

 **@Breanna\_Siple**y



# What's VAP got to do with it?

The evolution of blood parasitism in flatworms

[Breanna N. Siple](#), Stephen A. Bullard, Jamie R. Oaks, & Kenneth M. Halanych

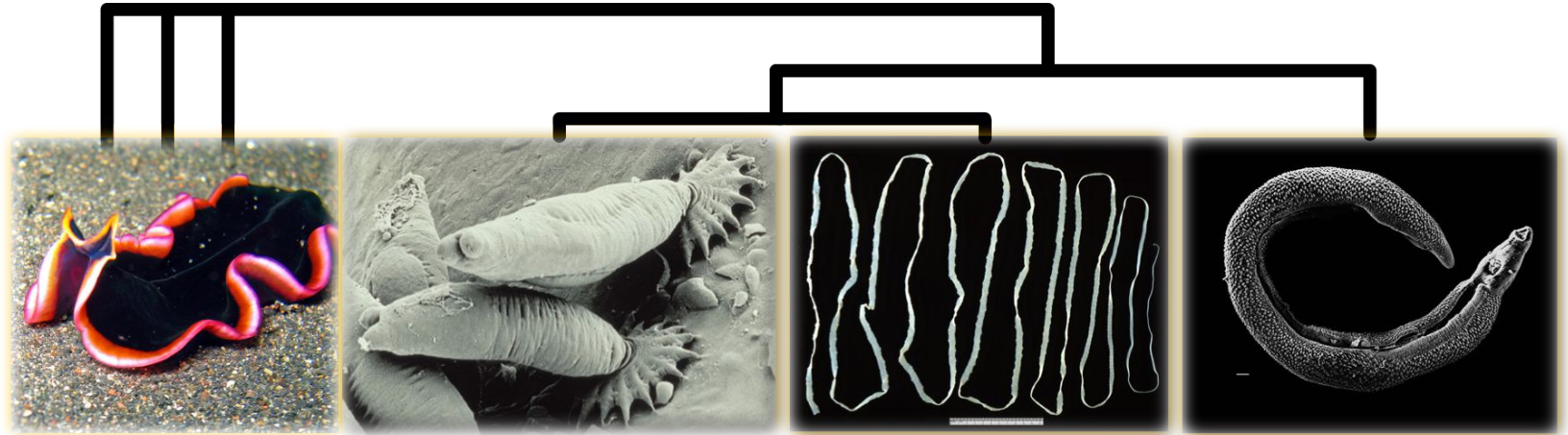


10 parasitic  
lineages contain  
40% of all animal  
diversity

Parasitism  
evolved at least  
223 times in  
Animalia

Weinstein & Kuris Biol Letters  
(2016)

# System: Flatworms



“Turbellaria”

Monogenea

Cestoda

Trematoda

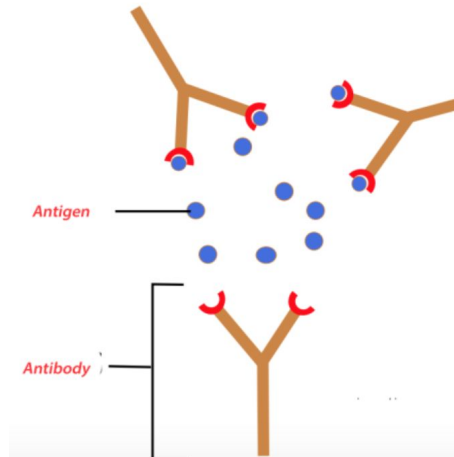
Free-living

Ectoparasites

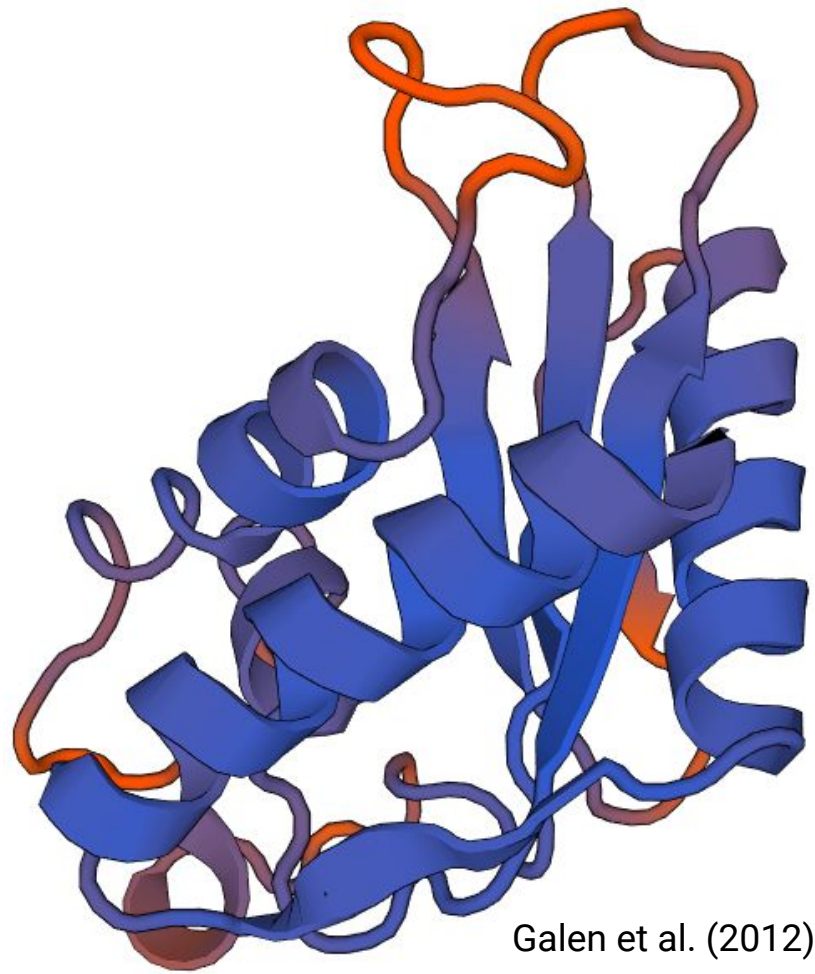
Tapeworms

Endoparasites

# Antagonistic coevolution btwn parasite allergens & host antibodies



# What's VAP got to do with it?

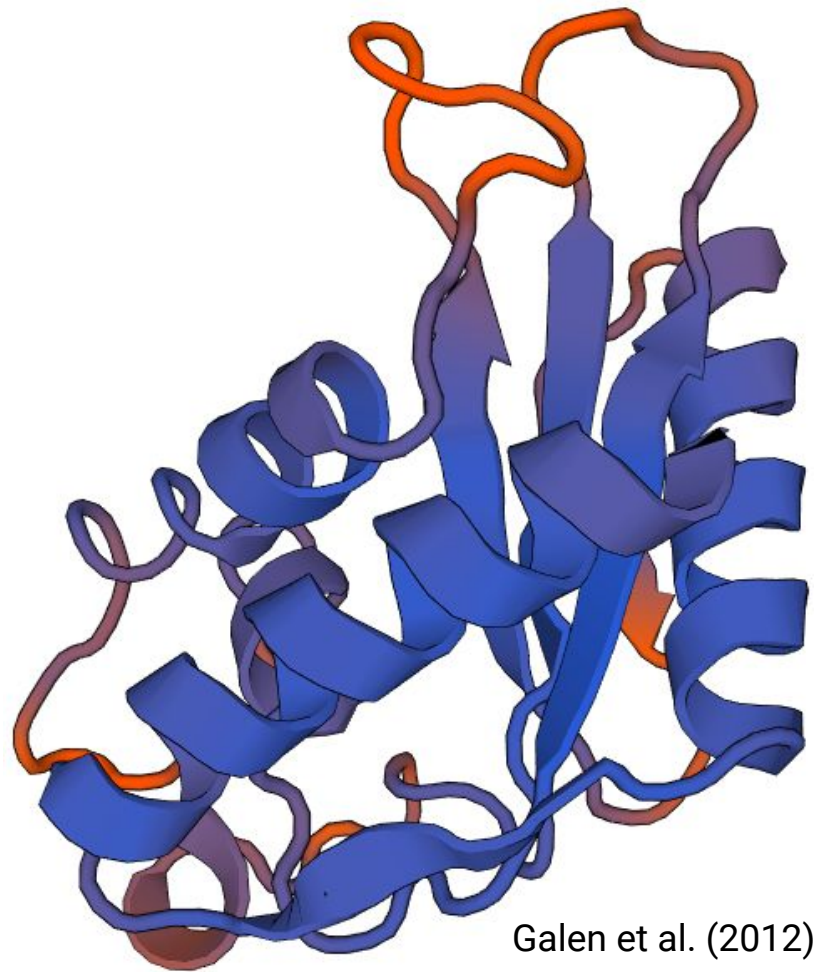


Galen et al. (2012)

# What's VAP got to do with it?

- 2 main groups of VAPs
  - Group 1: Secretory
  - Group 2: Intracellular
- Secretory VAPs from parasitic flatworms may be under (+) selection

Chalmers et al (2008) & Chalmers & Hoffman (2012)



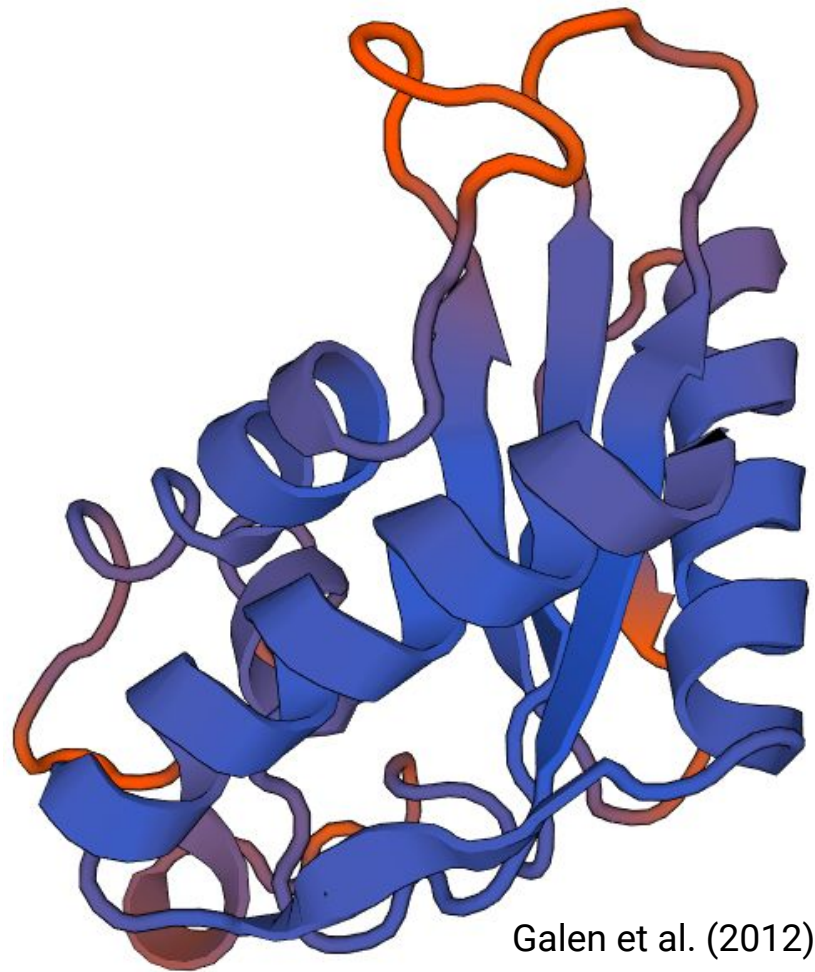
Galen et al. (2012)

# What's VAP got to do with it?

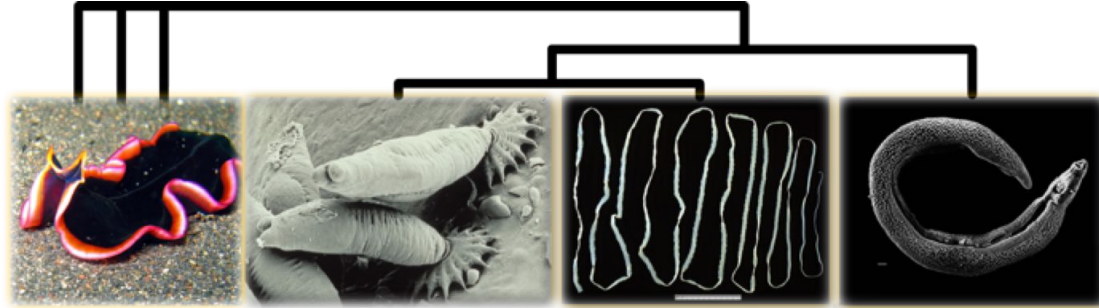
- 2 main groups of VAPs
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  - Group 2: Intracellular
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Chalmers et al (2008) & Chalmers & Hoffman (2012)

Included only parasites with medical/  
economic relevance



Galen et al. (2012)



“Turbellaria”

Free-living

7

Monogenea

Ectoparasites

2

Cestoda

Tapeworms

9

Trematoda

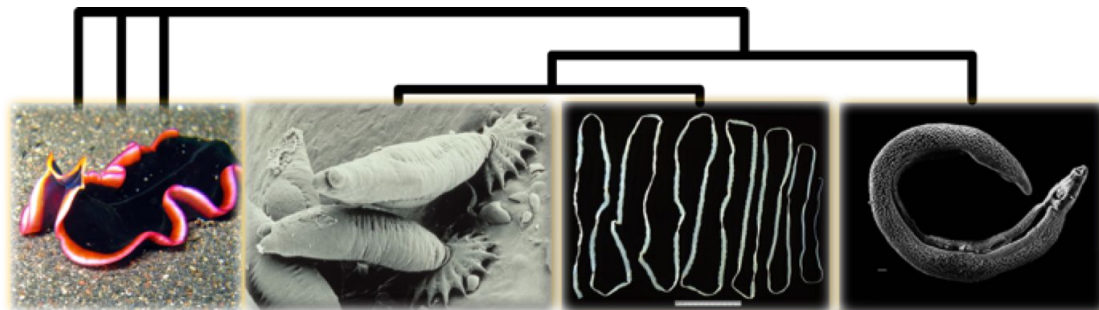
Endoparasites

29

- 3 schistosomes
- **21 non-schistosome blood flukes**
- 5 non-blood flukes

**Data: 47 transcriptomes**





“Turbellaria”

Free-living

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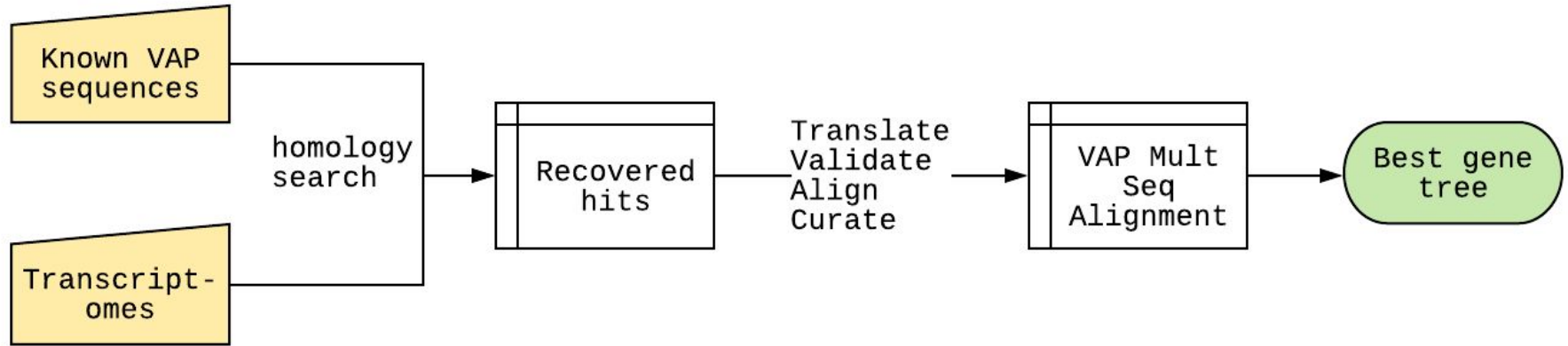
**H1:** VAPs expressed in all flatworms

**H2:** Two well-supported major VAP clades

**H3:** Signal peptides predicted in Group 1 VAPs

**H4:** Taxa-specific expansions in secretory VAPs

# Bioinformatics pipeline



**Group 1**  
Secretory

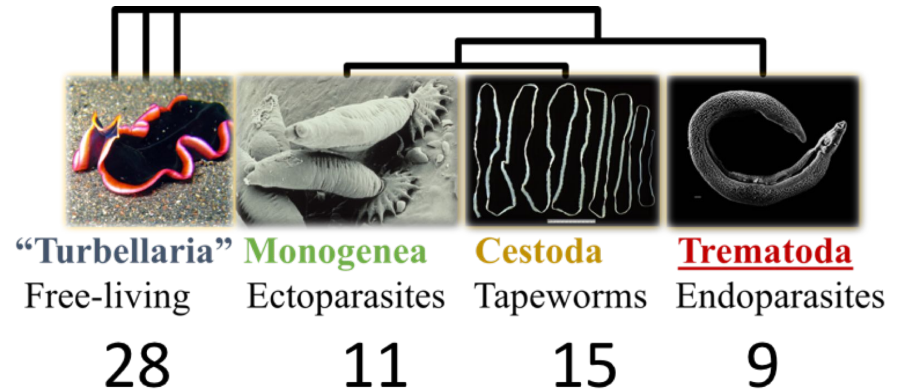
N- **signalP** — **CAP** — CAP2 — **Transmembrane motif** — C

**Group 2**  
Intracellular

N- — **CAP** — CAP2 — — C

# Results

H1: VAPs expressed in all flatworms

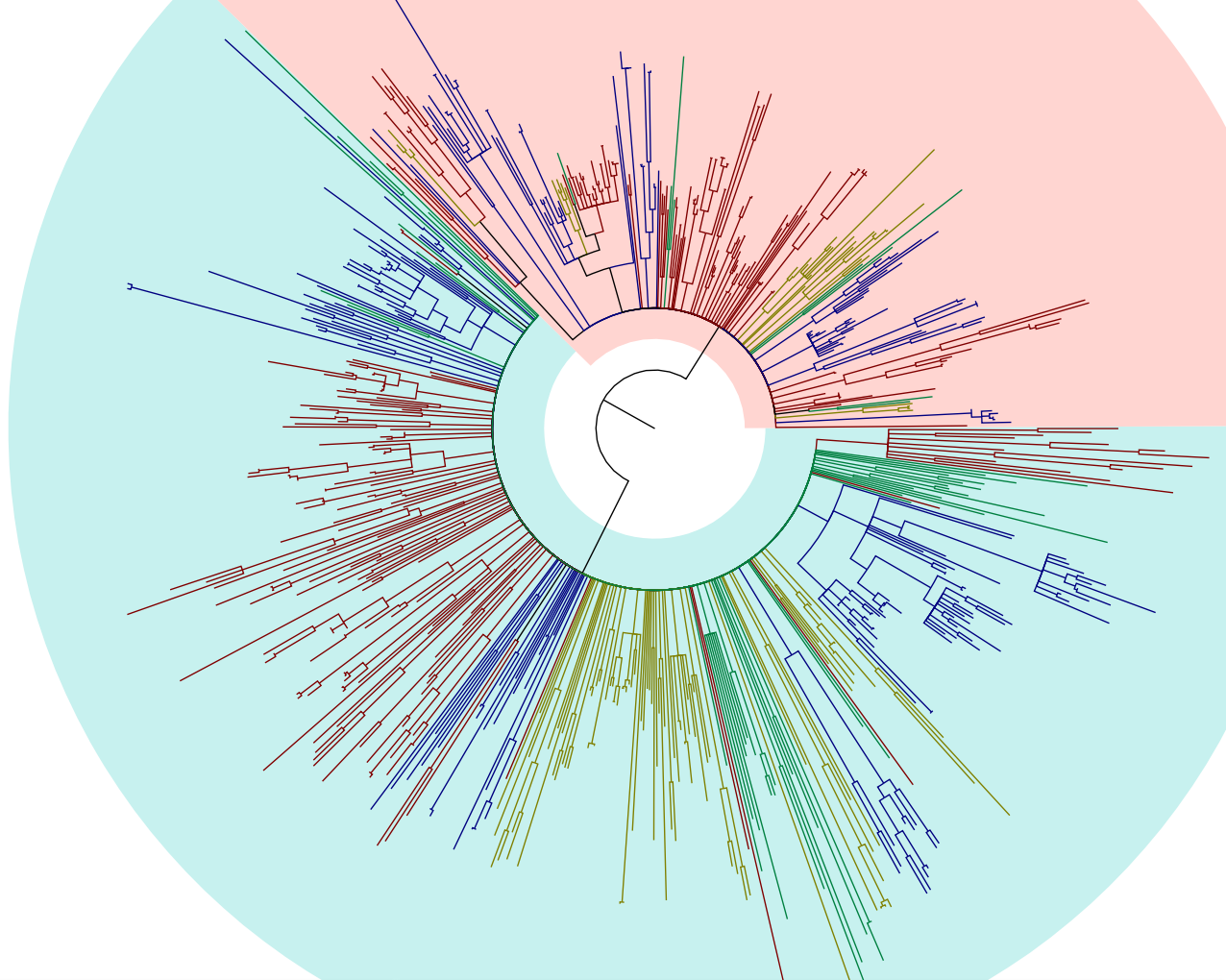


474 new VAPs

# Results

**H1:** VAPs expressed in all flatworms

**H2:** Two well-supported major VAP clades



**99% bootstrap support**

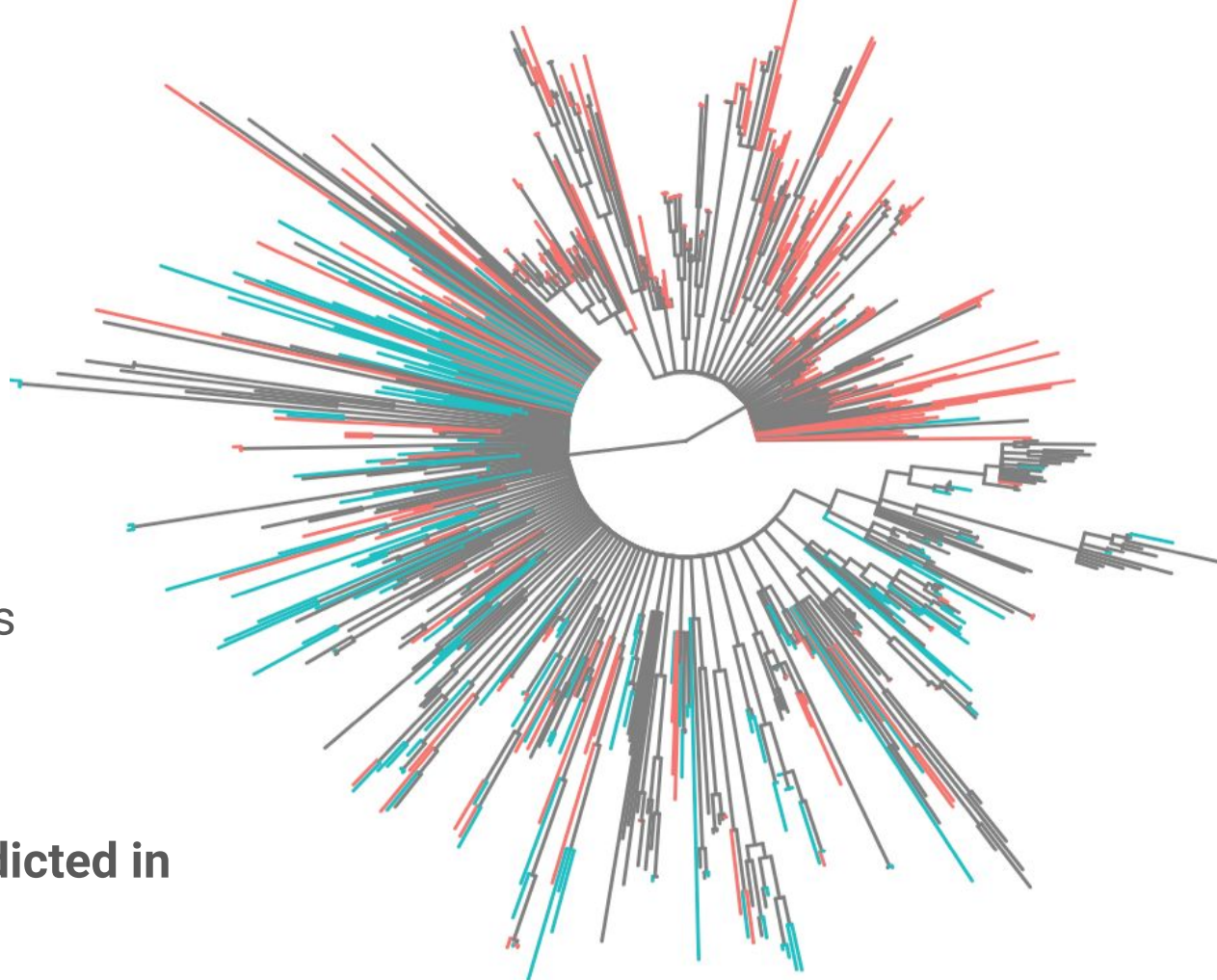
# Results

**H1:** VAPs expressed in all flatworms

**H2:** Two well-supported major VAP clades

**H3:** Signal peptides predicted in Group 1 VAPs

**Yes & only 1 SignalP predicted in Group 2**



# Results

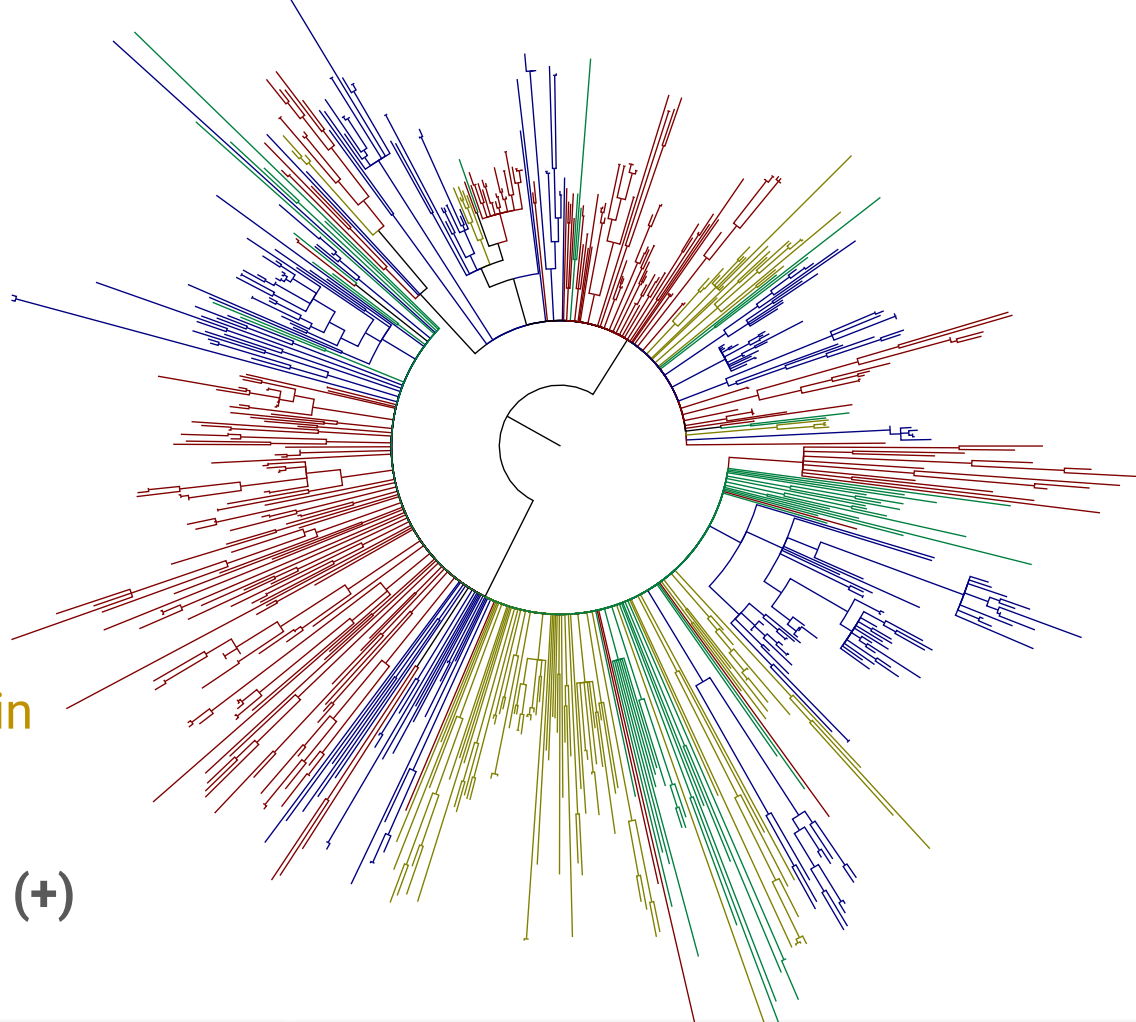
**H1:** VAPs expressed in all flatworms

**H2:** Two well-supported major VAP clades

**H3:** Signal peptides predicted in Group 1 VAPs

**H4:** Taxa-specific expansions in secretory VAPs

**Deeper exploration & tests for (+) selection to come...**



# Acknowledgements

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