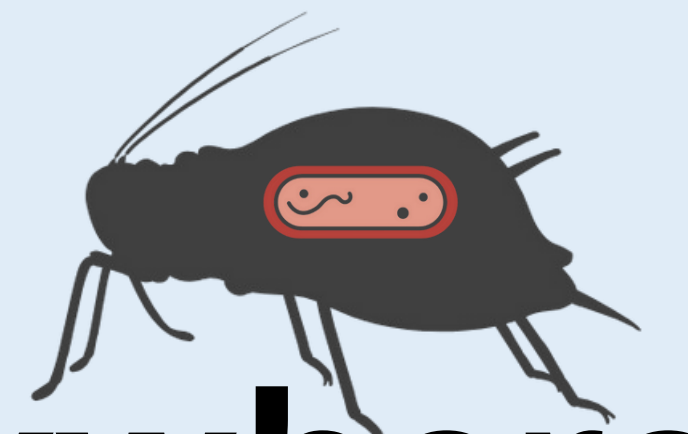


WOLBACHIA INVASION:

From aphid cells to plant tissue – It's everywhere!



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CONTEXT

Wolbachia pipientis is the most widespread **intracellular symbiont** in arthropods, influencing host biology in ways that range in a complex spectrum from **mutualistic** benefits to **parasitism**, with particular abilities to manipulate host reproduction. Despite its ubiquity in terms of host range, tissues infection, and the known potential for horizontal transmission between hosts, concrete evidence for such pathways remains scarce. In *Pentalonia nigronervosa* (**banana aphid**), we revealed the presence of *Wolbachia* in all embryonic stages and various somatic tissues in adults, from gut to antennae. Strikingly, we also detected *Wolbachia* in banana plant tissues after contact with aphids. These findings raises the intriguing possibility that **plants** may act as **vectors** for *Wolbachia* **horizontal transmission**.

Why studying *Wolbachia* in banana aphid?



- High prevalence of *Wolbachia*
- Agricultural pest, with ecological and economical implications
- A charming aphid, with bacteria that steal the show, who could resist?

METHODS

Wolbachia was visualized using **Fluorescent In Situ Hybridisation (FISH)**. Micro-dissection allowed obtention of the samples, which were then fixed and bleached in hydrogen peroxyde. Addition of specific fluorescent oligonucleotides probes allows us to highlight the localisation of the bacteria within tissues.

MAPPING WOLBACHIA IN SOMATIC TISSUES

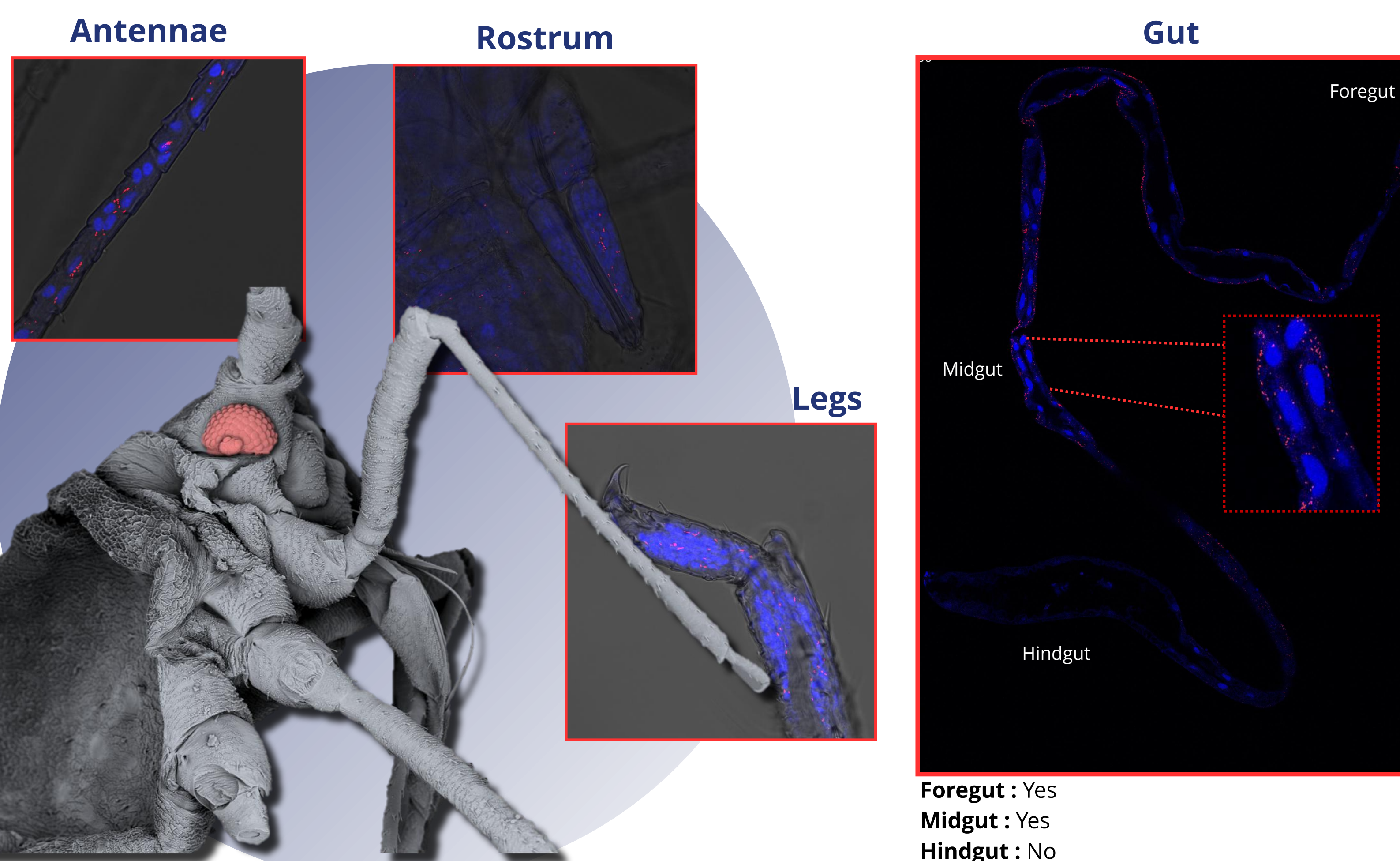


Figure 2. Representation of somatic tissues investigated for the presence of *Wolbachia*. The symbiont was found in as diverse tissues as antennae, legs, rostrum and all parts of digestive system, except in the hindgut, the posterior part of the digestive track.

WOLBACHIA IN APHID EMBRYOS

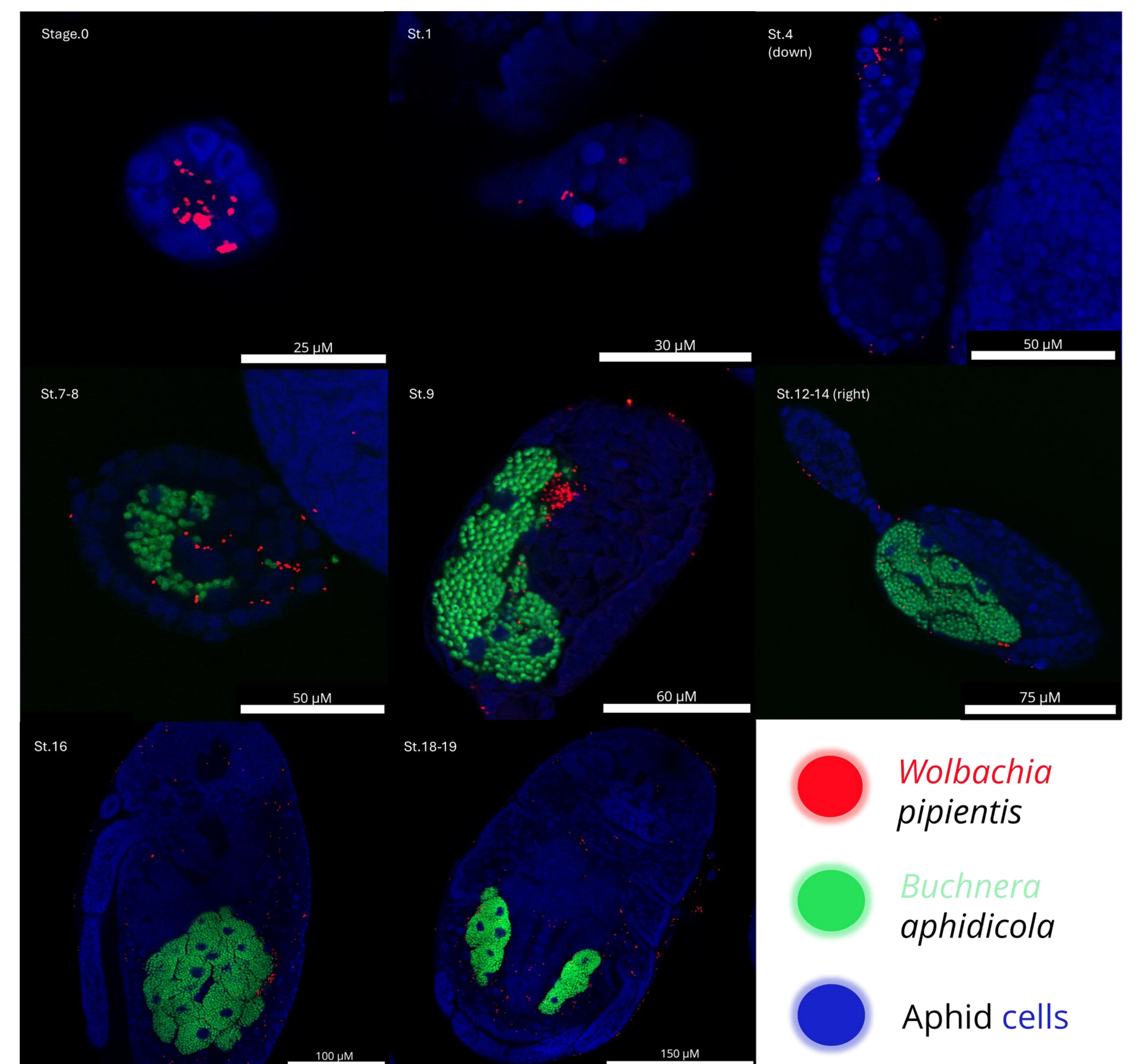


Figure 1. Representation of different aphid embryonic stages on FISH imagery. *Wolbachia* (red) is detected in all embryonic stages, even before arrival of obligate symbiont *Buchnera* (green), from first to last stage. Important variations in the distribution of the symbiont is observed during the development of aphid tissue (blue). *Wolbachia*'s distribution becomes increasingly sparse as the stages progress.

WOLBACHIA IN BANANA TISSUE

We know that *Wolbachia* :

- Is vertically transferred to progeny
- Has a very ubiquitous distribution in aphid tissue, including in gut and rostrum
- Can be detected in banana tissue

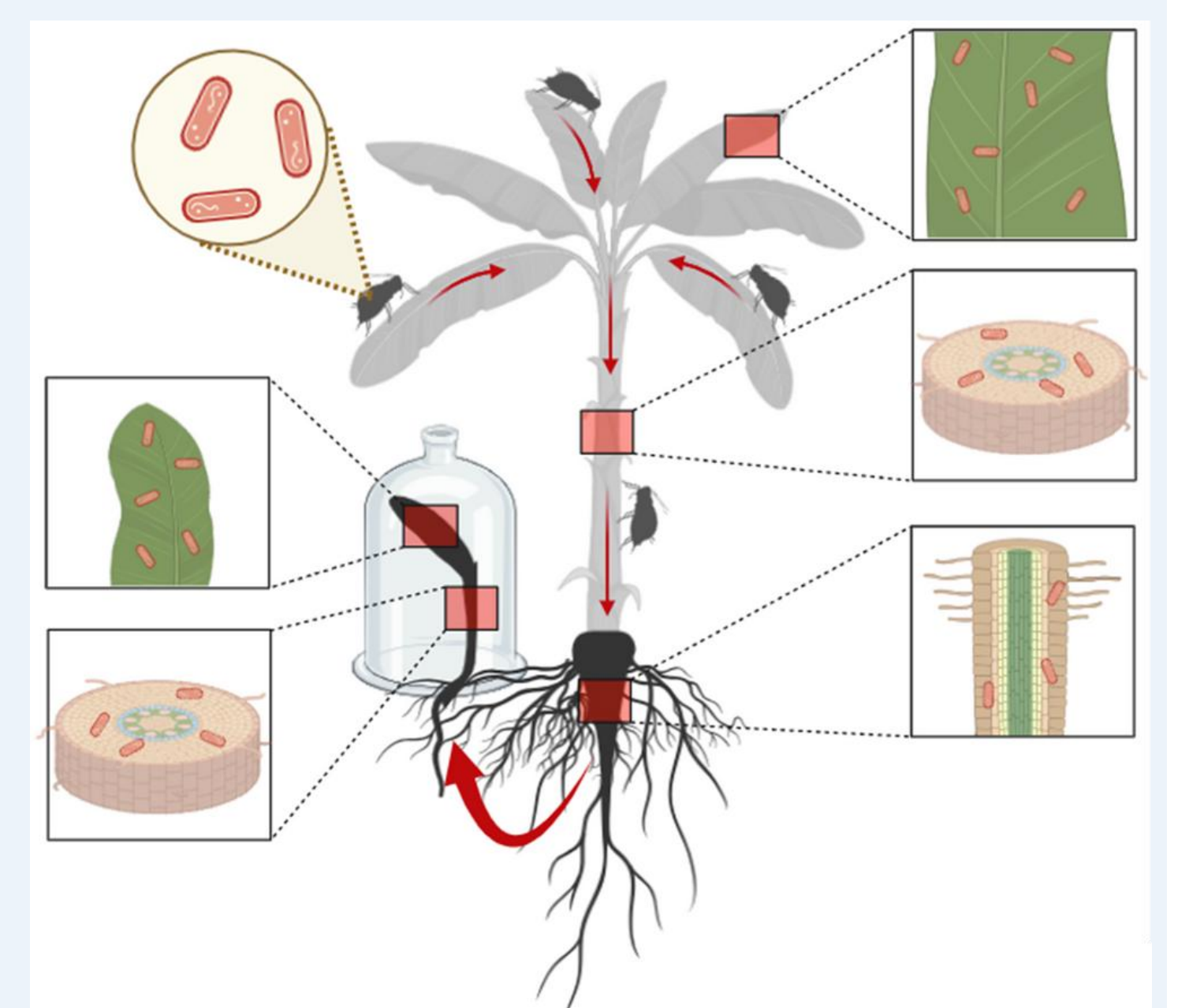
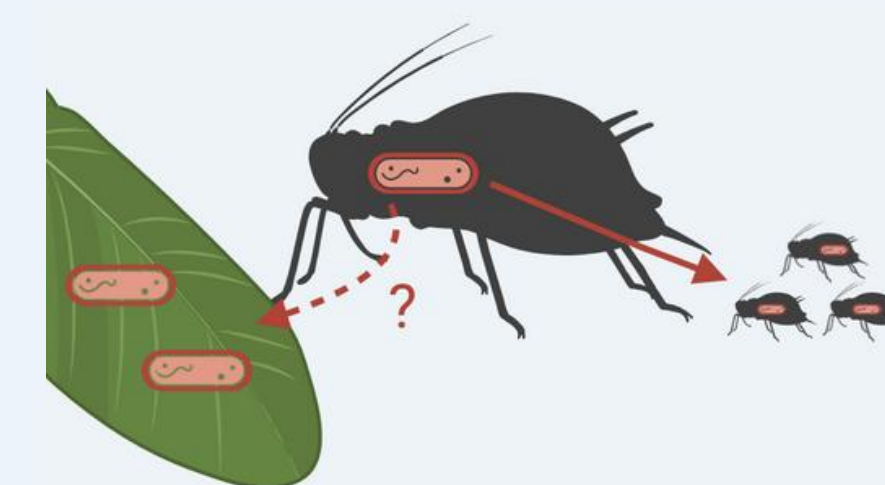


Figure 3. Banana plants (*Musa acuminata*) infested with banana aphids (*P. nigronervosa*) infected with *Wolbachia* for 35 days were analysed by PCR. The banana shoot, connected only by the root system to the parent plant, was isolated in a plastic bottle. The leaves, pseudotruncus and roots of the mother plant; the pseudotruncus and leaves of the shoot; and the root bulb were all infected with *Wolbachia*.

Wolbachia was detected in banana tissue after feeding of banana aphids. New analysis are needed to determine the transmission route of *Wolbachia* from aphid to plants, and the viability of the bacteria in plants, and infectiousness.

WHAT'S NEXT ?

1. Determine the persistence and the intra or the extracellular life into the plant
2. Analyze the presence of *Wolbachia* in salivary glands
3. Determine the ability of *Wolbachia* to infect other healthy aphids feeding on the same plant
4. Investigate the interactions aphid-*Wolbachia*