Utilising sequence data and genomics to improve novel carcass traits in beef cattle

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BREEDS USED FOR BEEF PRODUCTION IN THE UK
• Traditional BLUP EBVs for proxy traits
• Limousin Pedigree sector (~20,000/year)
  – 400 day weight (~5,000/year; 25%)
  – Ultrasound fat and muscle depth (~1,500/year; 7.5%)
• Commercial producers are paid based on EUROP system
Carcass trait UK genetic evaluations ~ future

- Actual carcass traits
- More animals recorded
- New technologies
  - Genomic breeding values
- Improved market signals

- Collaboration required
Genomic breeding values for VIA carcass traits

- A 3 year project (November 2011 – October 2014)
- Anglo Beef Processers (ABP), British Limousin Cattle Society (BLCS) and SAC
  - Technology Strategy Board funding
- Deliver to the industry genomic breeding values for Video Image Analysis carcass traits
- Provide platform
  - for future genomics work
  - other breeds
VIA system

- E plus V
- Carcass position over a holding frame
- Cameras and lighting fixed into position
- Computer control unit – automated
Calibrated images captured
Mechanically grades carcass
  - fat (2D)
  - conformation (3D)
Primal yields
Additional features

- Stop/start or moving carcass chain lines (<120/hr)
- Position triggered by sensors monitoring chain hook positions
- Needs carcass weight, sex and ID inputs for classification
- Provides classification outputs and estimates of lean yields
VIA as selection criteria

• A lot of research
  – T. Pabious ICBF
• VIA is a good predictor of carcass cuts
  – heritable
  – genetic variation
Sources of information

- VIA will be used to collect carcass information from animals processed by Anglo Beef Processors
- A large number of Limousin cattle will be genotyped by both the British Limousin Cattle Society and industry
- British Cattle Movement Service and performance recording data bases
ABP VIA data
Phenotypes, Fixed effects

BCMS database
Pedigree, fixed effects

Data set to produce de-regressed VIA EBVs

Limousin pedigree and performance recording

Genotypes from purebred Limousin sires

VIA SNP key produced

AAAGGCTTACCGGATCCTT

VIA SNP key produced from purebred Limousin sires
ABP carcass data
1 site since 2008
N=65,000 annually

BCMS database

Large amounts of Data

99.9% match rate

Encourage farmers to record sire on BCMS passport

N=15,600

22,000 Limousin/LimousinX animals annually
5,200 with sire recorded

A third of the carcass data was from Limousin or Limousin cross animals
SAC have 720 Illumina HD genotypes from influential Limousin males

BLCS will genotype ~2000 more Limousin males

Genotypes from purebred
Limousin sires

VIA SNP key produced
Flow of New Breeding Values

- **Bull breeders**
- **Suckler farmers**
- **Finishers**
- **ABP**
- **Retailers**

**BLCS (subsidiary company)**
- Pedigree
- Fixed effects

**Genetic Evaluation Service (SNP Key Implemented)**
- Pedigree
- Fixed effects

**Genotyping services**
- Genotypes

**Nasal swabs**

**GEBVs**
- Carcass Phenotypes
Benefits

• Accelerated genetic progress
  – GEBV at birth (generation interval)
  – Trait is actual abattoir trait (accuracy)
• Platform for future genomics
  – New technologies
  – New traits
• Places UK beef genetic evaluation with the world leaders
• Clear market signals
  – For the first time abattoir through to breeders are talking about the same trait
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