

The invasive lifestyle of *Wolbachia* in the banana aphid *Pentalonia nigronervosa* : Implications for horizontal transmission

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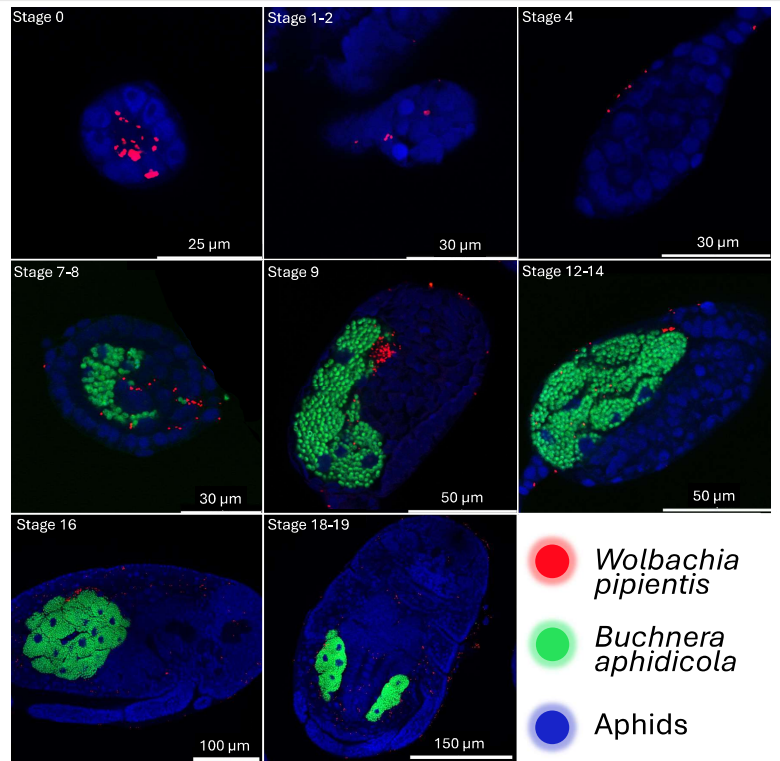
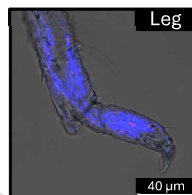
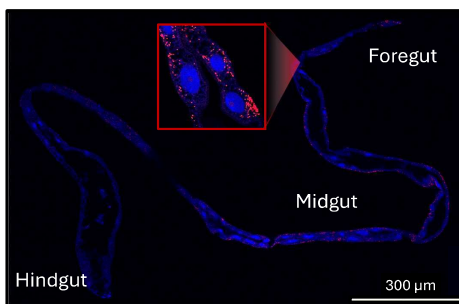
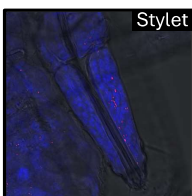
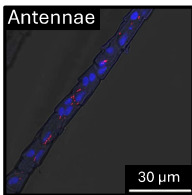
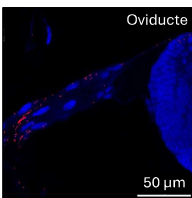


Background

Wolbachia pipientis are the most prevalent **intracellular bacterial** symbiont in arthropods. This symbiont is known to present a wide range of possible interactions, on a spectrum ranging from mutualism to parasitism, but in the specific case of *Wolbachia*-aphid interactions, this position is still unknown. Despite its extensive host range and indirect knowledge of **horizontal transmission**, empirical evidences for this type of transmission remains limited. *Wolbachia* localisation was determined by FISH, a technique using fluorophore-labelled oligonucleotide probes, coupled with confocal microscopy imaging. Using this technique on *Pentalonia nigronervosa*, the banana aphid, we demonstrated the presence of *Wolbachia* across all **embryonic stages** and various adult somatic tissues. Additionally, PCR diagnostics confirmed the presence of *Wolbachia* in banana plant tissues in contact with aphids, **from leaves to roots**, as well as **in secondary shoots**, suggesting potential transmission via plant phloem. This results suggest *Wolbachia* may have the ability to circulate in populations by plants as propagation vector.

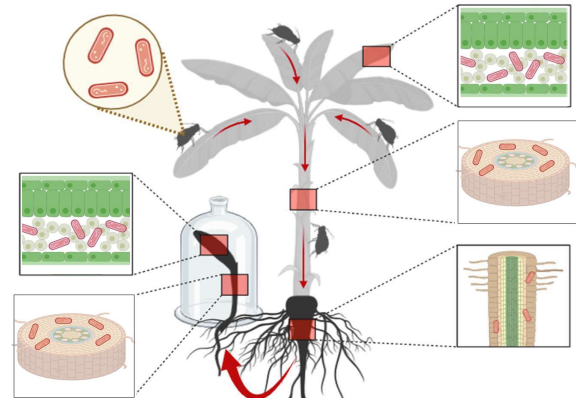
Mapping *Wolbachia* !

The discovery of the ubiquitous presence of *Wolbachia* in all tissues of the banana aphid, as well as its particularly invasive nature across all embryonic stages, opens new perspectives on the impact of this symbiotic bacterium. This finding suggests that *Wolbachia* could play an essential role in the development and overall physiology of this insect. Such ubiquity implies a close interaction between the bacterium and its host, potentially influencing key processes such as reproduction, immunity, or adaptation to variable environmental conditions.



● *Wolbachia pipientis*
● *Buchnera aphidicola*
● Aphids

The Hidden Role of Plants in Horizontal Transfer Dynamics



Banana plants (*Musa acuminata*) infested with aphids (*P. nigronervosa*) carrying *Wolbachia* were analyzed by PCR after 35 days. The banana sucker, connected to the mother plant's root system, was protected from aphid populations in a reservoir. *Wolbachia* was detected in the leaves, pseudostem, and roots of the mother plant, as well as in the pseudostem, leaves of the sucker, and the root bulb.

Can *Wolbachia* be transmitted by plants to healthy aphids ?
Can *Wolbachia* be transfected into a new aphid host ?

Future studies should aim to :

1. Determine the persistence and the intra or extracellular life into the plant
2. Analyze the presence of *Wolbachia* in salivary glands
3. Determine the ability to infect healthy aphids from infected plants

1. Li et al. (2017). Plant-mediated horizontal transmission of *Wolbachia* between whiteflies. *ISME Journal*, 11(4), 1019-1028. 2. Miura et al. (2003). A Comparison of Parthenogenetic and Sexual Embryogenesis of the Pea Aphid *Acyrtosiphon pisum*. *Journal of Experimental Zoology Part B: Molecular and Developmental Evolution*, 295(1), 59-81. 3. Pons et al. (2019). Circulation of the cultivable symbiont *Serratia symbiotica* in aphids is mediated by plants. *Frontiers in Microbiology*, 10(MAR). 4. Rasgon et al. (2006). Survival of *Wolbachia pipientis* in cell-free medium. *Applied and Environmental Microbiology*, 72(11), 6934-6937.