One world, one hive:
A scoping review of honey bees, climate change, pollutants, and antimicrobial resistance

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Introduction

- It is becoming increasingly important to consider global issues such as environmental change and antimicrobial resistance (AMR) through an interdisciplinary lens.[1,2]
- Honey bees can be used as a One Health model due to their symbiosis with determinants of environmental health.[3]
- The objective of this scoping review was to examine the range, extent, and nature of published literature investigating AMR and honey bees in the context of climate change and environmental pollutants.

Methods

- A protocol and search strategy was developed *a priori* in conjunction with a research librarian.
- Unrestricted search strings were run through MEDLINE®, Scopus®, AGRICOLA™ and Web of Science™ databases on July 10th, 2019.
- Articles were screened for eligibility by two independent reviewers via a two-stage screening process.
- Included articles had to examine honey bees, AMR, and either climate change or environmental pollution.

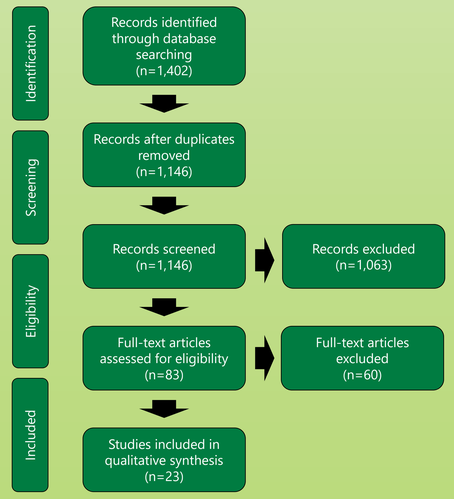


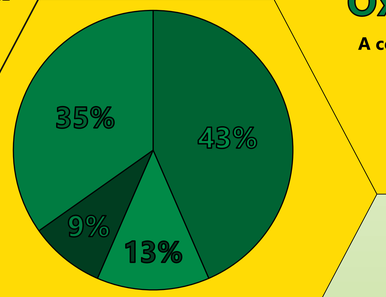
Figure 1. Adapted PRISMA flow chart for study selection

Preliminary Results

Honey bees as a model One Health organisms show little correlation between environmental change and AMR, but highlight key gaps for the future.

Most articles investigated
American Foulbrood
A common honey bee bacterial infection

22%
Of articles focused on resistance to
Oxytetracycline
A common antibacterial used by beekeepers



A third of articles focused on
Inhibition of Immunity
Due to environmental changes

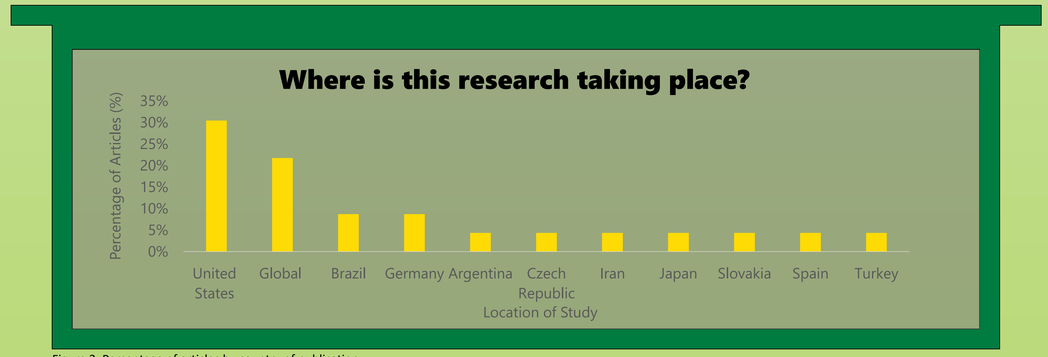


Figure 2. Percentage of articles by country of publication

Discussion

- Direct links between AMR and environmental change evidence streams in honey bees were rare.
- Research is new, topically varied, and geographically unfocused.
- Some research has been done on environmental pollutants and their effect on honey bee immunity, but extrapolation to AMR is largely overlooked.
- American foulbrood resistance to oxytetracycline showed potential for future research, but climatic variables are missed.
- Honey bees may be suitable One Health model organisms, but limited literature inhibited AMR and environmental change
- Overall, this scoping review exposed honey bee AMR and environmental change as a relatively new and unstudied field.

Next Steps

- Our study was limited by time and resources due to the course-based nature of the study
- Future studies may investigate whether interdisciplinary research is limited only in honey bees or if the field as a whole is underdeveloped

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