



The effect of patriline on bee learning ability



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Background

The study of learning and memory

- Many neurological diseases remain incurable¹
- Complexity of the human brain requires the use of model organisms¹

Honey bees (*Apis mellifera*) as model organisms



Past studies

- Majority of studies use appetitive conditioning
- Found that patriline does not directly affect appetitive learning ability⁴
- Stinger extension response has been conditioned using an electric shock⁵

Study question

Will patriline directly affect honey bee learning ability when conditioned with an aversive stimulus?

Hypotheses and predictions

Hypothesis 1:

- Patriline will directly impact shock responsiveness

Prediction:

- Average shock responsiveness will vary among patrilines

Hypothesis 2:

- Patriline will not directly impact learning ability

Prediction:

- Learning ability will be consistent among patrilines when shock responsiveness is similar

Methods

1. Determine the shock responsiveness of each subject

- Subject the bee to 6 trials of increasing voltage (Fig. 1)
 - 0.25, 0.5, 1, 2, 4, 8
- Score the stinger extension as a binary measurement
 - 0 = stinger not extended
 - 1 = stinger partially or fully extended
- Sum the results of the trials to determine the shock response score

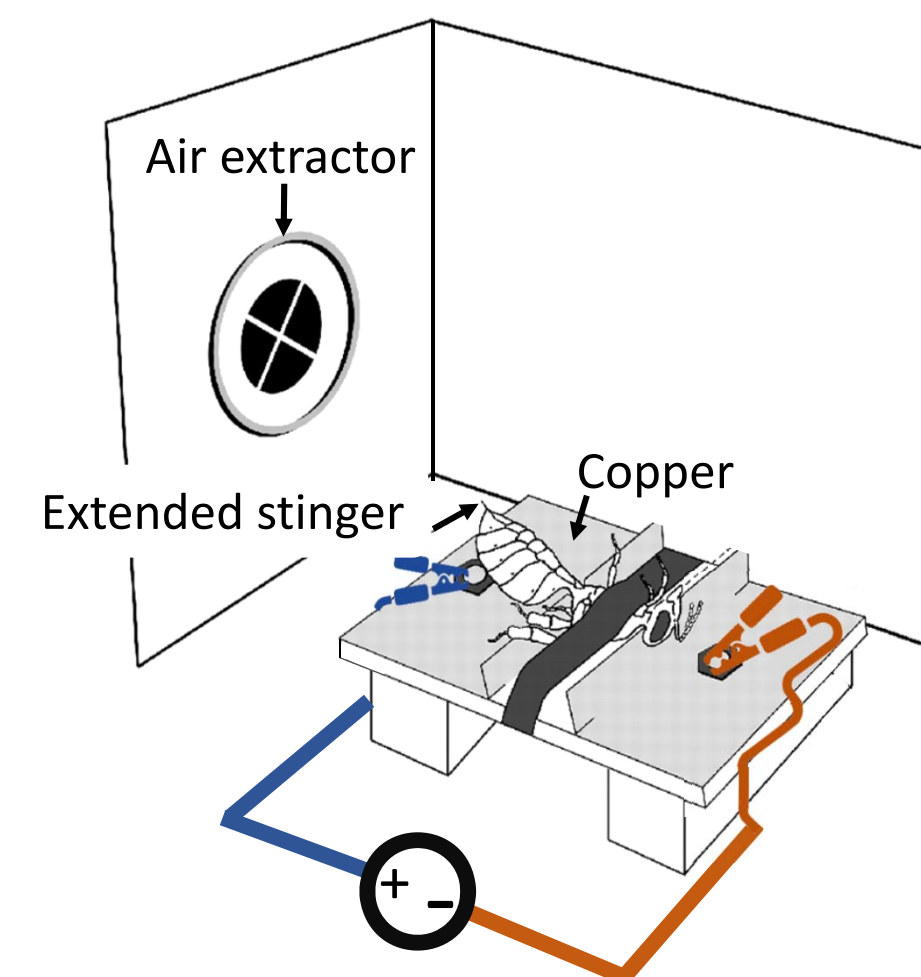
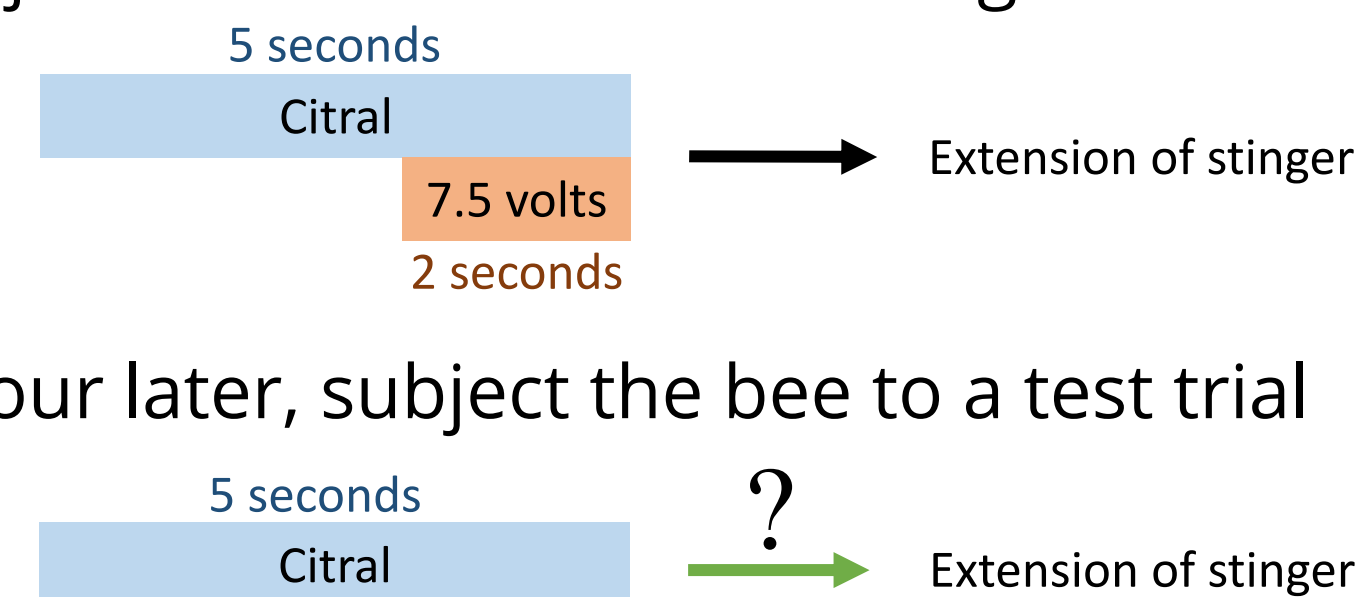


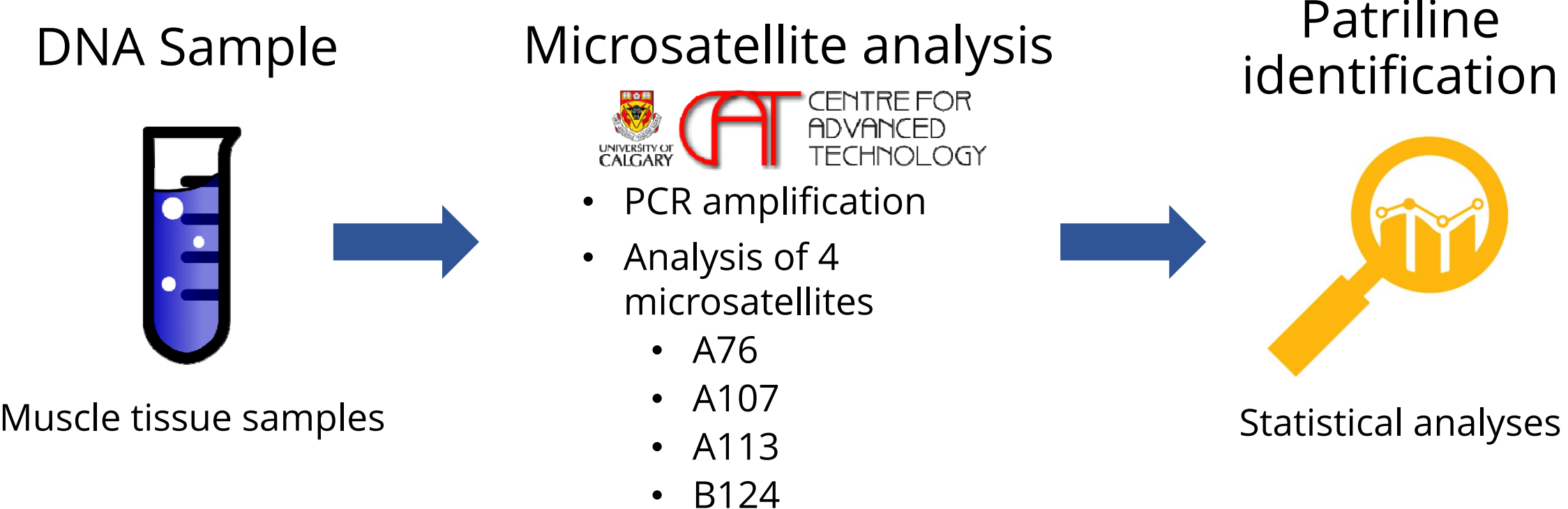
Figure 1. Contraption used for shock responsiveness and conditioning. Adapted from Mota et al. (2011).⁶

2. Condition the stinger extension response

- Subject the bee to 6 conditioning trials



3. Determine the patriline



Expected results

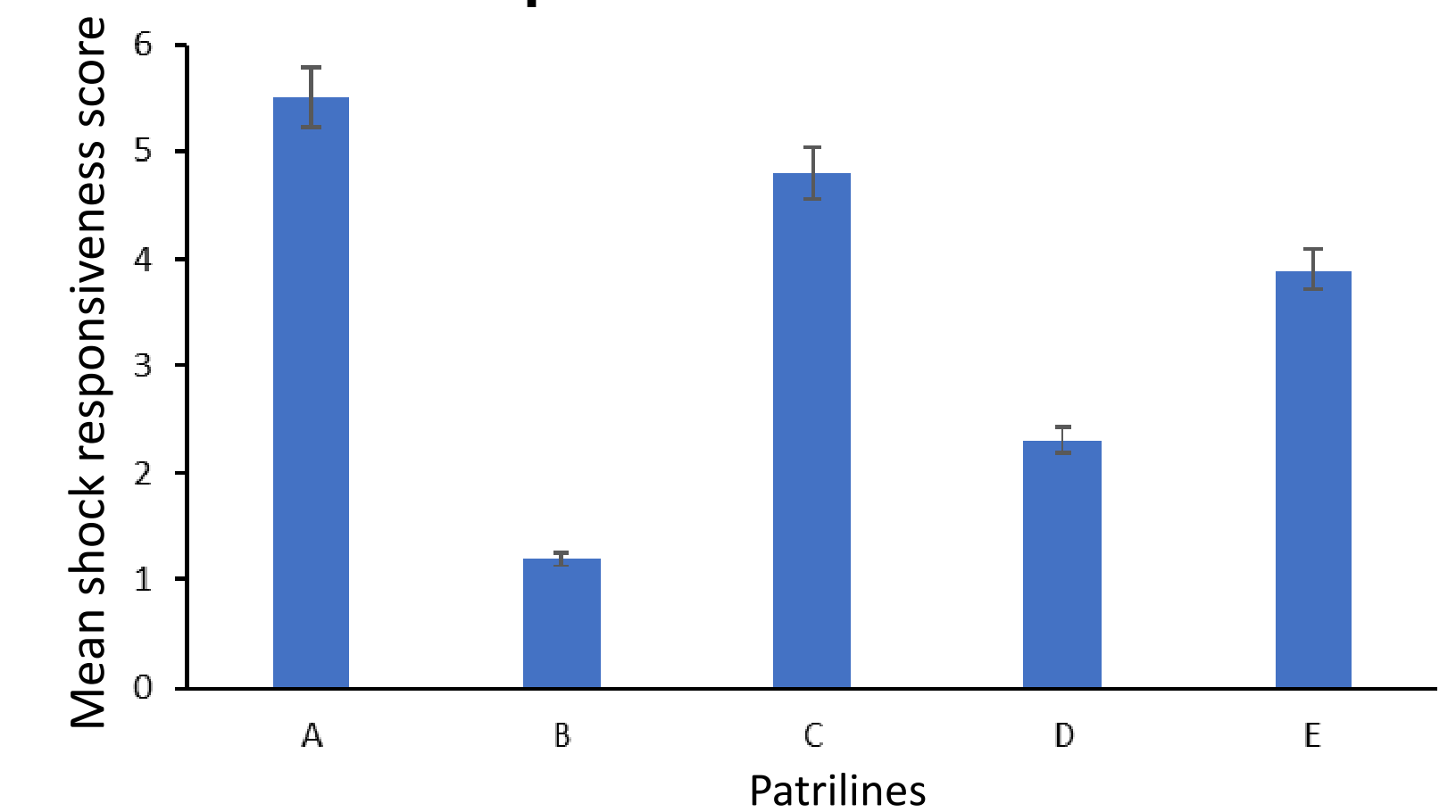


Figure 2. Mean shock responsiveness of individuals among different patrilines.

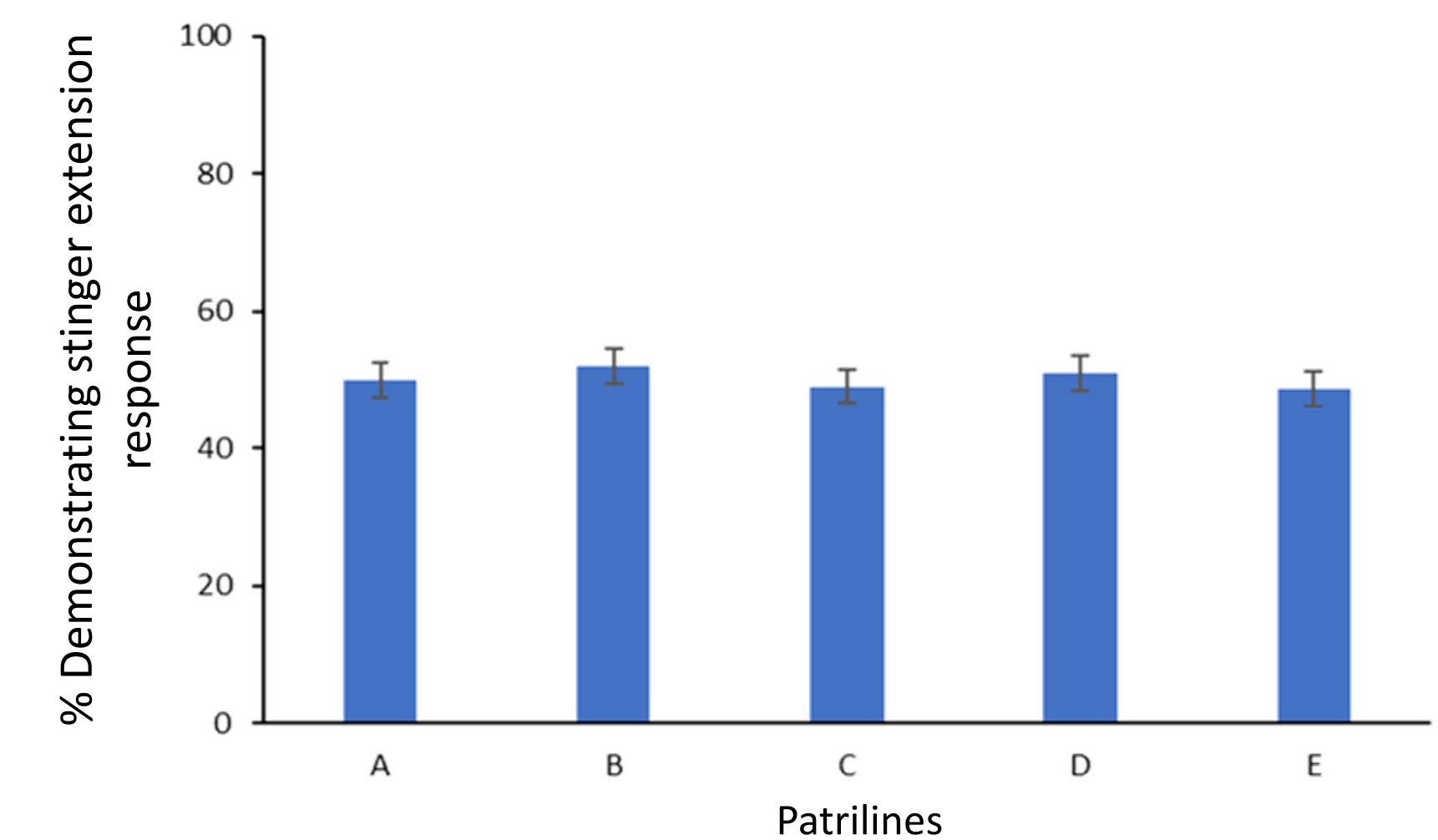


Figure 3. Percentage of individuals that demonstrate a stinger extension response during the test trial when shock responsiveness is similar among subjects from different patrilines.

Conclusion

- Results will guide future studies searching for specific genes that affect learning ability
- If results are as expected, these future studies should focus on genes that impact bees' shock sensitivity
- Determination of these genes will offer insight into learning mechanisms of many social species, including humans

Literature cited

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