

**Selection for Welfare,
a pragmatic approach**

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Welfare to me

- Quiet pens
- No aggression
- Healthy animals
- No tailbiting
- No repetitive behaviour
- No stomach ulcers after slaughter
-

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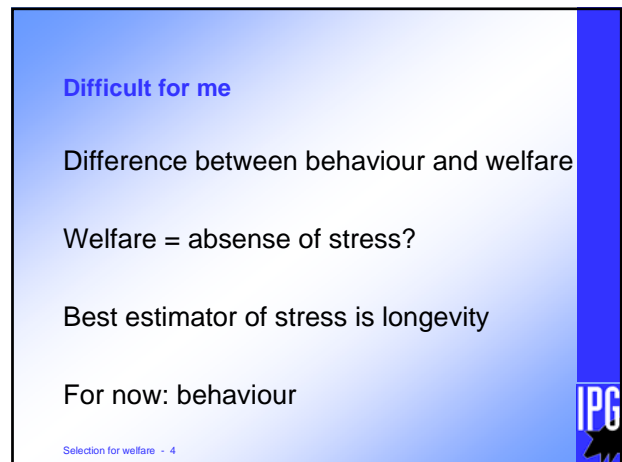


Welfare does not have an economic value!

- Unrest has!
 - Through feed conversion
- Aggression has!
 - Through damage and dis-uniformity
- Disease has!
 - Through gain and feed conversion
- Etc. etc.

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Difficult for me

Difference between behaviour and welfare

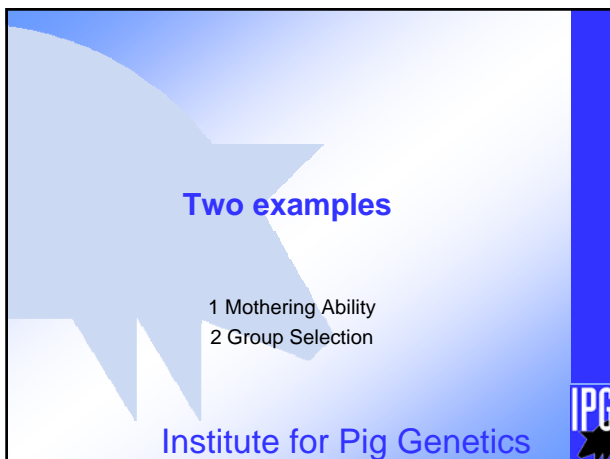
Welfare = absense of stress?

Best estimator of stress is longevity

For now: behaviour

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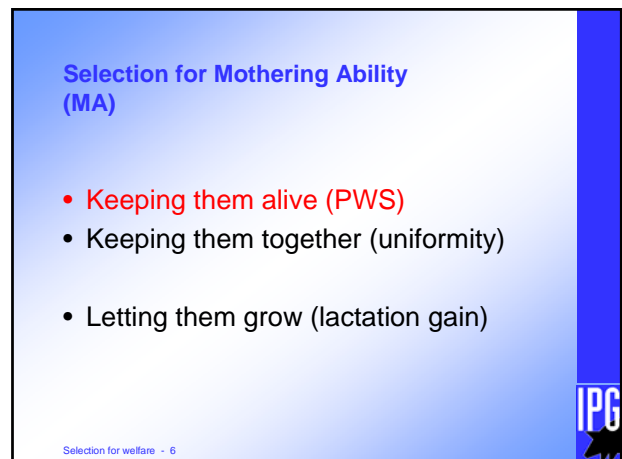


Two examples

- 1 Mothering Ability
- 2 Group Selection

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Selection for Mothering Ability (MA)

- Keeping them alive (PWS)
- Keeping them together (uniformity)
- Letting them grow (lactation gain)

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What we LIKE in a sow:

- Quiet
- Attentive
- Enough teats
- Quality of teats
- Enough milk
- Uniformity at birth and at weaning
- Maintenance of body condition
-

What we HAVE is EBV-MA based solely on:

Survival = HYS + ... + genes piglet + genes nursing sow (WP1)

And it appears to work beautifully

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Research question

1. EBV-MA → consequences for behaviour
2. Behaviour → consequences for EBV-MA

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Techniques

1. Scan sampling
2. Open field test
3. Aggression test
4. Questionnaire

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1. Scan sampling

- 4 hours walking through farrowing rooms
- 'Scanning' each sow every 5 minutes
- 5 observation days (days -2, 0, 7, 14)
- 80 sows, 150 traits

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Position



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Behaviour



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2. Open field test

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3. Aggression test

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4. Questionnaire

Tattoo number	89BE65	
Farrowing date	23 - 03 - 2006	

Behaviour (mark when observed)

Aggressive to people	X
Aggressive to piglets	
No care for piglets	
Fearful during handling	X

Udder quality	Birth		3 weeks							
Number of teats	14									
Regularity (low-high)	1	X	3	4	5					
Litter quality	Birth		3 weeks							
Weight (low-high)	1	2	3	X	5	1	2	X	4	5
Uniformity (low-high)	1	X	3	4	5	1	2	X	4	5

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1. Results: Scan sampling

Sows with high EBV-MA:

- Less changes of posture
- Less activity
- Less in sitting position

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2. Results: Open field test

Sows with high EBV-MA:

- More exploring behaviour in open field

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3. Results: Aggression test

Sows with high EBV-MA:

- More lying laterally
- More vocalisation
- Less aggression (biting plush piglet)!!!

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4. Questionnaire

	h^2	SD	r_g MA2
Aggressive to people	0.05	0.06	
Aggressive to piglets	0.16	0.07	
Fearful during treatment	0.06	0.07	
Aggression + fear	0.12	0.07	-0.63
No care for piglets	0.03	0.05	
Weight at birth	0.26	0.09	-0.03
Weight at weaning	0.22	0.08	0.12
Uniformity at birth	0.10	0.07	0.91
Uniformity at weaning	0.13	0.07	0.72
Regularity udder	0.10	0.07	0.16
Number of teats	0.21	0.08	0.38

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Conclusion

- Current selection for Mothering Ability is, for a layman, *at least* not in contrast with animal welfare
- Behavioural traits are heritable and could be selected on


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2 Group Selection

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Group selection experiment Muir 1996

- % mortality
 - 68% in generation 2
 - 8.8 % in generation 6
- Egg mass improved from
 - 5.1 kg
 - 13.4 kg per hen housed.



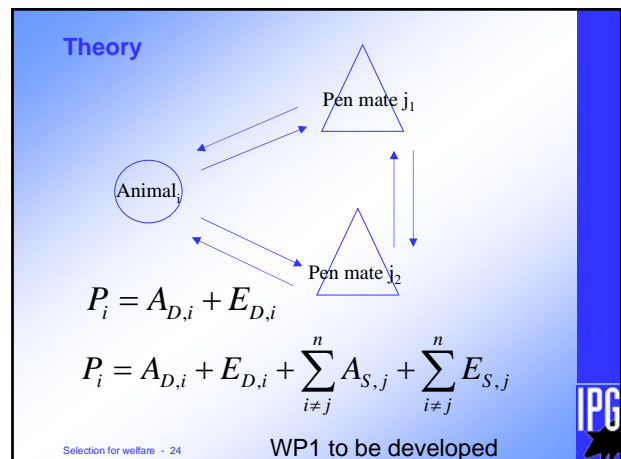
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GENETICS



About the Cover
 Fish, like all other animals and plants, compete for limited resources such as food and desirable habitats. These innate interactions can interfere with the breeding of food animals. Scientists are learning about these heritable interactions and finding ways to breed animals to make them less competitive and more productive. See *BIJMA et al.* companion articles (pp. 277–288, 289–299). (Photograph by William Muir.)

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Definition Breeding Value

$$TBV_i = DBV_i + (n-1) SBV_i$$

TBV = Total Breeding Value
 DBV = Direct Breeding Value
 SBV = Associative Breeding Value
 n = number of pen mates



Multilevel heritability

Trait	'Classical'	Multilevel selection	
	$h^2 \pm se$	$h^2 \pm se$	$r_{A_{int}} \pm se$
Net daily gain (g/d)	0.26 ± 0.03	0.70 ± 0.09	0.21 ± 0.11
Backfat HGP (mm)	0.33 ± 0.03	0.34 ± 0.04	-0.05 ± 0.22
Muscle depth HGP (mm)	0.25 ± 0.02	0.31 ± 0.00	0.96 ± 1.63
Feed intake (g/d)	0.38 ± 0.05	1.04 ± 0.26	0.43 ± 0.19



Multilevel selection

Genetics 2007, Introducing articles of Bijma et al.:

"Just when we all thought that the only remaining frontier for quantitative genetics entailed molecular markers, these articles develop a whole new level to components of genetic variation and demonstrate their importance in selection response."



Correlations between EBV ADG and EBV for aggression at mixing

« Genetic » associations

Lesions	Direct effect	Group effect
Front	0.027	-0.034
Rear	-0.103***	0.035

*: p ≤ 0.05; **: p ≤ 0.01; ***: p ≤ 0.001

Pigs with genetic potential for OWN growth: genetic determinism for more aggressiveness

Dominant, aggressive and successful

Behaviour	Direct effect	Group effect
Fights initiated	0.108***	0.093**
Fights won	0.081**	0.073**
Fights lost	0.003	0.134***
Bullies given	0.150***	0.216***
Bullies received	-0.216***	0.017

Pigs with higher genetic potential for OTHERS growth: positive genetic association with aggressiveness

Challenging and winner + loser

L. Canario, R. Bergsma, R.B. D'Eath, A.B. Lawrence, R. Roehle, N. Lundeheim, L. Rydhmer, E. Knol, S.P. Turner



Genomics into the discussion

- Per Jensen: AVPR1A?????



Correlations between EBV ADG and EBV for aggression and activity 3 wks later

« Genetic » associations

Lesions	Direct effect	Group effect
Front	0.013	0.045
Rear	0.016	0.108***

Behaviour	Direct effect	Group effect
Activity	0.078**	-0.062*

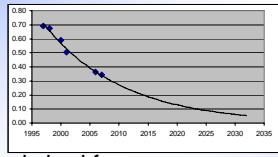
*: p ≤ 0.05; **: p ≤ 0.01; ***: p ≤ 0.001

Pigs with higher genetic potential for OTHERS growth: genetic association with more lesions in the rear part of the body, and with lower general activity

Reception of injuries without retaliating and calmness



In summary

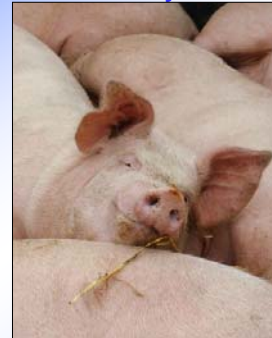


- Compromised welfare is bad for economy
- (Some) evidence that proper ! economical selection leads to improved welfare
- Proper genetic modelling is necessary AND possible nowadays
- Open mind for clear behavioural indicators of improved economy

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Thank you



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