

UNITED KINGDOM · CHINA · MALAYSIA



Cobalt deficiency in Sheep: Nutritional and Genetic regulation of B12 metabolism

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Cobalt (Vitamin B12) Deficiency

- ↓ Productivity
- Infertility
- Anaemia
- Anorexia

Cost to industry

- Lamb growth ↓ 30%
- Autumn lamb sales ↓ £5.3 million
- Prophylactic treatment up to £35 million





Susceptibility depends on...

1) Geographical Location

2) Nutrition

3) Genetics



Geographical location





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Experiment 1

Aim: To confirm, on a farm scale, the observation that a deficiency in one trace-element may mask responses to treatment of another

Pilot study 2012



KD Sinclair, personal communication

- 400 twin bearing mule ewes
- 2 management groups/fields
- Random allocation to 1 of 4 treatments

 B12
 +
 +

 Se I
 +
 +
 +

- Treatments administered following lambing immediately prior to turnout
- BCS (Ewes) Lambing, 8 weeks, weaning
- Weights (Ewes and Lambs) Lambing, 8 weeks and weaning
- Blood samples (Ewes and Lambs) 8 weeks and weaning (~12 weeks)
- Metabolomics B12, Hcy, MMA, SA, Se, Co, GSHPx





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Genetics

Hypothesis

SNPs in genes encoding enzymes involved in 1C metabolism collectively account for the considerable degree of variability in metabolic and physiological responses observed in sheep when fed diets that differ in levels of 1C metabolites or when global metabolic homeostasis is disturbed.

Objectives

1. SNP discovery

Identify SNPs in genes encoding enzymes involved in:

- One-carbon metabolism
- Closely related pathways

2. Functional significance of SNPs

Identify SNPs leading to modifications in 1C metabolism

- SNP analysis
- Metabolomics GCMS, HPLC, LC-MS/MS
- Bioinformatics

3. Functional consequence study

Application of information obtained in objective 1 and 2

 Construct functional SNP chip for identification of animals with 'low-risk' and 'at-risk' allele variant combinations

4. Additional study

Application to the national flock

- Nasal swab collection of DNA
- 3 native British breeds
 - Suffolk
 - Bluefaced Leicester
 - Swaledale
- Between and within breed comparison of SNPs

Thank you









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