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Improving dairy ewes resistance to gastro-intestinal parasite infections in natural conditions by selecting rams in artificial infections

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GenPhySE – INRA Toulouse

Session Biology - Disease Resistance

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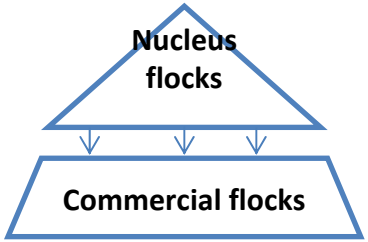
Breeding strategies to select for parasite resistance

- **Resistance measure = Fecal Egg Count (FEC)**

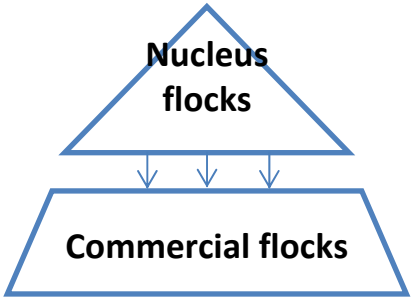
- **Selection of the rams based on the phenotypes of their offspring in natural infections**
  - ✓ only one intervention on the animals
  - × around 30 animals by sire → good accuracy of the index
  - × no control of the number of larvae ingested by the animals

- **Selection of the rams based on their own phenotypes in experimental infections**
  - ✓ pyramidal organization of the population
  - ✓ fewer animals are phenotyped
  - × at least 3 interventions per animal
  - × time consuming



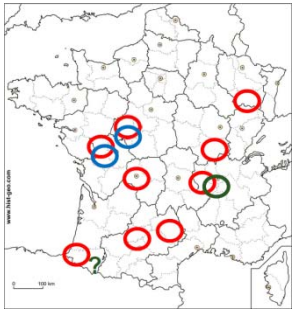
Sheep breeding and parasitism in South-West of France

- **2nd area for dairy sheep production in France**
  a total population of 280,000 Blond-faced Manech ewes in 2015
  28% ewes in selection program
  150 AI progeny tested rams / year } Nucleus flocks



- **Favorable conditions to parasites in this area:**
  flocks mainly raised outside
  mild temperatures (5°C-25°C)
  rainy area (1000-1600mm of annual rainfall)

- **Anthelmintic resistance in parasite populations:**
  only one efficient molecule without any withdrawal time for milk



Anthelmintic resistance in France

Two populations to study genetic resistance to parasites

603 nucleus rams

Experimental infection

103 rams with phenotyped offspring

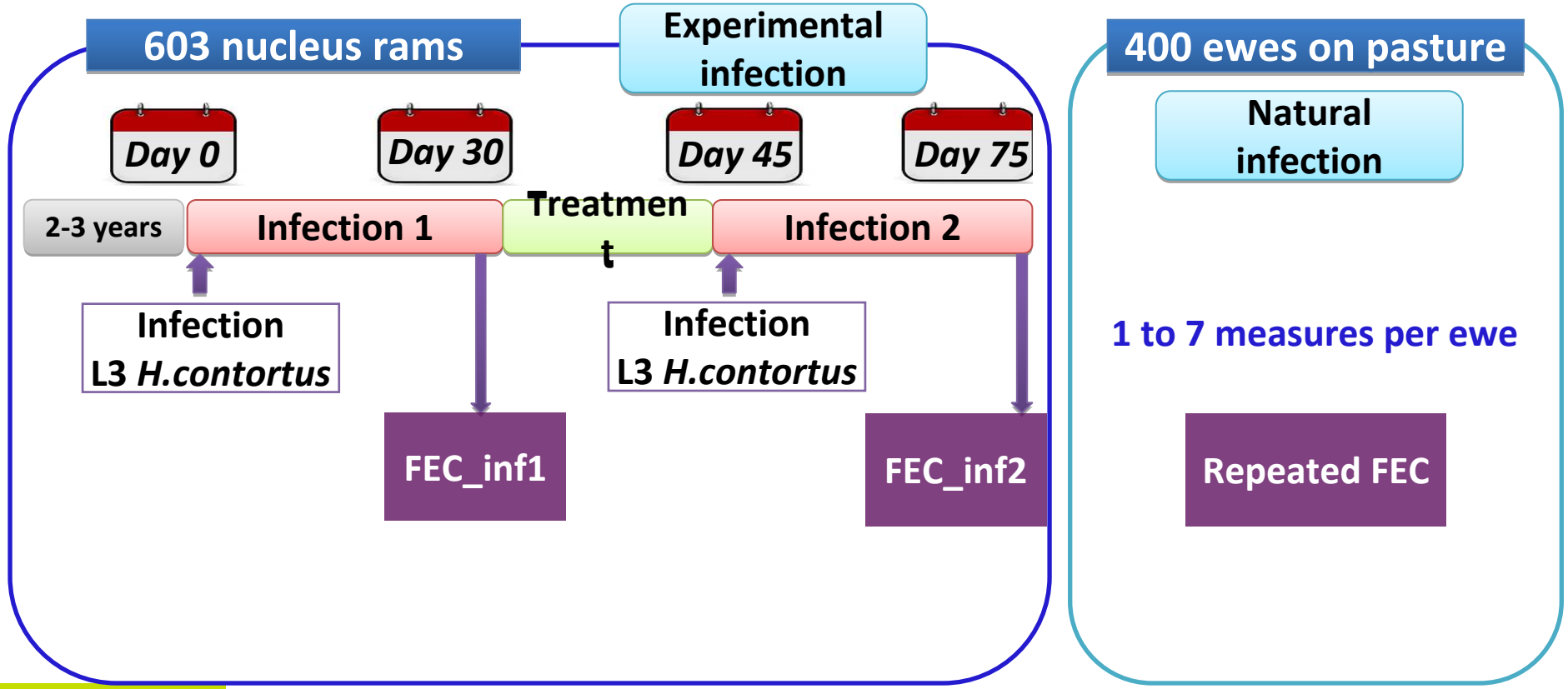
- 2 to 3 years old males
- Naïve animals
- Infected with *Haemonchus contortus* only
- Phenotyped between 2008 and 2016

400 ewes on pasture

Natural infection

- 2 to 4 years old females
- 7 flocks
- Different physiological status (pregnant / milking ewes)
- Multi-species infections

Phenotypes in experimental and in natural infections



FEC : Fecal Egg Count

Estimation of heritabilities and genetic correlations

603 nucleus rams

Experimental infection

Model :

FEC = infectious group + gen_animal + e

400 ewes on pasture

Natural infection

Model :

FEC = year×season + age + treatment + permanent environment + gen_animal + e

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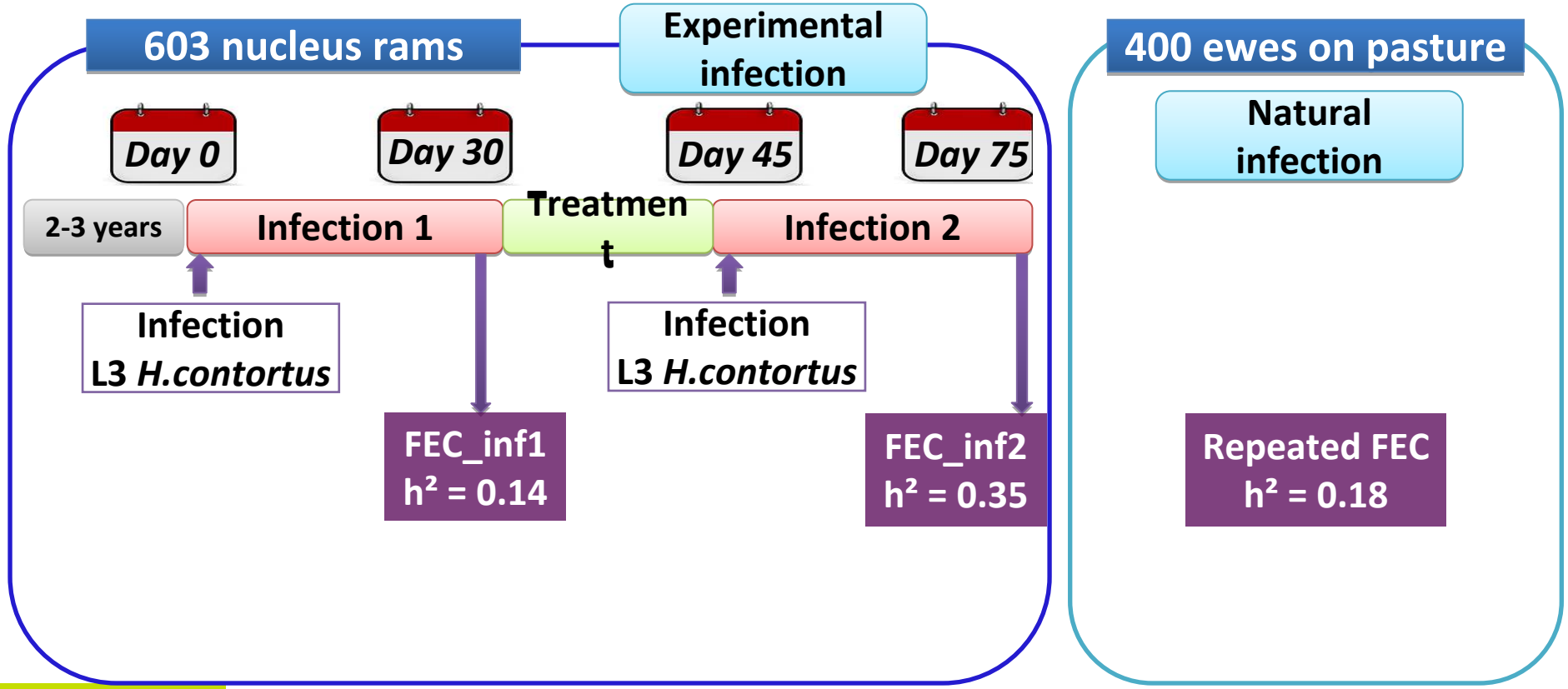
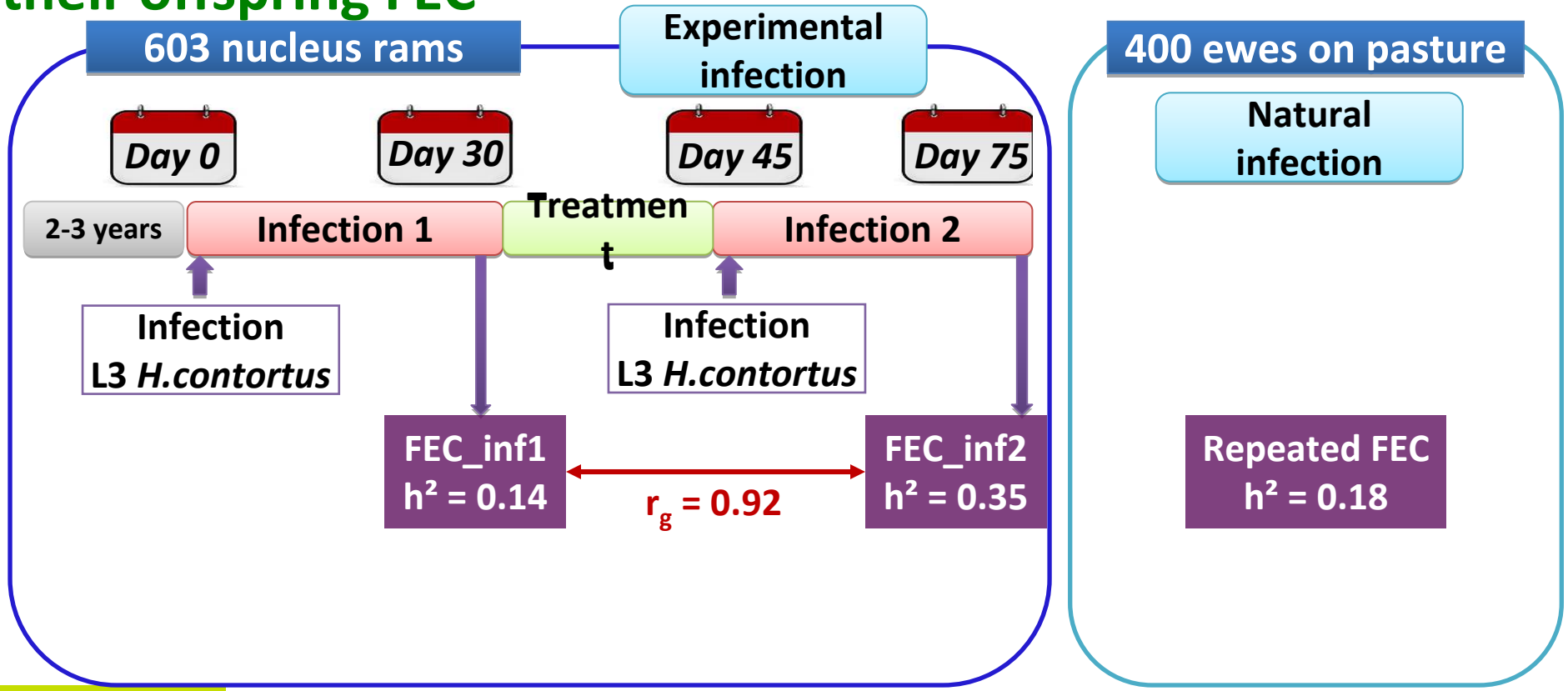
heritabilities and genetic correlations

FEC : Fecal Egg Count

FEC are heritable both in experimental and natural conditions



High genetic correlations between nucleus rams FEC and their offspring FEC



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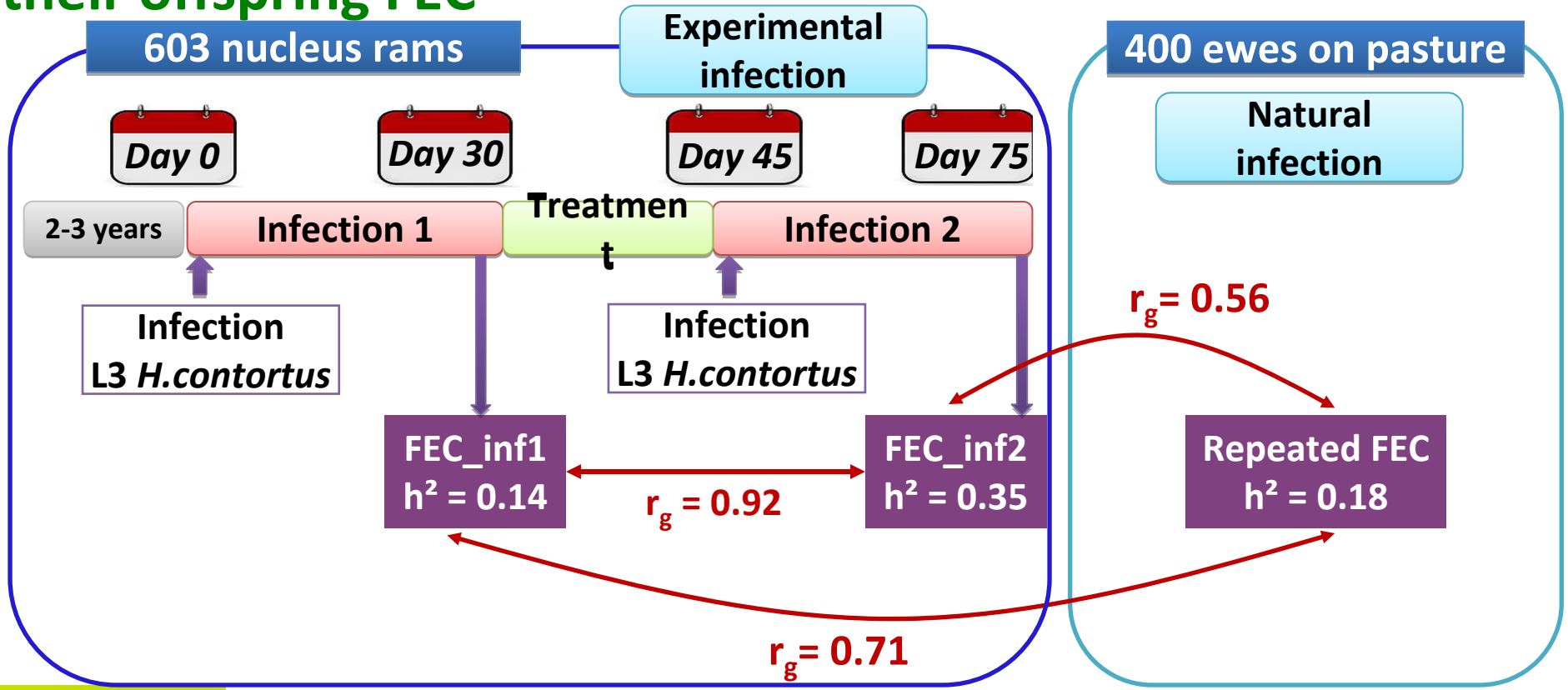
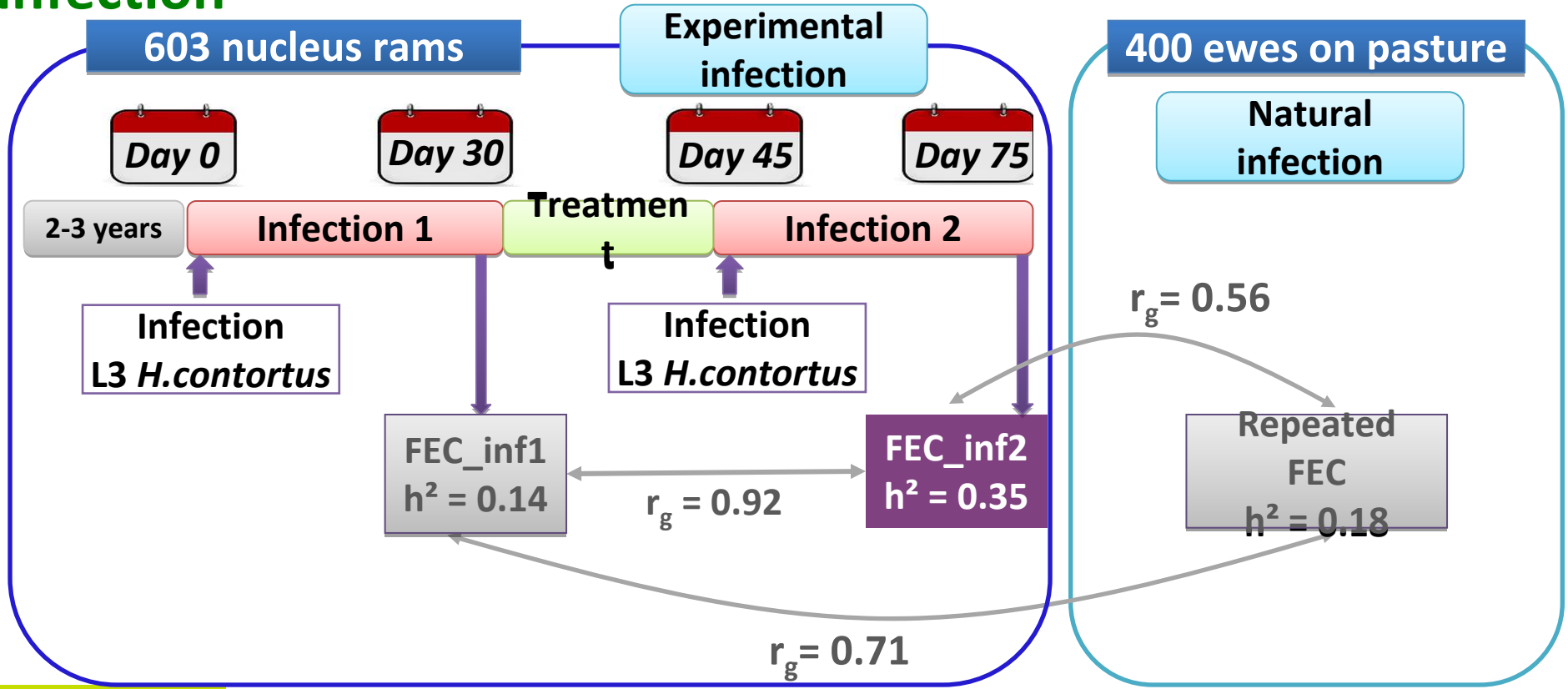
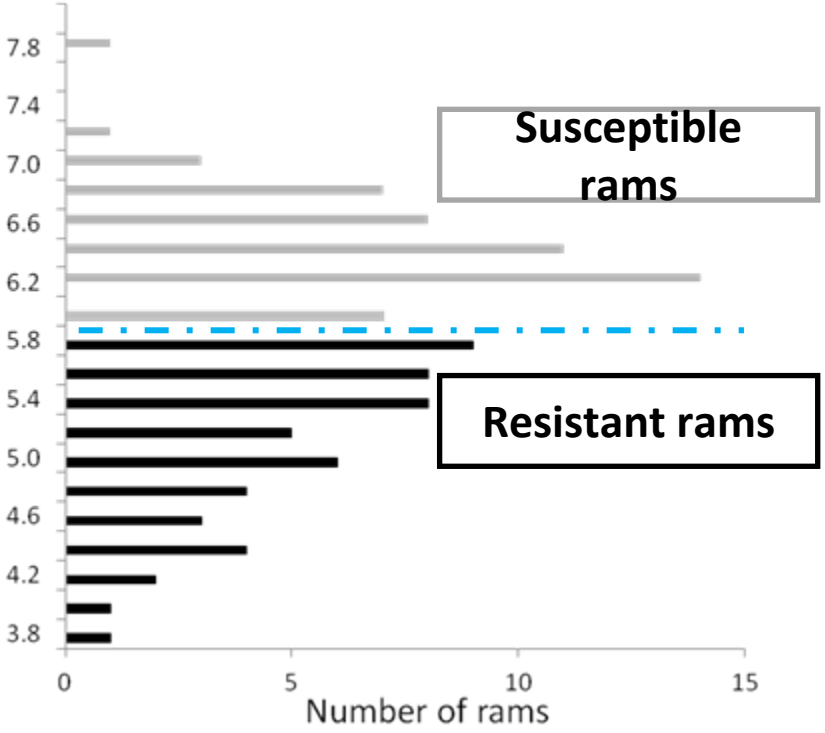


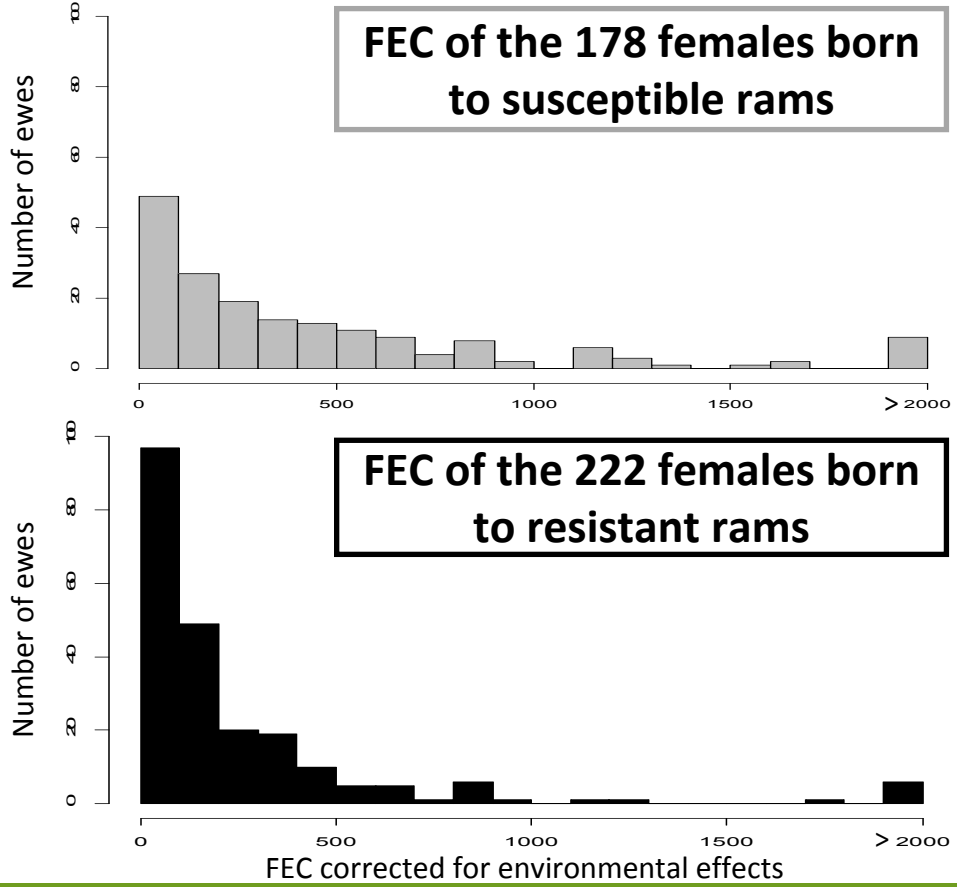
Routine evaluation based on fecal egg count after the second infection



Practical demonstration of the efficiency of the selection

Genetic values of the rams based on their own FEC in second infection





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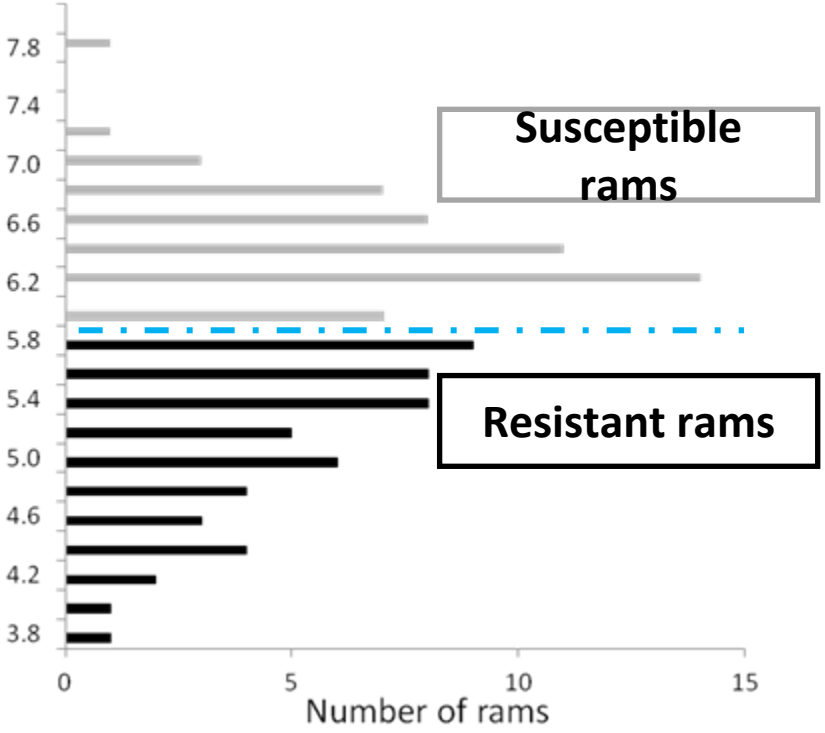

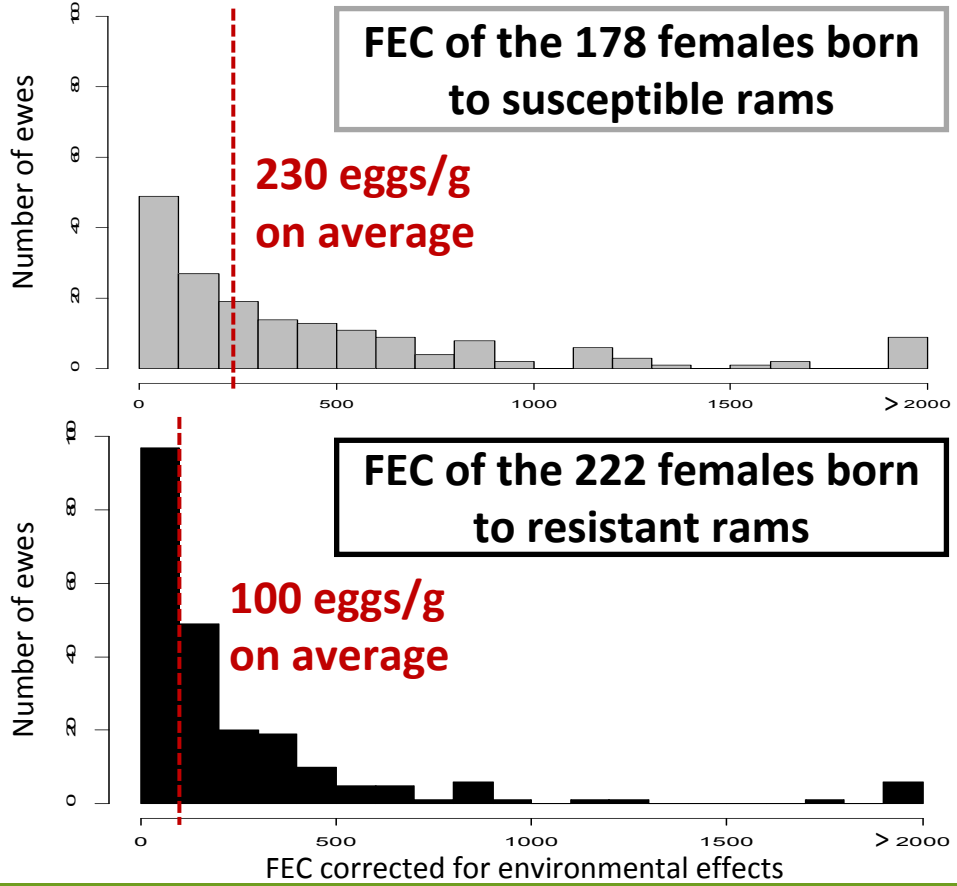

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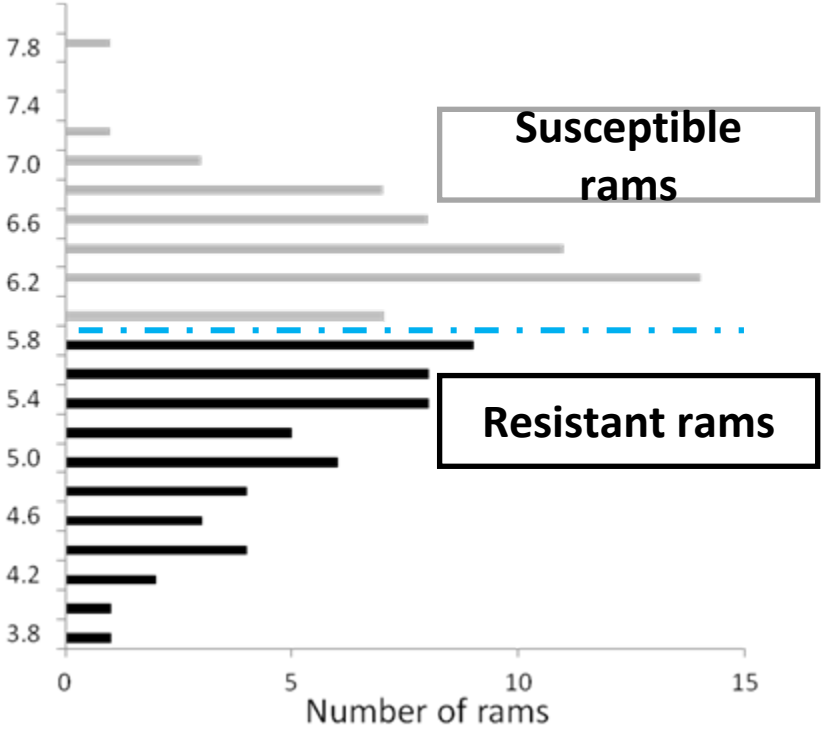

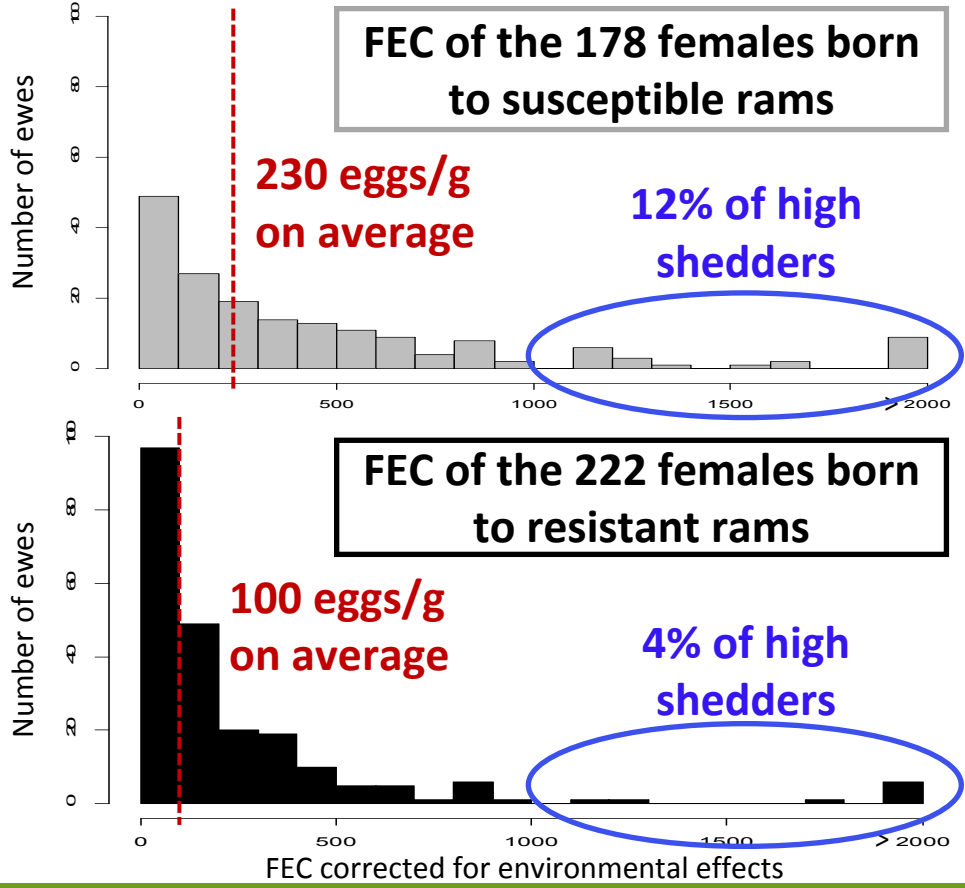

Take home message

Selecting rams for resistance in experimental infections is an efficient way to increase resistance to GIN in naturally infected ewes in pastures

- ✓ Fecal egg counts are heritable
- ✓ High genetic correlations between fecal egg count of nucleus rams and fecal egg count of their offspring
- ✓ Practical demonstration of the efficiency of the selection

Thank you for you attention !

Article under review:
S.Aguerre et al.,
2018 Veterinary
Parasitology

Acknowledgements

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