Can differential gene expression explain differential host resistance?

Nellie Konijnendijk[1], Joost Raeymaekers[1,2], Massimo Milan[3], Tim Howes[4] & Filip Volckaert[1]

1 KU Leuven, Laboratory of Biodiversity and Evolutionary Genomics, Belgium 2 Universität Basel, Zoologisches Institut, Evolutionsbiologie, Switzerland, 3 University of Padova, Public Health, Comp Pathology & Veterinary Hygiene, Italy 4, Stanford University School of Medicine, Department of Developmental Biology, United States.

Contact information presenter: Nellie Konijnendijk, Charles Deberiotstraat 32, 3000 Leuven, +32 16324572, **Nellie.Konijnendijk@bio.kuleuven.be**

Conclusion

- We found **candidate genes** that might contribute to **differential host resistance** in the **threespined stickleback** (*Gasterosteus aculeatus*).
- However, most of these genes are differentially expressed **with or without experimental infection** of a prevelant ecto-parasite.
- Differences in expression level of genes related to this specific infection might be too hard to detect (due to subtle changes or timing issues).
- Differences in **background level expression** among populations might however also be important in explaining host resistance.

Questions

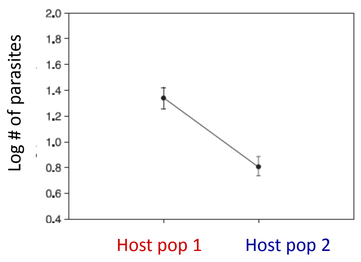
1. **Do host populations that differ in parasite resistance have differential gene expression patterns?**
2. **Are the genes that differ among these populations related to immunity?**
3. **Do we find expression differences in immune genes after infection with a prevalent ecto-parasite** (*Gyrodactylus gasterostei*) **that is known to be harmful to the host[1]?**

Answers

1. **Yes**, 3.391 genes are differentially expressed with expression differences up to a 200 fold change.
2. **Some**, including good candidates for parasite resistance like MHC2
3. **Only in 1 gene** do we find significant expression differences due to infection.

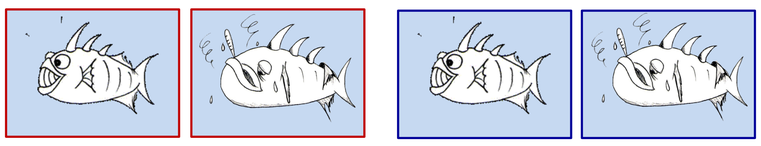
Experimental set-up

1 Selection Populations

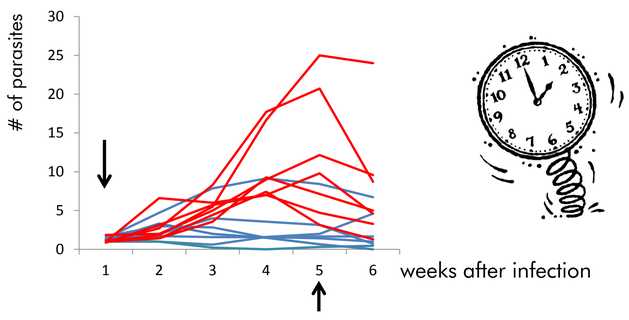


Konijnendijk et al, 2013

2 Infection experiment



3 Time points

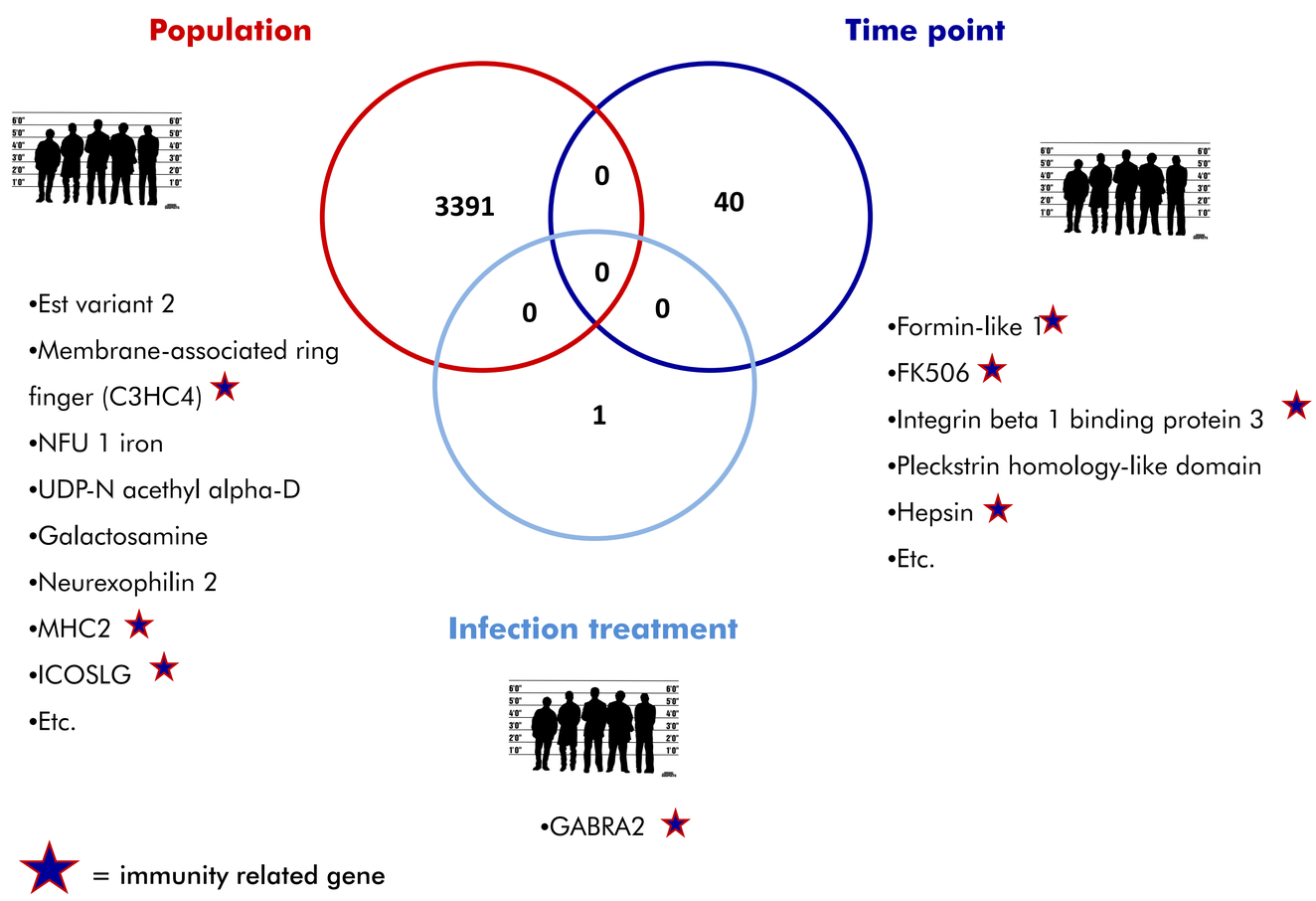


4 Extraction of spleen tissue

5 RNA → 60k Microarray

6 Data-analysis

Results



Why do we want to know?

- Understanding adaptation to local selection pressures is key in understanding the role of ecology in evolution and vice versa.
- We start to understand more and more about genomic signatures of selection.
- Many responses however might be caused by changes in gene expression rather than structural changes in functional genes.
- If we understand more about the impact and influence of gene regulation on adapting to the environment we start to understand more of the adaptability of species in nature.

References:

1. Eizaguirre, C., Lenz, T.L., Kalbe, M. and Milinski, M. 2012. Divergent selection on locally adapted major histocompatibility complex immune genes experimentally proven in the field. *Ecology Letters*, 15: 723 - 731
2. Konijnendijk, N., J.A.M. Raeymaekers, S. Vandeuren, L. Jaquemin, F.A.M.Volckaert. 2013. Testing for local adaptation in the *Gasterosteus–Gyrodactylus host-parasite system. Evolutionary Ecology Research 15: 489 - 502*

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