

The evolution of a social transcription factor

Background: Eusociality has evolved across several lineages producing an immense diversity and throughout the caste system and incredible example of polyphenism. Particularly in hymenoptera and blattodea worker, queen forager and soldier castes are all derived from the same genome. A key transcription factor that has been identified in relation to caste development and social behaviour in bees and ants is the zinc finger kruppel homolog - 1 (Kr-h1). Kr-h1 expression is driven by juvenile hormone (JH) which has been shown to be key for caste determination in multiple eusocial species [1, 3, 2]. However the evolution of Krh1 has not been looked at in regards to social evolution across lineages and particularly within blattodea.

Objectives: The objective will be to investigate Kr-h1 across several evolutionary origins of eusociality. The initial step will involve identifying orthologous gene across hymenoptera and blattodea. The comparative work will then depend upon time and progress to investigate; selection analysis, protein domain dynamics, promoter variation and JH variation.

Requirements:

- Interest evolutionary biology
- Knowledge / Interest in programming either Python, R or Linux
- Ability to work independently

Methods:

- Orthology identification
- Multiple sequence alignment using MAFFT
- Selection analysis using HYPHY

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Selected Literature:

References

- [1] Hagai Shpigler et al. "The transcription factor Krüppel homolog 1 is linked to hormone mediated social organization in bees". en. In: *BMC Evolutionary Biology* 10.1 (Dec. 2010), p. 120. ISSN: 1471-2148. DOI: 10.1186/1471-2148-10-120. URL: <https://bmcevolbio.biomedcentral.com/articles/10.1186/1471-2148-10-120> (visited on 12/19/2022).
- [2] Judith Korb and Xavier Belles. "Juvenile hormone and hemimetabolous eusociality: a comparison of cockroaches with termites". en. In: *Current Opinion in Insect Science* 22 (Aug. 2017), pp. 109–116. ISSN: 22145745. DOI: 10.1016/j.cois.2017.06.002. URL: <https://linkinghub.elsevier.com/retrieve/pii/S2214574516301687> (visited on 12/16/2022).
- [3] Janko Gospic et al. "Kr-h1 maintains distinct caste-specific neurotranscriptomes in response to socially regulated hormones". en. In: *Cell* 184.23 (Nov. 2021), 5807–5823.e14. ISSN: 00928674. DOI: 10.1016/j.cell.2021.10.006. URL: <https://linkinghub.elsevier.com/retrieve/pii/S0092867421011806> (visited on 12/19/2022).