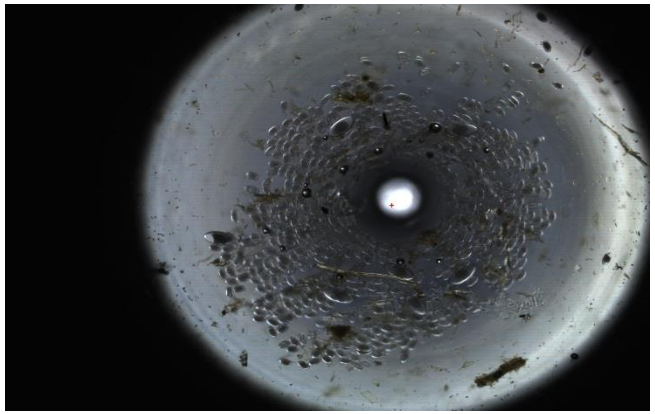
Getting better at collecting what is required

George Cullimore - Performance Recorded Lleyn Breeders

PERFORMANCE
RECORDED
LLEYN BREEDERS



Who are we?

- A group of like minded Lleyn breeders recording with Signet
- Formed in 2013 we now have about 25 members throughout the UK
- One of our aims was to look at the options available for breeding for worm resistance

PERFORMANCE RECORDED LLEYN BREEDERS

Getting started

- Previously the main focus had been on ‘resistance’ through the collection of individual Faecal Egg Counts for Strongyles (FEC S) and Nematodirus (FEC N)
- Research at Glasgow University had shown that parasite specific IgA in saliva could provide a new worm resistance phenotype. We secured a Farmer Innovation Grant to trial this ‘on farm’
- Signet ‘helpfully’ suggested that we should also do the more well established collection of individual FECs for which we already had an EBV.
- We began collecting samples in 2014

Worm resistance is not a ‘nice’ trait to look at – there is plenty to put you off

- FEC is expensive
- To get meaningful FEC results lambs have to be under a significant worm challenge – may have to accept a check in production
- Have to mess about with poo and saliva

But - THINKING POSITIVELY

- Unlike a lot of the challenges we face it is one of the ones that we as sheep breeders can help to do something about

Better as a group

- Pool skills and resources
- Easier to apply for funding
- Give each other advice and support
- Quicker to build up a critical mass of phenotypes
- Gives you a source of stock recorded for the same traits
- Helps if one or two take ‘ownership’ of the project
- Needs to be the right people – a group of radiators

Supplying large quantities of electronic data isn’t quite as glamorous as it sounds…..

The other end isn’t quite so bad ….

Although we supply Signet with data electronically for lots of other traits, for these we take the easier option which is ….

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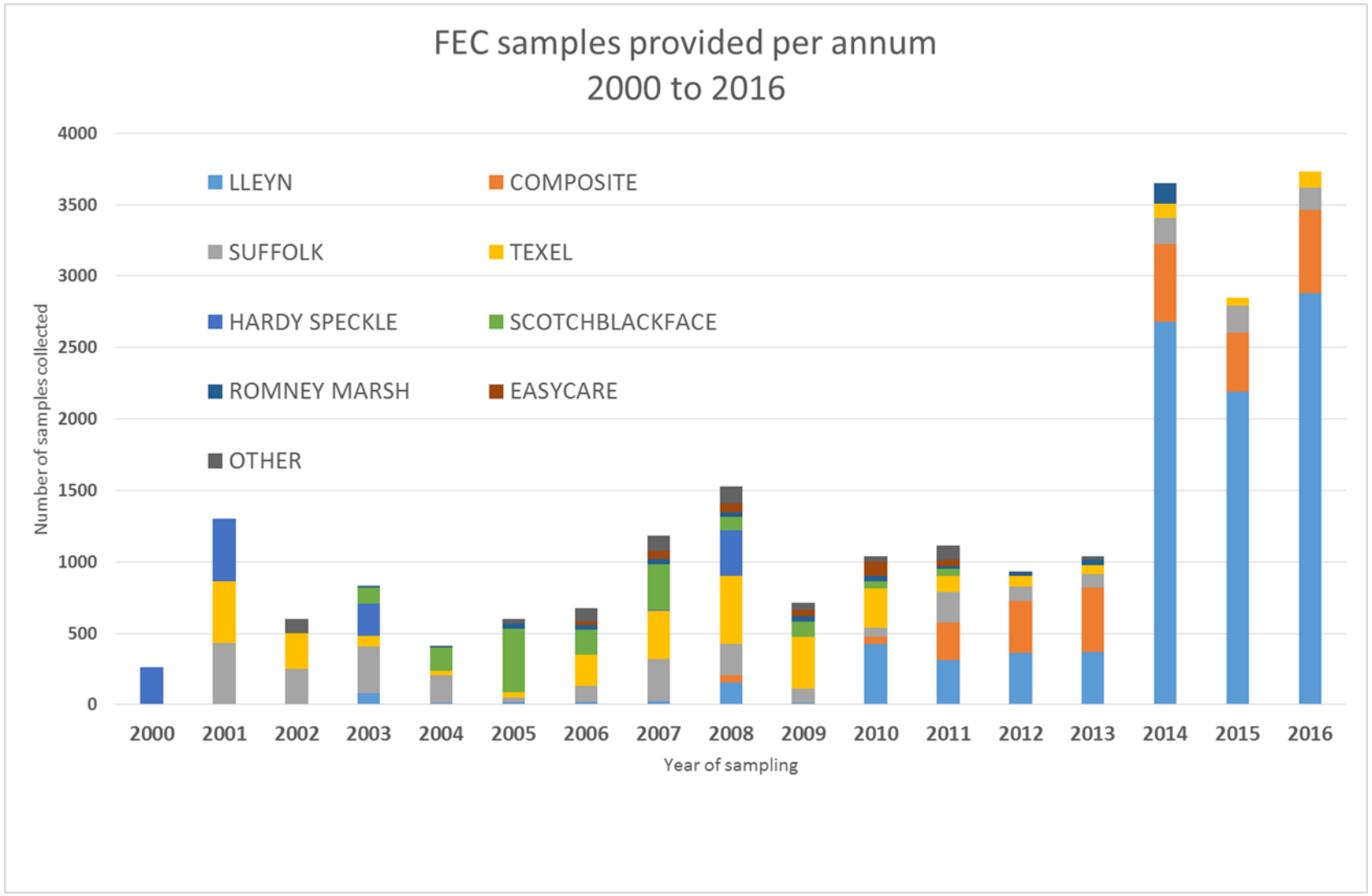
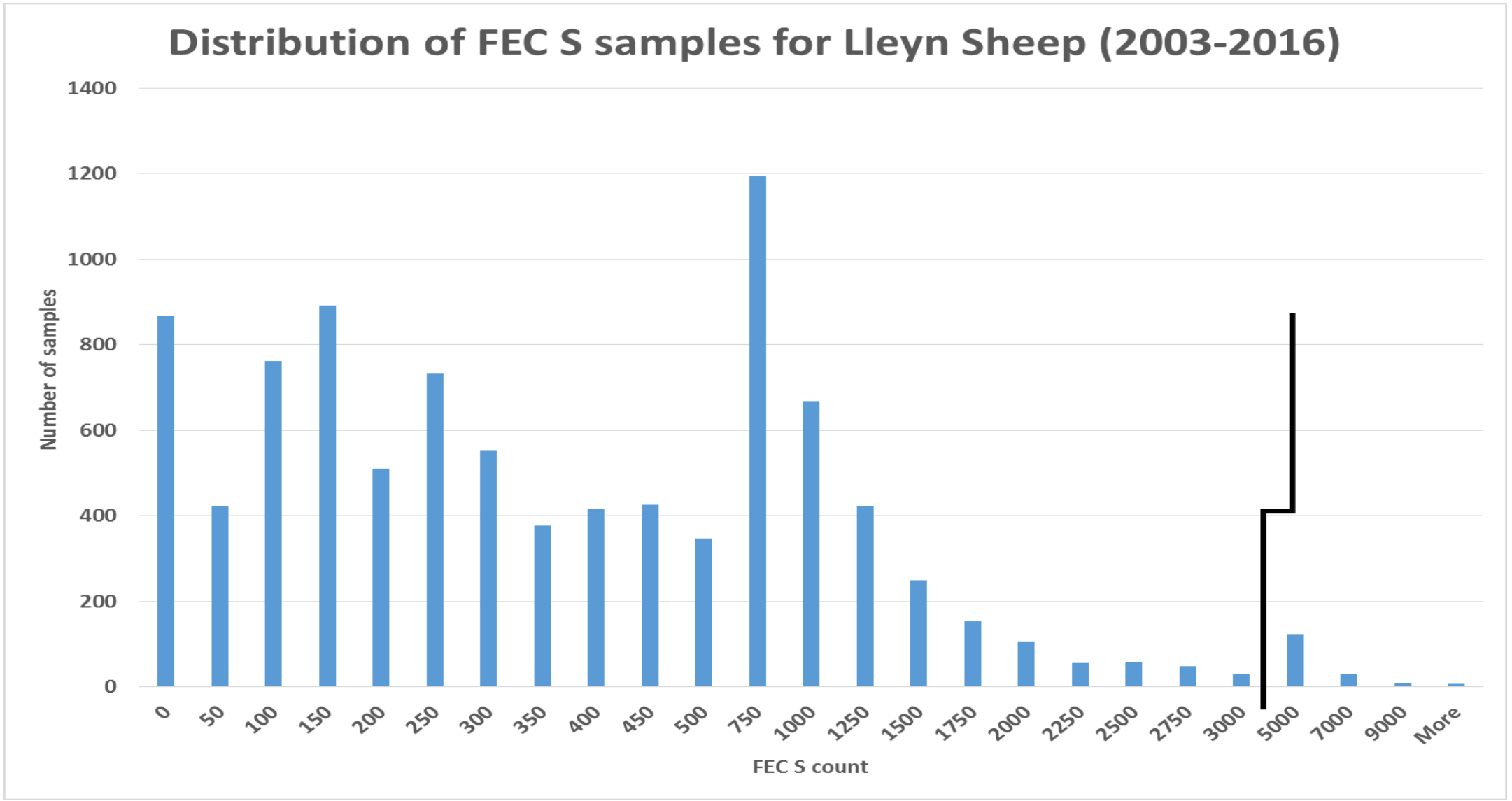
to get someone else to do it for us

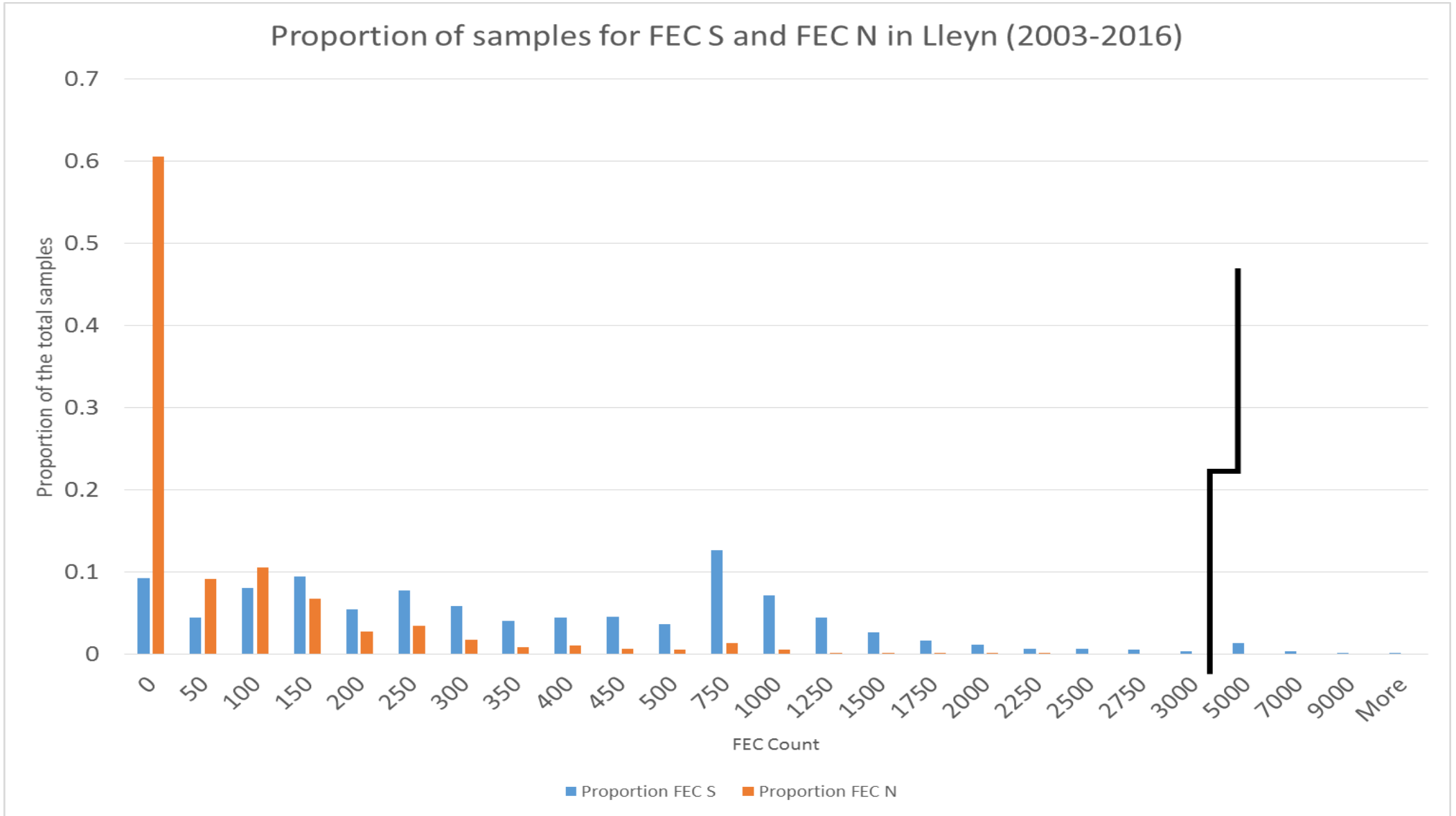
- All our FEC samples go to Techion in Aberystwyth
- Saliva samples go to the University of Glasgow for analysis
- They submit the results directly to Signet

How many samples are we talking about?



What do the results look like?




Proportion of samples for FEC S and FEC N in Lleyn (2003-2016)
Proportion of the total samples
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
50
100
150
200
250
300
350
400
450
500
750
1000
1250
1500
1750
2000
2250
2500
2750
3000
5000
7000
9000
More
FEC Count
Proportion FEC S
Proportion FEC N

What have we done with all this data ?

AHDB Beef and Lamb funded two pieces for work

- IgA phenotype collection (over 10,000 samples to date)
- FEC and IgA analysis to produce EBVs

We now have

- Separate FEC S and FEC N EBVs published – previously they had been combined
- New published Saliva IgA EBV
- Updated heritabilities for FEC S, FEC N and Saliva IgA
- Known genetic correlations between these traits

New heritability Values

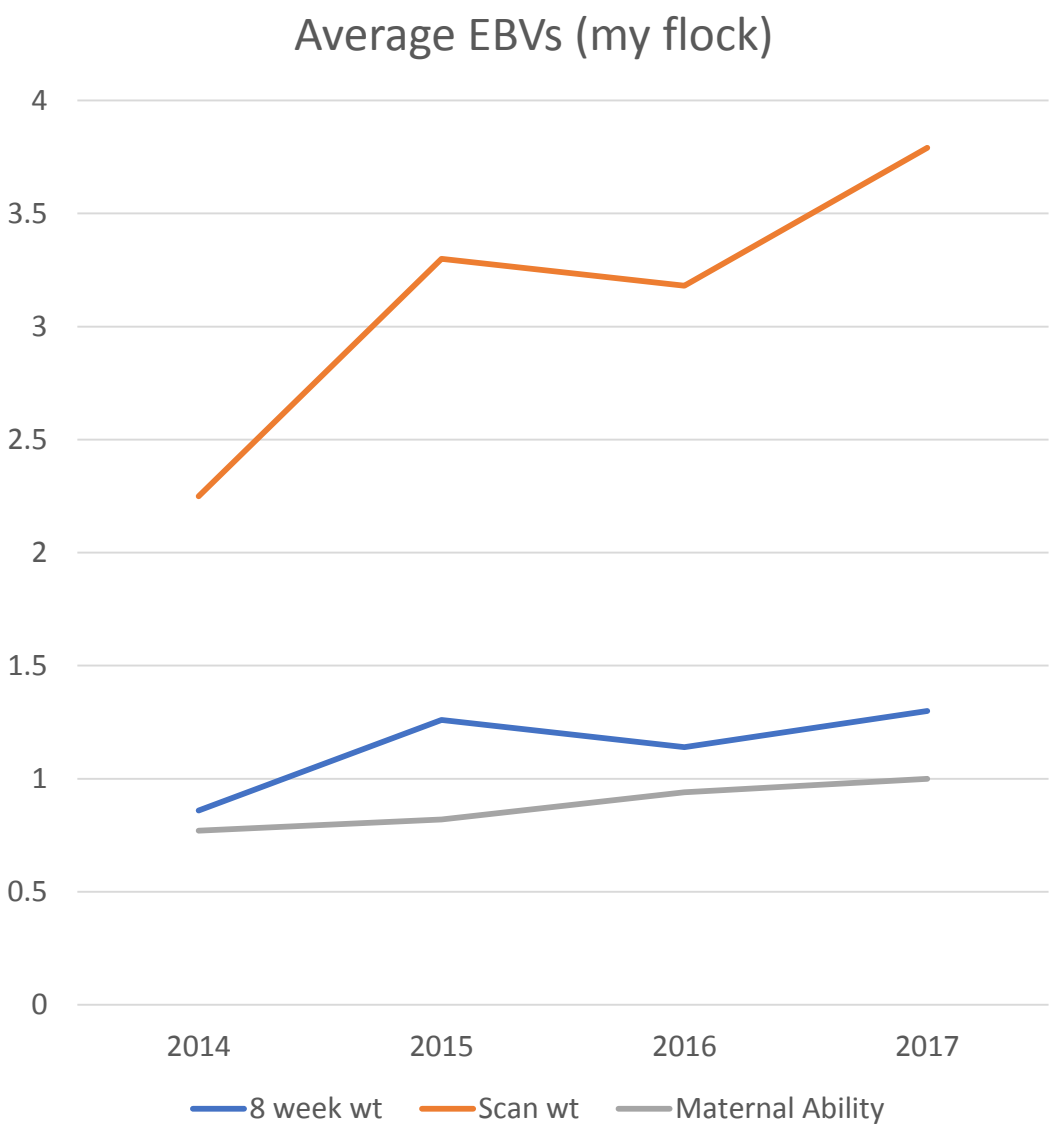
For Lleyn 2017

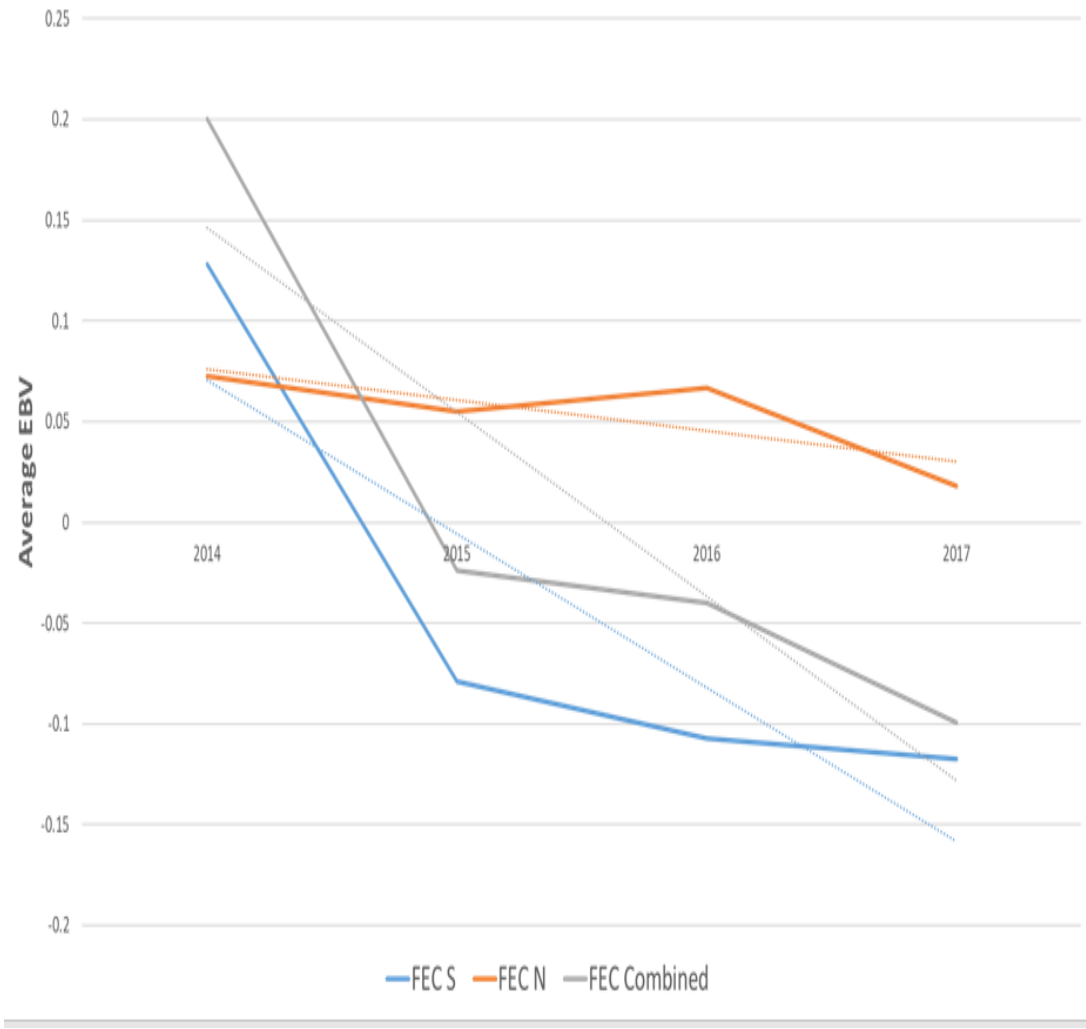
- Saliva IgA =0.16
- Strongyles (FEC S) = 0.08
- Nematodirus (FEC N) = 0.14

The updated FEC heritabilities are lower than previous estimates but still give us something to work with

Genetic correlations

- Positive correlation between FEC S and FEC N (0.61)
- Negative correlation between IgA and FEC S (-0.26)
- No significant correlation between IgA and FEC N
- Very low correlations to performance traits


Average EBVs (my flock)
4
3.5
3
2.5
2
1.5
1
0.5
0
2014
2015
2016
2017
8 week wt
Scan wt
Maternal Ability


0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
Average EBV
2014
2015
2016
2017
FEC S
FEC N
FEC Combined

What next?

European Innovation Partnership project

- Further 3000 FEC and Saliva IgA samples on 13 commercial farms
- Planned matings at HAU using 300 ewes mated to 6 rams – 3 ‘good’ and 3 ‘poor’ for worm resistance EBVs
- 200 lambs FEC and IgA sampled on consecutive days to look at repeatability of both tests
- All lambs from planned matings to be tested and 50 to be slaughtered after testing so that worm counts can be carried out on gut contents and intestines examined
- Results and final report July 2019

Final thoughts

- Will data collection continue?

  Farmers still enthusiastic but will need

  market for resistant stock

- Can we increase heritability?

  How big an impact are age and challenge

  having?

- How will the Saliva IgA help?

  We should learn a lot from the Harper Adams trial

- Are we tackling the right species?

  Small speciation study with Glasgow University

Signet

Signet Breeding Services

THE EUROPEAN INNOVATION PARTNERSHIP

SRUC

AHDB

BEEF & LAMB

University of Glasgow

VIA VERITAS VITA

PERFORMANCE RECORDED LLEYN BREEDERS

Harper Adams University

FECPAK G2

Remote Location Parasite Diagnostics

Salivary IgA:
a tool for selective breeding

Karen Fairlie-Clarke

University of Glasgow

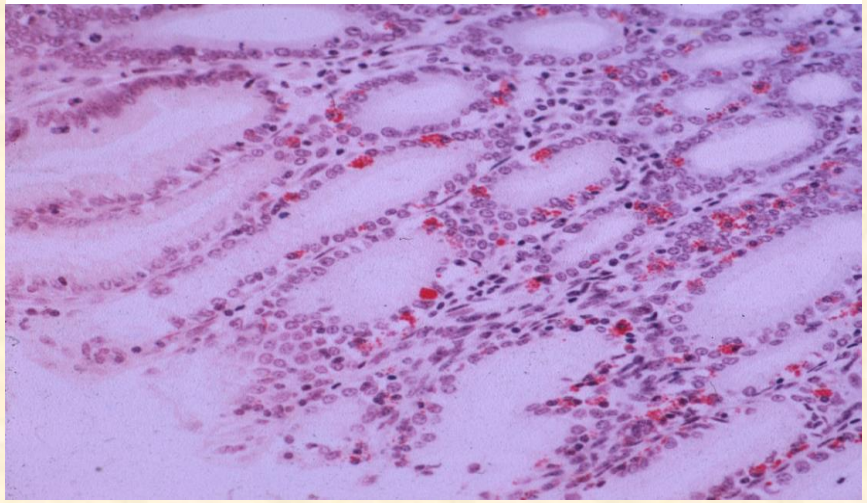
Email: karen.fairlie-clarke@glasgow.ac.uk

The Immune Response to *Teladorsagia circumcincta*

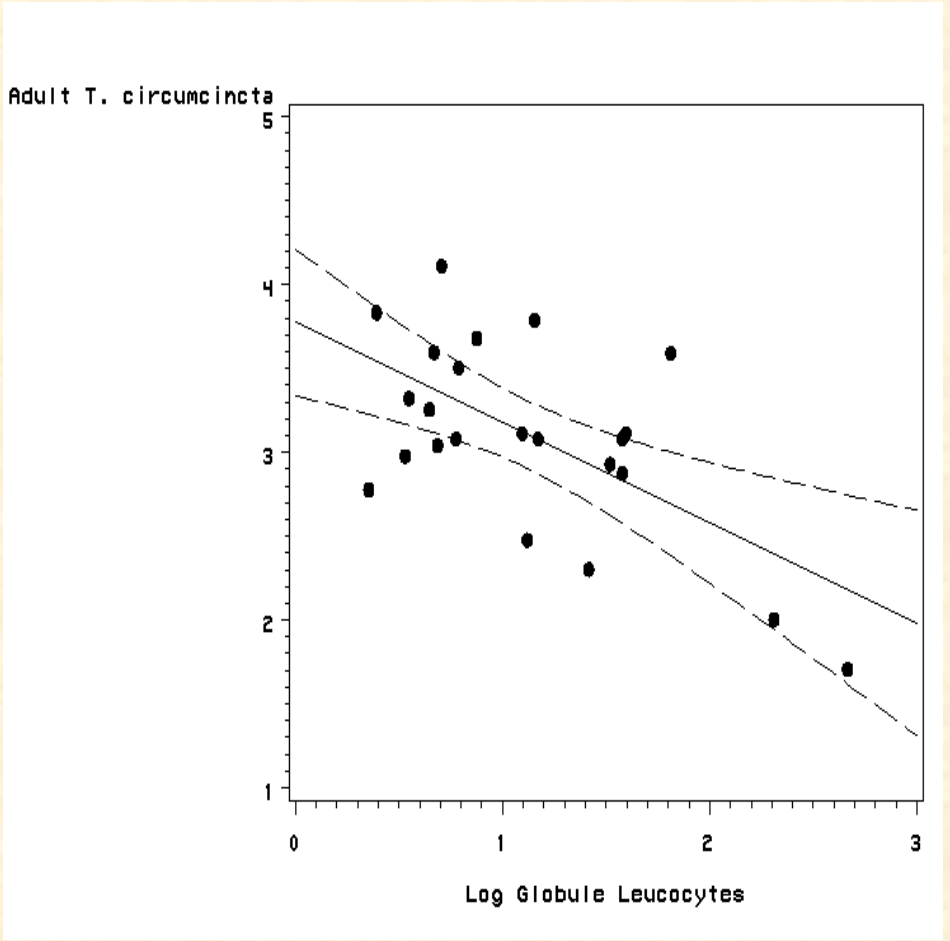
1) IgE controls adult worm number

IgE + Mast cell = release of histamine + proteases (globule leucocytes)

Globule leukocytes in the abomasum



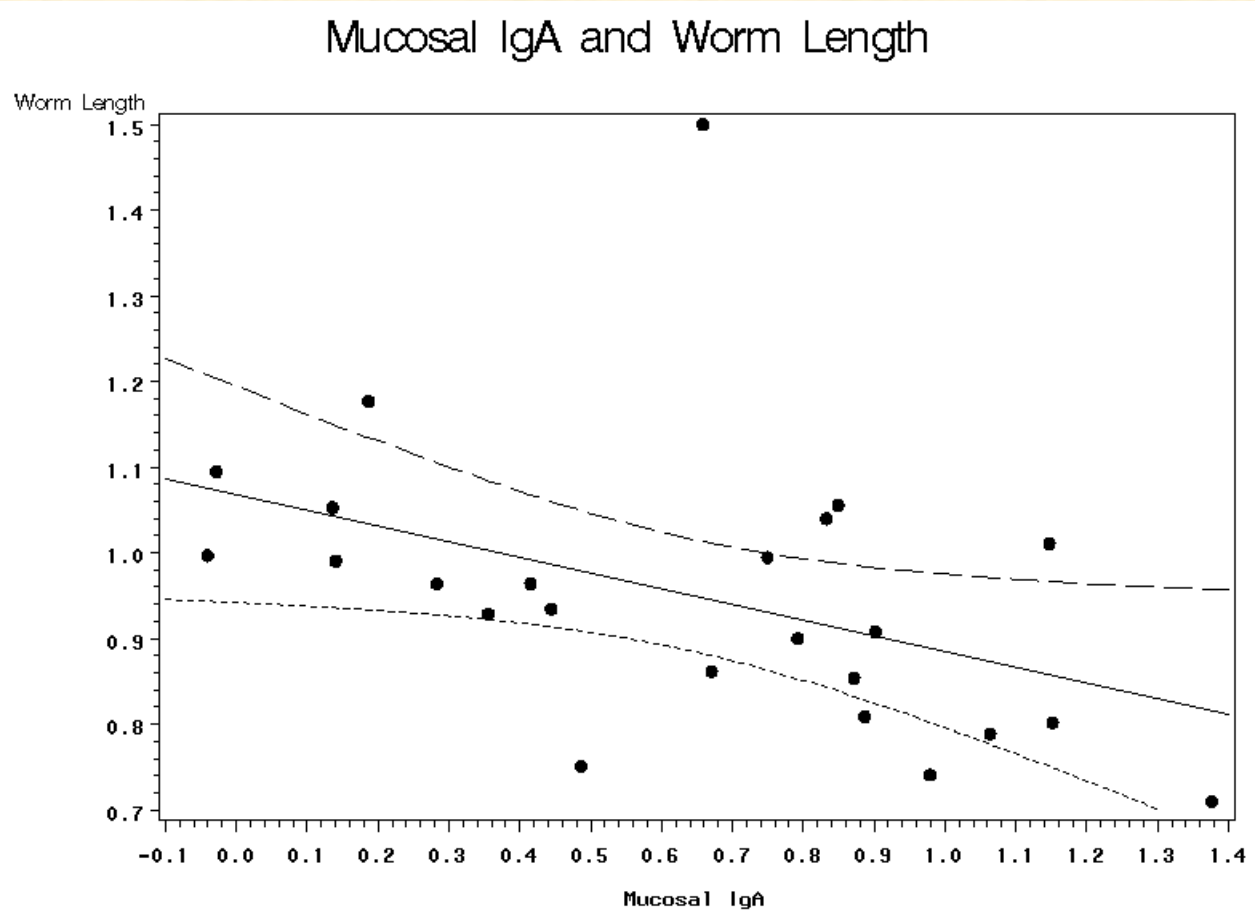
Pathology!!
Gastric ulcer-like = protein deficit
Reduced lamb growth.



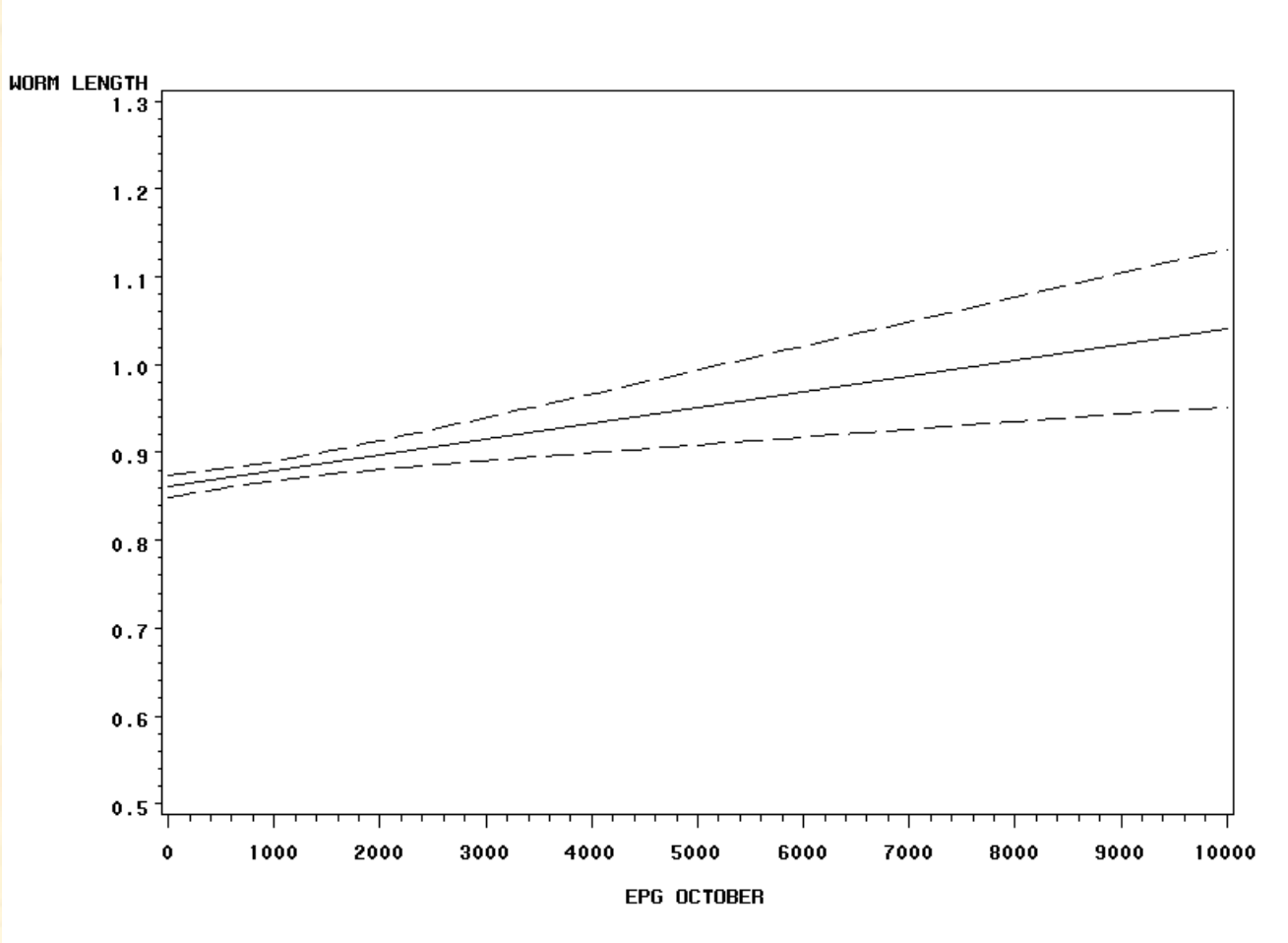
The Immune Response to *Teladorsagia circumcincta*

2) IgA controls adult worm length

How is not exactly known – target immune cells to worm, prevent worm feeding

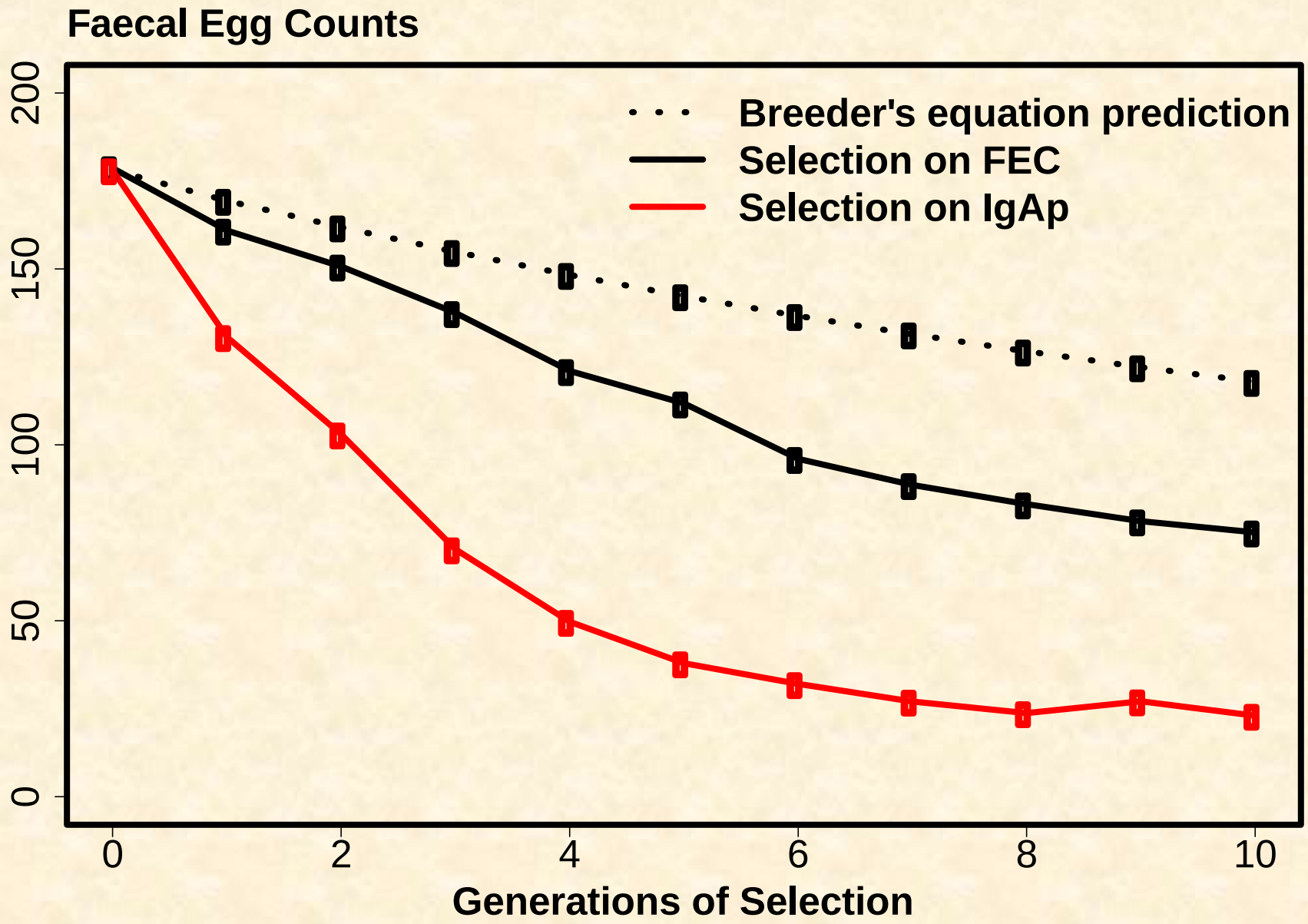


Shorter worms produce fewer eggs

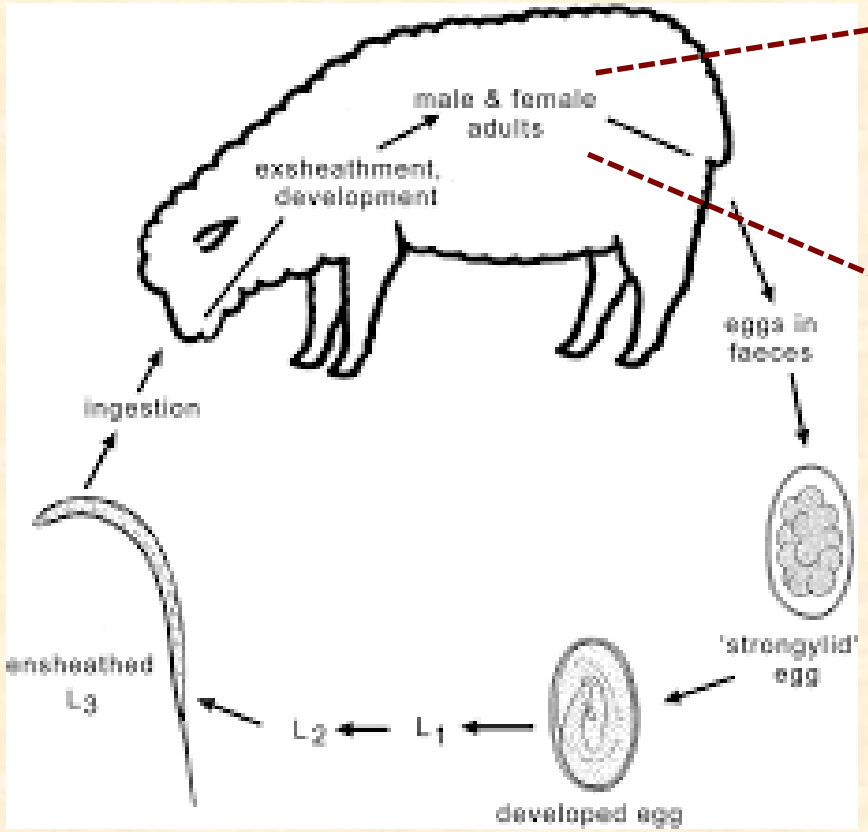


- Increased female worm length associated with increased egg production (fecundity)
- Eggs from immune sheep less fertile

Predicted Response to IgA Selection



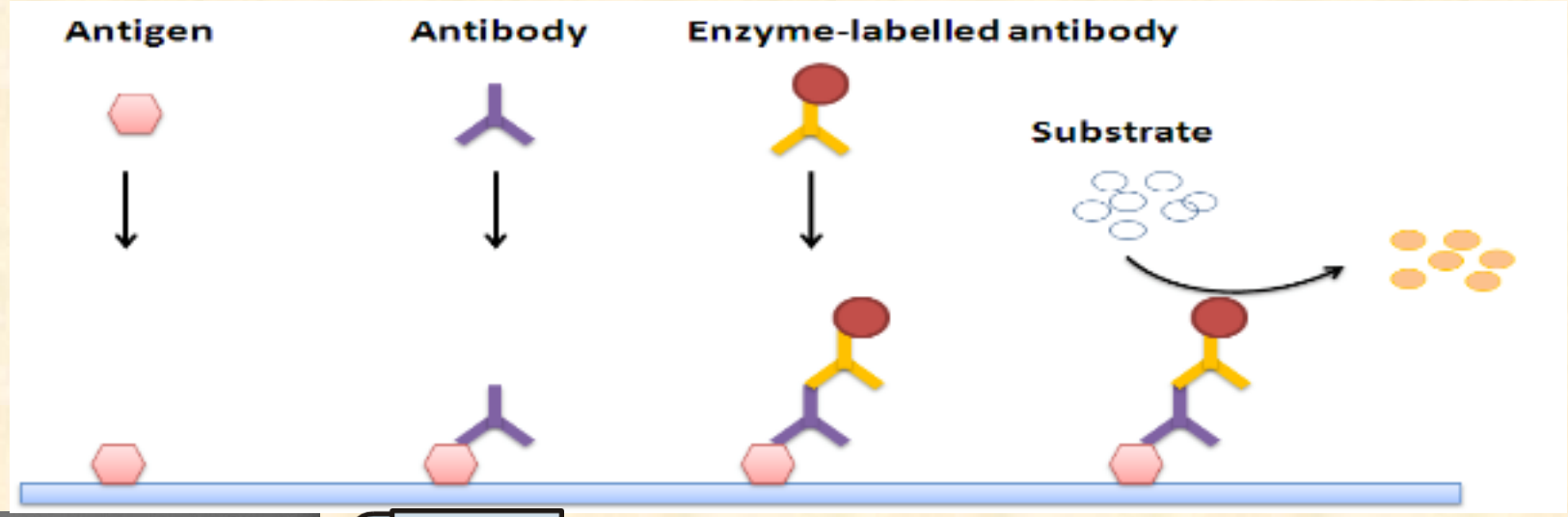
The salivary IgA test

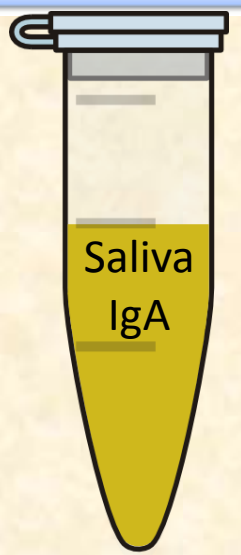


Abomasal IgA
Shorter worms
Reduced fecundity
No pathology

Salivary IgA
Ease of collection
Live individual

The salivary IgA test



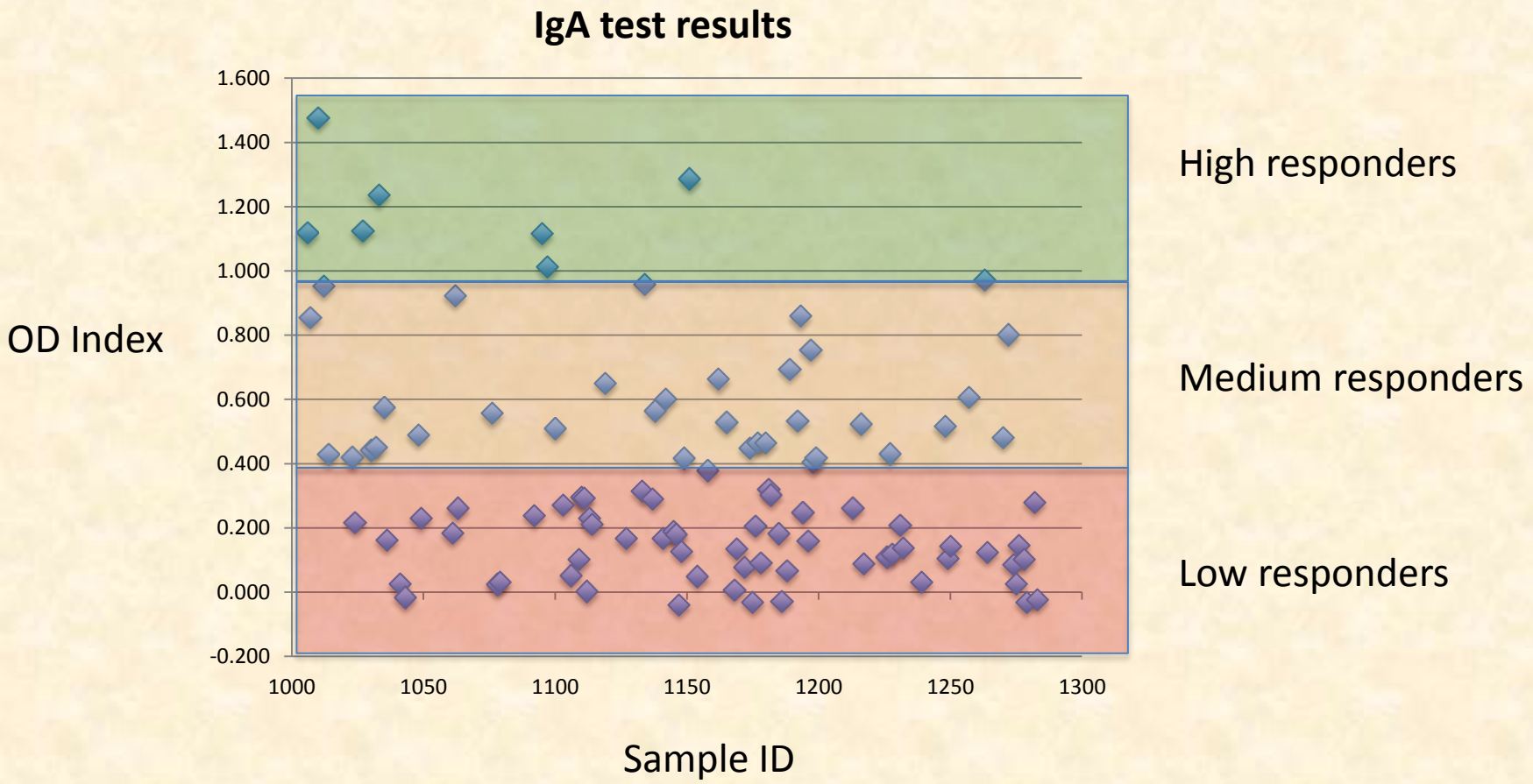


Anti-sheep IgA

Colour change (Optical Density)

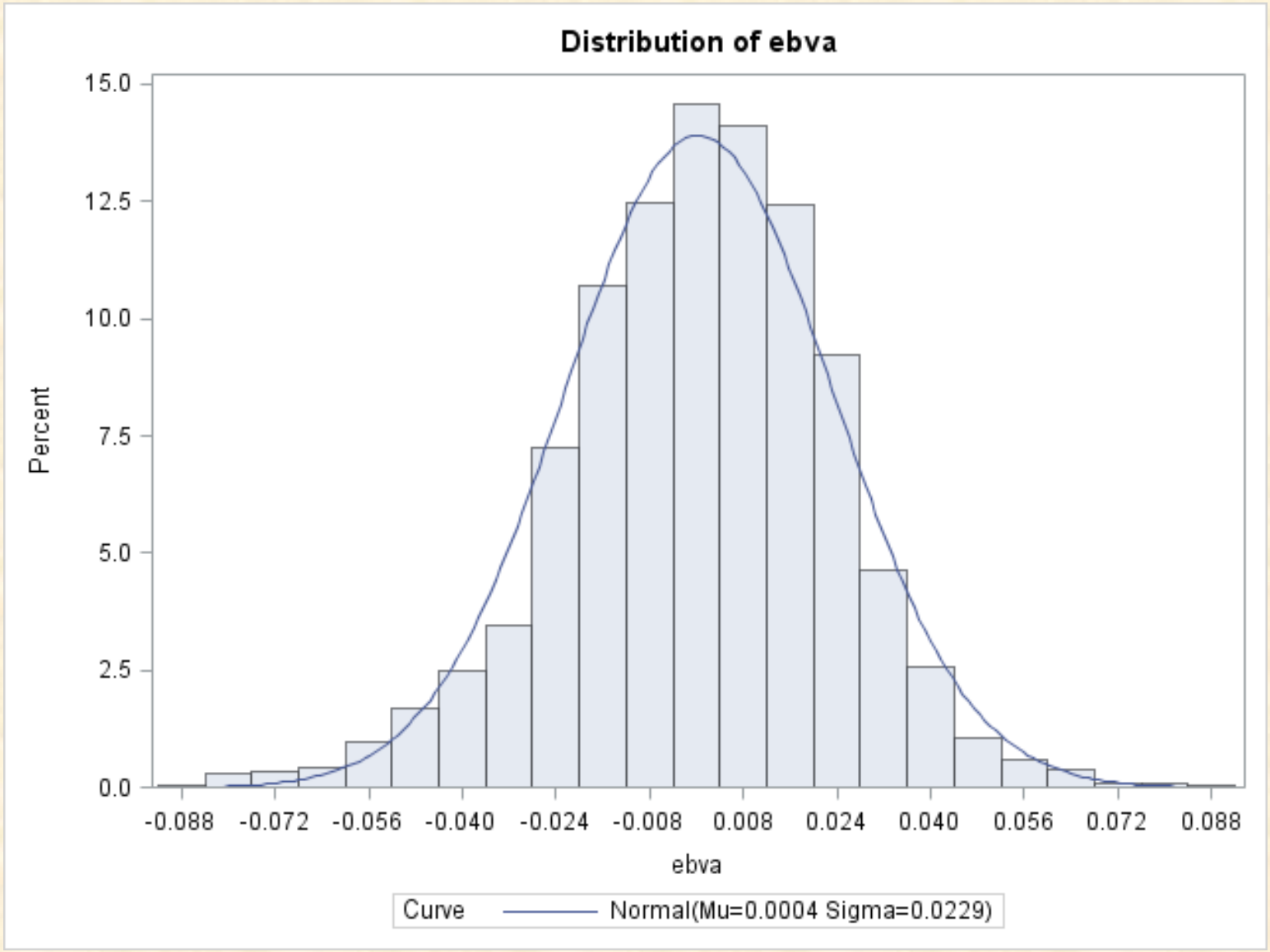
- Measures response to T. circumcincta L3
- Result is an Optical Density
- Given as a proportion of high responder pool
- Optical Density Index
- Converted to EBV via Signet & Egenes

IgA test results: Optical Density Index



IgA test results: EBV

Heritability 0.16 (double that of FEC)



The future of the IgA test

YEAR	Sheep sampled
2014	2970
2015	3349
2016	4055
2017	4500

Moredun Research Institute hopefully adopting the test

The BUG Consortium

We are a team of scientists and vets working on better ways to control stomach worms in the face of increasing resistance

We need your help!

We are looking for barbers pole worm (Haemonchus contortus) on UK farms that use ivermectin (e.g. Ivomec, Oramec)

We would like faecal samples from 10 sheep just before worming with ivermectin and 14 days after worming

For more information please contact:

Dr Roz Laing: Rosalind.Laing@glasgow.ac.uk

Website**:** https://bugconsortium.wordpress.com

VIA VERITAS VITA

The BUG Consortium
BUILDING UPON THE GENOME

BBSRC
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Acknowledgements

Performance Recorded
Lleyn Breeders

Egenes

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