

3rd SABRE Conference: Welfare and Quality Genomics

Foulum, Denmark

“Quality improvements: implementation in practice”

Session 4: Welfare, Quality, productivity; are they compatible?

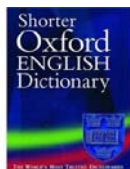
Gary Evans
 Technology Business Manager
 PIC/Genus

- Quality: what is it?
- Breeding for product quality
 - Current activities
 - Difficulties
- Genomics:
 - Focus on meat quality
- Compatibility (the title of the session)
 - Robustness
 - MAS
- Conclusions

Quality: what is it ?

The Shorter Oxford English Dictionary, 3rd edition, 1973

- A peculiar excellence or superiority
- The degree or grade of excellence



Quality: what is it ?

- Quality denotes a degree of excellence
- Quality is subjective
- Quality is determined by the end user
 - what it is
 - how it is quantified
- Quality perceptions change over time..
and different markets

Quality: what is it ?

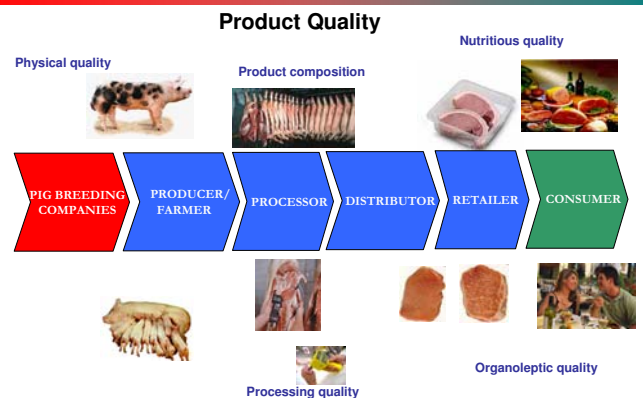
Quality:

- A peculiar excellence or superiority
- The degree or grade of excellence

The shorter Oxford English dictionary, 3rd edition, 1973

The characteristic of a product that would lead a consumer to buy it more eagerly or at a higher price.

Quality in the Global Pig Supply Chain



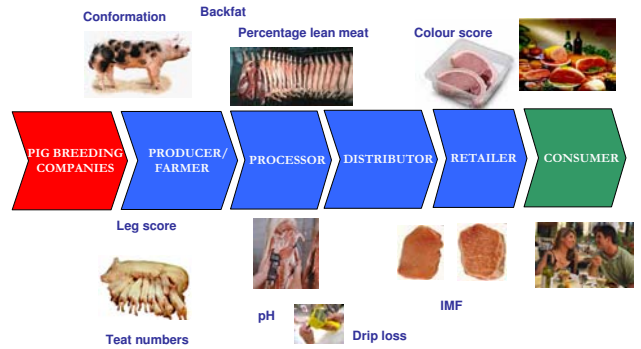
Quality: what is it ?

What does this have to do with animal breeding ?

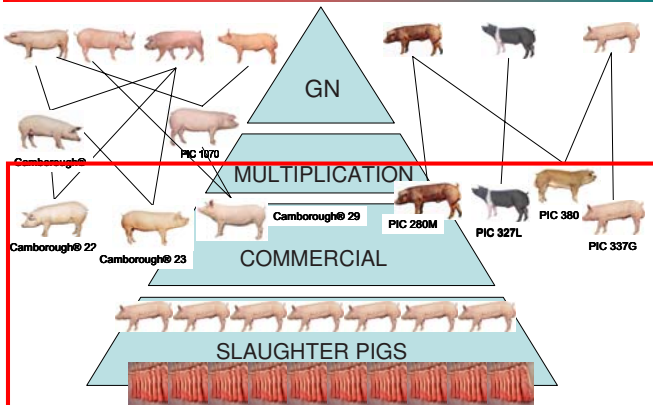


Quality in the Global Pig Supply Chain

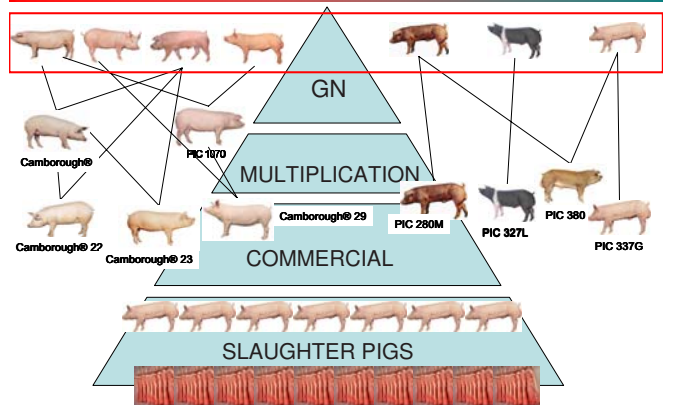
Product Quality - Traits



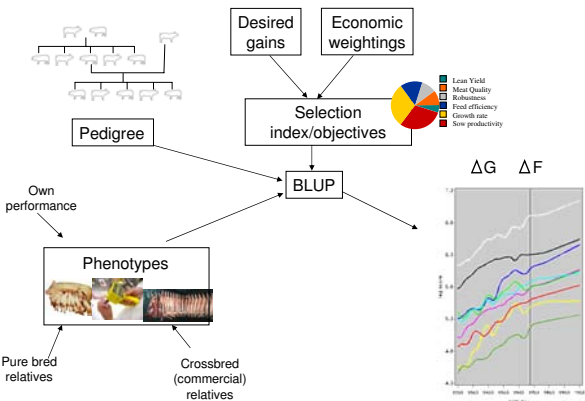
Breeding for Quality



Breeding for Quality

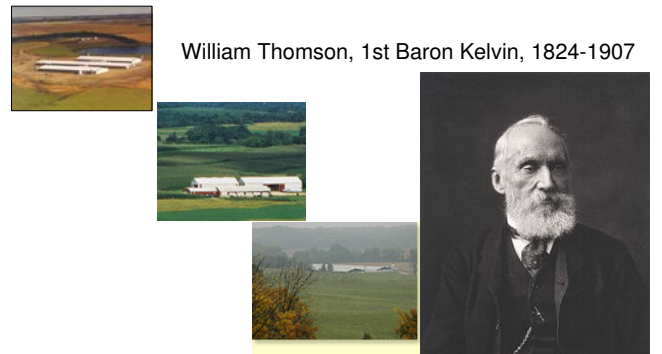


Breeding for Quality: Genetic Improvement



Breeding for Quality

"If you cannot measure it, you cannot improve it"





Breeding for Quality

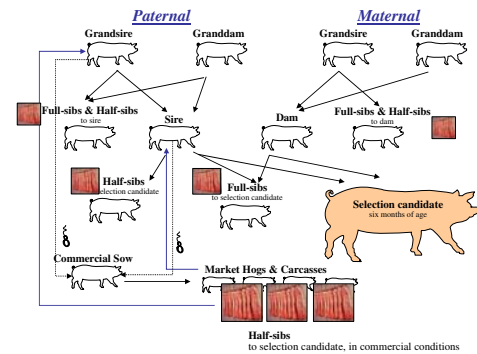


Issues

- Many Q traits are difficult to measure
 - only on dead animals
 - only on older animals
 - only over a long time
 - only in non-commercial conditions



Breeding for Quality



Breeding for Quality



Issues

- Many Q traits are difficult to measure
 - only on dead animals
 - only on older animals
 - only over a long time
 - only non-commercial conditions
- Expensive to acquire data for EBV purposes
 - elaborate logistics to keep the carcass identified throughout the slaughter line
 - sophisticated measurements on large numbers of carcasses
- Lowly heritable
- **Ideal application for Genomics & Marker Assisted Selection**

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Genomics of product quality



Example: Halothane

- Intensive selection for increased lean yield
- Antagonistic relationship with meat quality: Porcine Stress Syndrome resulting in PSE meat



Genomics of product quality



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- <1990: Using Halothane gas to detect stress susceptible pigs



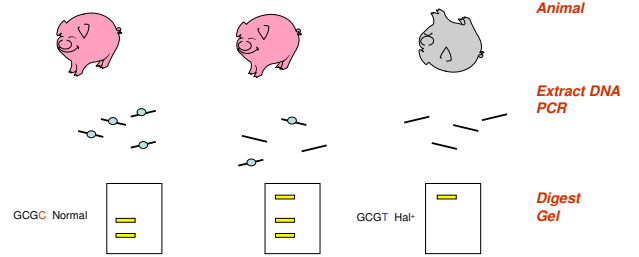
PIC Genomics of product quality **Genus**

Example: Halothane

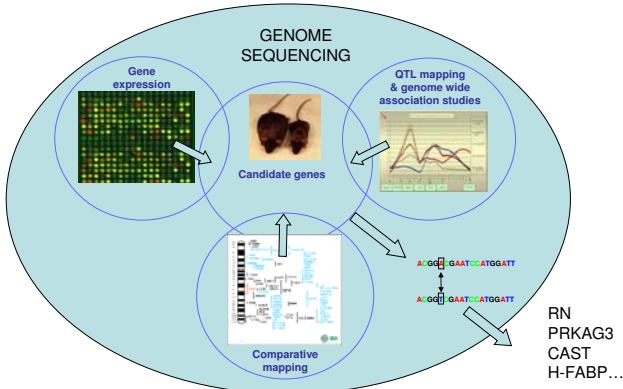
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- Causative mutation found in 1991 (Fujii et al.).....

PIC Genomics of product quality **Genus**

- Causative mutation found in 1991 (Fujii et al.).....
 - Arg615Cys mutation of sarcoplasmic reticulum Ca²⁺ release channel (RYR1)
 - Resulting in Hal1843 test

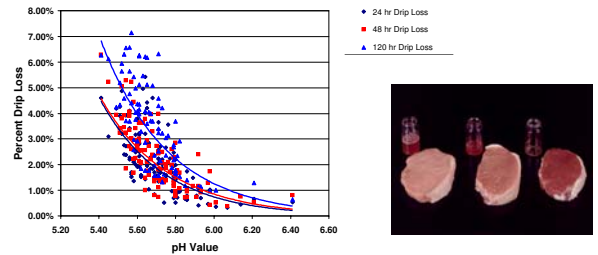


PIC Genomics of product quality: More examples **Genus**



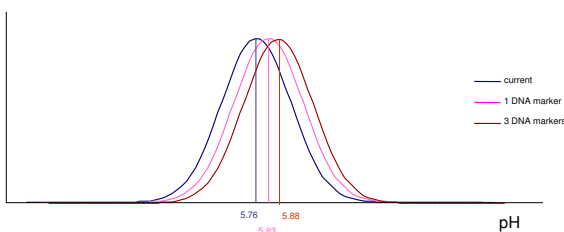
PIC Genomics of product quality: pH and drip loss **Genus**

Relationship between Percent drip loss and pHu

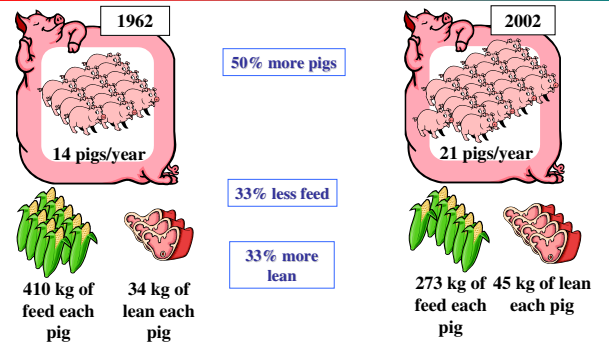


PIC Genomics of product quality: More examples **Genus**


Product Differentiation



PIC Genetic Improvement works: Production traits **Genus**




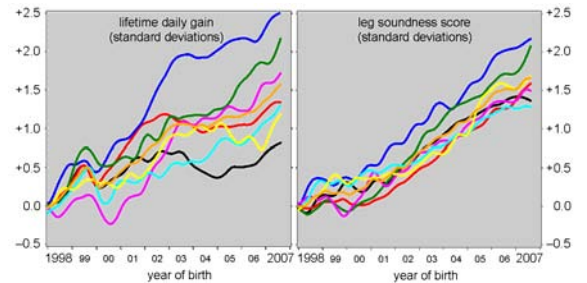
But, is this compatible with quality and welfare?


PIC But, is this compatible with quality and welfare? 

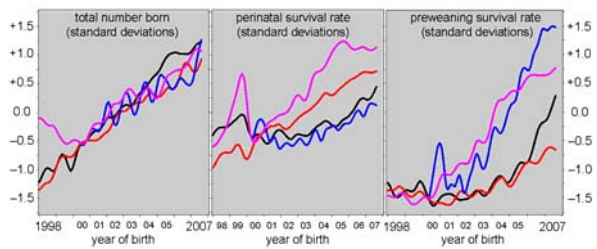
- Best way of encompassing quality and welfare from a breeding company point of view is robustness
- *Robust Pigs* have the ability to combine
 - a high production potential
 - resilience to stressors of all possible kinds.




PIC But, is this compatible with productivity and welfare? 



PIC But, is this compatible with productivity and welfare? 




.....and DNA markers can also help here too.

PIC Marker assisted selection: Robustness, Quality, Production 

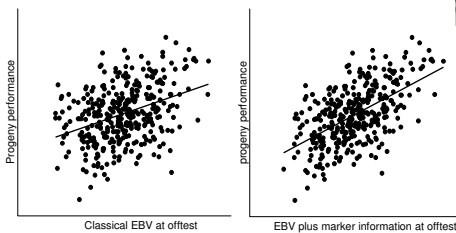
Traits	DNA Markers
Avg. lifetime daily gain of hot carcass weight	38
Test average daily feed intake	32
Backfat	41
Loin depth	44
pR24	53
Minolta L*	17
Pre-weaning mortality (piglet trait)	11
Nursery mortality	12
Grow-finish mortality	14
Scrotal hernia and rigs	4
Leg score	40
Marbling	15
Total number born	16
Stillborn	10
Piglet survival (sow trait)	16
Litter weaning weight	11
Sow mortality	3
Reproductive PRRS	5
Edema disease	1


MA-BLUP*
 (Marker Assisted Best Linear Unbiased Prediction of trait breeding values EBVs)

140 DNA markers used in trait EBVs today plus an additional 62 markers in further validation prior to using in MA-BLUP

PIC Marker assisted selection: Robustness, Quality, Production 

Adding DNA markers results in EBVs that are more accurate at predicting progeny performance



PIC Summary 

- Definition of quality:
- Quality has impact at different levels throughout the chain
- Possible to breed for these different quality attributes
- Many successful examples across species
- **BUT**
 - If you can't measure it you can't improve it
 - Some traits difficult to measure and lowly heritable
- Best way to take into account welfare, production and quality is :
 - through balancing goals and;
 - adding more data (robustness) from commercial slaughter pig level



Summary



- Welfare, Quality, productivity; are they compatible?
 - **Yes**, under the definition of quality and welfare used here
- Can we do a better job?
 - **Yes**
 - We need more and better data
 - Markers and Genomics can help

Thank you
for your
attention

