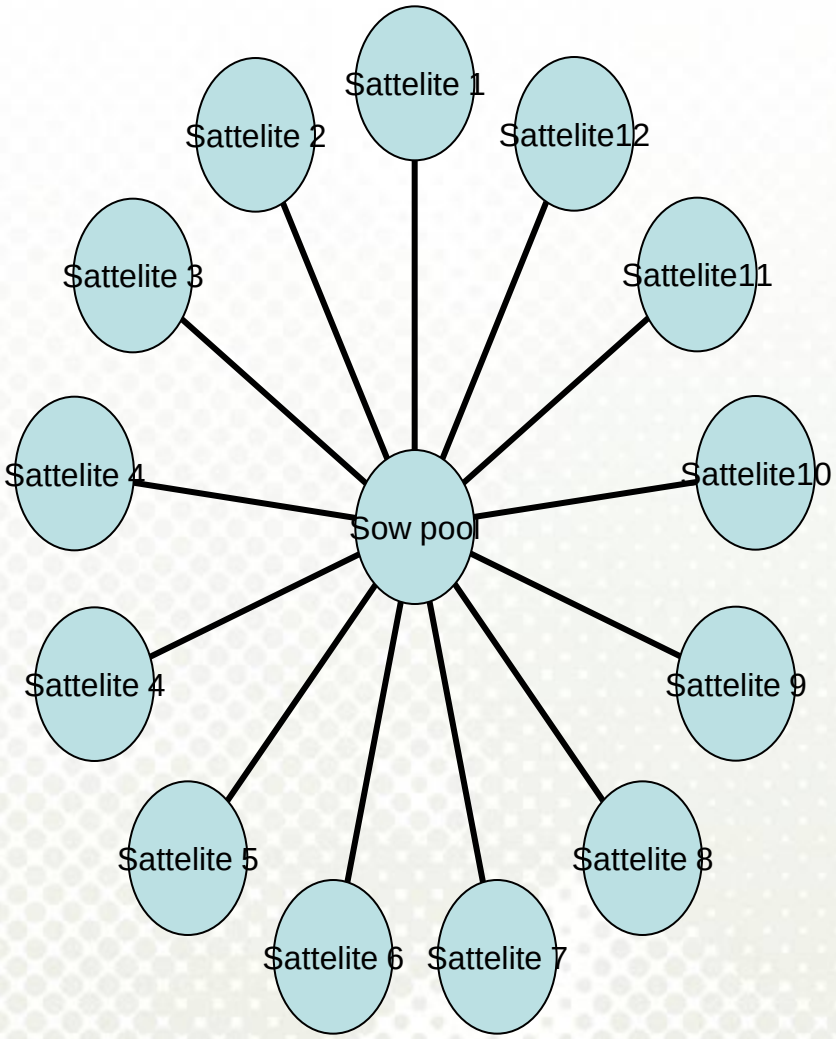
	2000	2008
No. herds	2967	1655
No. Sows/herd	30.6	60.2

Norwegian pig production – results 2009

Source: Norsvin årsstatistikk 2009, 470 herds, 87 sows per herd

	Mean	Top 10	Bottom 25 %
Litter/sow/year	2.17	2.28	2.03
Liveborn (per litter)	12.7	13.9	12.2
Stillborn (per litter)	1.2	1.0	1.3
Postnatal mortality (%)	14.9	10.8	18.1
Weaned (per litter)	10.8	12.4	10.0
Age at weaning (d)	33.7	33.2	35.0
Weaned piglets per sow and year	23.0	28.6	19.3

Improving production and labour requirements in "small herds"



1. Batch farrowing
2. Sattelite system

Norwegian regulations for confinement of sows (2003/2010)

- Confinement of pigs is not allowed. However, confinement is allowed: individual sows that are particularly restless from farrowing and to 7 days after farrowing
- For new buildings and for rebuilding of farrowing sections, the pens should be designed so that confinement is not necessary

Other Norwegian regulations

- There should be solid floor or deep bedding in the lying area, and the size of the lying area should provide enough space so that all animals can rest simultaneously. The other part of the pen can have slatted floor.
- Pigs should have access to sufficient quantities of materials so they can explore and root.
- Pens for loose-housed lactating sows should have a minimum space allowance of 6.0 m^2 and be at least 1.8 m wide.
- The piglets should have a separate space in the pen, protected from the sow
- Plentiful amounts of bedding should be provided in the farrowing pens. Three days before expected farrowing the sows should have access to nestbuilding materials.

Farrowing pen systems

- Pens with crates (≤4 m^2)
- Pens with partial confinement (< 5 m^2)
- Pens for loose housed sows (> 6 m^2)
- Loose-housing systems with several sows

Thermal requirements for piglets

Lower critical temperature (LCT) for newborn piglets: 31 – 34 ℃

Lower critical temperature (LCT) for farrowing sows : ??

Effect of infrared temperature on thermoregulatory behaviour in suckling piglets

(Vasdal, G., Wheeler, E.F., Bøe, K.E. 2009. Animal, 3, 1449-1454.)

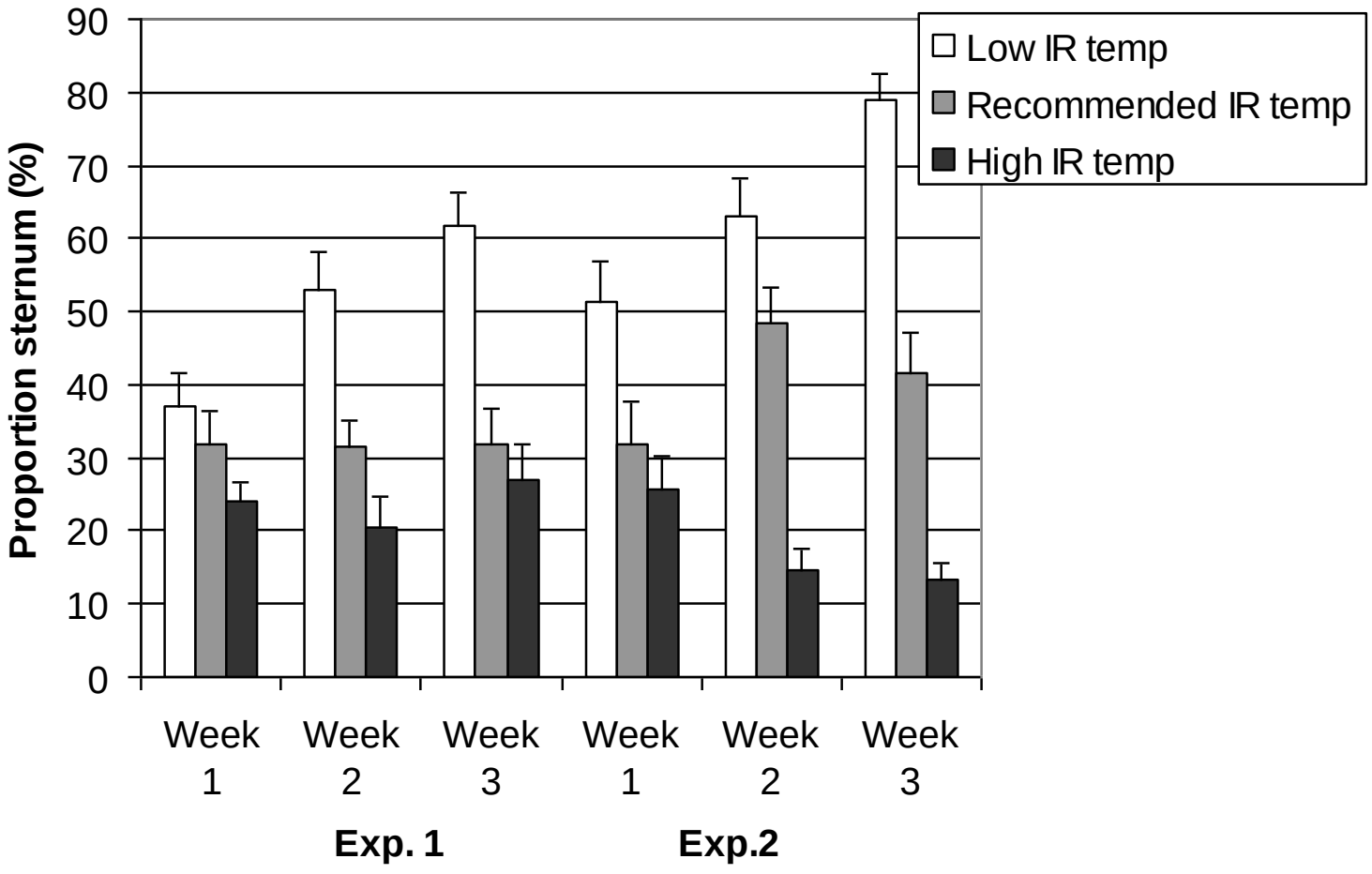
Piglets may reduce the heat loss by:

1. Changing body posture
2. Huddling

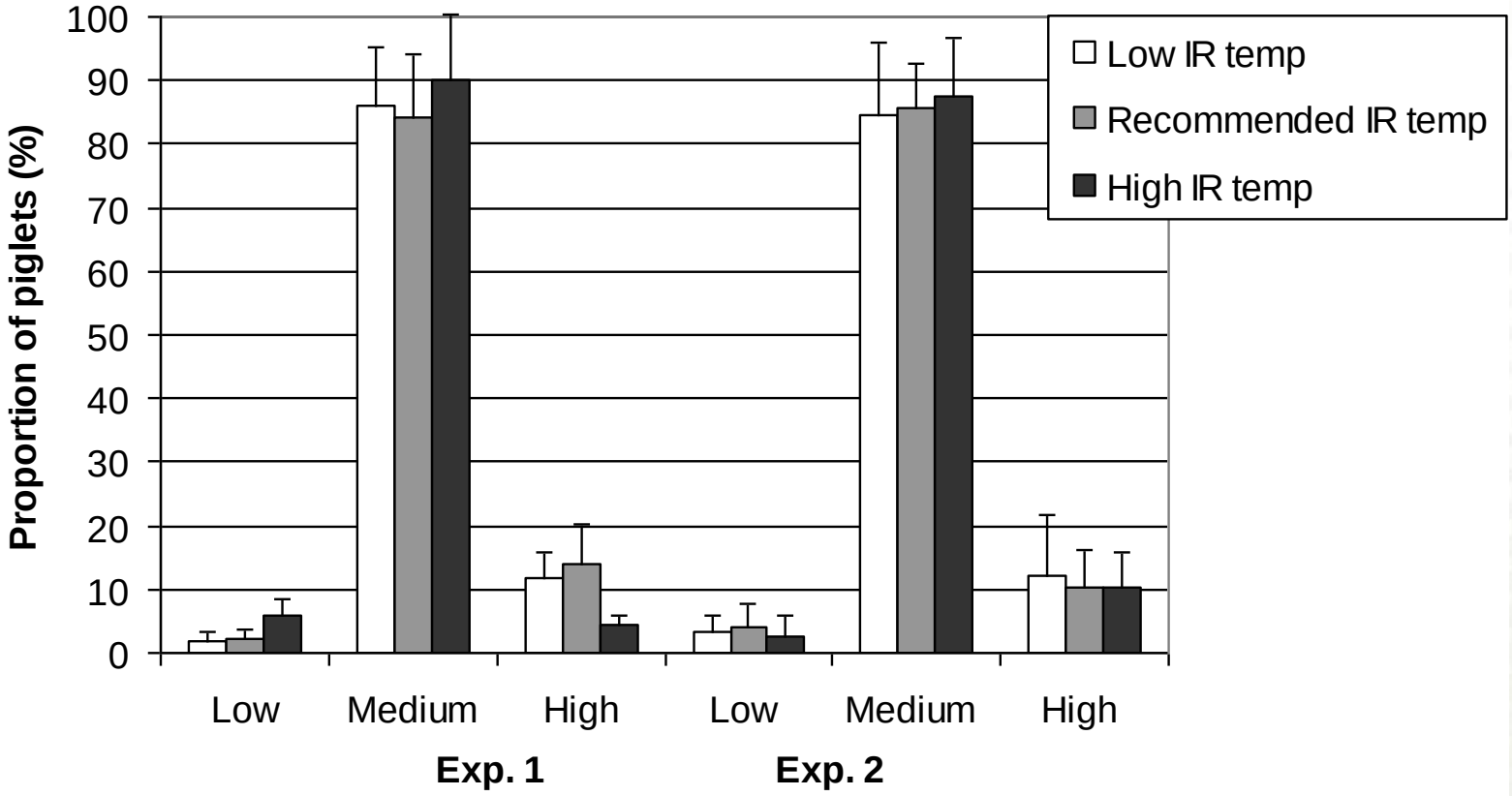
How do these mechanisms develop in young piglets?

16 litters tested in experimental creep box at 1, 2 and 3 weeks of age at radiant temperature ±4 °C and ±8 °C of recommended temperature

Postural changes



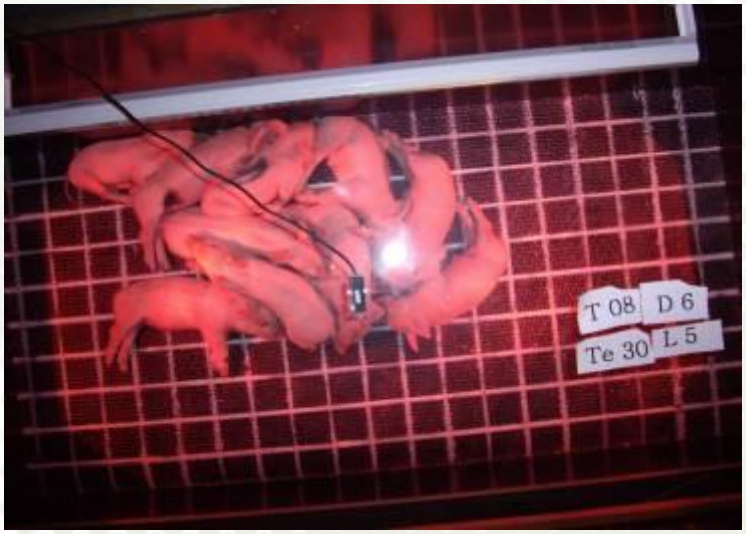
Huddling


Proportion of piglets (%)
100
90
80
70
60
50
40
30
20
10
0
Low IR temp
Recommended IR temp
High IR temp
Low
Medium
High
Low
Medium
High
Exp. 1
Exp. 2

Static space requirements for piglet creep area as influenced by radiant temperature

(Wheeler, E.F., Vasdal, G., Bøe, K. E., 2008. Transactions of the ASABE, 51, 271-278)

- Few spatial recommendations for suckling piglets
- How much space does a litter of piglets occupy?
- The aim of the study was to determine the actual area occupied by a resting litter at thermoneutral and challenging temperature conditions during the first three weeks after birth
- Week 1, 2 and 3 after birth
- Recommended temp ± 4ºC



Static space requirements for piglet creep area as influenced by radiant temperature

Week1	30℃	**34°C**	38℃	P-value
	0.57 ±0.12	0.61 ±0.13	0.66 ±0.13	<0.010
Week 2	23℃	**27°C**	31℃	P-value
	0.61 ±0.11	0.71 ±0.10	0.86 ±0.13	<0.0001
Week 3	21℃	**25°C**	29℃	P-value
	0.88 ±0.10	0.94 ±0.11	1.10 ±0.16	<0.0005

1 week: 0.06m²/pig (14= 0.84m²)
2 weeks: 0.07m²/pig (14= 0.98m²)
3 weeks: 0.09m²/pig (14= 1.26m²

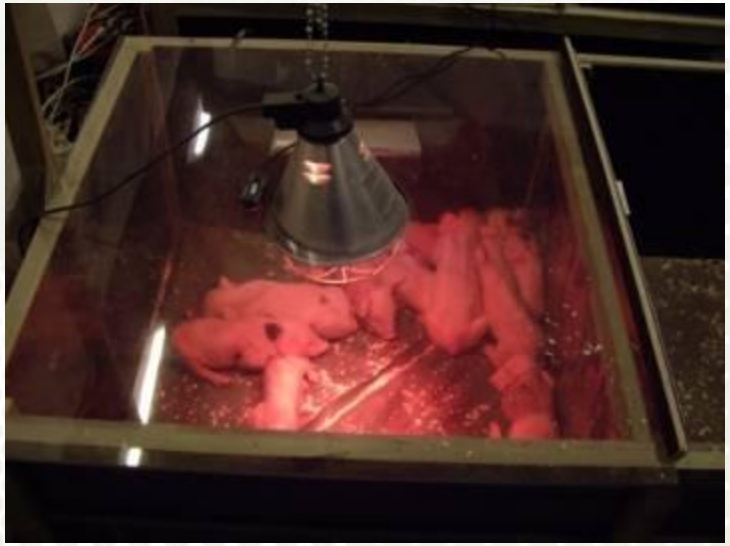
Piglet preference for infrared temperature and bedding

(Vasdal, Møgedal, Bøe, Kirkden, Andersen, 2010. Appl. Anim. Behav. Sci, 122, 92-97

Goal: Increase the use of the creep area day 1 and 2 after farrowing

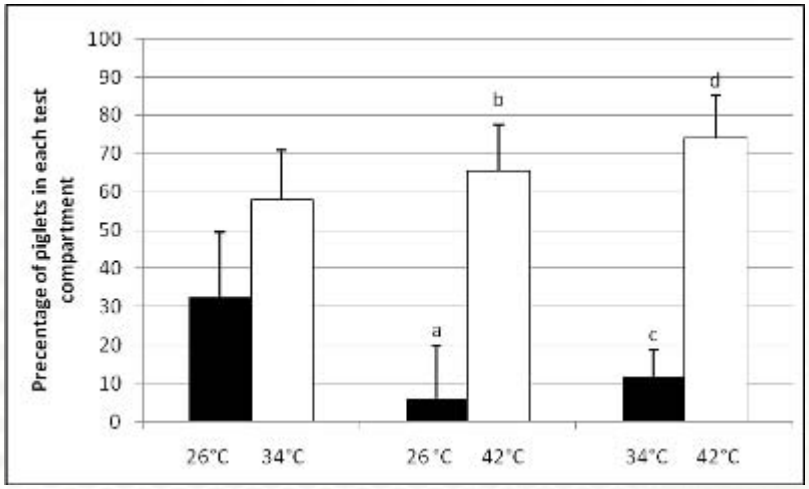
What is attractive to piglets?

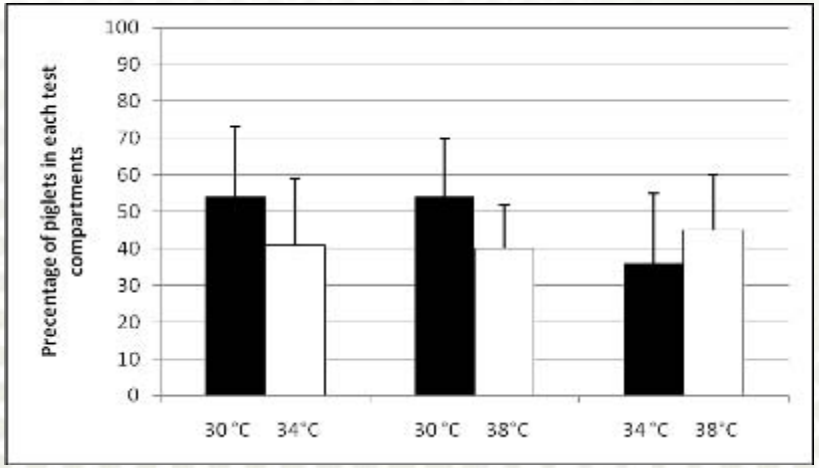
Aim of research: Examine the preference for different infrared temperatures and surfaces in 24 h piglets



Piglet preference for infrared temperature and bedding

(Vasdal, Møgedal, Bøe, Kirkden, Andersen, 2010. Appl. Anim. Behav. Sci, 122, 92-97)





Piglet preference for infrared temperature and bedding

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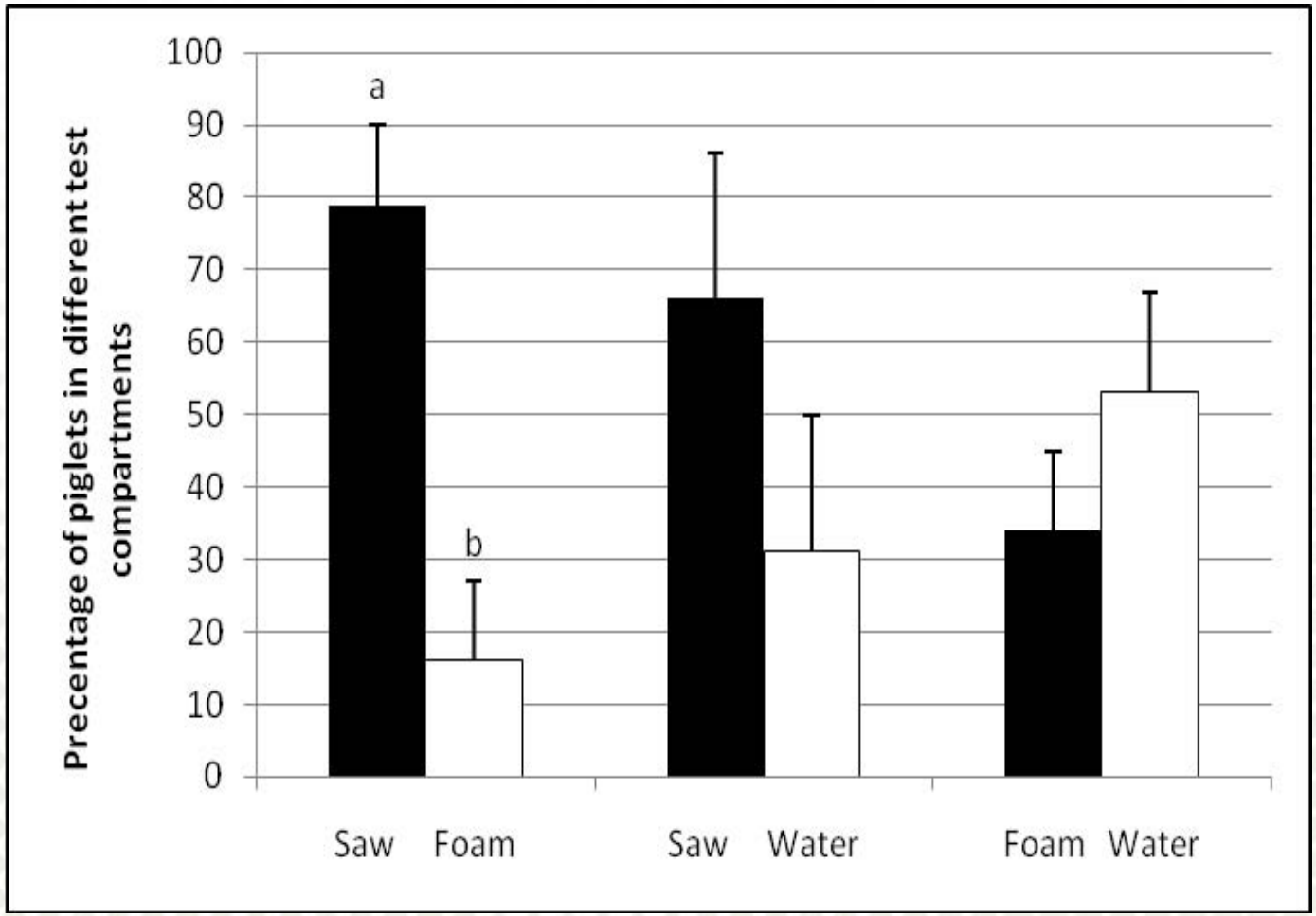
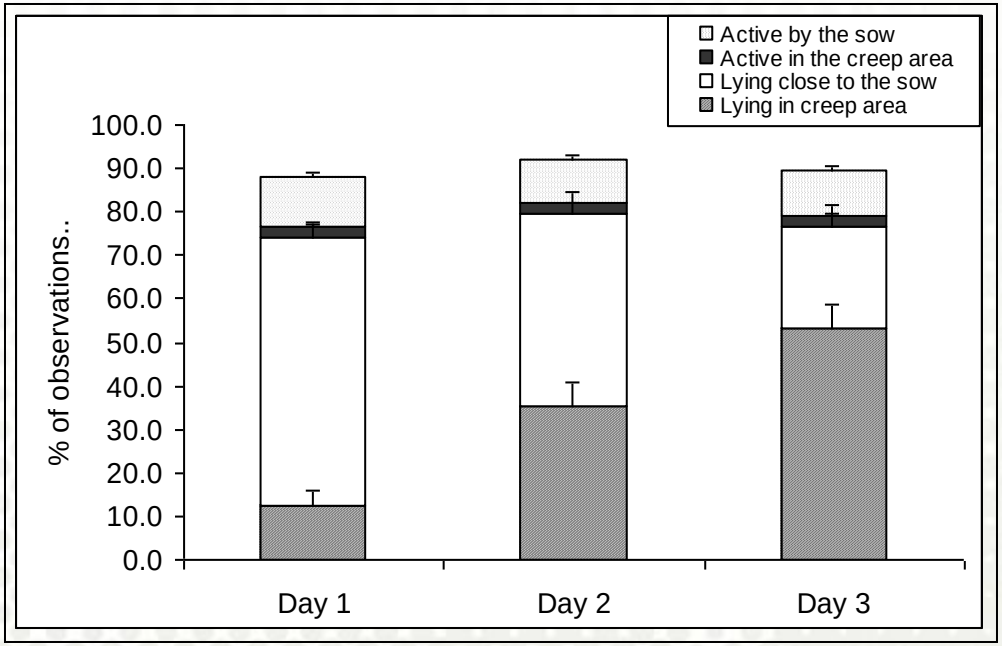


Use of creep area

Berg, Andersen, Tajet, Haukvik, Kongsrud, Bøe, 2006. Anim. Sci., 82: 1-5.

96 loose-housed sows in a commercial herd.
Tr. 1: Closed inside creep area for 15 minutes during sow feeding day 1
Tr. 2: Closed inside creep area for 15 minutes during sow feeding day 1 and 2



No effect of closing the piglets inside the creep area

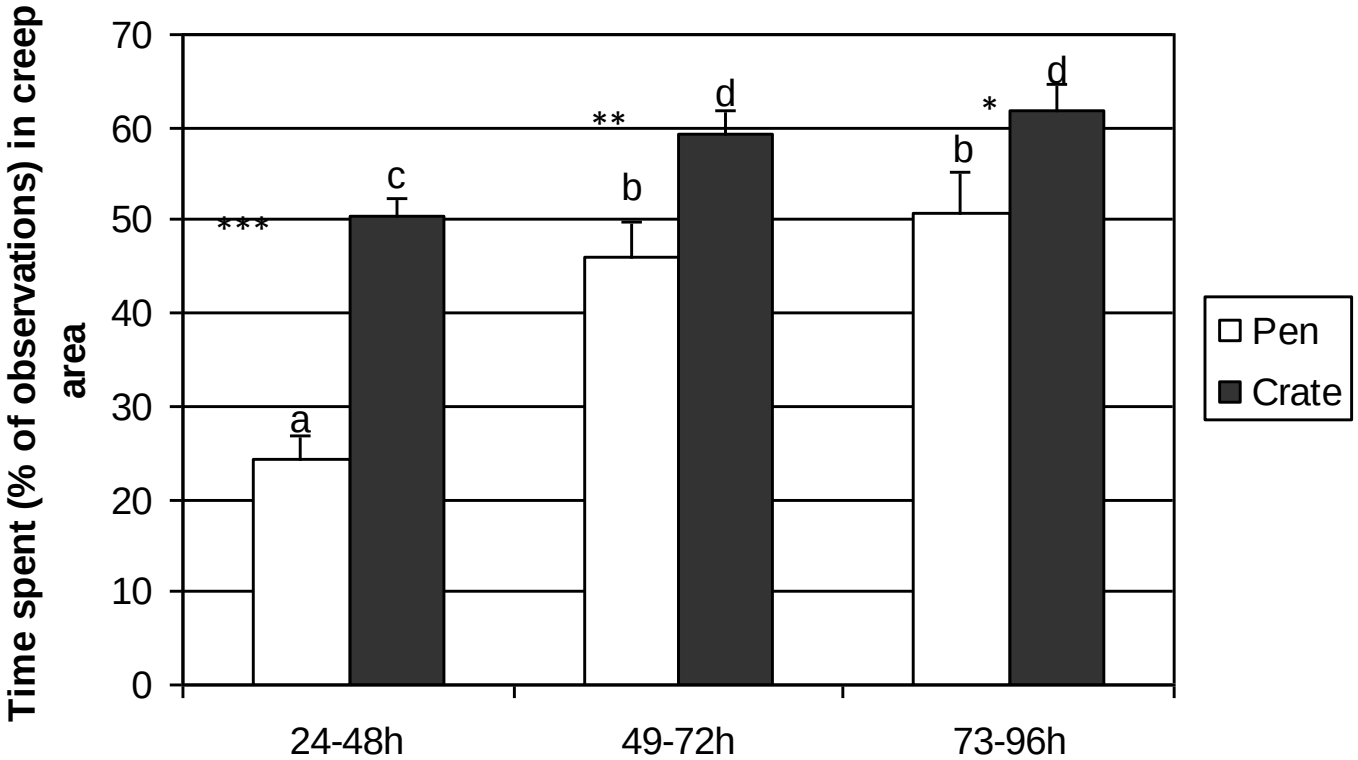
No effect of use of piglet creep area or piglet mortality

Piglet use of the creep area - effects of breeding value and farrowing environment

(Vasdal, G., Andersen, I. L., Pedersen, L. J. 2009. AABS, 120, 62-69.)

- It is assumed that increased use of the creep area will reduce piglet mortality
- How does the farrowing environment affect time spent in the creep area?

Piglet use of the creep area - effects of farrowing environment



- *Changes in time spent (% of observations) in creep area (mean ± S.E.) in crate and pen during the first three days after birth. Difference within day between environments: * P< 0.05, ** P<0.01, ***P<0.001. Difference between days within environment: a, b, c: P<0.05.*

Increasing the piglets' use of the creep area – a battle against biology?

Vasdal, Glærum, Melisova, Bøe, Broom, Andersen, 2010. Appl. Anim. Behav. Sci., 125: 96-102

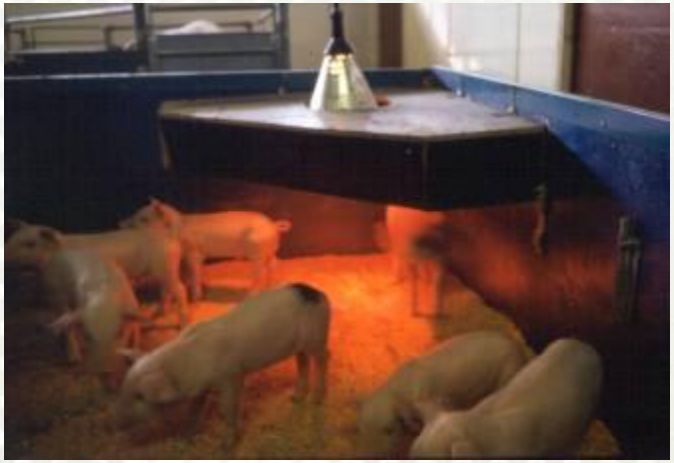
- The aim of this study was firstly, to try to increase the use of the creep area by providing attractive stimuli, and secondly, to investigate the effects of increased time spent in the creep area on piglet mortality.

Results – use of creep area and piglet mortality

	Treatment			Day		T*D
	Control	Bed	Hut	$F_{2,82}$	P-value	Pvalue
In creep area	28.8	30.4	17.0*	20.6	<0.001	<0.01
Nursing	27.3	24.8	25.0	84.2	<0.001	ns
Active sow area	10.3	9.7	12.4	4.7	<0.05	<0.05
Resting alone	5.1	3.6	11.3*	1.8	ns	0.05
Resting near sow	28.4	31.3	44.0*	7.9	<0.01	ns
Mortality	13.4	12.9	15.2	2.8	0.06	<0.05

Conclusions on creep area

- The piglets spend not much time in creep area during the three first days after farrowing
- No correlation between time spent in creep area and mortality
- To try to attract piglets to the creep area seem to be a battle against biology



Thanks for your attention

FTS = farrowing to slaugther

Number of FTS-herds in Norway 2007	**44**
FTS Full	15
FTS Light	25
FTS Full + Light	4

Mean number of pens per herd : 52

Mean number of pens per section: 20

FTS – Production results I

	Mean FTS	Variation FTS	In-Gris 2006
Number of herds	16		524
Sow/year	51	13-100	73
Weaned pr sow and year	22,4	18,6 - 25,5	22,7
Litters/sow/year	2,05	1,85 – 2,30	2,15
Liveborn per litter	12,8	11,6 – 13,7	12,4
Weaned per litter	10,8	9,8 – 12,2	10,6
Postnatal mortality (%)	15,8	8,7 – 22,0	14,4

FTS - production results II

	FTS	In-Gris 2006
Number of herds	5	83
Number of pigs	1000	1215
Daily gain from (g)	931	928
Weight at start (kg)	24,5	29,1
Mortality (%)	1,6	1,8

Commercially viable non-crated farrowing systems

Rebecca Morrison PhD.

Rivalea AUSTRALIA

Current position

- **MCOP Farrowing crates**
  - Agreed that farrowing crates have no commercial alternative that also provides adequate welfare for piglets
  - Maximum duration in farrowing crates limited to 6 weeks.

- **Rivalea's commitment to investigate non-crated farrowing systems.**
  - Sow welfare
  - Customer demand

- **Investigating non-crated farrowing systems which do not constrain the sow pre- and post-farrowing.**

What must an non-crated farrowing system deliver?

Sow

vs.

Piglets

Farmer

Return to first principles:

What are the biological needs of the sow?

What are the biological needs of the piglets?

i.e. what does it need to survive?

What are the needs of the farmer?

Economics

Safety

Ease

(From Baxter, 2010)

Definition of maternal behaviour:

That behaviour, exhibited by mothers towards their young, which is presumed to aid the young in their survival, growth and development, both physically and behaviourally.

Components of maternal behaviour in pigs:

Selection of the birth site

Site formation (nest-building activities)

Parturition

Acceptance of the young and suckling

Defence of the nest and/or litter

(From Cronin, 2007)

Non-crated systems must be commercially viable

- **Piglet survival similar to farrowing crates - 88% survival of piglets born**
  - Piglet welfare and economics
- **Non-crated farrowing system must fit into existing "footprint" of farrowing sheds /infrastructue or "Free Range".**
  - Producers must be able to use existing infrastructure-capital investment
  - Effluent system management
- **Environmentally sustainable/environmental permits**

Non-crated farrowing systems

- Rivalea are investigating :
  - Deep-litter, group lactation
  - Free-Range (whole life cycle for boars, sows and piglets)
  - PIGSafe farrowing pen

St Bernard's Free-Range System

Deep-litter, group lactation in Ecoshelters.

Thorstensson version:

Farrow in temporary boxes in group room, with removal of boxes when pigs are 10 days old.

- 10 sows and litters/room
- 7m^2/sow and litter
- Individual farrowing pens

(From WCROC, Uni. Minnesota)

Weaner housing

(From WCROC, Uni of Minnesota)

"PIGSafe"

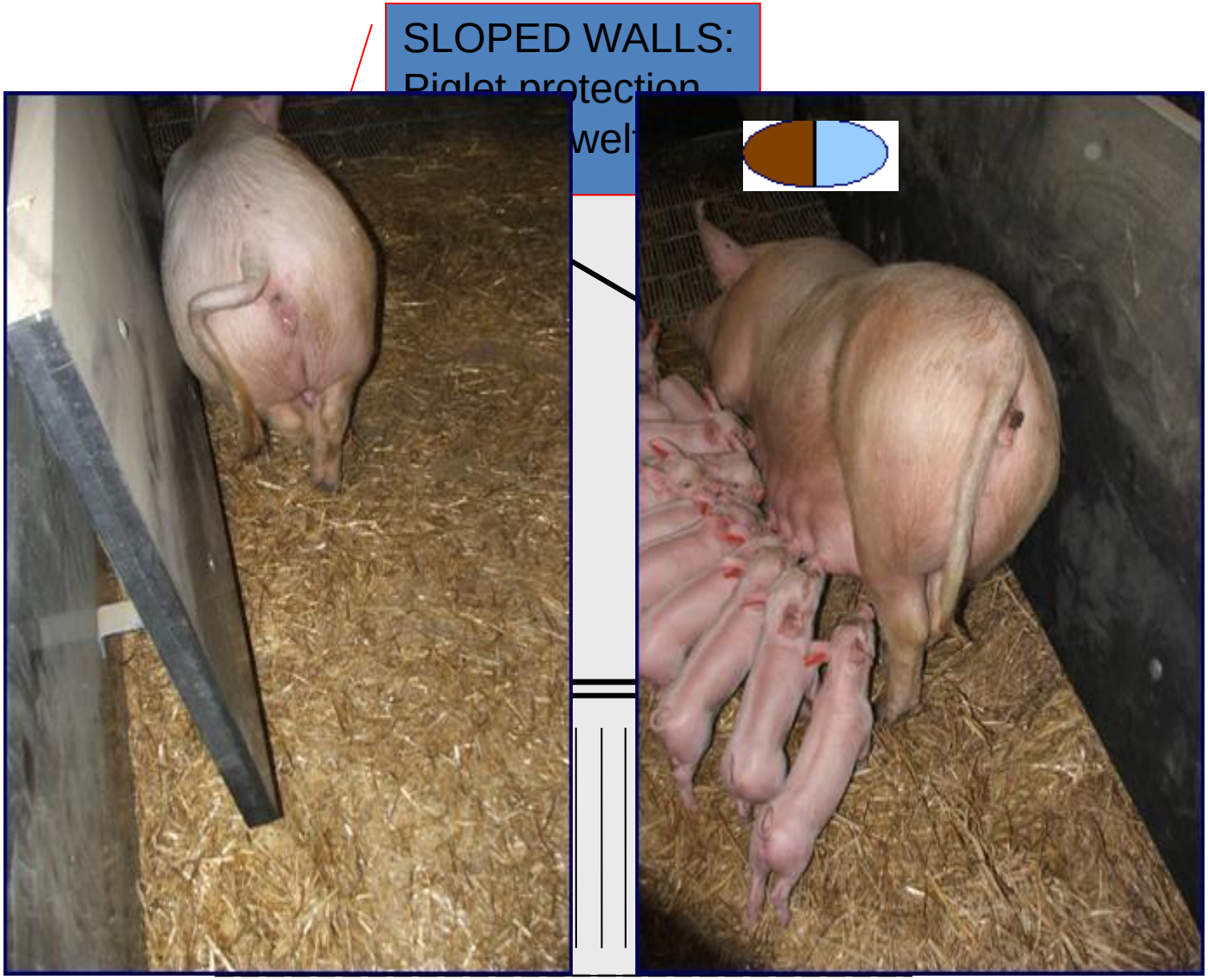
(Piglet and Sow alternative farrowing environment)

Prof. Sandra Edwards and Dr Emma Baxter
Newcastle University and Scottish Agricultural College, UK

Prototype design – Farrowing location

(From Baxter, 2010)

Prototype design – Piglet protection



(From Baxter, 2010)

Initial observations-Rivalea

- **Sows are *extremely individual* in their ability to farrow and raise piglets successfully in non-crated farrowing systems.**

- **The first 24 hrs is critical in terms of piglet survival. The majority of piglet deaths are caused by being overlain by the sow within 24 hrs of birth.**

- **Investigate the use of sloping walls in farrowing pens to reduce the time taken for the sow the lie down/assist sow to suckle pigs.**

- **Once piglets get past the first 24-48 hour period they are healthy and viable up to weaning.**

Current activities

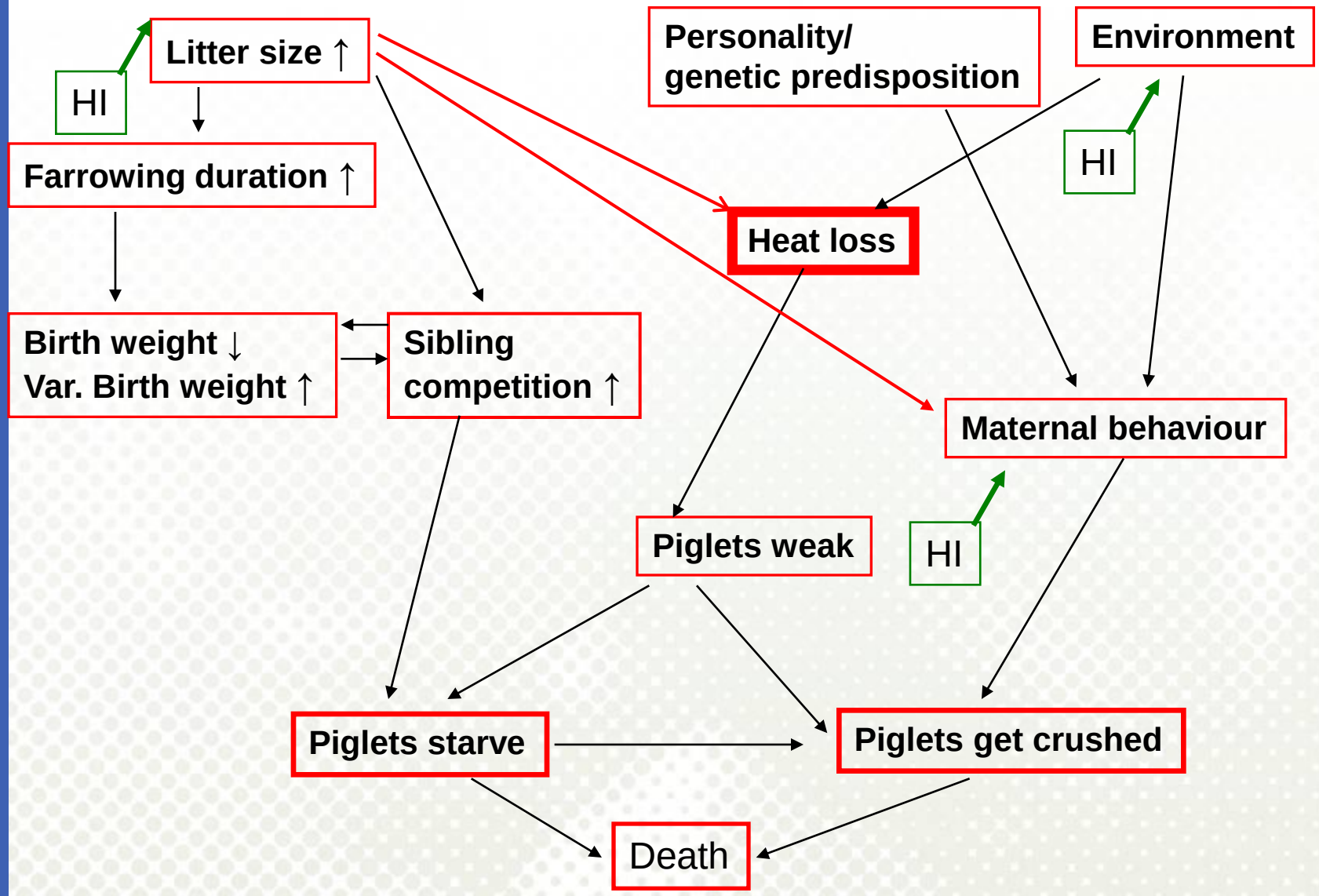
- **APL funded literature review-"Alternatives to Farrowing Crates"**
- **APL/Rivalea funded Travel Award-PIGSafe system**
- **Non-crated farrowing focused research workshop-Wed Sep**
  - Identify gaps in knowledge:
    - Dr Greg Cronin/Hugh Payne
    - Prof. Sandra Edwards/Dr Emma Baxter
    - Prof. Alastair Lawrence
    - Australian Pork Producers using alternative farrowing
- **PIGLink seminar-Prof. Sandra Edwards**

Piglet survival in individual, loose-housed sows – the impact of sow behaviour, farrowing environment and management

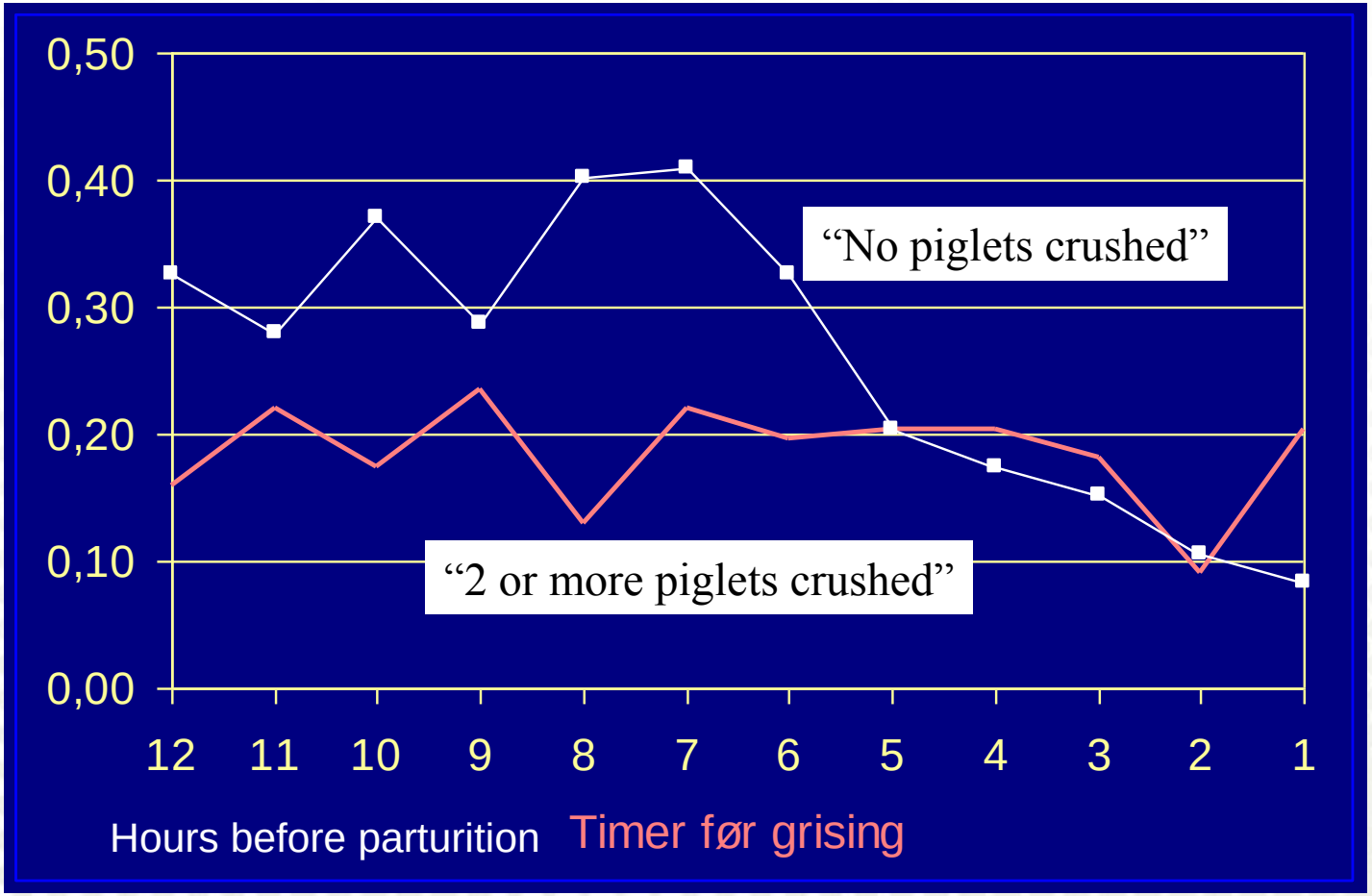
Inger Lise Andersen, Guro Vasdal and Knut Egil Bøe

Associate professor in ethology at the Norwegian University of Life Sciences, Dep. of Animal and Aquacultural Sciences

Relationship between predisposing factors of mortality



Proportion of time (% av obs) spent nest building the last 12 hours before parturition (Andersen et al., 2005)



In Norway we recommend: free access to long straw 12 hours before expected farrowing

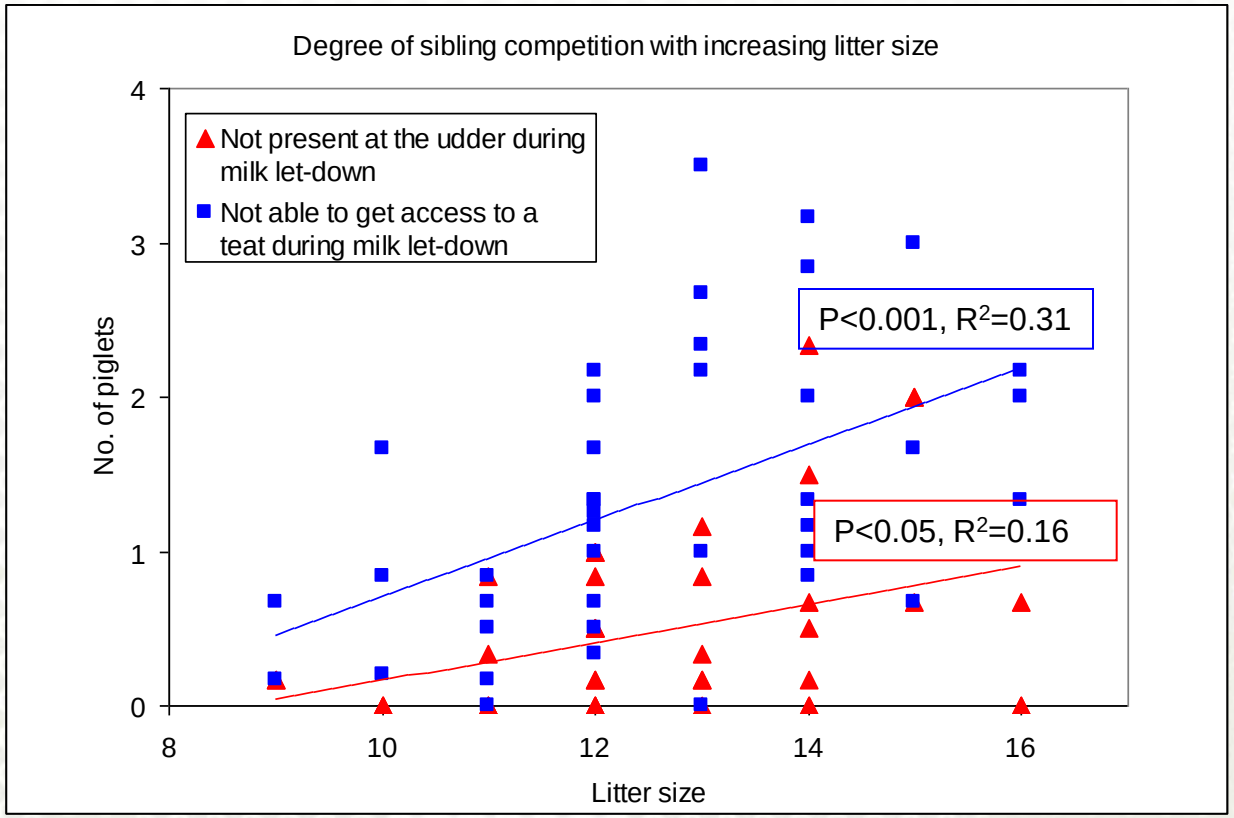
Field surveys in Norway (Stokke, 2005**)**: herds with less than 10% mortality use 2-3 kg of straw per sow

- **Effects of litter size on maternal behaviour, competition for teats, piglet mortality and piglet growth** (Andersen et al., submitted)

Results – piglet mortality

	Litter size		Parity (no. of litters)	
	$\chi^2_{1,35}$	P-value	$\chi^2_{3,35}$	P-value
No. of surviving piglets	0.6	0.45	1.3	0.73
Piglet mortality (% of live born)	96.4	<0.0001	54.4	<0.0001
Maternal crushing/no milk (% of dead piglets)	65.0	<0.0001	3.9	0.27
Maternal crushing/milk (% of dead piglets)	0.3	0.56	19.0	<0.001
No milk, i.e. starved (% of dead piglets)	13.9	<0.001	18.7	<0.001
Other causes (% of dead piglets)	16.0	<0.0001	8.7	<0.05

Results – sibling competition



Results – change in sow behaviour with increasing litter size:

- The sows tended to spend a larger proportion of their time standing or rooting
- The piglets were more often located in close proximity of the sow when she was not nursing

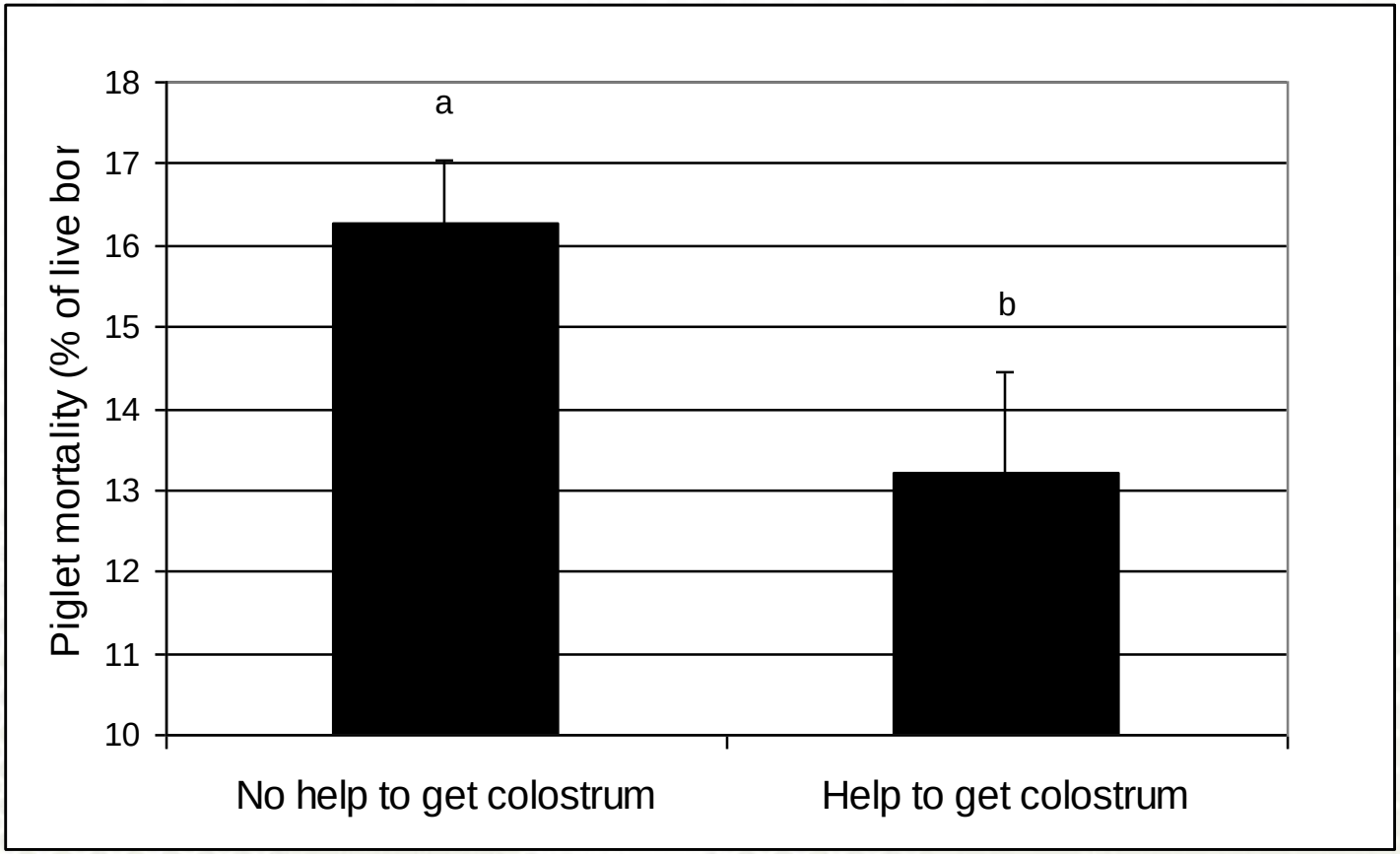
- **Primiparous sows appeared to adjust their investment with increasing litter size better in that they had a:**
  - sharper increase in proportion of nursings terminated by the sow over the lactation period
  - they increased their time spent standing, making it more difficult for the piglets to initiate nursings

Other effects of litter size:

- **Tuchscherer et. al. (2000) + our EU-project (WQ 3.5.2.1):**
  - Piglets spend longer time before finding a teat after birth and have lower rectal temperature 1-2 H after birth
- **Our EU-project (unpublished):**
  - The larger the litters, the more nursings were initiated by the piglets
  - Sows with larger litters nose less on their piglets on day 1
  - Sows with large litters show a weaker response to piglets being handled (piglet handling test) and to recorded piglet screams (piglet scream test)

Management

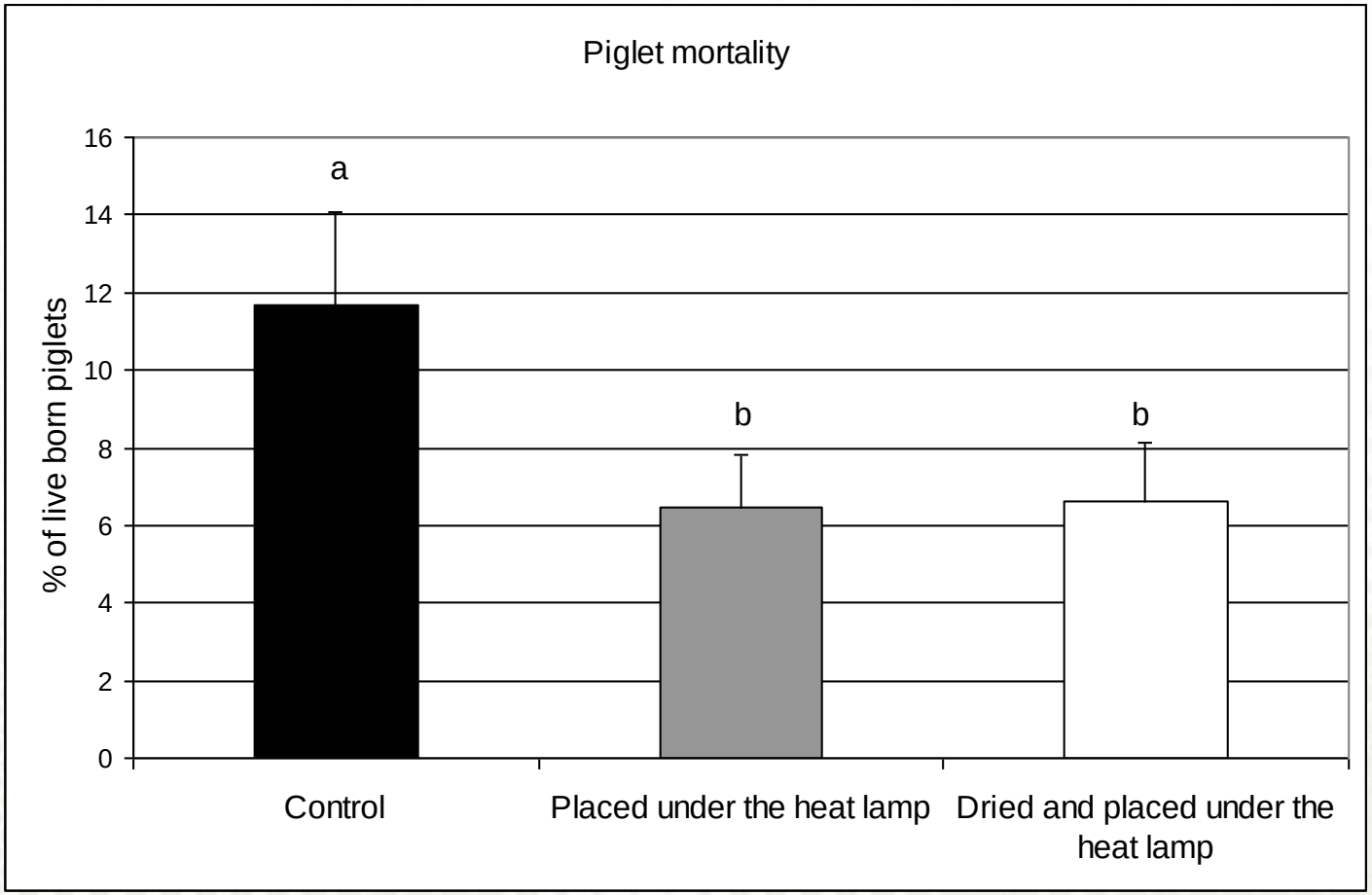
Help to get to the udder to suck a teat immediately after birth (Andersen et al., 2007) :



Management at the time of farrowing (Andersen et al., 2008)

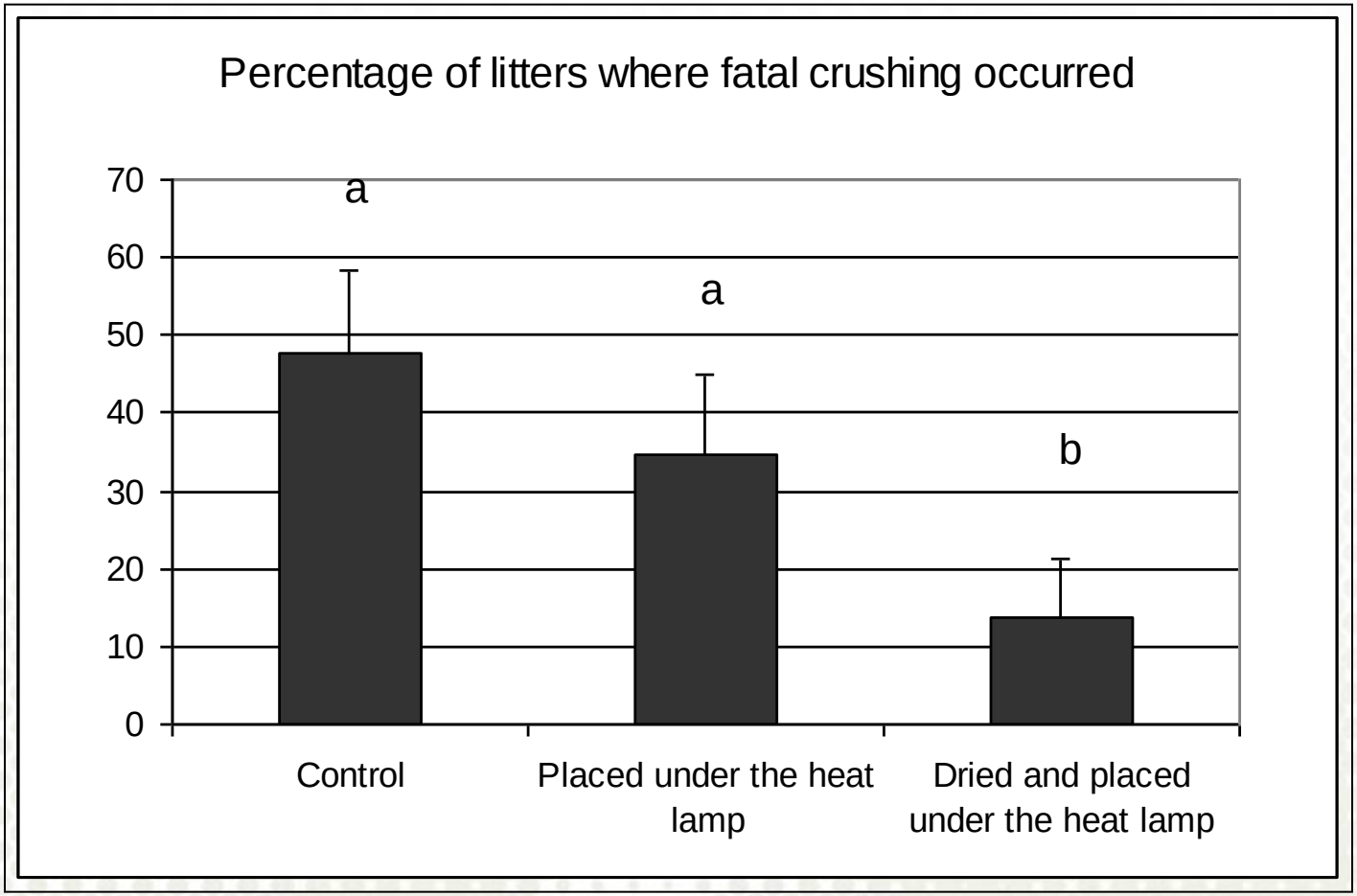
1. Control
2. Placed under the heat lamp
3. Dried/massage with straw and paper towel + placed under the heat lamp

Piglet mortality (% of live born) and routines



Supported by Christison et al., 1997

Piglet mortality (% of live born) and routines



Factors related to the farrowing environment (physical factors)

Optimal farrowing pen?

Loose-housing of lactating sows

Department of Animal and Aquacultural Sciences

Results from our EU-project (e.g. Perdersen et al., subm)

Neonatal piglet mortality in relation to housing system and breeding value for piglet survival rate

Lene J. Pedersen, Inger L. Andersen, Grete M. Jørgensen, Signe Thingnes, Kari Torsethaugen

Faculty of Agricultural Sciences, Aarhus University, Denmark

Norwegian Uni. Life Science, Norway

Experimental design

128 gilts selected from a breeding herd:
Breeding value for Survival Rate day 5=SR5
(Live piglets day 5/total born piglets)

High SR5
N=50

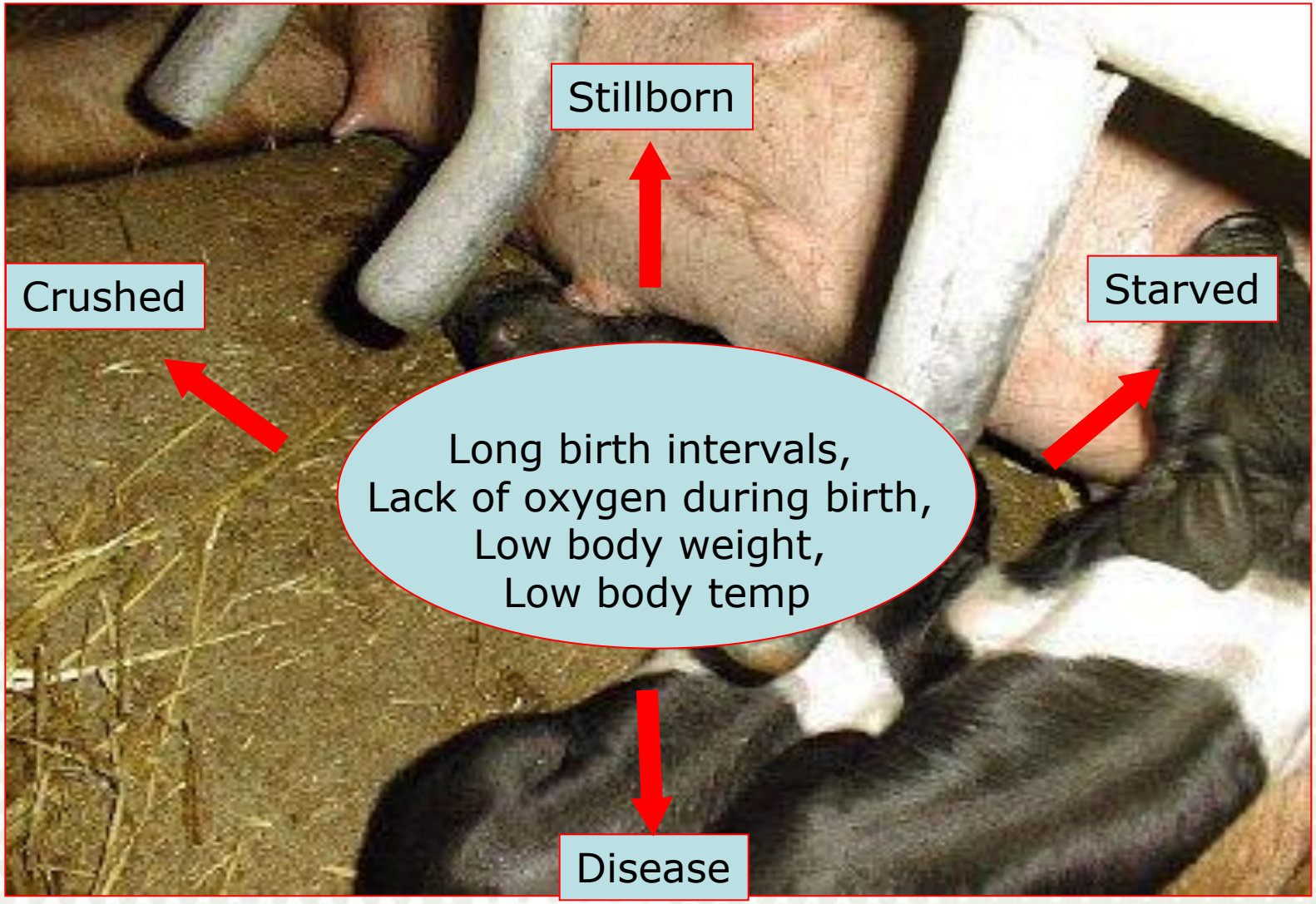
Low SR5
N=50

Crates, n=50

Pens, n=50

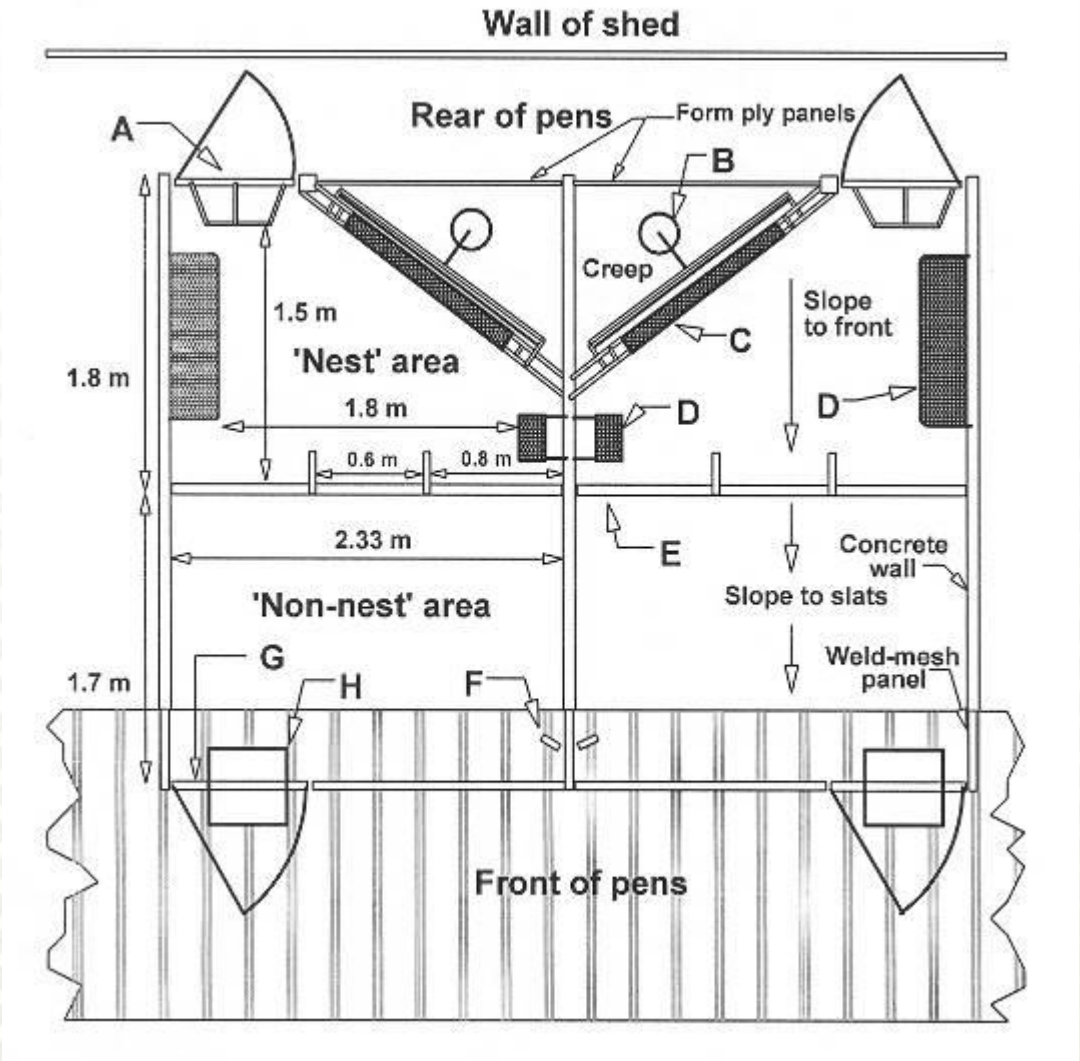
No sign. diff in piglet mortality between crated and loose-housed sows!

Main predisposing piglet-related factors of mortality



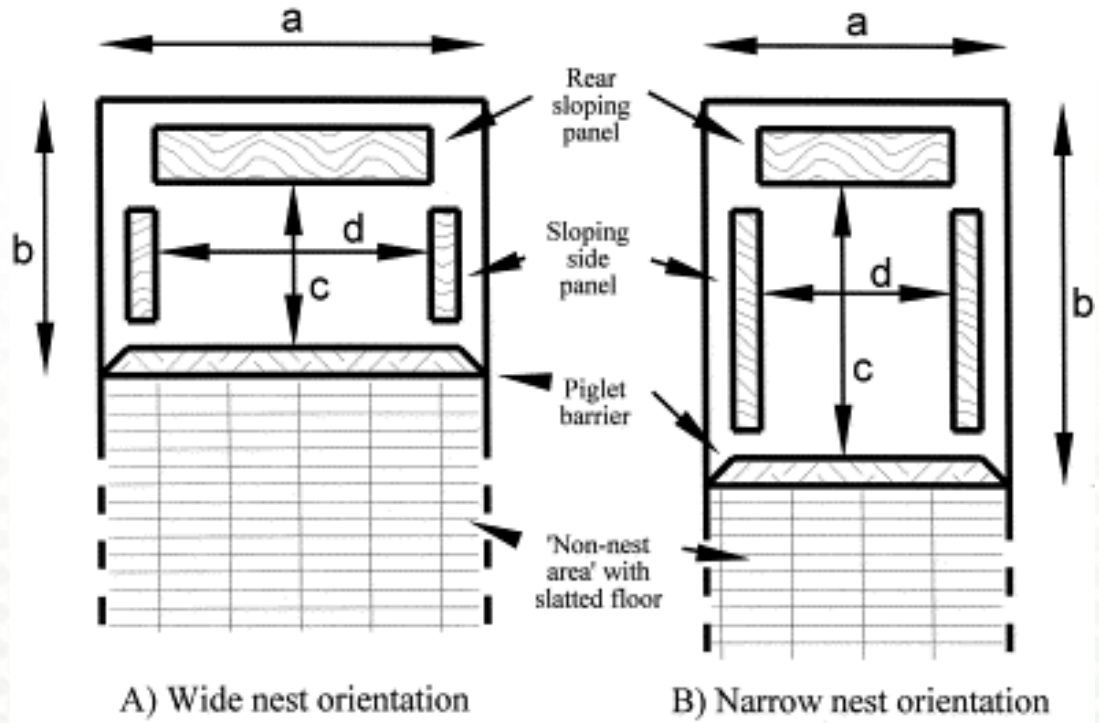
Werribee farrowing pen from Australia, Cronin, 1997-2000

Total space: 8,2 m^2



Wide vs. narrow nest area (Cronin, 1997)

a=2.0-2.4 m



a=1.7-1.8 m

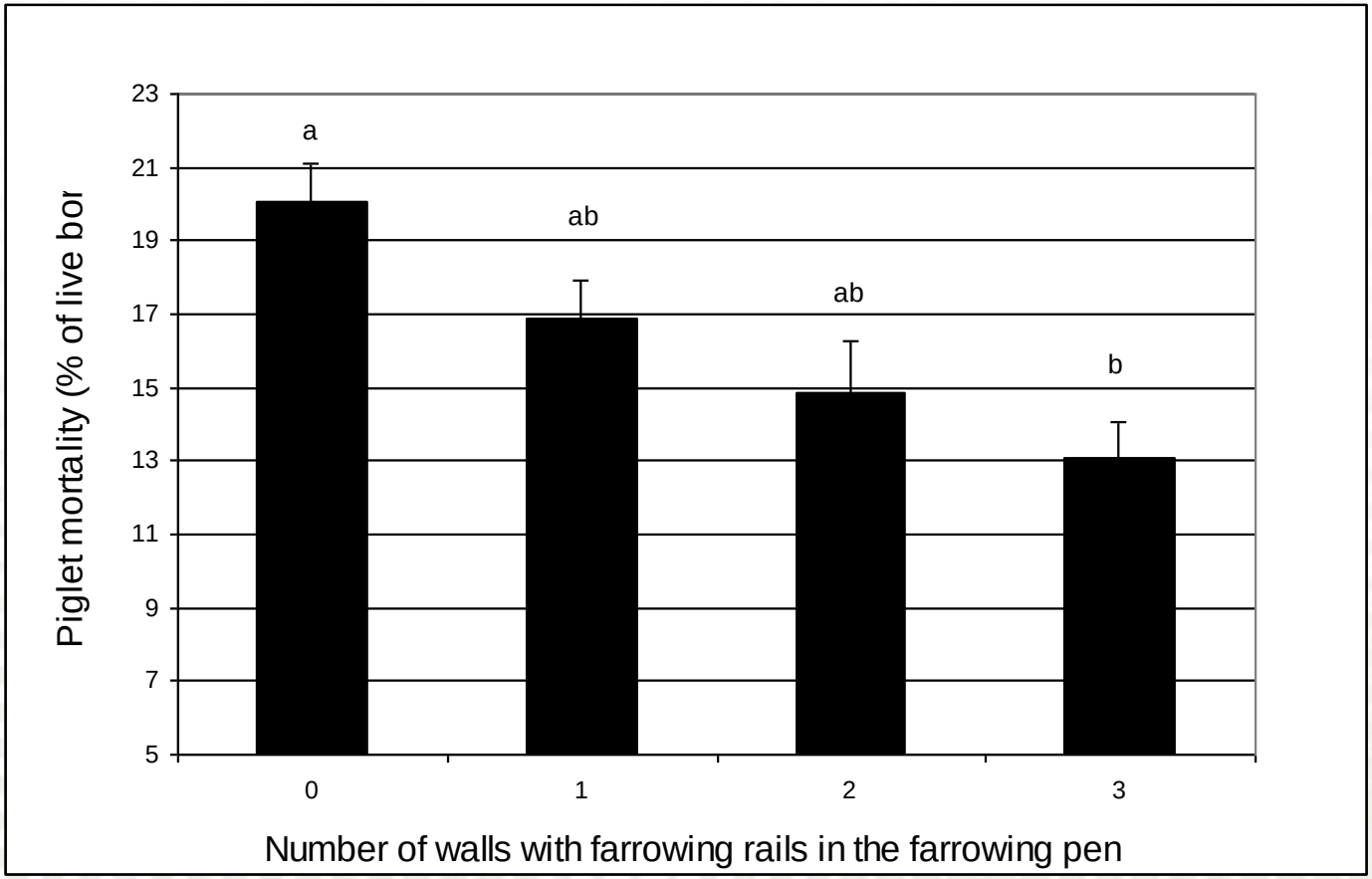
90,5 % of the piglets survived until weaning when a wide nest was used, whereas 83 % of the piglets survived in the narrow nest

The sows had less vocal communication with the piglets at the time of nursing in the narrow nest

70 % more posture changes in the narrow nest

Piglets suckled less frequently in the narrow nest

Factors related to the farrowing pen (Andersen et al., 2007)



Other factors related to the farrowing pen

- Andersen et al., 2007: herds with no or hardly any sawdust in the sow area in the pen have 4% higher mortality than herds using moderate or large amount of sawdust
- Size of the pen?

Pregnant sows

PigCare®: Pig welfare and quality assurance

Kathleen Plowman
General Manager Policy
Australian Pork Ltd

Animal Welfare Science Centre
Pig Welfare Seminar
July 2010

PigCare® - overview

- Quality Assurance: APIQ review, welfare and lessons learnt
- APIQ✓ 2010 and *PigCare*®
- Where to from here

Quality assurance

- APIQ✓ is the key industry quality assurance program
- Managed and administered by APL, BUT auditors are independent of APL
- Producers audited at least annually, sometimes more frequently depending on customer requirements
- Based on managing farm risks by following GAP using the principles of HACCP
- Covers five key areas:
  - management
  - food safety
  - animal welfare
  - biosecurity and
  - traceability

- Demonstrates compliance with relevant state and federal legislation
- Demonstrates that producers are responsible farmers who care for their animals
- APIQ✓ certification, and hence compliance with APIQ✓ welfare standards, is a requisite for the sale of pigs through many Australian processing facilities

APIQ✓ covers any type of production system






APIQ 2004: Welfare Audit

- Based on a previous Pig Welfare Code (1998)
- Audit structure and approach follows a question and answer-based methodology
- Generates a closed, subjective, qualitative and poorly repeatable set of outcomes
- System is desk and facilities driven
- Incorporates only some aspects of stockmanship
- Provides very little direction toward animal-based indicators and animal-based outcomes
- Minimal guidance to auditors
- System does not provide reliable and repeatable assurance of animal welfare in a given situation

APIQ 2010

- APIQ review identified:
  - ✓ need for animal-based pig welfare assessment indicators
  - ✓ must be outcomes focused
  - ✓ indicators designed to enable semi-quantitative and repeatable assessments of on-farm animal welfare
  - ✓must be cross-referenced to the 2007 Model Code
  - ✓ need for strategic non-animal based assessments to ensure compliance with Model Code and relevant state legislation
  - ✓critical importance of auditor competency, training and calibration
  - ✓importance of system transparency, robustness and validation
  - ✓need for an independent module – *PigCare* - which can be adapted for use outside of APIQ✓ to promote animal welfare on farm

PigCare® - its origins

• Concept and framework for the *PigCare*® welfare audit template is based upon the NZ on-farm welfare assessment of pigs program

- Acknowledge the New Zealand Pork Industry Board and Ian Barugh of Massey University

• Producers, SPSCA, National Animal Welfare Advisory committee and vets identified a list of parameters

- originally over hundreds of parameters which were consolidated and refined down to a few key parameters
- emphasis is placed upon animal-based indicators and outcomes
- cognisant of specific, prescriptive Standards in the Code, particularly those addressing facility and competency parameters

• Subsequently modified, adapted and trialled to fit the Australian context

PigCare®

- Principles of *PigCare* are to identify any signs of pig behaviour or appearance that may suggest an animal welfare issue exists

- A diagnostic process is then used, that links back to the *Model Code,* to determine the cause of the issue so a solution can be implemented

- The audit system is designed as a day-to-day management tool that a stockperson or herd manager can use in assessing pig welfare

PigCare®

- Primarily based on animal welfare indicators:

I. First as a whole of enterprise
   - **Enterprise Checklist**
     - Takes a *horizontal bird's eye view of the whole of* the enterprise and its management areas
     - addresses both the prescriptive and cross production welfare standards that apply to all production in the piggery

II. Then onsite inspection
   - **Production Checklist**
     - Takes a *vertical* view of welfare based animal indicators
     - Assessed at the pig shed/production unit level

PigCare® - Audit check list

- Audit check-*sheets use a 'traffic light' system to record the* observations made:
  - green = good, no action required
  - amber = OK, means something is not quite right and more investigation is required
  - red = not OK, means there is a definite problem that needs immediate attention

- As a general guide:
  - OK/not OK scoring is used for parameters where the judgement is fairly straight-forward and objective, for example, yes or no
  - Traffic light scoring is used on parameters where the judgement is more subjective, and the aim is to objectify subjective criteria

PigCare® - Enterprise checklist

- **Checklist**
  - ✓ Stockmanship
  - ✓ Husbandry
  - ✓ Herd Health
  - ✓ Management

RECORD 10 — STAFF TRAINING/COMPETENCY REGISTER

NAME	
POSITION	
ADDRESS	
TELEPHONE No.	

Staff Training/Competency Register	**Date**	**Signature of trainer/ assessor**
APIQ✓™ briefing		
Instruction/assessment on pig welfare in accordance with the *Model Code*		
Pig handling and movement		
Instruction/ assessment on correct use of prodders		
Instruction/ assessment on sick pig identification and treatment		
Instruction/ assessment on estimating weight of pigs		
Instruction/ assessment in injection techniques		
Instruction/ assessment on minor surgical tasks/ elective husbandry procedures in accordance with the *Model Code*		
Instruction/ assessment on feed management		
Instruction/ assessment on biosecurity		
Aware of important emergency diseases, are able to recognise the signs of ill-health in pigs and are aware of the procedures to follow when such signs are seen.		
Instruction/ assessment in euthanasia methods in accordance with the *Model Code*		
Ante-mortem inspection		
Other		

Approved: Date:

1. PigCare - Enterprise Checklist

1. Stockmanship

Check	Assessment
1. Copy of WCOP present?	OK/Not OK
2. Competency records sighted for all current staff?	OK/Not OK
3. Specific competencies.	OK/Not OK

Procedure	When	By whom	Competency record checked?
Castration			
Tail docking			
Teeth clipping			
Ear notching			
Identification			
Pregnancy diagnosis/P2 testing			
Tusk trimming			
Vaccination			
Treatments			
Euthanasia			

Standards

Persons responsible for the day-to-day needs of pigs must ensure animals under their control are cared for in accordance with the Standards in this Code

Pigs must be cared for by personnel who are skilled in pig husbandry and are competent to maintain the health and welfare of the animals in accordance with the Standards listed in this Code, or are under the direct supervision of such personnel. Such competency must be able to be demonstrated within three years of endorsement of this Code.

Persons responsible for the care of pigs must be competent to recognise the signs of ill health in pigs, including behavioural anomalies, and must take appropriate action when any such signs are observed in pigs under their care.

If the person in charge is not able to identify the causes of ill health and correct them, they must seek advice from those with training and experience in such matters.

Vaccinations and other health treatments must be administered to pigs only by persons competent in such procedures or by persons under the direct supervision of a person experienced in conducting the procedure.

Stock-persons must not carry out elective husbandry procedures unless they are competent to undertake them or are under the direct supervision of a person experience in conducting the procedure in accordance with this Code

A competent person who is suitable trained to perform the euthanasia.

PigCare® - Production checklist

- Production unit is a physically defined area including directly comparable production facilities/environment that are under common management and is audited separately
  - ➢dry sows and boars, farrowing and post weaning
- **Checklist for all production units**
  - ➢ covers pig welfare requirements and everyday piggery functions:
    - ✓ Hunger and thirst
    - ✓ Interaction with physical environment
    - ✓ Health, injury and disease
  - ➢ Assessed against a set of criteria to capture animal based indicators reflecting the physical and emotional well being of the pigs:
    - ✓ Behaviour
    - ✓ Vocalisation
    - ✓ Physical appearance
    - ✓ Mobility
    - ✓ Faeces

PigCare Production Checklist Farrowing – Sows and Boars

AUSTRALIAN

PigCare Production Checklist Farrowing – Sows and Boars

Sows and Boars		Hunger and Thirst	Interaction with Physical Environment	Health, Injury and Disease
Animal Indices	**Vocalisation** ● ● ●	*Indicators of hunger and thirst* - Elevated noise and squealing *Note: Elevated noise is expected during specific activities such as sow feeding and piglet interactions*	*Indicators of poor housing/facilities* - Negative social interactions, such as squealing, vocal aggression and conflict	*Indicators of ill health* - Coughing andsquealing - Excessively quiet *References: Cough Index; Herd Health Plan*
	Physical appearance ● ● ●	*Indicators of hunger and thirst* - Body condition - some variation between individuals is normal, but no individual should be less than 2 - Scratches and lesions due to competition for food/water - Chronic under-feeding , demonstrated by backbone prominence, hairiness andelevated shoulder ulcers *References: Condition Scoring Table; Health and Injury Guidelines*	*Indicators of poor housing/facilities* - Excessively dirty pigs - Elevated lameness - Skin lesions/wounds due to fighting/injury (piglets) - Tail/vulva/ear biting - Pressure wounds, such as shoulder/hip/limb/backbone lesions - Sunburn - Discharges, such as nasal, ocular, wound and vulval - Excessive pre-weaning mortalities *References: Health and Injury Guidelines*	*Indicators of ill health* - Body condition - hairy, razor-backed - Skin – lesions, pressure sores, bruising and abnormal colour - Discharges, such as scouring, vulval, nasal, ocular andwound/abscess - Hernias or prolapses *Note: Pigs in good health should appear bright-eyed, fine-haired, pink-skinned and in good condition* *References: Health and Injury Guidelines; Condition Scoring Table*
	Behaviour ● ● ●	*Indicators of hunger and thirst* - Agitation, bossiness, fighting - Restlessness - Attracted to water if a bucket is introduced to the pen	*Indicators of poor housing/facilities* - Temperature – huddling, shivering, panting - Fighting - Nervous/evasive pigs - Stereotypies/repetitive behaviours *Note: Pigs in good housing should appear relaxed, content and responsive*	*Indicators of ill health* - Reduced awareness, indicated byapathy and lethargy - Huddling - Scratching - Restless and agitated
	Mobility ● ● ●	*Indicators of hunger and thirst* - Partial restriction - increased activity, fighting and congestion at drinking/feeding points - Complete restriction – restlessness and no congestion at drinking/feeding points - Advanced deprivation - reduced activity, lethargy and neurological abnormalities (salt toxicity) *Note: Mobility assessment not applicable in areas of restricted movement, such as farrowing crates*	*Indicators of poor housing/facilities* - Restricted mobility or space - Obstruction of movements by bars/fittings - Inability to suckle piglets on both sides (farrowing house) - Elevated lameness *References: Space Allowances for Pigs (farrowing); Health and Injury Guidelines*	*Indicators of ill health* - Elevated lameness *Note: Mobility assessment difficult in areas of restricted movement, such as sows/boars in stalls* *References: Health and Injury Guidelines*
	Faeces ● ● ●	*Indicators of hunger and thirst* - Low quantity of fresh dung - Quality of fresh dung, for example, dryness indicating reduced water access	*Indicators of poor housing/facilities* - Discharges - Are pigs dunging in the appropriate area?	*Indicators of ill health* - Scouring - Constipation - Traces of blood, digesta etc.

PigCare Production Checklist – Animal Indices

Indicator of Ill Health - Vocalisation

Cough Score

Score	Description
0	No coughing whilst observer is walking through shed
1	<5% (1 pig in 20) coughing; coughing is not persistent whilst observer walking through shed; mild coughing after pigs are encouraged to move
2	10-50% coughing; cough observed in pigs which are undisturbed but may not be persistent for entire time observer is in shed
3	>50% (1 pig in 2) coughing, including pigs at rest; cough is constant whilst observer walks through shed

Source: Massey University, 2009. On-farm Welfare Assessment of Pigs: a user guide and supplementary information for an on-farm assessment tool

PigCare Production Checklist – Animal Indices

Indicators of Ill Health

Gilts, Sows and Boars			
	🟢	🟡	🔴
Lameness	<0.1%	0.1-2%	>2%
Abscesses	<1%	1-2%	>2%
Wounds: • Shoulder • Vulva • Other parts of body	 <5% <5% <5%	 5-15% 5-15% 5-15%	 >15% >15% >15%
Scratches	<15%	15-40%	>40%
Body condition score <2	<0.1%	0.1-2%	>2%

Neonatal Piglets, Nursery and Finisher Pigs			
	🟢	🟡	🔴
Pigs euthanised (as % of total deaths)	>20%	5-20%	<5%
Lameness	<1%	1-5%	>5%
Abscesses	<1%	1-5%	>5%
Wounds	<5%	5-15%	>15%
Scratches	<15%	15-40%	>40%
Body condition score <2	<0.1%	0.1-2%	>2%

PigCare Production Checklist – Animal Indices

Facilities Guidelines

Prevalence of Facility Problem			
	🟢	🟡	🔴
Insufficient space: • Gilts, sows, boars • Nursery/finisher pigs	 <1% <1%	 1-10% 1-10%	 >10% >10%
Pens with: • damaged flooring • damaged fencing • damaged equipment • inappropriate feeder space • inadequate water availability	 <1% <1% <1% <1% <0.1%	 1-2% 1-2% 1-2% 1-2% 0.1-0.2%	 >2% >2% >2% >2% >0.2%

PigCare® - Auditor references

- Tables to assist auditor with the evaluation of the *PigCare*:

1. Condition Scoring Table
2. Air Quality Guidelines
3. Temperature Recommendations
4. Water Requirements
5. Lighting Guidelines
6. Facilities Guidelines
7. Health and Injury Guidelines
8. Coughing Score
9. Mortality Guide
10. Space Allowances
11. AAPV Guidelines for Management

APIQ✓ Compliance Audit Report: The Audit Checklist (Enterprise)

No.	Standard	Y/N/NA	SOP/ Record no.	Record accurately maintained	Comments
	Animal Welfare Module [note MCOP references in square brackets]				
	ENTERPRISE CHECKLIST				
	The Stock Person				
W1	Pigs are cared for by competent stockpersons (refer M3).				
	Routine Husbandry Checks				
W2	Pigs are inspected at least once daily, and more often if necessary, by a competent stock person.				
W3	Pigs with injuries or illness are identified and treated as soon as practically possible (including isolation or separation from herd mates if necessary) [5.2.1, 5.2.4] Where no treatments are available or used, pigs are euthanised as per the *Model Code* and procedures outline in the *Piggery Management Manual*. Where health problems cannot be identified, advice is obtained and recommendations followed. [5.2.8] Dead pigs are removed as soon as practicable. [5.2.3]				
	Equipment				
W4	A risk management system is in place in case of breakdown of mechanical equipment or delay of feed delivery, to ensure alternative sources of feed and water are available, and to provide for environmental needs.[4.2.3]				

APIQ✓ Compliance Audit Report: The Audit Checklist (Production Unit)

No.	Standard	Dry Sows	Farrowing and Mating	Post Weaning	Comments
	PRODUCTION AREA CHECKLIST				
	Feed and Water				
PA1	Pigs are provided with daily access to feed that maintains their health and meets their physiological requirements. [3.1.1]				
PA2	Drinking water, or another wholesome liquid, is available to pigs at all times to meet their physiological water needs. [3.2.1]				
PA3	Action is taken if persistent bullying is leading to deprivation of food or water. [3.1.2 and 3.2.3]				
PA4	Automatic feeders and waterers are checked daily. [3.1.3 and 3.2.2]				
PA5	Pigs are maintained with a body condition score of 2 or above. - Where the body condition score of a pig falls below 2 (on the scale of 1-5, *See Appendix 1 of Model Code*), action is taken to improve body condition. - If remedial action fails to recover them to a score above 2, they are culled. [3.1.5]				
	Accommodation				
PA6	Accommodation, shelter or protective structures for pigs are constructed and maintained so that pigs are protected from adverse weather, injuries or predators. Accommodation, shelter or protective structures provide at least the minimum space requirements specified in *Appendix III of the Model Code*. [4.1.1 and 4.1.2] For pigs kept outdoors, and free range pigs, see PA18 - PA24				

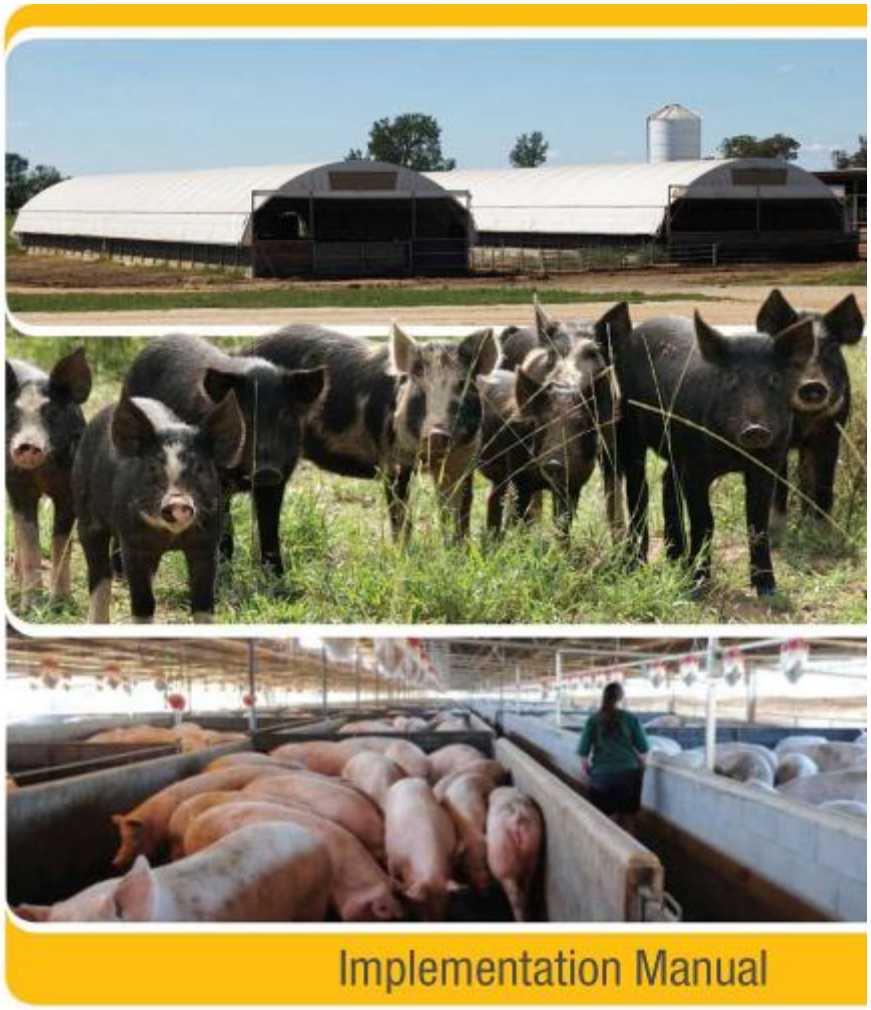
Model Code of Practice: Standards Mapped to PigCare Audit Checklist and Categories

Standard		Audit Checklist	Checklist Category • For Production Component, unless stated otherwise assume standard is covered in all classes of audit – Farrowing, Dry Sow & Boars, Post Weaning
2.1	Persons responsible for the day-to-day needs of pigs must ensure animals under their control are cared for in accordance with the Standards in this Code.	Enterprise	1. Stockmanship
2.2	Pigs must be cared for by personnel who are skilled in pig husbandry and are competent to maintain the health and welfare of the animals in accordance with the Standards listed in this Code, or are under the direct supervision of such personnel. Such competency must be able to be demonstrated within three years of endorsement of this Code.	Enterprise	1. Stockmanship
3.1.1	Pigs must be provided with daily access to feed that maintains their health and meets their physiological requirements.	Production	Hunger and Thirst – Animal Indices; Stockmanship Indices
3.1.2	A stock-person responsible for pigs must take remedial action if persistent bullying is leading to deprivation from food.	Production	Hunger and Thirst – Animal Indices; Stockmanship Indices
3.1.3	Automatic feeders must be checked daily.	Production	Hunger and Thirst – Facilities indices
3.1.4	Weaners must be provided with access to feed at least twice daily.	Enterprise Production	2b. Husbandry - Special Requirements for Certain Pigs Hunger and Thirst – Animal Indices; Stockmanship Indices (Post Weaning only)
3.1.5	If body condition score of a pig falls below 2 on a scale of 1-5, see Appendix 1) action must be undertaken to improve body condition. If remedial action fails to recover them to a score above 2 they must be culled.	Production Production	Hunger and Thirst – Animal Indices; Stockmanship Indices Health, Injury and Disease – Animal Indices; Stockmanship Indices
3.2.1	Drinking water or another wholesome liquid must be easily available to pigs at all times to meet their physiological water needs.	Production	Hunger and Thirst – Animal indices; Stockmanship Indices
3.2.2	Automatic watering systems must be checked daily.	Production	Hunger and Thirst – Facilities Indices
3.2.3	A stock-person responsible for pigs must take remedial action if persistent bullying is restricting access to water.	Production	Hunger and Thirst – Animal Indices; Stockmanship Indices
4.1.1	Accommodation for pigs must be designed, constructed and managed in such a way that it protects pigs from adverse weather, injuries or other harm.	Production	Interaction with Physical Environment – Animal Indices; Facilities Indices
4.1.2	Accommodation for pigs must provide at least the minimum space requirements identified as Standards in Appendix 3.	Production	Interaction with Physical Environment – Animal Indices; Facilities Indices
4.1.3	Sows and boars accommodated individually in stalls must be able to stand, get up and lie down without being obstructed by the bars and fittings of the stall, to lie with limbs extended, to stretch and to be able to freely undertake such movements. Specifically, in the case of sows and boars: a) They must be able to stand up at rest in a stall without simultaneously touching both sides of the stall; b) When they lie down in the stall, their snout and hindquarters must not simultaneously be touching the ends of the stall. c) If the stall has bars along the top these must not touch their backs when standing at rest or when they have their heads down feeding; d) The placement of drinkers and/or feed/water troughs in the stall must be easily accessible to them, but must not prevent ability to stand, stretch and lie down. e) When lying down, any contact with their neighbours in stalls on either side must not result in injury.	Production	Interaction with Physical Environment – Animal Indices; Facilities Indices (Dry Sow & Boars only)
4.1.4	Stalls and farrowing crates must be designed and constructed to minimise aggression between pigs and overlying of piglets by sows.	Production	Interaction with Physical Environment – Animal Indices; Facilities Indices (Farrowing + Dry Sow & Boars only)
4.1.5	From 10 years after endorsement of the Code a sow must not be confined in a stall for more than six weeks of any gestation period. An exception is for individual sows that are under veterinary advice or special care by a competent stock-person.	Enterprise	4b. Management – Stalls
4.1.6	Facilities for lactating sows must allow them to: a) Stand and lie down without obstruction by the bars or fittings of the crate; b) Give birth to piglets without obstruction, and minimise losses of piglets from crushing, trapping or injuries; c) Suckle piglets so that both sides of the udder are accessible; d) Access feed and water without obstruction.	Production	Interaction with Physical Environment – Animal Indices; Facilities Indices (Farrowing only)

PigCare® - where to from here

- Particular emphasis is placed on the competency of auditors in the efficacy of the program and credibility of its outcomes
- Emphasis also placed upon the monitoring of progress internationally and, where relevant, the incorporation of internationally developed tools into the Australian system
- Auditor training, calibration, guides and tools will be evolved on an ongoing basis
- Model developed as a stand-alone pig welfare assessment tool
  - -as a day-to-day management tool that a stockperson or herd manager can use in assessing pig welfare
  - - therefore has uses beyond the establishment of APIQ✓™ compliance
  - - with further refinement as a standalone document for use by small producers, DPI livestock inspectors, RSPCA inspectors and veterinarians
- Designed for use by auditors and producers alike, across the spectrum of pig flow and production applications

THANK YOU



PORK CRC 2011-2019: HIGH INTEGRITY AUSTRALIAN PORK

Animal Welfare Considerations

Current pork CRC

- Based on increasing efficiency and reducing cost of production
- Better grains and better grain utilisation
- Better pigs and systems to reduce costs and grain resources - pigs and systems that don't need feed
- Better pork –identify and promote the natural human health benefits of pork.
- Better people – training

Collateral Production Costs

- Negative effects on animal welfare
- Environmental impacts and net carbon footprint
- Negative consequences arising from consumption
- Costs imparted in foreign production systems (*i.e. conservation of local resources and maintenance of local animal welfare cannot be justified if they are exploited elsewhere*).

Global Food Security – big picture issues

- Increasing population
- Increasing demand for traditional energy sources
- Increasing urbanisation
- Decreasing investment in agriculture

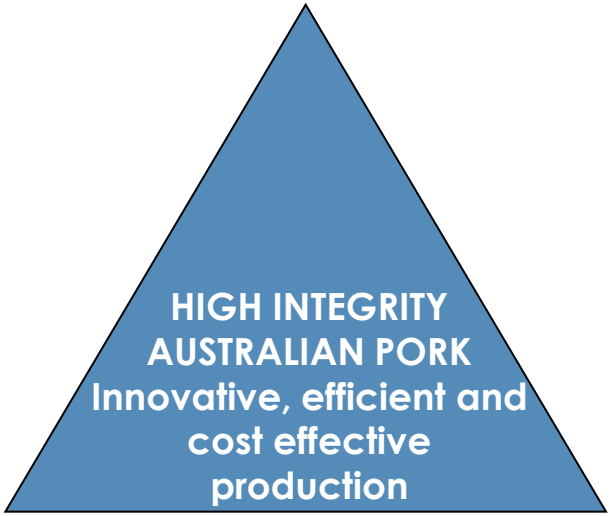
High Integrity Australian Pork

Australian pork will remain an essential contributor to food diversity and choice, here and overseas, is a cornerstone to our future food security and will be differentiated based on:

- Safe with a high level of traceability
- Nutritious with demonstrated health benefits
- Affordable, abundant, consistent and versatile
- Locally produced using Australia's unique environmental and geographical attributes
- Optimal welfare production practices
- Minimal CO_2 impacts – Mitigating production systems
- Sustainable and profitable industry that supports regional development and attracts new investment

High Integrity Australian Pork

WELFARE OPTIMAL
Confinement-Free Sows



HEALTHY
1. Antibiotic Reduction
2. Demonstrated Health Benefits for Consumers

CARBON-CONSCIOUS
<1 kg CO_2 equivalents/kg Pork Produced

Pork CRC 2011-2019…

- Efficient and ethical production without the need for sow confinement in stalls or crates or widespread use of antibiotic medications;
- Deliver key nutrients via pork, safely, enhancing the health and well-being of consumers;
- Utilise revolutionary feed sources and effluent management systems resulting in emissions of less than 1 kg of CO_2 equivalents per kg of pork produced, and;
- Contribute significantly to Australia's economic growth and food security without drawing on the ecological capital of other parts of the world.

Pork CRC Programs

- Program 1:
  - Confinement-Free Sow and Piglet Management
- Program 2:
  - Next Generation Health Management and Antibiotic Reduction
- Program 3:
  - Healthy Pork Consumption
- Program 4:
  - Carbon Conscious Inputs and Outputs

Program 1 – Confinement-Free Sow and Piglet Management

- World first research that will optimise sow and piglet welfare while maintaining production efficiency.
- Breakthrough science will facilitate innovative mating, suckling and weaning management eliminating the need for sow confinement in stalls or crates.

INDUCING OVULATION IN LACTATION

- Project initiated to investigate the possibility of extending weaning by mating sows during lactation and reduce empty days.
- Project conducted and technology developed by University of Sydney
- Sows induced at 20 days of lactation and compared with those weaned at 20 days.

Initial results for sows induced at 20 days

Treatment	*Control (weaned 20 days)*	*Induced (weaned at 35 d)*
Number	23	23
Days to mating	4.4	4.2
Conception rate (%)	70	83
Litter size (born alive)	10.6	11.9

Subsequent results

- Similar levels of reproductive efficiency can be achieved by inducing ovulation at 14-16 days of lactation.
- Some 10%- 20% of sows weaned at 23 days found to have ovulated during lactation.

Program 1 – Confinement-Free Sow and Piglet Management

- **Project 1:** Mating and Lactation
- **Project 2:** "Gradual" Weaning Systems
- **Project 3:** Management of Weaned Sows in Groups

PROGRAM 1 WILL UTILISE THE WORLD'S BEST MINDS AND CORE AND SUPPORTING PARTICIPANTS TO COVER

- Development of confinement free management procedures and systems that minimise the need for sow and piglet confinement with enhanced productivity
- Technologies for optimal reproduction, nutrition and health management of sows housed in groups during lactation
- Genetics (dam lines) more suited to new management and confinement free production systems
- Development of gradual weaning to enhance piglet performance and health
- Effective management of sows housed in groups during gestation

Production Systems

Farrowing and Lactation	Weaning and Remating	Gestation stalls

Day 0 23 30 145

Weaners	Growers	Finishers

Production Systems




Farrowing and Lactation	Weaning and Remating	Gestation stalls	Gestation groups

Day 0 23 30 72 145

Weaners	Growers	Finishers

Production Systems

Farrowing and Lactation	Weaning and Remating	Gestation groups

Day 0 23 30 145

Weaners	Growers	Finishers

Production Systems

New Production Paradigm




Farrowing, Lactation, Mating, Weaning	Gestation Groups

Day 0 7 11 35-40 145

Growers	Finishers

Theoretically feasible
but many unknowns

Timely and Coordinated Research

- Australian industry at a ‘tipping point” – need to ensure a cohesive approach to new production systems and strong research to underpin changes
- Multi-disciplinary research challenges – nutrition, genetics, management, welfare and behaviour.
- Need for basic and applied research
- Research outcomes required now
- Previous and current research without a common focus and cooperative approach has not produced and will not produce outcomes that can be adopted by industry

Core Participants

- APL
- CHM
- Rivalea
- APFG
- University of Melbourne
- Chris Richards and Associates
- Murdoch University
- University of Adelaide
- SARDI
- NZPIB
- Ridley Agriproducts
- University of Sydney
- WA Agricultural Produce Commission

Supporting Participants

- University of Queensland
- Alltech Inc.
- Feedworks
- APSA
- Elanco
- Zamira
- Pfizer
- University of South Australia
- NSW Innovation and Investment
- DAFWA
- Charles Sturt University
- CSIRO
- NZ Plant Breeders
- Waratah Seeds
- Pork Scan
- Woolworths
- Iowa State University
- Ohio State University
- University of Alberta
- Kansas State University
- Zinpro
- AGBU
- Biomin Singapore Pte Ltd
- RSPCA
- Craig Mostyn Group
- Westpork Pty Ltd
- MBD Energy
- NIWA (NZ)
- DSM

Funding Strategy

- "Terminal" CRC
- Phased out Federal funding – genuine attempt to establish an alternative, on-going R&D infrastructure
- Productivity commission enquiry into RDC's
- APL levy increase negotiations and strategies
- Basis for Plan "B"

Funding Scenario

Year	Federal	Core	Supporting
2010-11	Business as usual – Current CRC		
2011-12	$4 million	$1.83 million	$470,000
2012-13	$4 million	$1.83 million	$470,000
2013-14	$4 million	$1.83 million	$470,000
2014-15	$4 million	$1.83 million	$470,000
2015-16	$4 million	$1.83 million	$470,000
2016-17	$3 million	$1.83 million	$470,000
2017-18	$2 million	$1.83 million	$470,000
2018-19	$1 million	$1.83 million	$470,000
Total	$26 million	$14.64 million	$3.76million

Total Funding: $44.4 million cash + $60 million in-kind

Timing

- Significant research challenge – 3-5 year research program
- Model code of practice changes relating to sow stalls come into force in 2017
- RSPCA has a sow confinement "deadline" of 2020
- Industry Consultation has begun
- Changing rural R&D environment in Australia
- Australian pork industry poised for change in production methods now.

Summary

- The Australian pork industry will make a greater contribution to global and local food security in the future
- Australian pork will be a “high integrity” food that accounts for both financial and collateral production costs
- The Pork CRC 2011-2019 represents one of the most important research programs ever undertaken by the industry and will reshape pork production in Australia and overseas
- Change in emphasis reflects changing community “concerns” (the challenge) and where the greatest opportunities for the industry and producers lie going forward.