

Genetic parameters for *Fasciola hepatica* in Irish dairy cows



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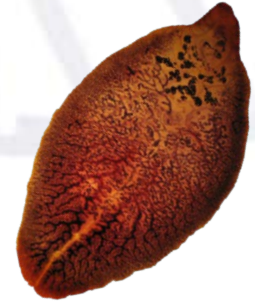
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Fasciola Hepatica (Liver Fluke)

- Parasitic disease in cattle and sheep
- Life cycle
- Environment
 - Grazing
 - Temperate climate
- Large prevalence
- Anthelmintic treatment



Why am I the
only cow with
liver fluke





Born in February 2009



4th lactation

Calved in April 2014



F. hepatica
Negative

F. hepatica
Positive

F. hepatica
Negative

F. hepatica
Positive

F. hepatica
Negative



All slaughtered on 16/02/2015

Materials & Methods



Live *F. hepatica*

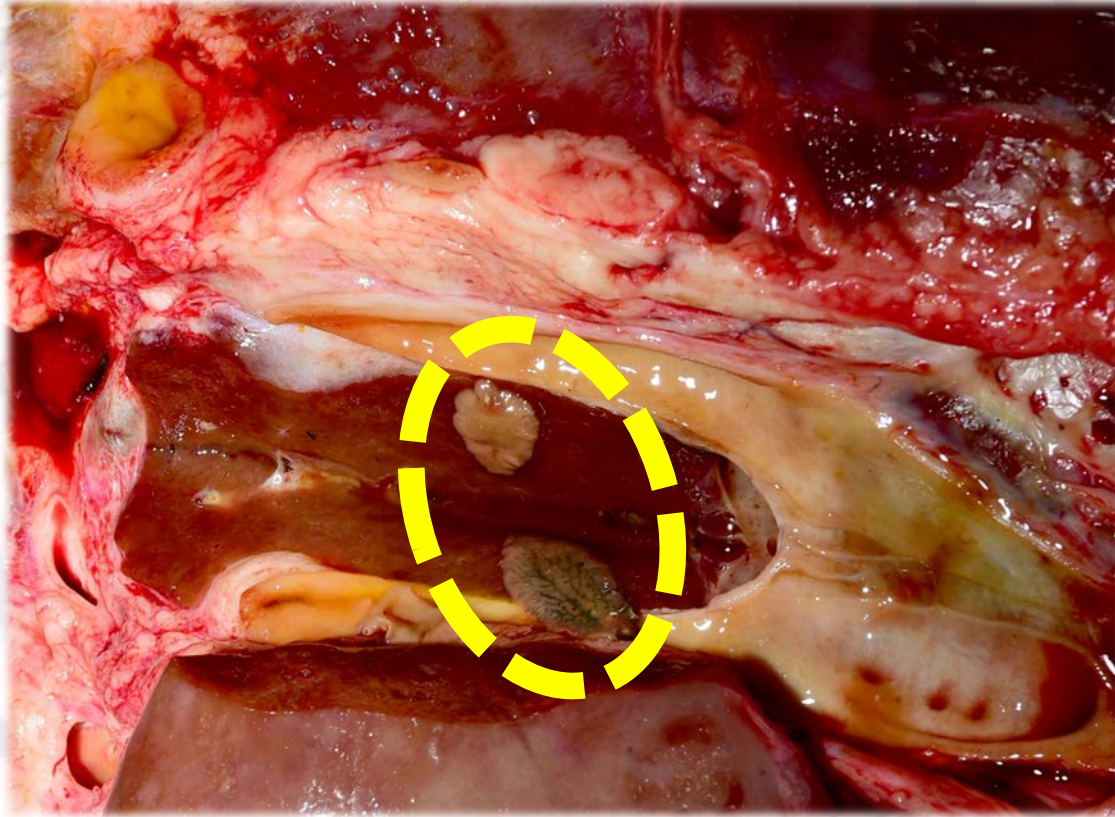


Photo courtesy of Animal Health Ireland

Liver damage caused by *F. hepatica* without live *F. hepatica*

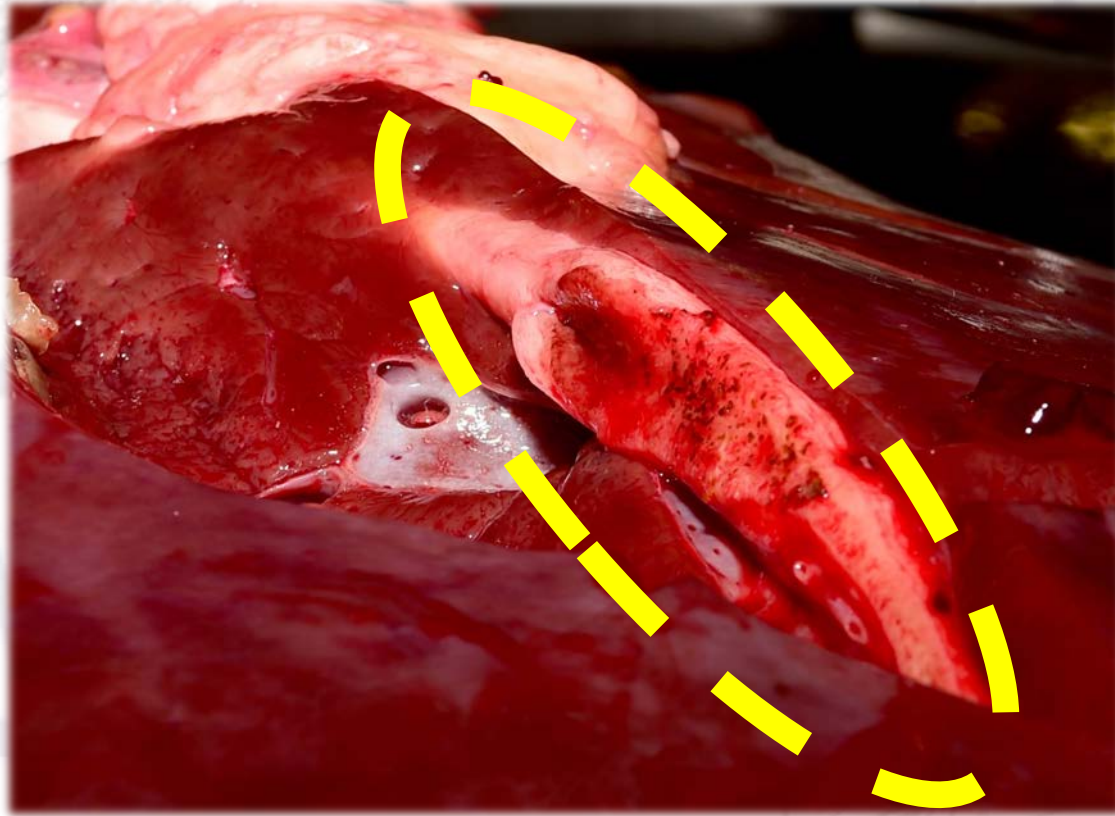


Photo courtesy of Animal Health Ireland

No liver damage

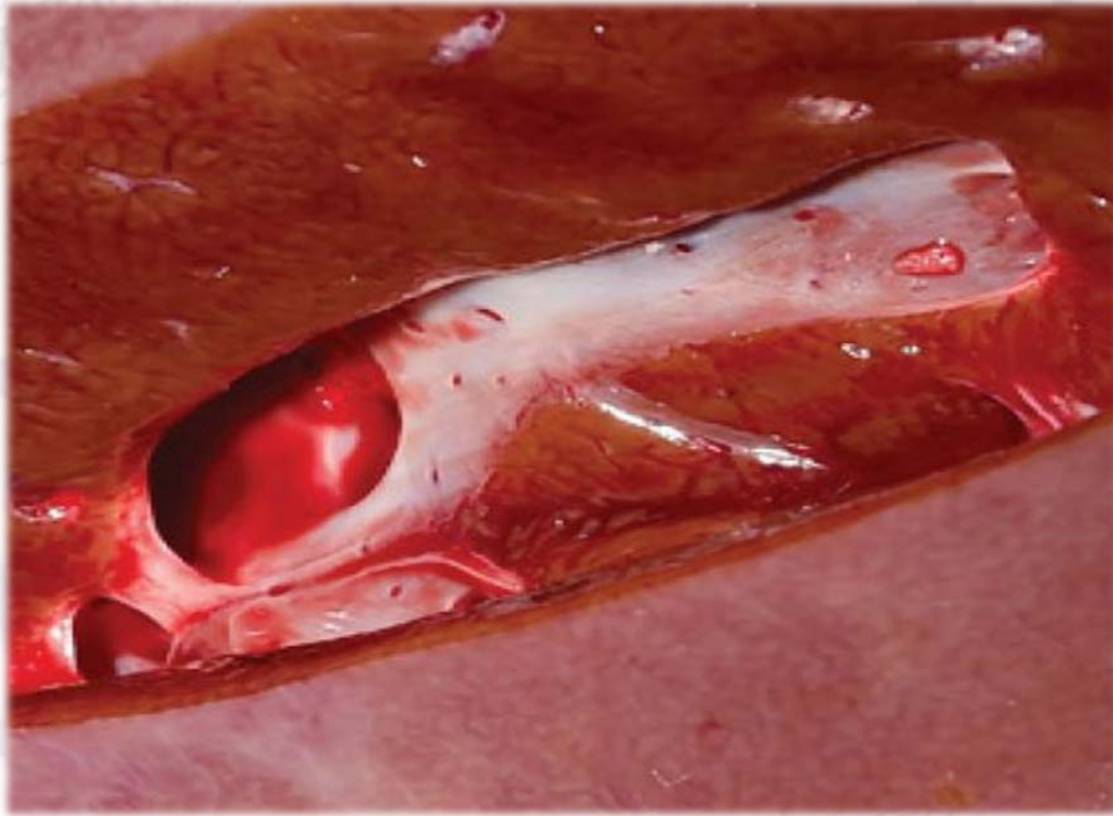
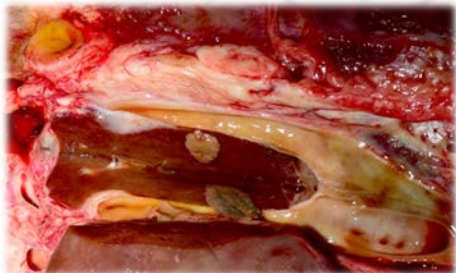


Photo courtesy of Animal Health Ireland

Exposure



Live *F. hepatica*



Herd-mates 100 days
prior diagnosis



No live *F. hepatica*



Herd-mates 100 days
prior diagnosis



Born within 100 days of the
diagnosed cow's birthdate

Study Herd Data

- 69 dairy farms
- Binary trait
 - $ODR \geq 0.4$ / $ODR < 0.4$
- Exposed animals:
 - Herds with > 5 positive cows and $\geq 5\%$ prevalence
 - 48 herds exposed



Statistical Analysis

$$Y = X\beta + Z\gamma + \varepsilon$$

- *F. hepatica*-liver damage (n=16,734)
- binary trait for antibody response (n=6,907)

Statistical Analysis

$$Y = X\beta + Z\gamma + \varepsilon$$

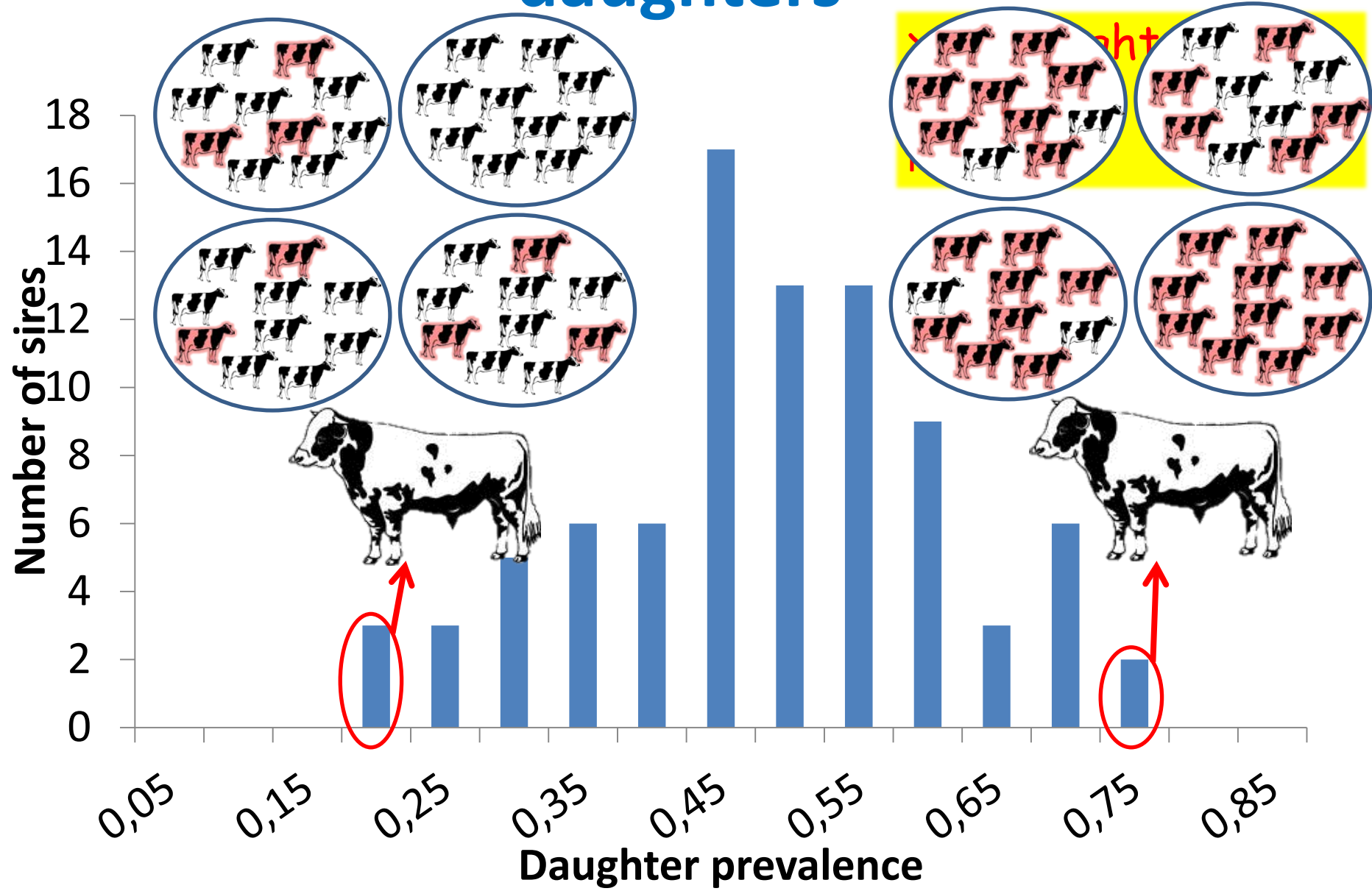
- *F. hepatica*-liver damage
- binary trait for antibody response
 - HYS (herd-year-season of calving)
 - heterosis
 - recombination loss
 - age relative to parity median
 - parity
 - stage of lactation
 - factory-date (abattoir data only)

Statistical Analysis

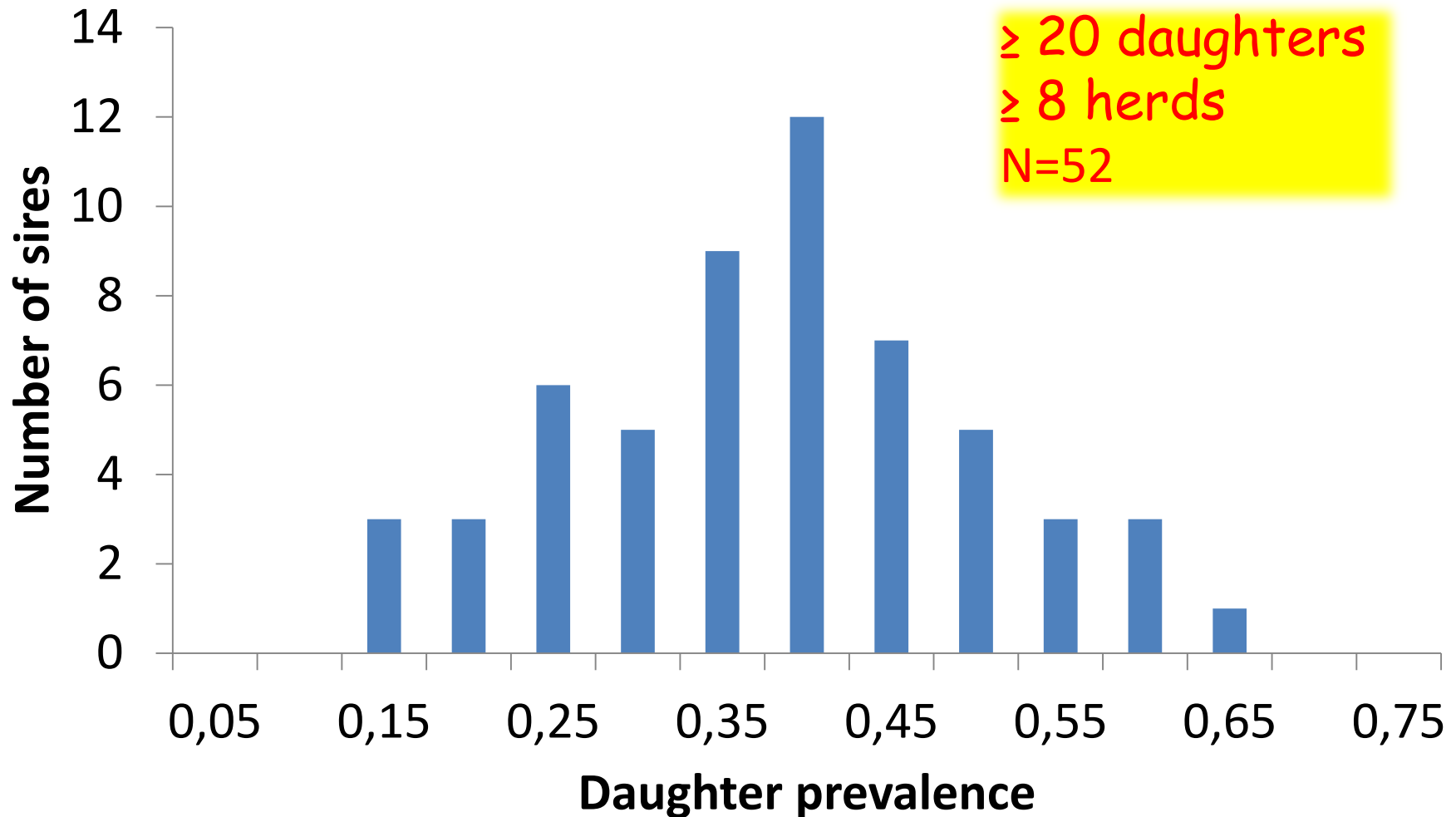
$$Y = X\beta + Z\gamma + \varepsilon$$

- *F. hepatica*-liver damage
- binary trait for antibody response
 - HYS (Herd-year-season of calving)
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 - age relative to parity median
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 - factory-date (abattoir data only)
 - direct additive genetic effects
 - residual

Prevalence of *F. hepatica* of sire's daughters



Prevalence of *F. hepatica* of sire's daughters

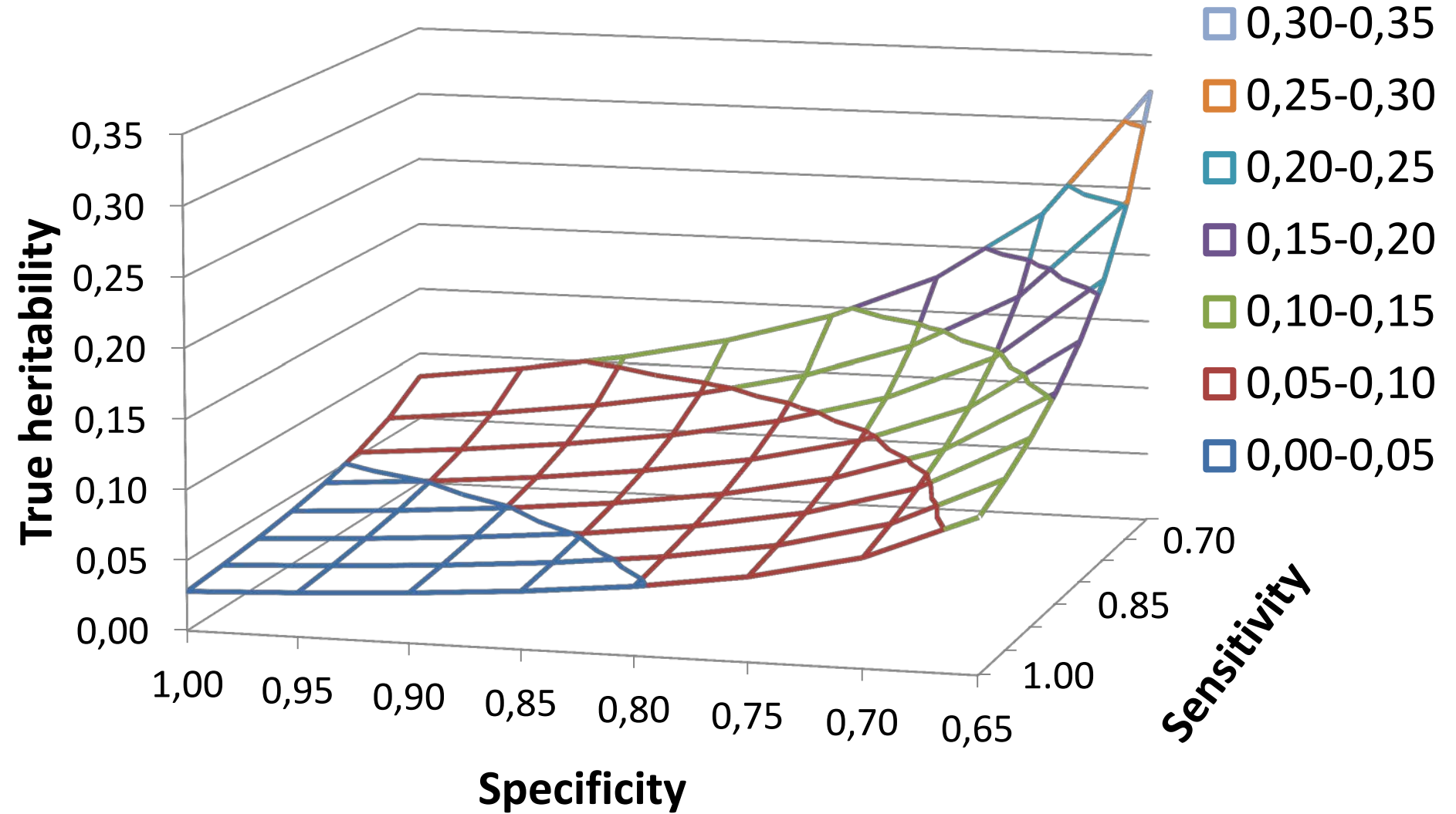


Results

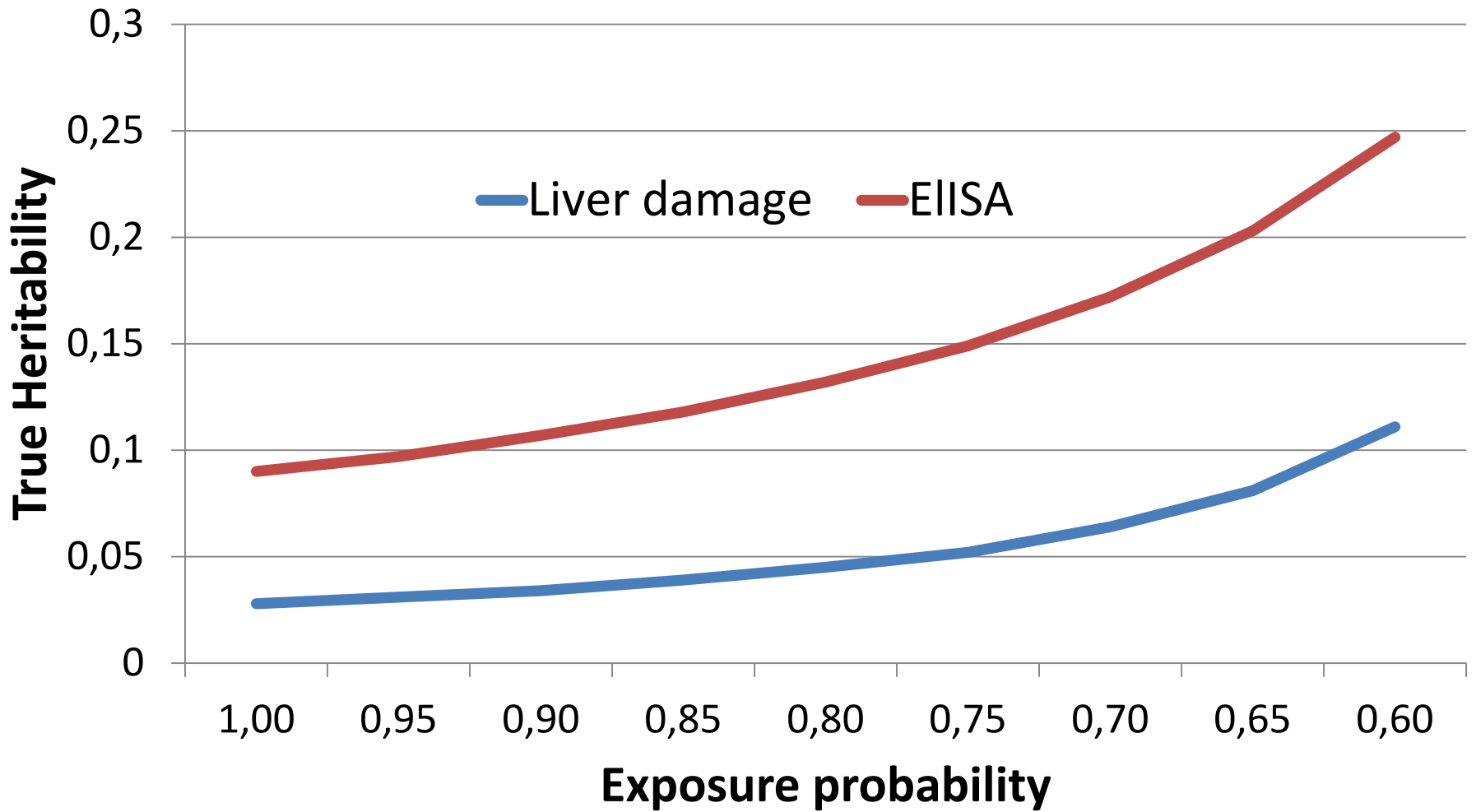
	Abattoir data	Study herd data
Prevalence	47%	37%
Heritability	0.03 (0.01)	0.09 (0.02)
Genetic standard deviation	0.069	0.112

Genetic correlation between the two datasets was 0.37 (SE=0.283)

True Heritability



(Bishop and Woolliams, 2010)



(Bishop and Woolliams, 2010)

Conclusion

- Control *F. hepatica* by breeding
- Complementary to anthelmintic treatment
- Sustainable – permanent and cumulative
- Large amount of data available



Acknowledgements

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Department of
**Agriculture,
Food and the Marine**

An Roinn
**Talmhaíochta,
Bia agus Mara**