

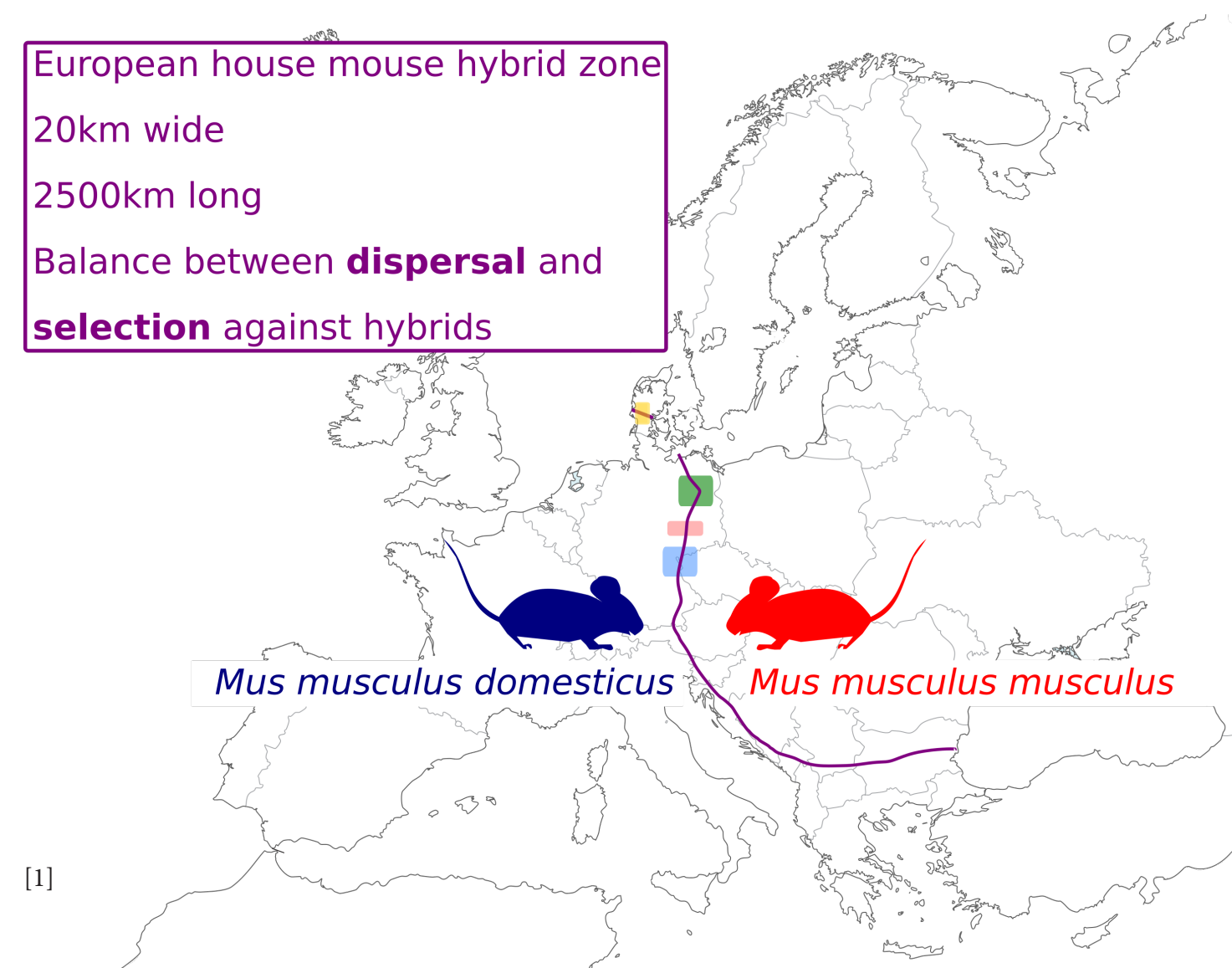
# TOLERANCE OF HYBRID HOSTS AGAINST INFECTIONS

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## TOLERANCE IN THE EUROPEAN HOUSE MOUSE HYBRID ZONE

The European House Mouse Hybrid Zone (HMHZ) is a natural laboratory to study the genetic impact of hybridization on resistance and tolerance

European house mouse hybrid zone  
20km wide  
2500km long  
Balance between **dispersal** and **selection** against hybrids



### ABSTRACT

> **Resistance** of *Mus musculus domesticus* and *Mus musculus musculus* hybrids against infections is **increased** [1, 2]

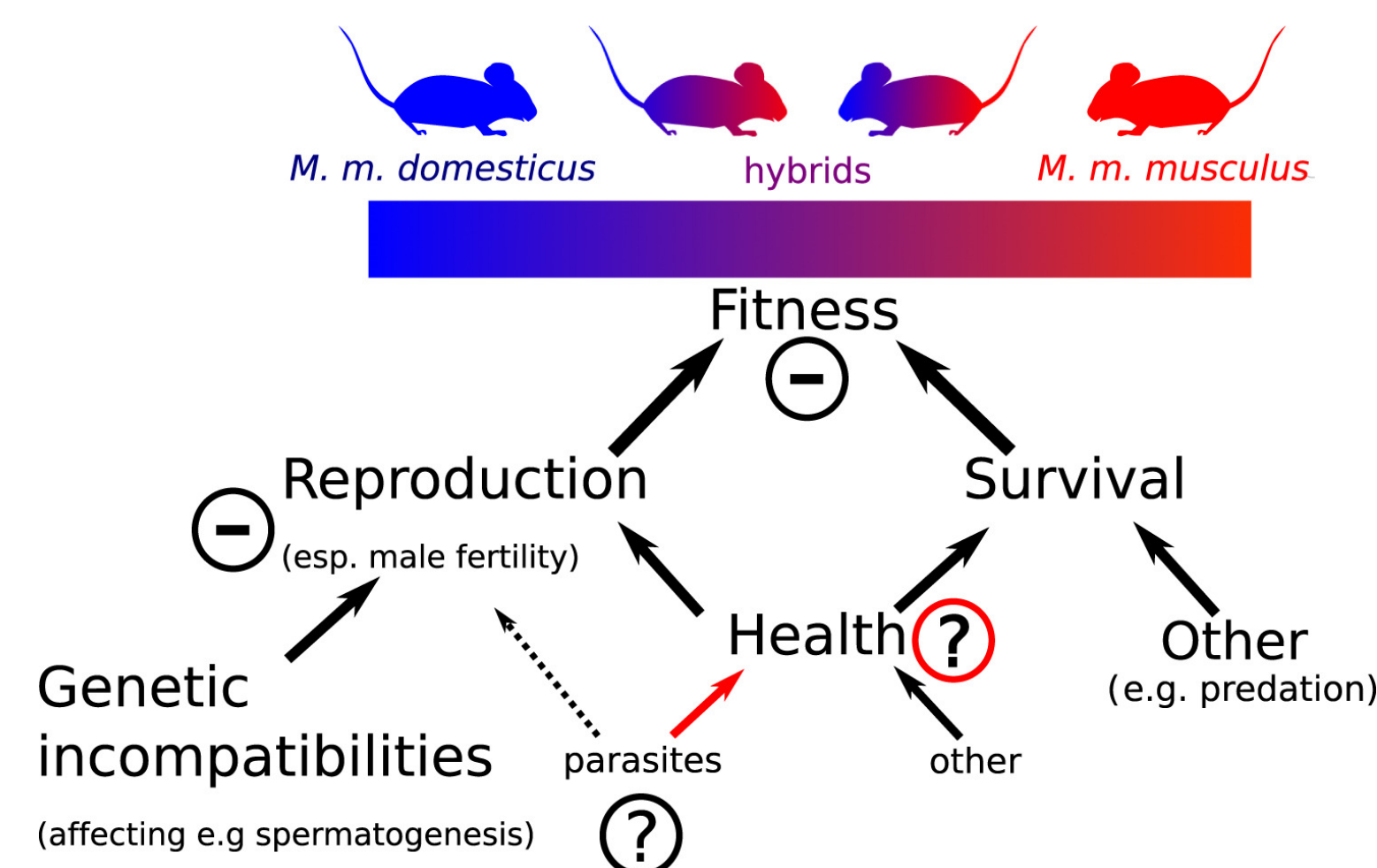
> **Tolerance** remains elusive in the HMHZ

**Question: Is tolerance modulating the fitness of hybrids?**

> Measuring the health impact of parasitic infections in the wild, is inherently difficult. We train a random forest model on **immune parameters** measured in experimental **laboratory** infections with *Eimeria* spp.

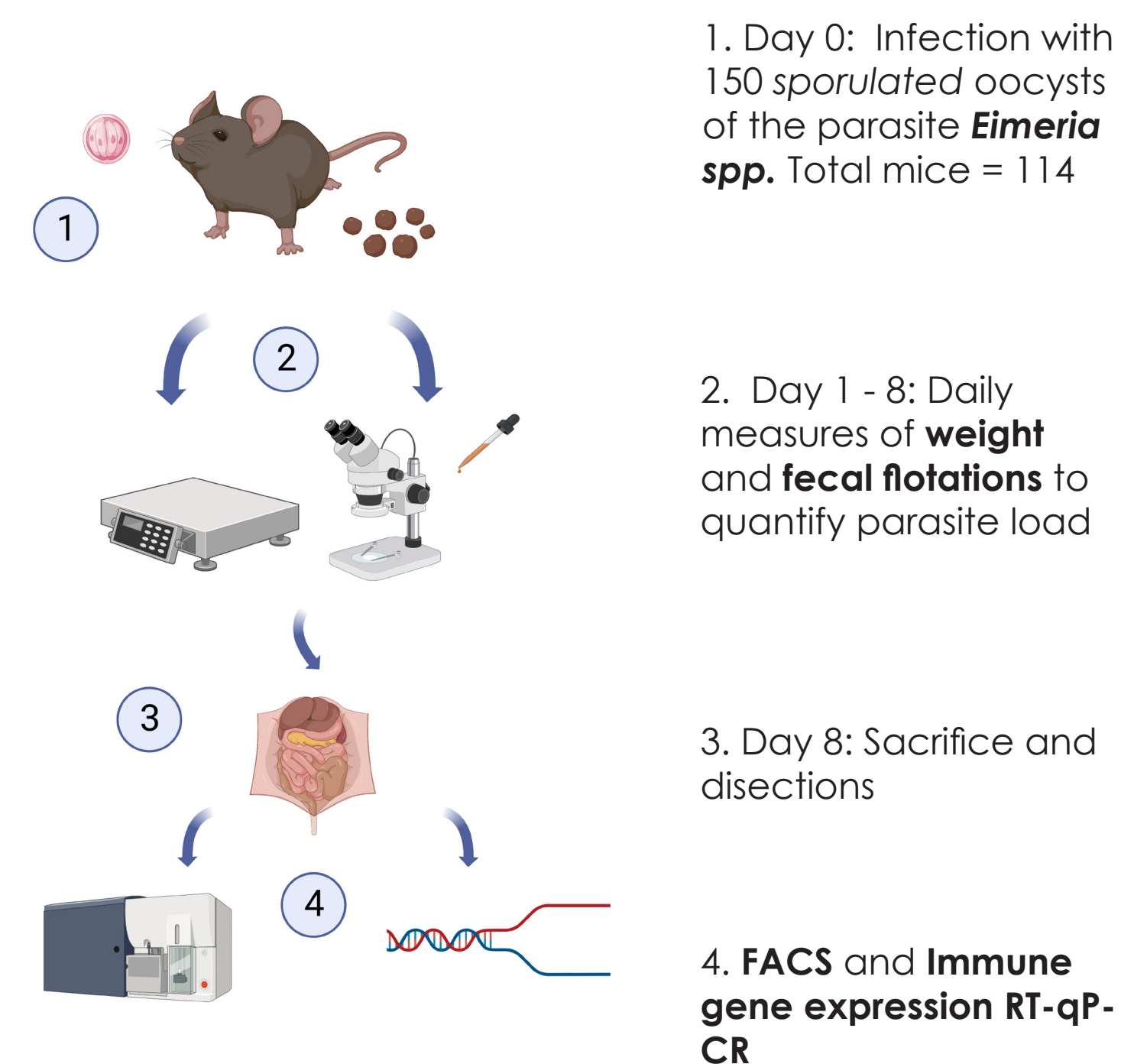
> We then apply the model on data obtained from the **field**

## Fitness components of hybrid mice [3]

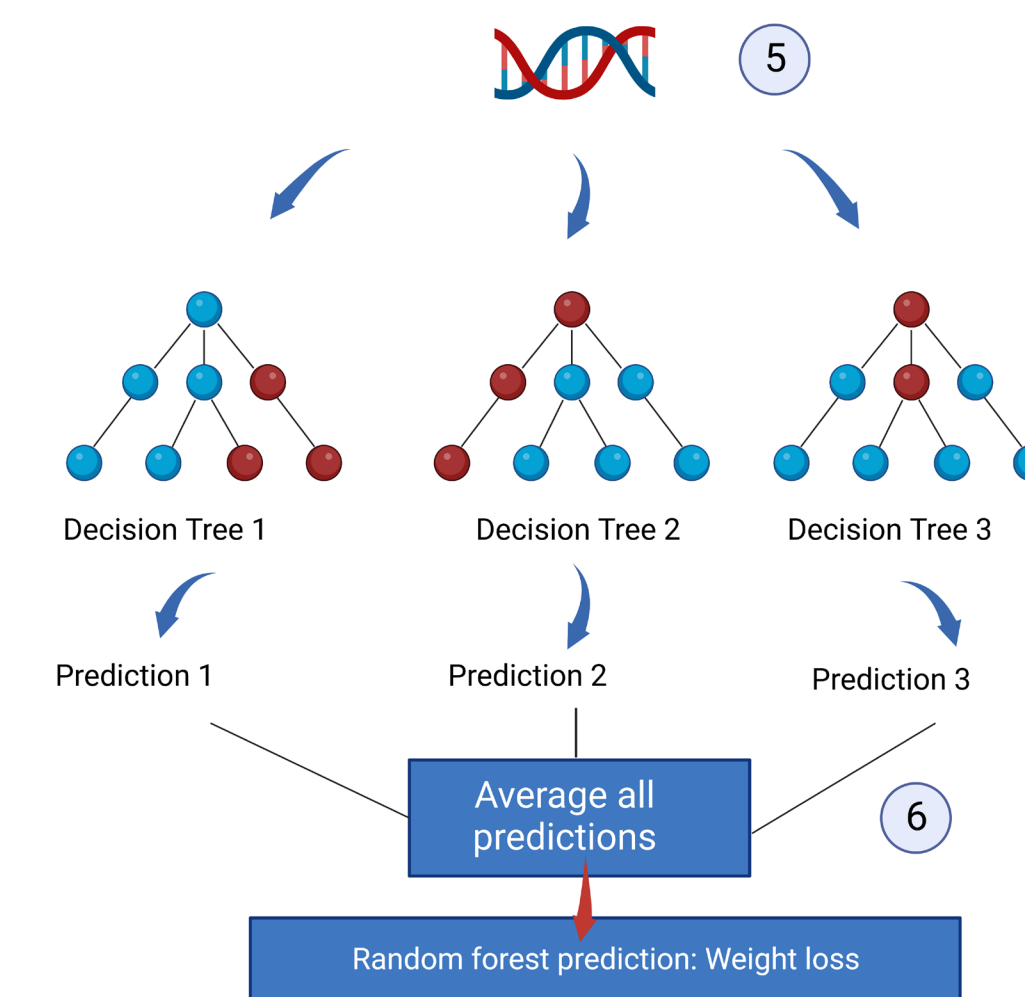


## METHODS

### Experimental laboratory infections with *Eimeria* spp.



## Random forest to predict weight loss



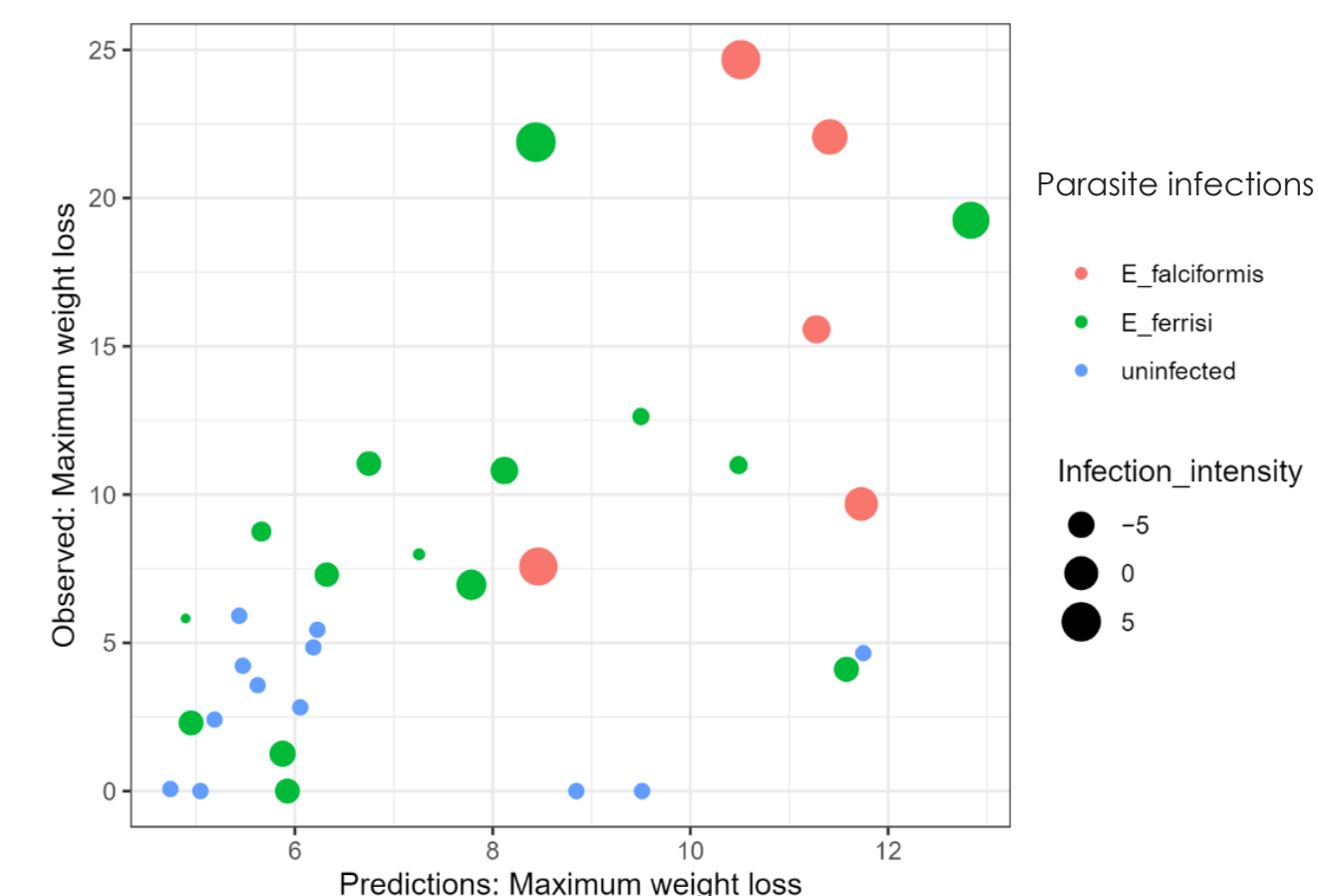
5. **Immune gene expression** RT-qPCR from laboratory infections with *Eimeria* spp.

6. Training the random forest to predict weight loss as a proxy for health

a. Training (70 % of data)

b. Testing (30 % of data)

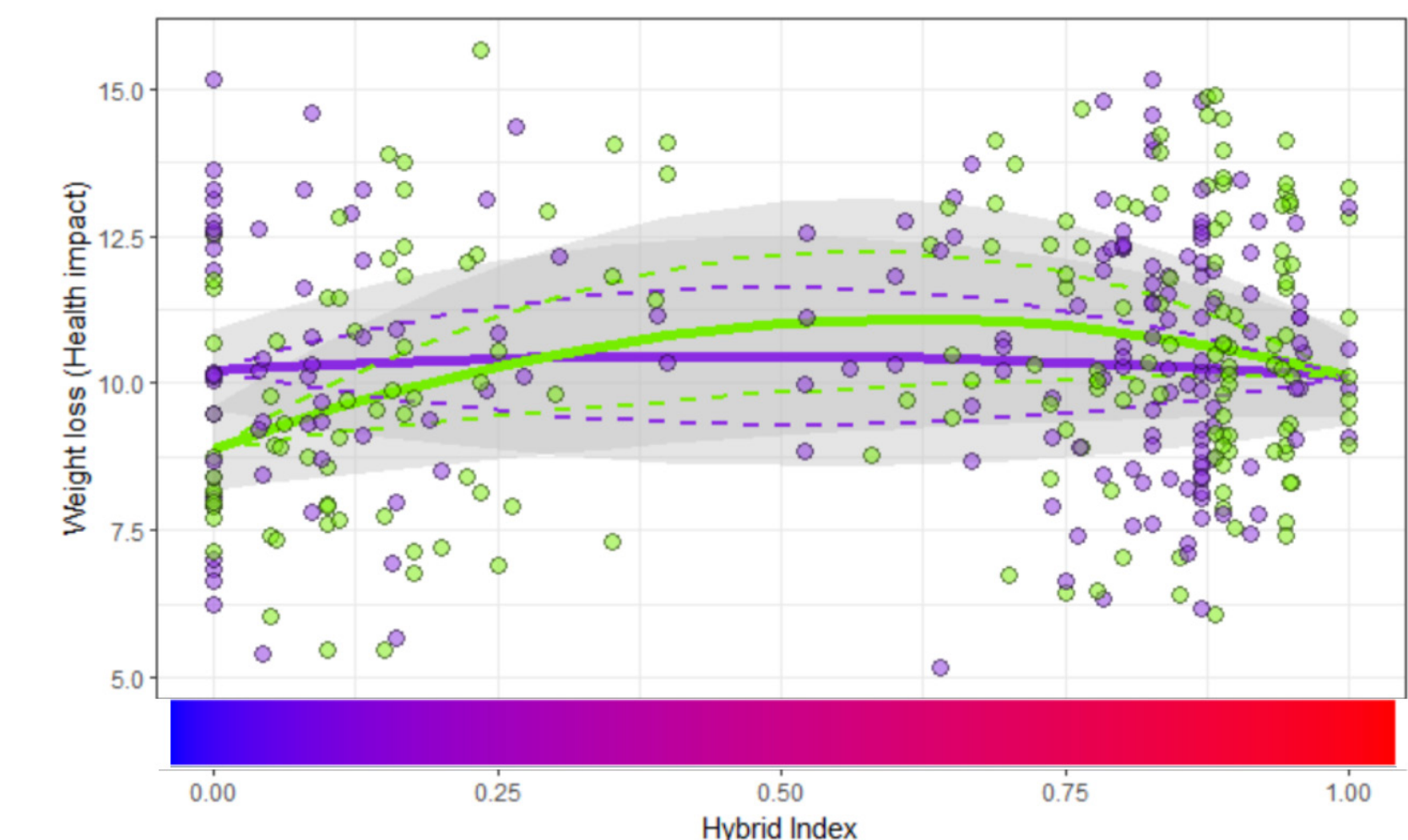
### Testing the random forest model on the laboratory infection data



### Predicted and observed values of weight loss

Increased weight loss in the mice infected with *Eimeria* spp.  
> Highest weight loss on average in the mice infected with *E. falciformis*  
> Mice with higher infection intensities loose more weight  
> **Spearman's rank correlation, Rho: 0.5699874**  
p-value = 0.0006603

## RESULTS



Testing the random forest model on **field data** collected from the **House Mouse Hybrid Zone**

**Predicted weight loss is increased in hybrid male mice**

> Total mice = 358

> Groups: **female** / **male**

> Hybridization effect on males: P value: 0.007448931

> Male effect: P value: 0.02043259

## CONCLUSIONS

> Our preliminary data indicates that **male hybrid mice suffer** to a greater extend during infections, indicated by the higher predicted weight loss (when compared to the parental species)

> The extrapolated tolerance is likely lower in hybrid male mice

> We hypothesize that tolerance in mice may be affected by autosomal sex chromosome / genetic interactions

## REFERENCES

1. Baird, S. J. E. et al. Where Are the Wormy Mice? A Reexamination of Hybrid Parasitism in the European House Mouse Hybrid Zone. *Evolution* 66, 2757–2772 (2012).
2. Balard, A. et al. Intensity of infection with intracellular *Eimeria* spp. and pinworms is reduced in hybrid mice compared to parental subspecies. *Journal of Evolutionary Biology* 33, 435–448 (2020).
3. Balard, A. & Heitlinger, E. Shifting focus from resistance to disease tolerance: A review on hybrid house mice. *Ecology and Evolution* 12, e8889 (2022).