The Relationship Between The Geographic Area and the Distribution of Wolbachia in Mosquitoes

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ABSTRACT

Research Question: what is The Relationship Between The Geographic Area and the Distribution of Wolbachia in Mosquitoes?
Objective: To collect and barcode macroinvertebrates to determine the presence of Wolbachia in mosquitoes in different locations in the world.
Hypothesis: There are differences between the distribution of Wolbachia in mosquitoes in Israel and New Jersey.
Biological Basis: Wolbachia densities show complex dependence on temperature. In some insect species they decrease with increased temperature, while in others they increase. The mosquitoes examined in Israel are from Einot Gibton - brackish water hot springs reserve in Israel. We assume the averagely warm temperature prevailing in Israel, especially in such environments (hot springs), compared to New Jersey, is a factor influencing the Wolbachia distribution in mosquitoes.

HYPOTHESIS

Wolbachia is a gram-negative parasitic bacterium that is found in arthropods and nematodes. It causes reproductive alterations such as cytoplasmic incompatibility, parthenogenesis induction, feminization and male killing, in the organisms it infects. It prevents their hosts from transmitting human viruses such as Zika, dengue and chikungunya.

METHODS

link to video - Ofri and Hadar (Israel) :
https://www.youtube.com/watch?v=x-0MAQ0FFJQ&feature=youtu.be

figure 1: a photo taken during the experiment in Israel

RESULTS

Israel: The presence of Wolbachia was examined in 6 Culex Pipiens mosquitoes from Einot Gibton in Israel. They were all Wolbachia positive
New jersey: The presence of Wolbachia was examined in 2 Culex Pipiens from Island Beach State Park New Jersey. The results were unclear due to an error.

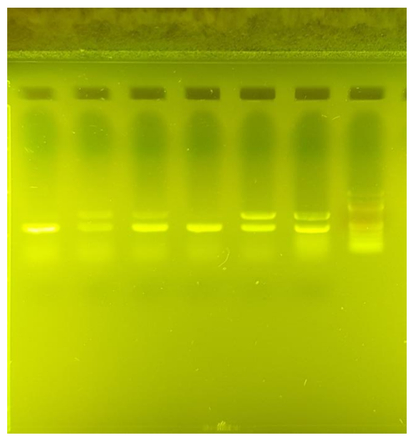

figure 2a: results of electrophoresis in Israeli mosquitoes

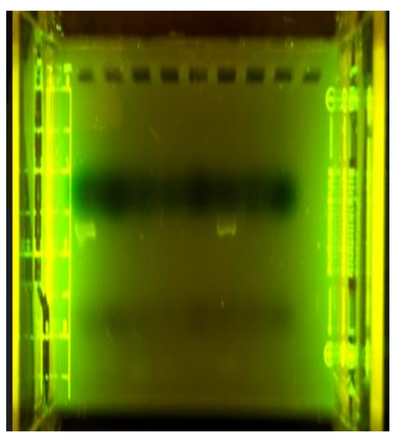

figure 2b: results of electrophoresis in New Jersey mosquitoes

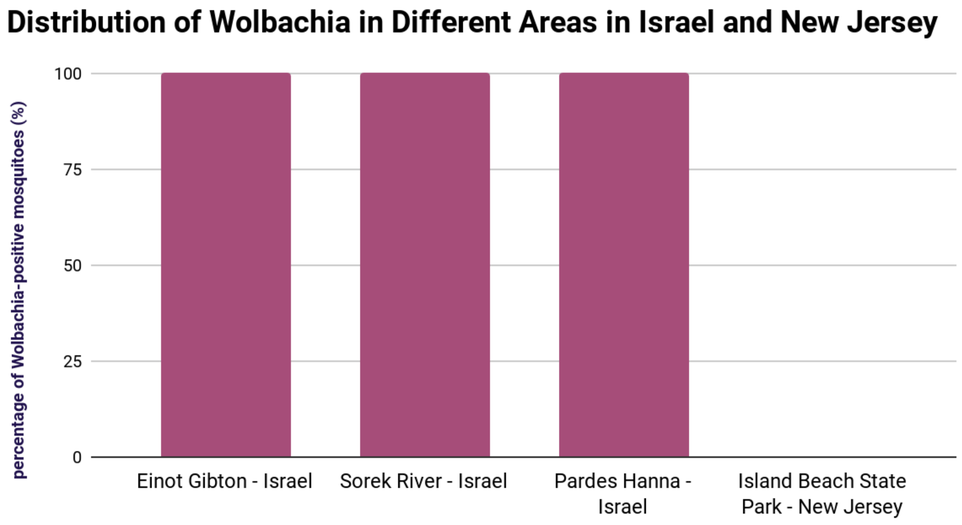

figure 3: graph showing the distribution of Wolbachia in mosquitoes in different areas

DISCUSSION & CONCLUSION

Wolbachia was found in all mosquitoes checked from different geographical areas in Israel.

In New Jersey, the results were inconclusive due to an experimental error in the procedure. The experiment needs to be repeated in order to get clearer results. However, due to prior knowledge and experimentation, Wolbachia is a universal bacteria that can be found in several areas around the world.

The geographical closeness between different areas in Israel can explain why Wolbachia is found so commonly - it can be transferred easily between mosquitoes in different areas.

In addition, Wolbachia is an adaptive bacteria that is found in an r-selected species. Since mosquitoes reproduce rapidly the bacteria are able to evolve and thrive in various location despite the geographic location.

Critical consideration of the conclusion and limitations of the research:

We don't know the biological sex of the mosquitoes we checked, we only checked 6 mosquitoes in Israel.

On the other hand, the fact all 6 mosquitoes we checked were infected supports the assumption that the Wolbachia is widely common in these areas.

Wolbachia is becoming a common bacteria found in arthropods and nematodes globally. We were only able to test on 2 mosquitoes per person in New Jersey and we would like to have more data. 2 procedures were followed and had inconclusive results.

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