Phenotyping that maximizes the value of genotyping

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ICAR 2011

Genomics = collaboration

Edinburgh GENetic Evaluation Services (EGENES)

- First set up in May 2004
- Based at Bush Estate, Edinburgh
- Provide genetic evaluations for UK Livestock
- Only UK accredited centre with ICAR Quality Seal

Agenda

- Background
  - Genomics and recording
- Response of Industry to genomics
- Altered relationship between farmers and breeding companies
- New traits
- How to best exploit

Background

- Recording in most countries is driven by farmers need for management records
- Genetic improvement is a by-product
- Most countries record production well but many have lower number of records for non-production traits
- Genomics makes great promises
  - Can we exploit it effectively?
  - What blockages exist?
  - How will the industry respond?

Background

- Genomic selection established
- On-going developments in technology but is being implemented in many countries (including UK)
- Fundamentals are same for all species
  - Implementation is different due to structure of industries
- SNP chips at different density all available
  - Offers choices to farmers
  - Creates opportunities for recording companies

Industry response

- Response to genomics
  - Use existing structures and exploit the best way possible – businesses already exist and simply adapt to the changing market
  - Positively alter industry structures to make best use of genomics – businesses are stimulated to change to meet opportunities created

Recording response

- Altered relationship between farmers and breeding companies
  - Genotype animals before offering to breeding companies?
  - Farmers marketing genomically tested bulls direct?
  - Payment for data specifically collected?
  - Establishment of contracted recording farms?

Contract recording herds?

- Progeny test e.g. 1000 bulls
- 120 daughters per bull (low heritability traits)
- 120,000 animals = 1200 herds (UK)
- Could contract to provide records
  - Paid per record
  - Only if whole herd pass QA tests on numbers

New traits for genomic selection

- Traits
  - Milk fatty acids (genetics, diets, season)
  - meat quality (sat/unsat fats)
    - Abattoir data?
  - Energetic efficiency
    - Residual feed intake (beef)
    - liveweight (dairy)
  - Environment (methane)
  - Health and welfare
    - Mobility data?
    - Foot trimmer data?
    - Disease data?
- Islands of data?

Species specific issues

- Dairy
  - Almost 100% AI
  - Phenotypes freely available in large numbers
    - New phenotypes? (Johnes, TB, fatty acids)
  - Swapping genotypes easy
  - SNP effects programs freely available
  - Lots of international activity
    - Developments to 1 pass evaluations
    - Quicker algorithms

Species specific issues

- Beef
  - Use of AI/natural service bulls
  - Low number of phenotypes – carcass traits data?
  - Interbeef
  - Strategic use of LD/HD chips
  - Sequencing

Species specific issues

- Sheep
  - Almost no AI
  - Almost all natural service
  - Little connections between countries
  - Low connections between flocks
  - Low reliability proofs
  - No individual animal ID (yet)
  - Use of resource populations to create reference?
  - Huge impact!

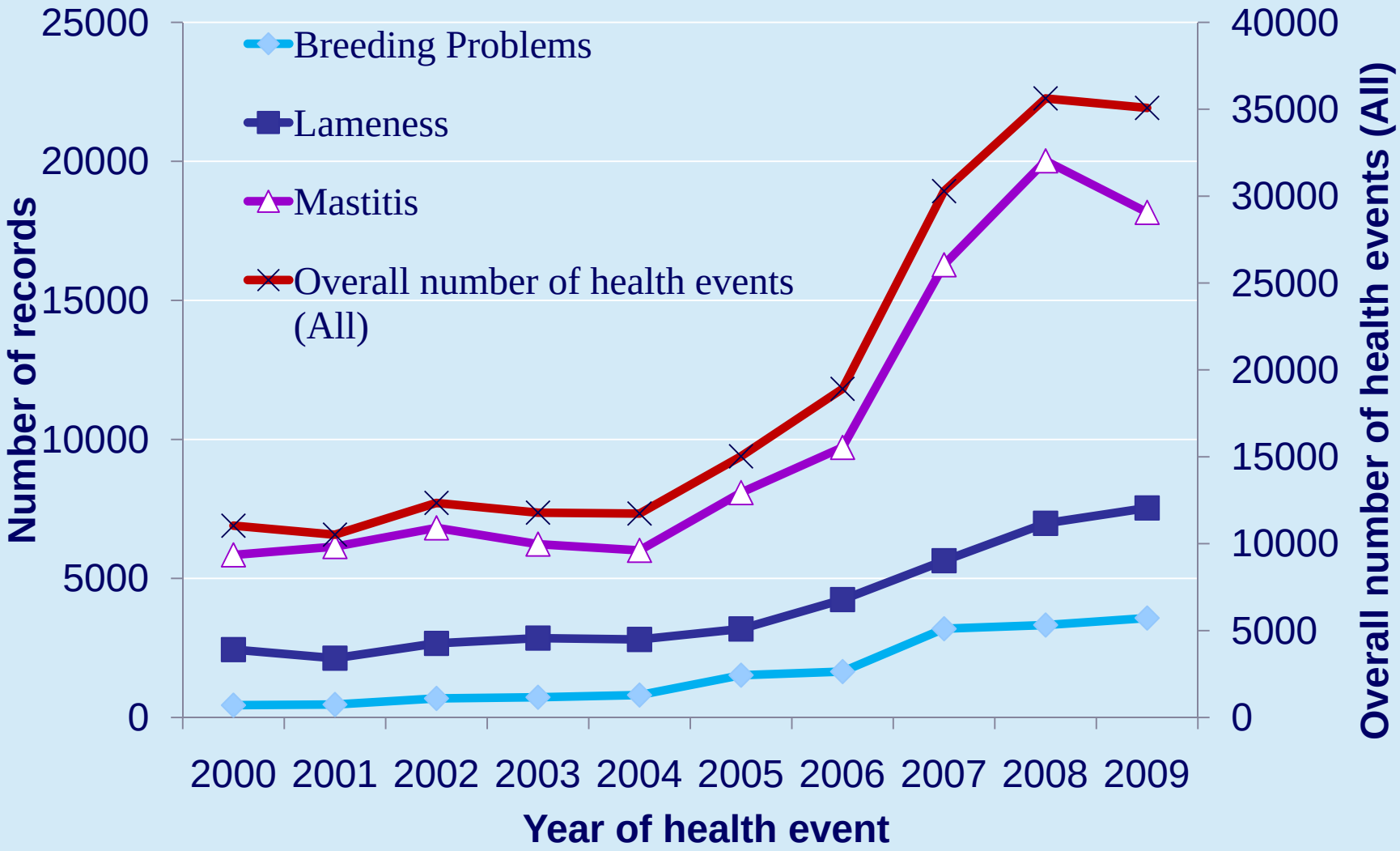
Contract recording herds?

- Could contract herds to provide records
  - Paid per record
  - Only if whole herd pass QA tests on numbers
- How to judge this
- What to expect

Health records at Langhill farm (200 cows)

Trait	2006	2007	2008	2009
Mastitis	94	66	81	77
Udder	192	187	195	194
Reproduction issues	805	830	638	708
Metabolic problems	18	10	9	17
Foul of foot	2	1	4	
Laminitis/foot injury	28	26	36	20
Feet problems	502	518	562	490

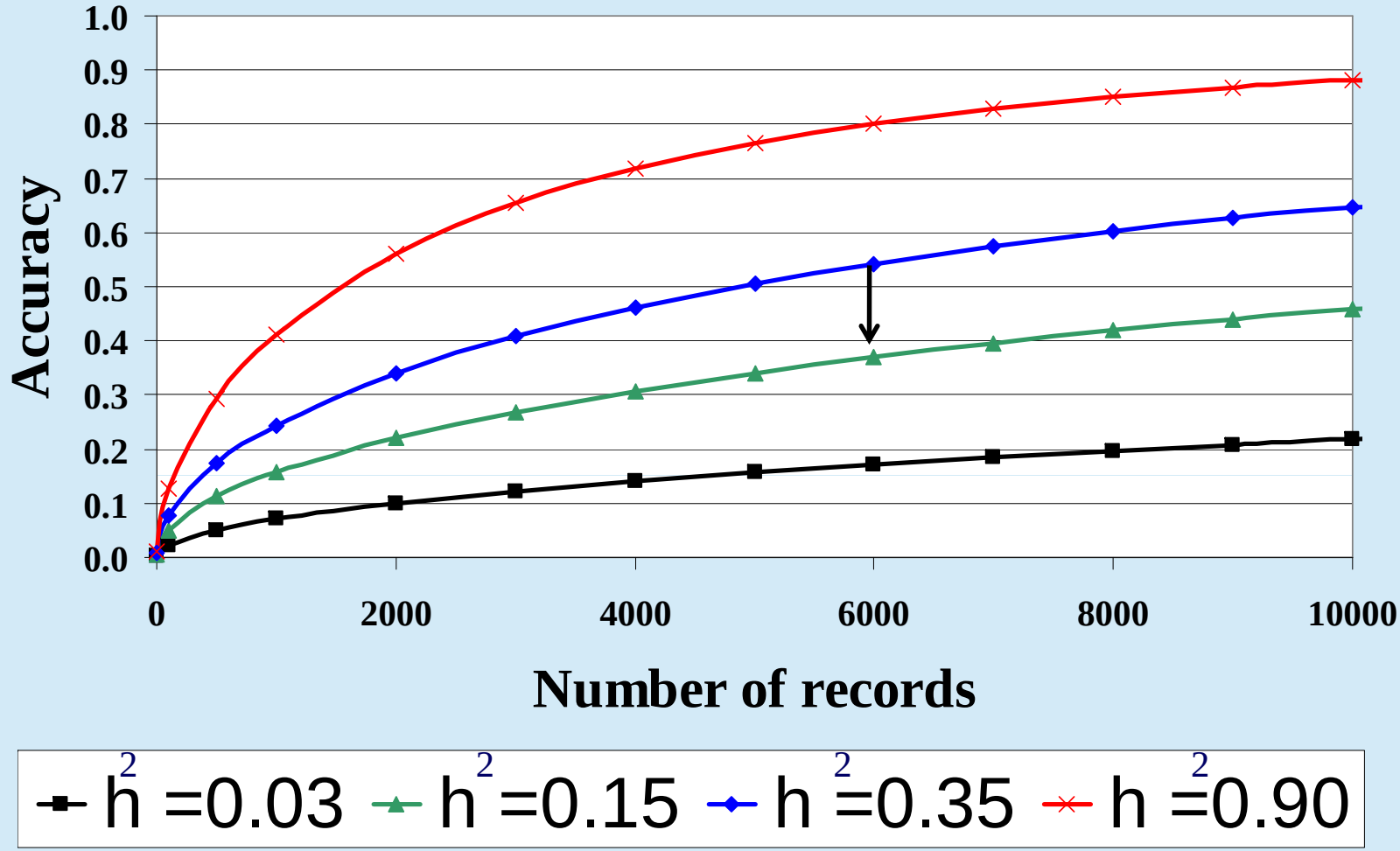
Data recording on health events



Potential problems with genomic selection

- If all things remain the same
  - More bulls with production proofs
  - Greater improvement in production relative to non-production
  - Lead to bigger disparity between fitness traits and production
- Greater effort needed in recording health and fitness traits

Accuracy of genomic selection



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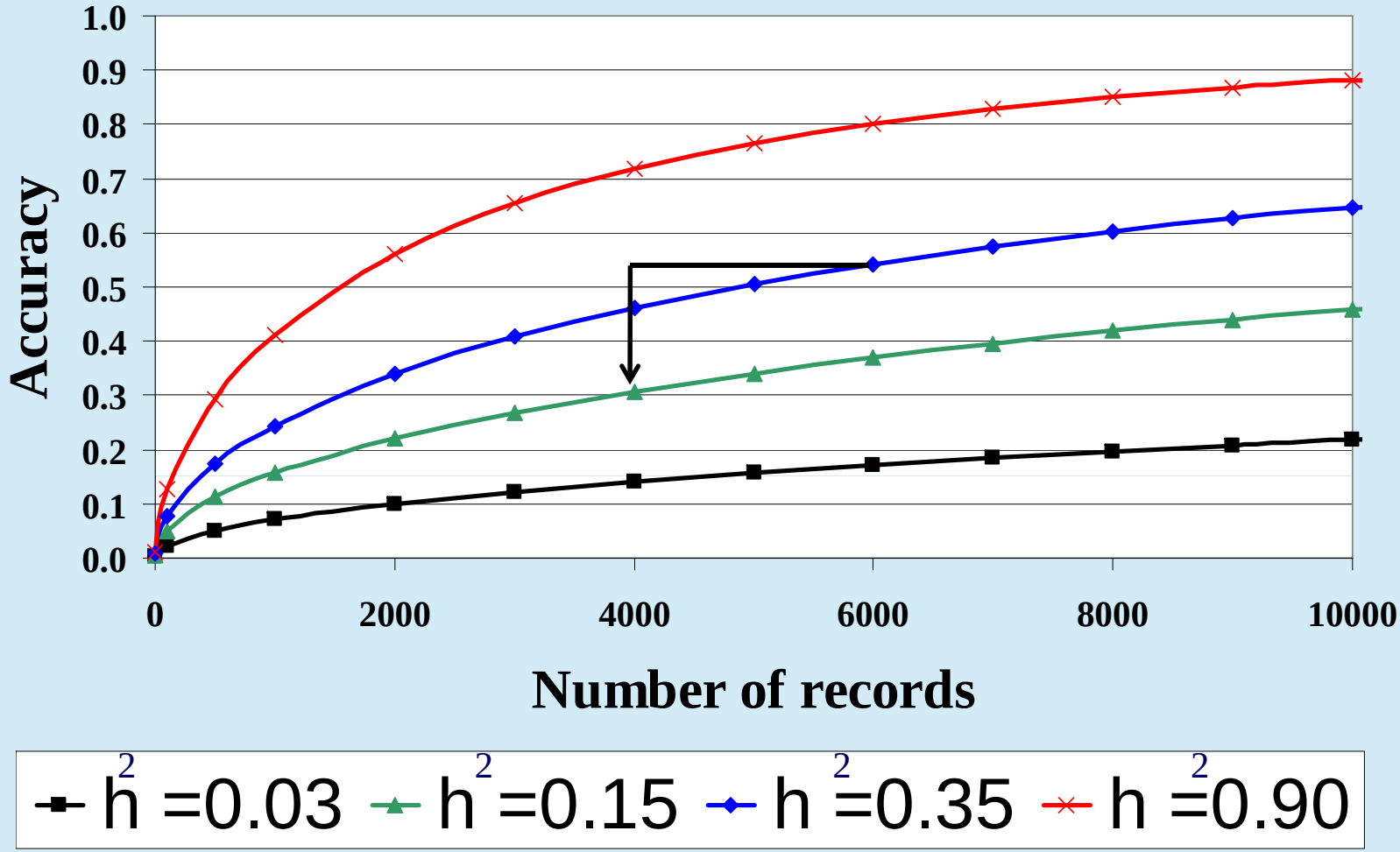
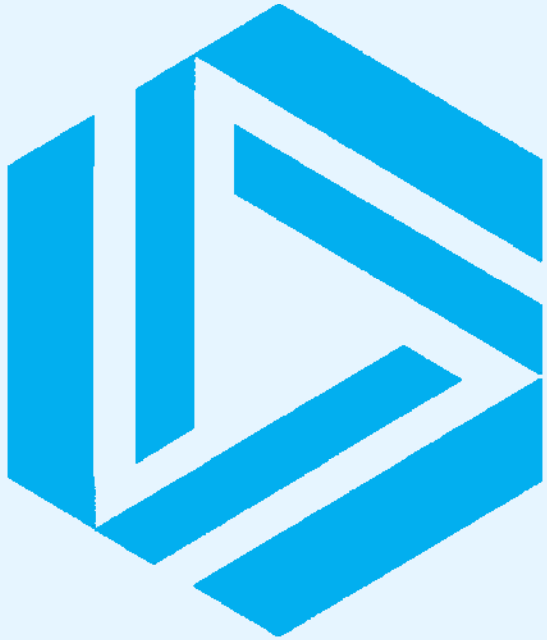


Summary

- Genomics offers great promise
- Turning that promise into profit is our jobs
  - Need long-term view
  - May require structural changes in recording
  - Can observe that change or manage it
- Going fast in the slightly wrong direction will turn out to be costly
- Need more effort on fitness trait recording

In the age of the genotype……

PHENOTYPE IS KING!



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Success through **Knowledge**