

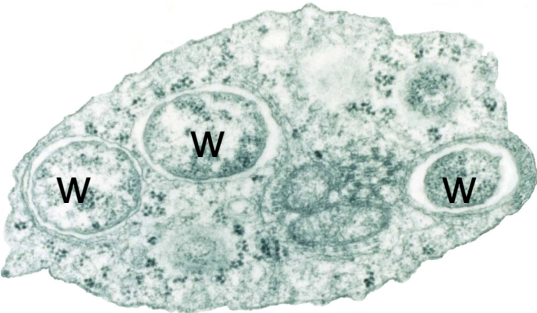
# Relative impact of *Wolbachia* genotype and host genetic background on cytoplasmic incompatibility in *Drosophila suzukii*



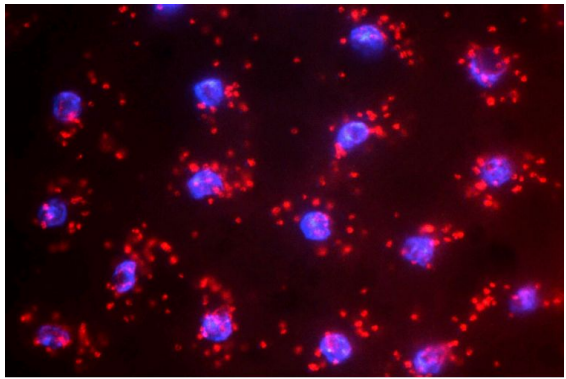
By Mountassira MATIN

Mentors: Svitlana SERGA, Nicolas RODE  
Tutor: Mathieu SICARD

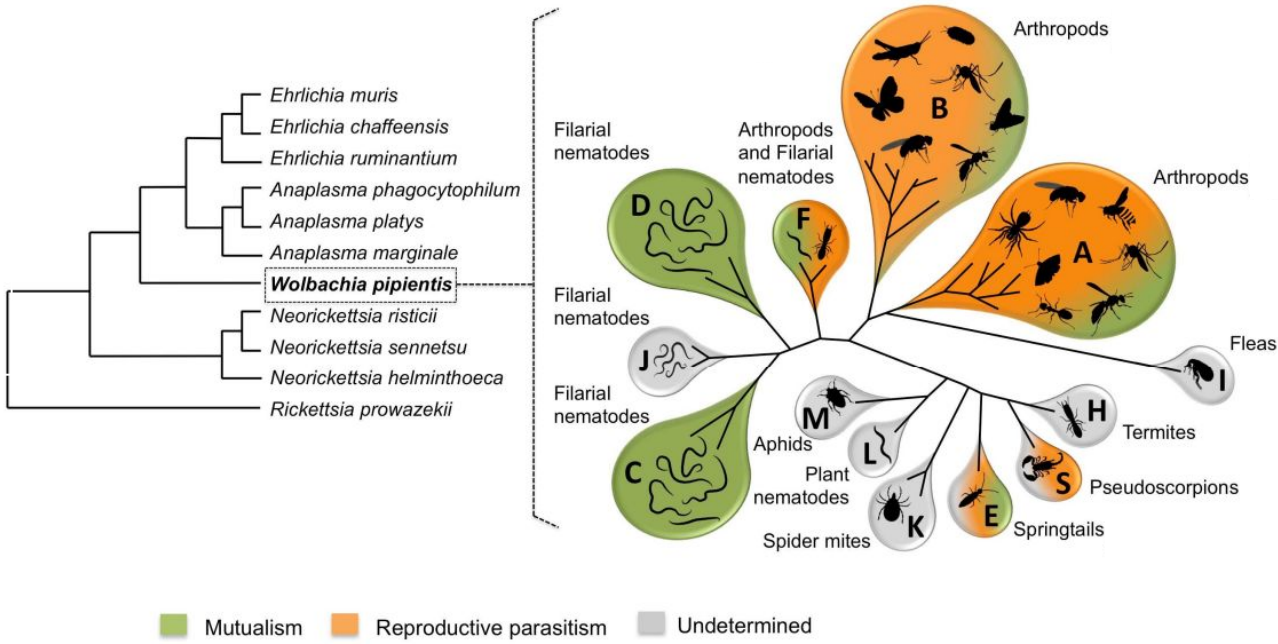
# Introduction: Presentation of *Wolbachia pipientis*



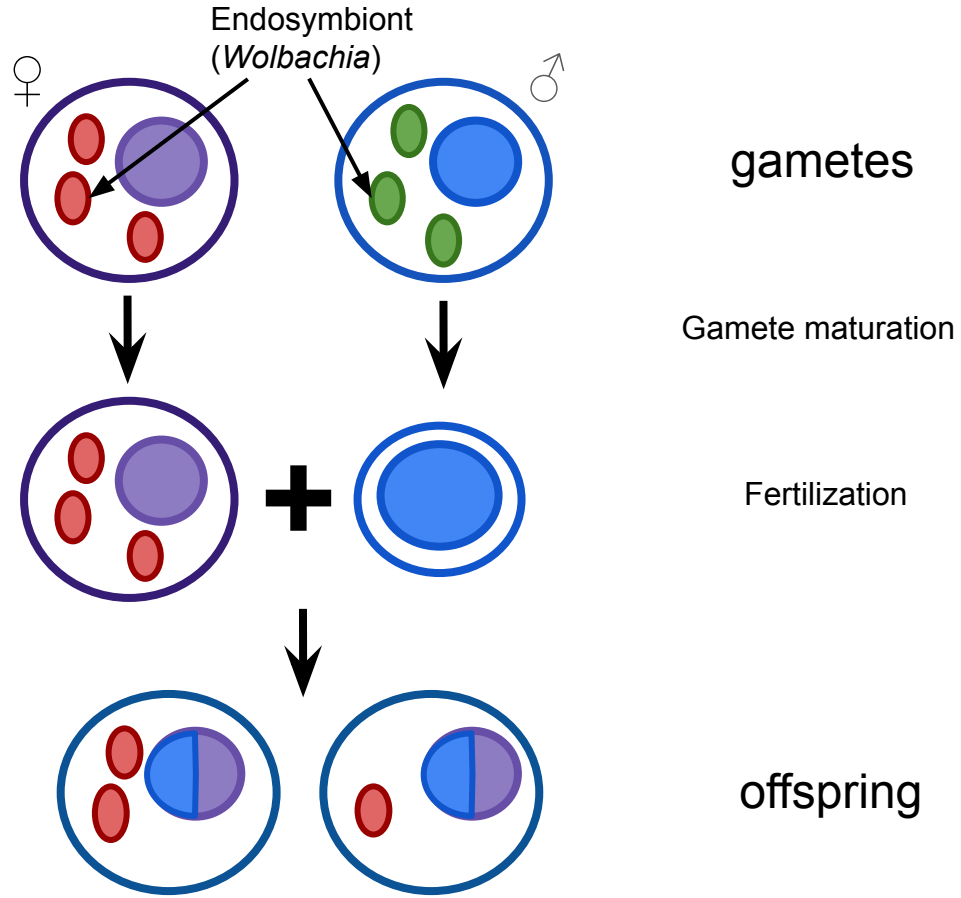
*Wolbachia pipientis* (w) under an electron transmission microscope inside of an insect cell (David Clancy, 2001)



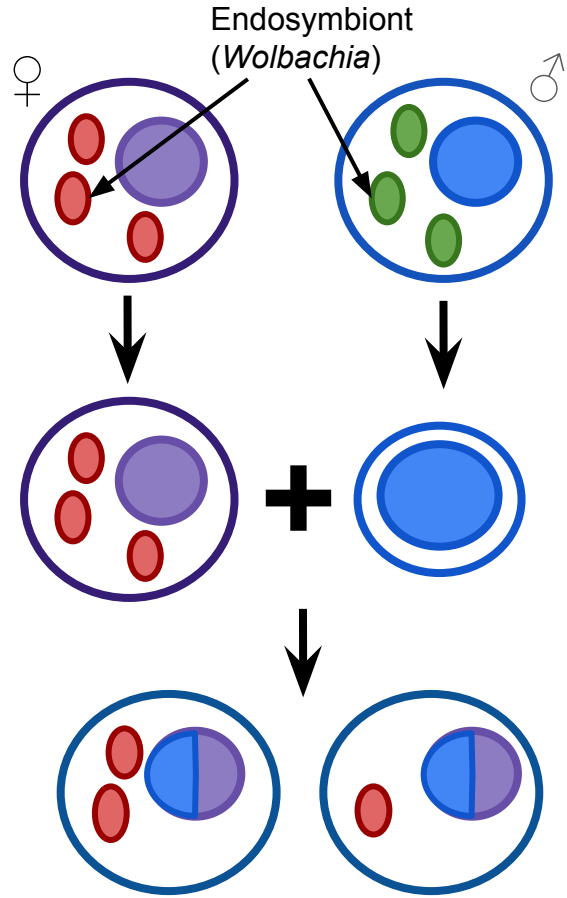
DAPI-stained *Drosophila* embryo tissue with the nuclear DNA appearing blue and the *Wolbachia* appearing red (David Clancy)



# Introduction: Maternal transmission of *Wolbachia*



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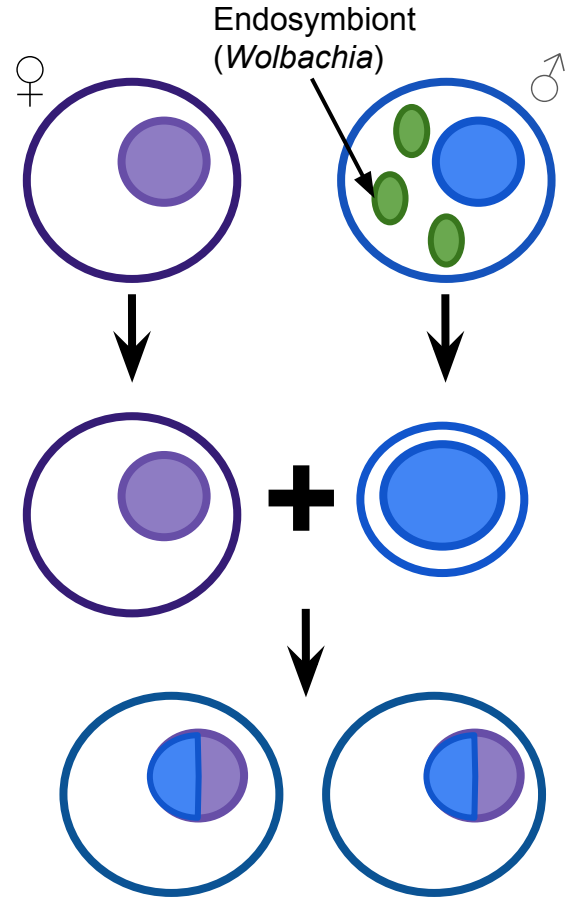


gametes

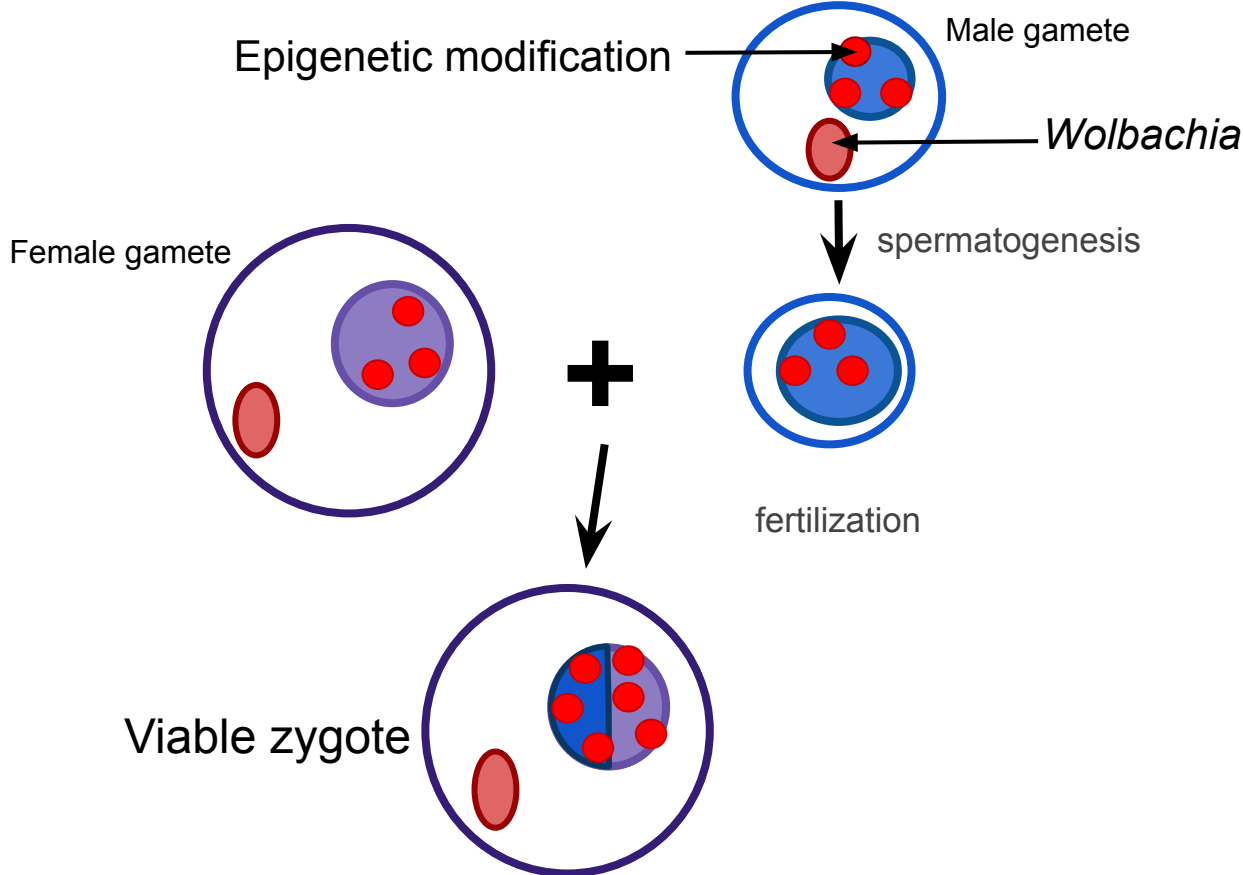
Gamete maturation

Fertilization

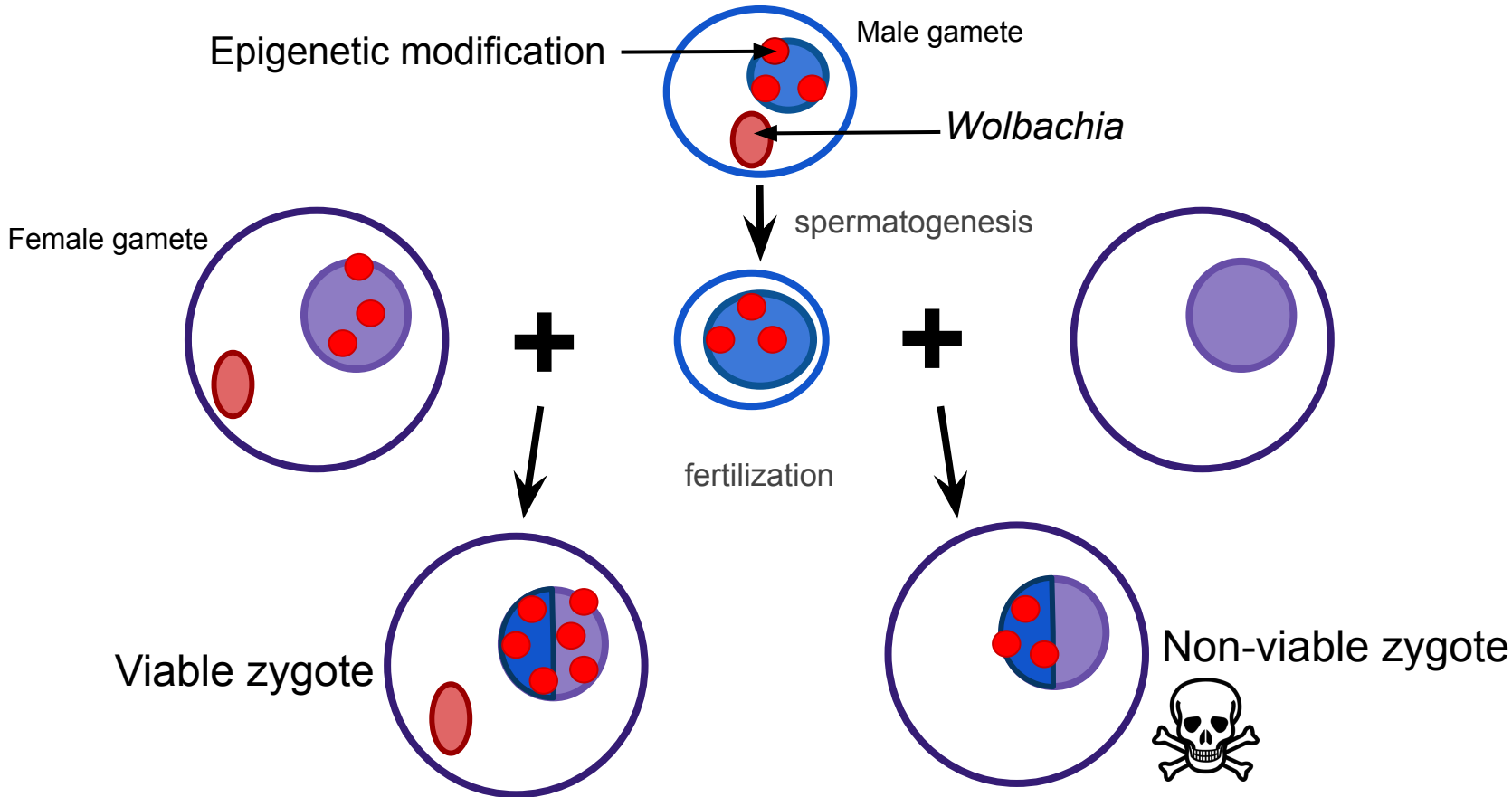
offspring



# Introduction: Explanation of Cytoplasmic Incompatibility (CI)

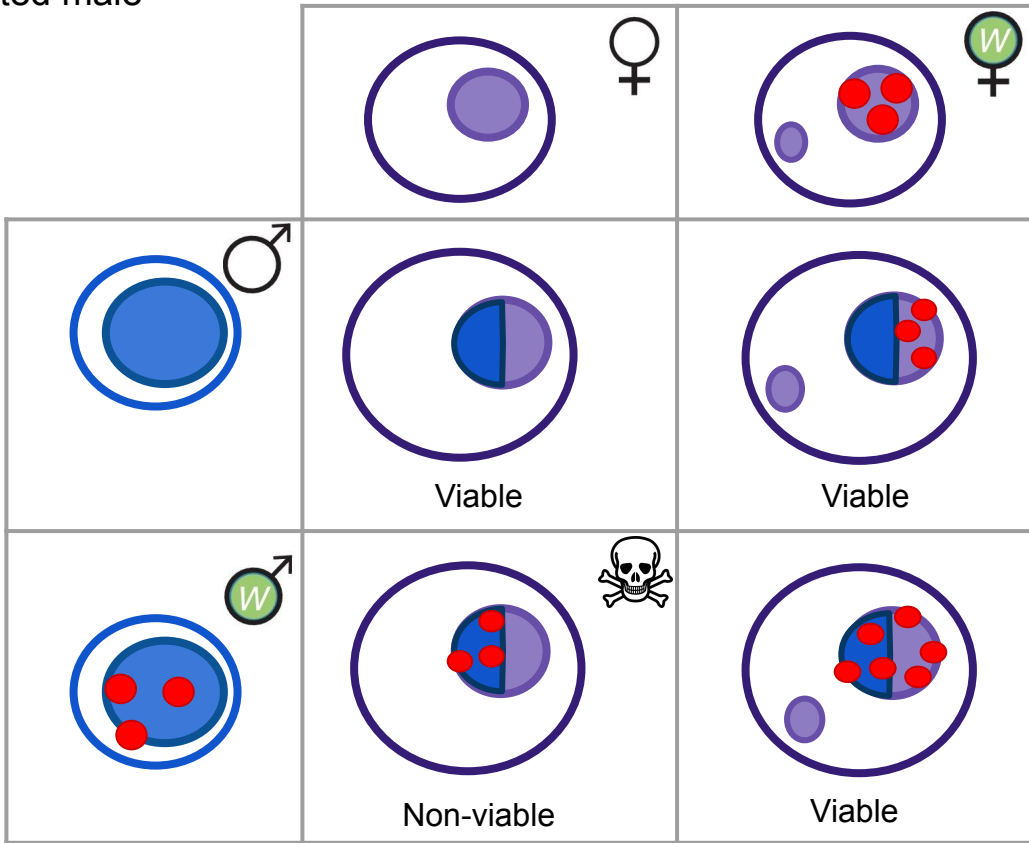


# Introduction: Explanation of Cytoplasmic Incompatibility (CI)



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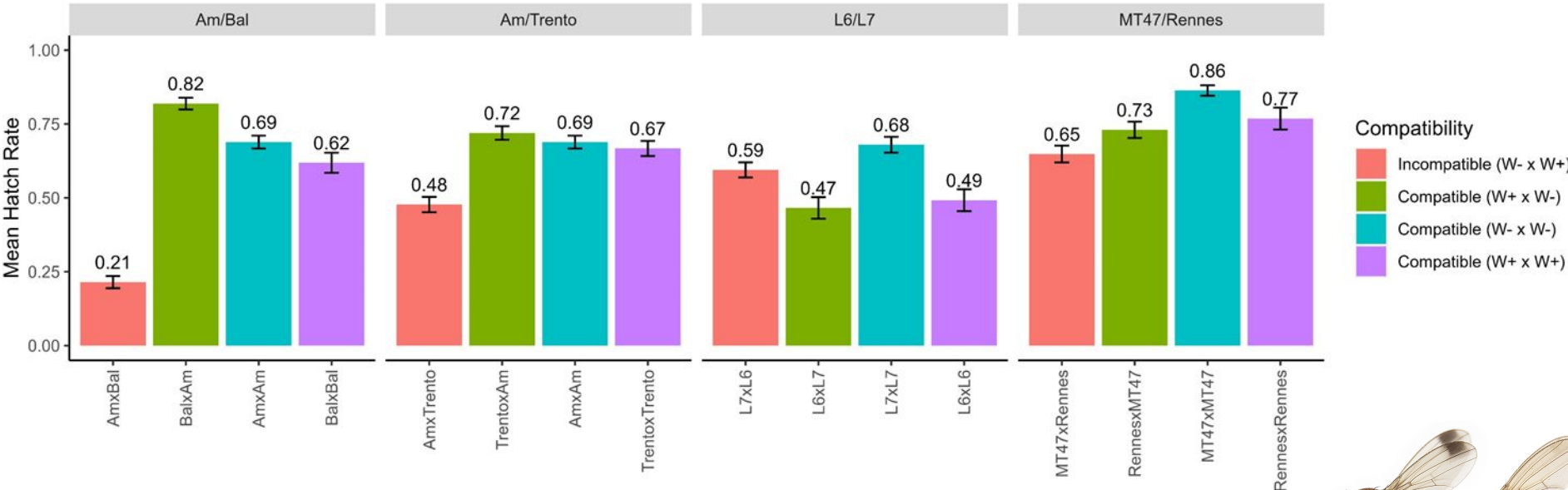
**Cytoplasmic Incompatibility (CI):** embryonic lethality resulting from the cross between an uninfected female and a *Wolbachia*-infected male



modification

# Introduction: Preliminary work on CI and *Drosophila suzukii*

hatch rates for crossings between *D. suzukii* strains Am(uninfected), Baladran(infected), Trento (infected), L6 and L7 (infected) (unpublished data)



Cross Type (female strain x male strain)

**High CI – 70%**

**Intermediate CI - 30%**

**No CI**

**Intermediate CI - 20%**



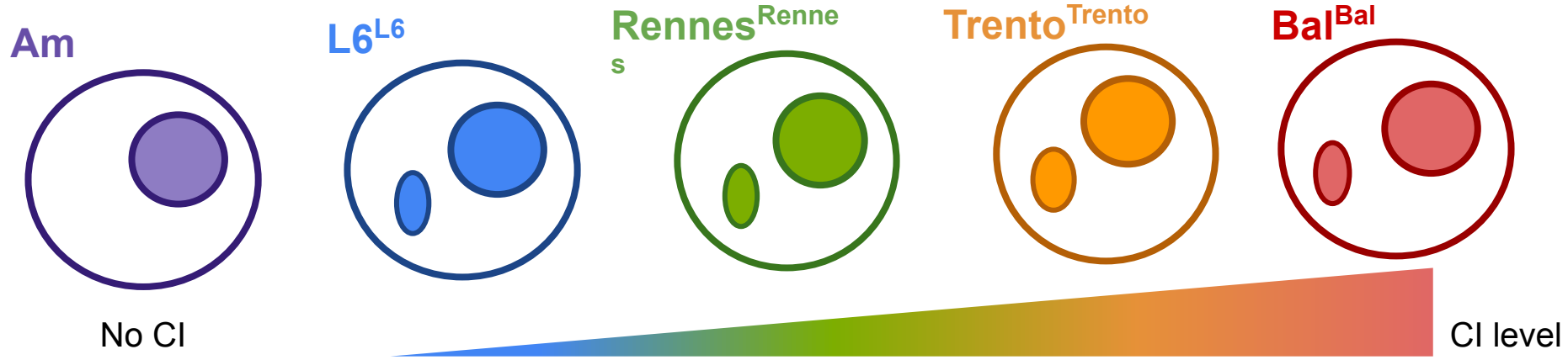
photo McEvoy 2017



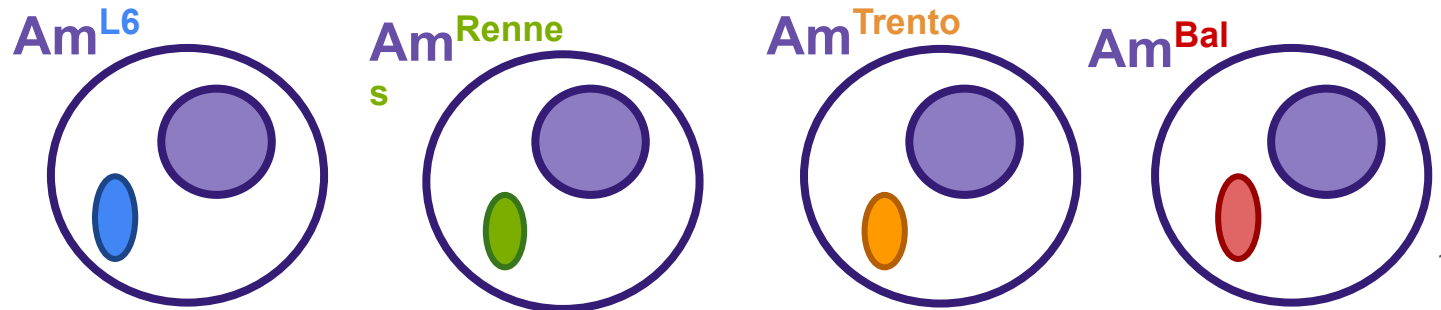
What causes these  
variations in CI levels?

# Introduction: Presentation of the experiment

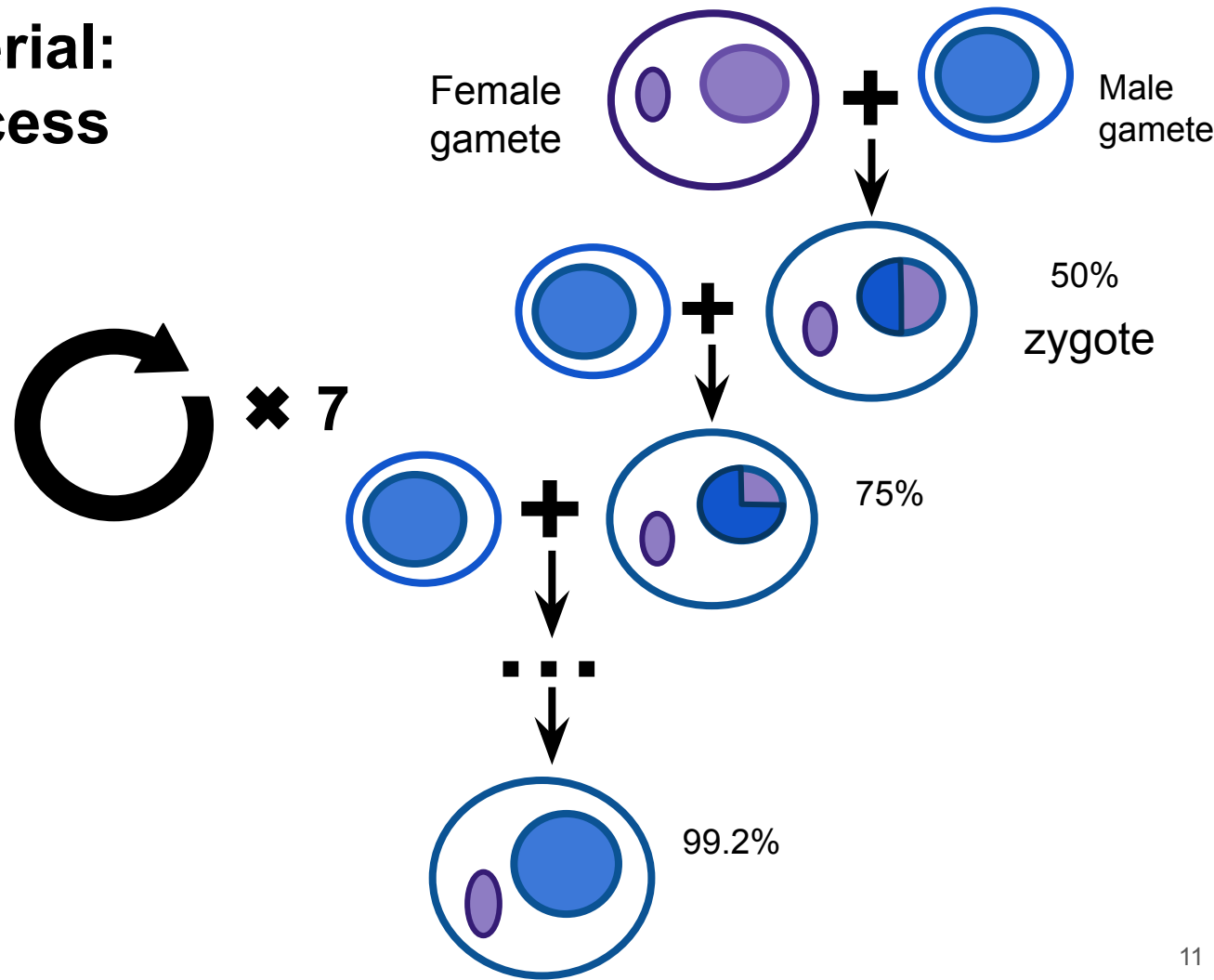
**Objective:** test the relative effect of *Wolbachia*'s genetic background versus the male host's genetic background on CI



Introgressed lines:




# Methods and material: Introgression process




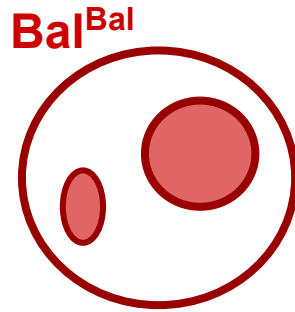
# Hypotheses

 Incompatible crossing

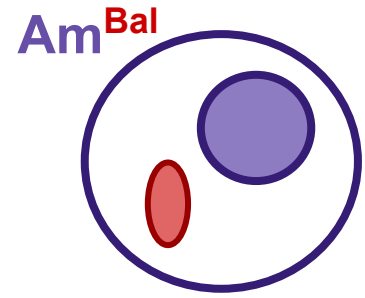
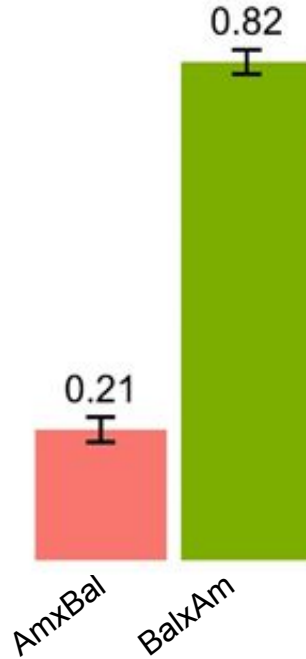
 Compatible crossing

 Expected hatch rates with introgressed lines if CI levels only depend on the variant of Wolbachia (same CI levels as expected results)

 Expected hatch rates with introgressed lines if CI levels are influenced by male host genetic background (different results than expected results)



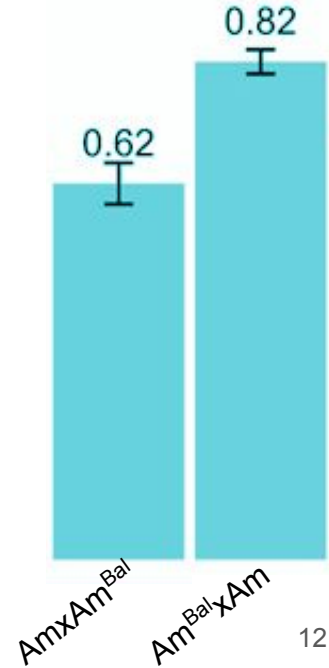
Original results



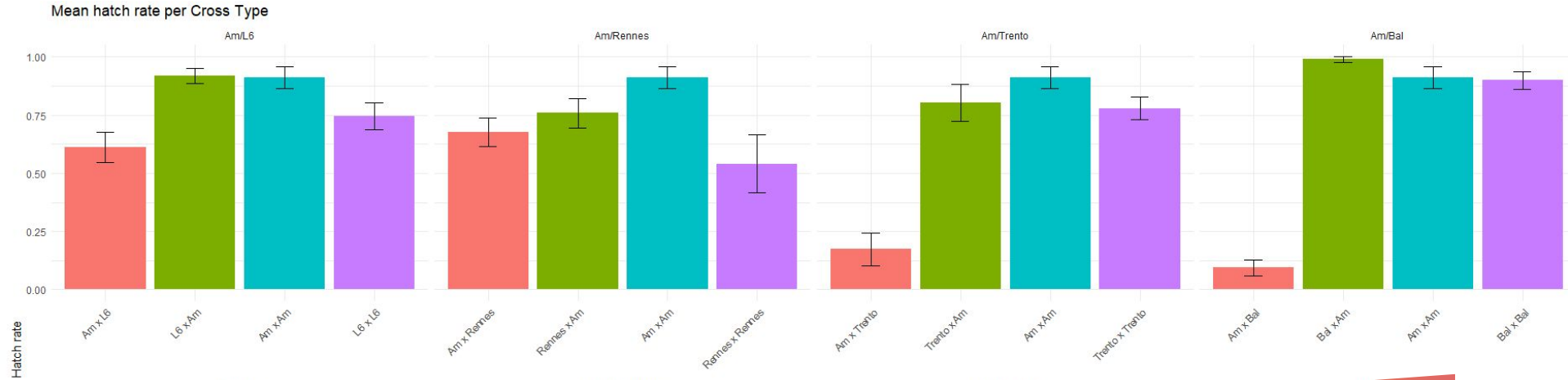
First hypothesis



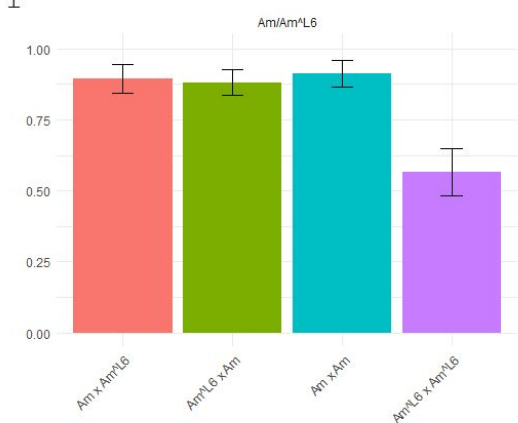
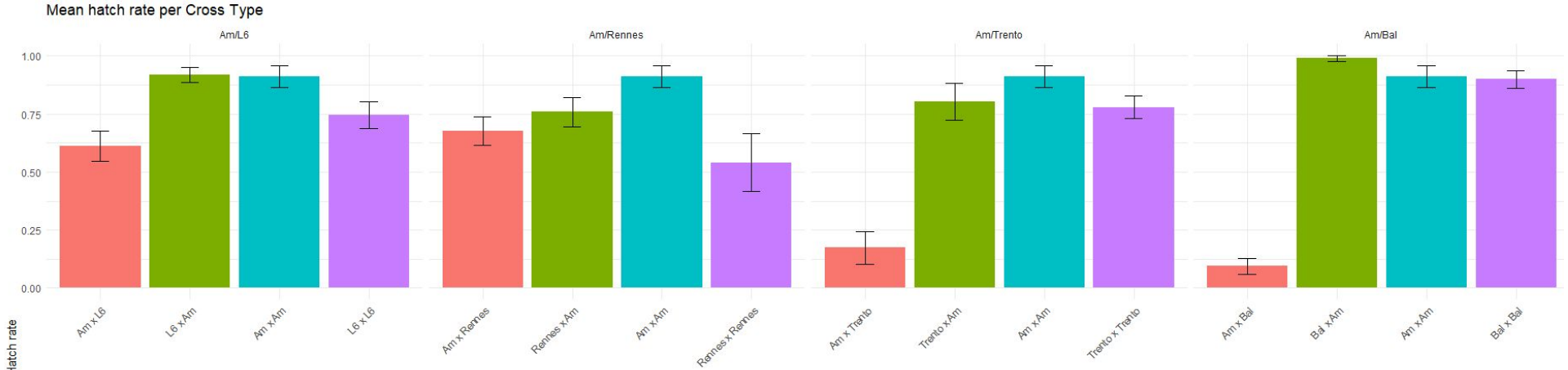
Alternative hypothesis



# Results

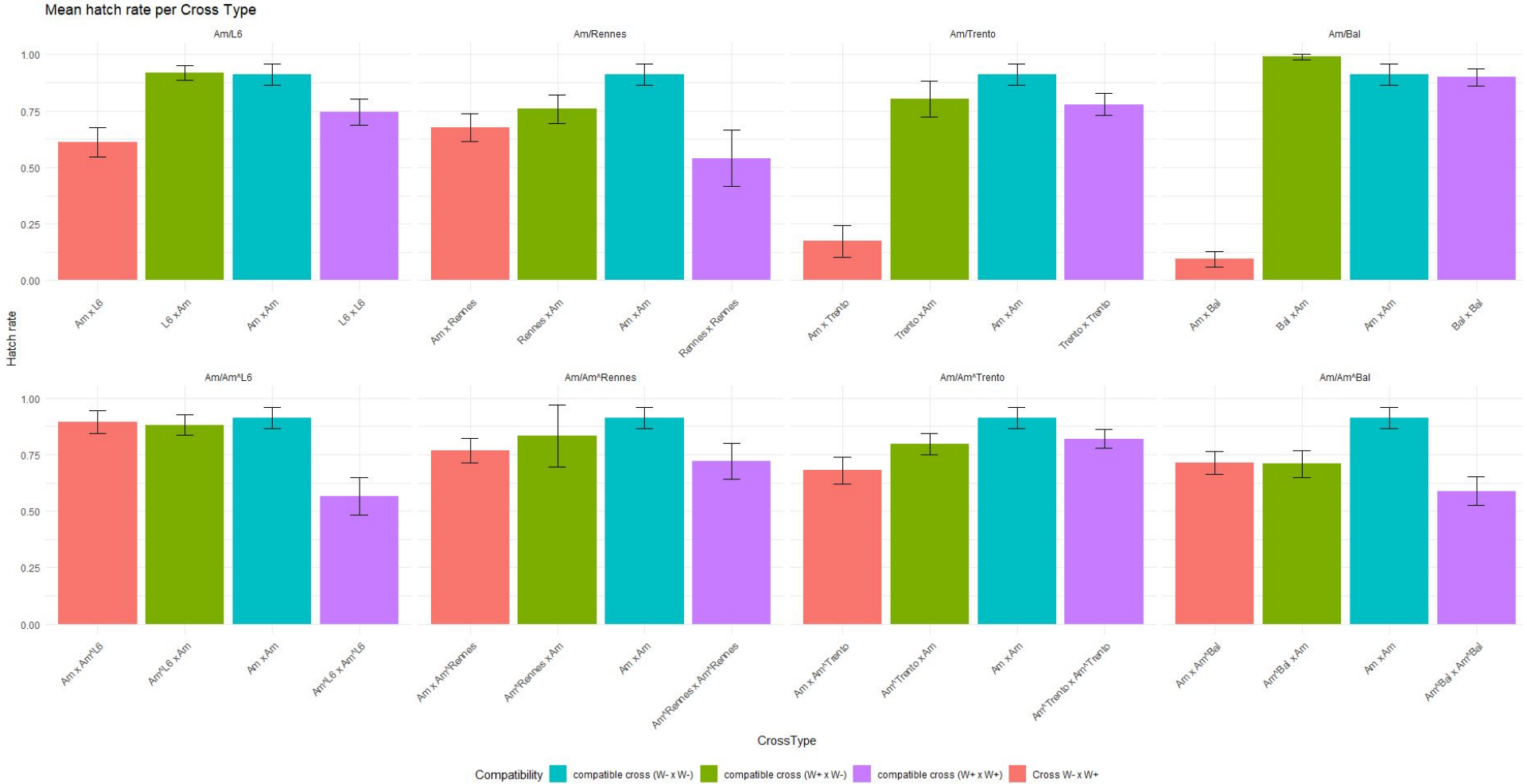


CI level



CrossType

Compatibility ■ compatible cross (W+ x W-) ■ compatible cross (W+ x W+) ■ compatible cross (W+ x W+) ■ Cross W-x W+



# Model used for statistical analyses

The hatch rate ( $Y_{ij}$ ) for a cross between a female strain  $i$  and a male strain  $j$  carrying a *Wolbachia* variant  $k$  is:

$$Y_{ijk} = \mu_{ij} + \delta_k + \varepsilon_{jk}$$

$\mu_{ij}$  = effect of the female genotype  $i$ , male genotype  $j$ , and the genetic interaction between genotypes  $i$  and  $j$

$\delta_k$  = degree of *Wolbachia*-induced incompatibility in crosses between the  $i$ th female strain and the  $j$ th male strain for a *Wolbachia* of  $k$  genotype

$\varepsilon_{jk}$  = interaction between *Wolbachia* and male genotypes  $k$  and  $j$  respectively



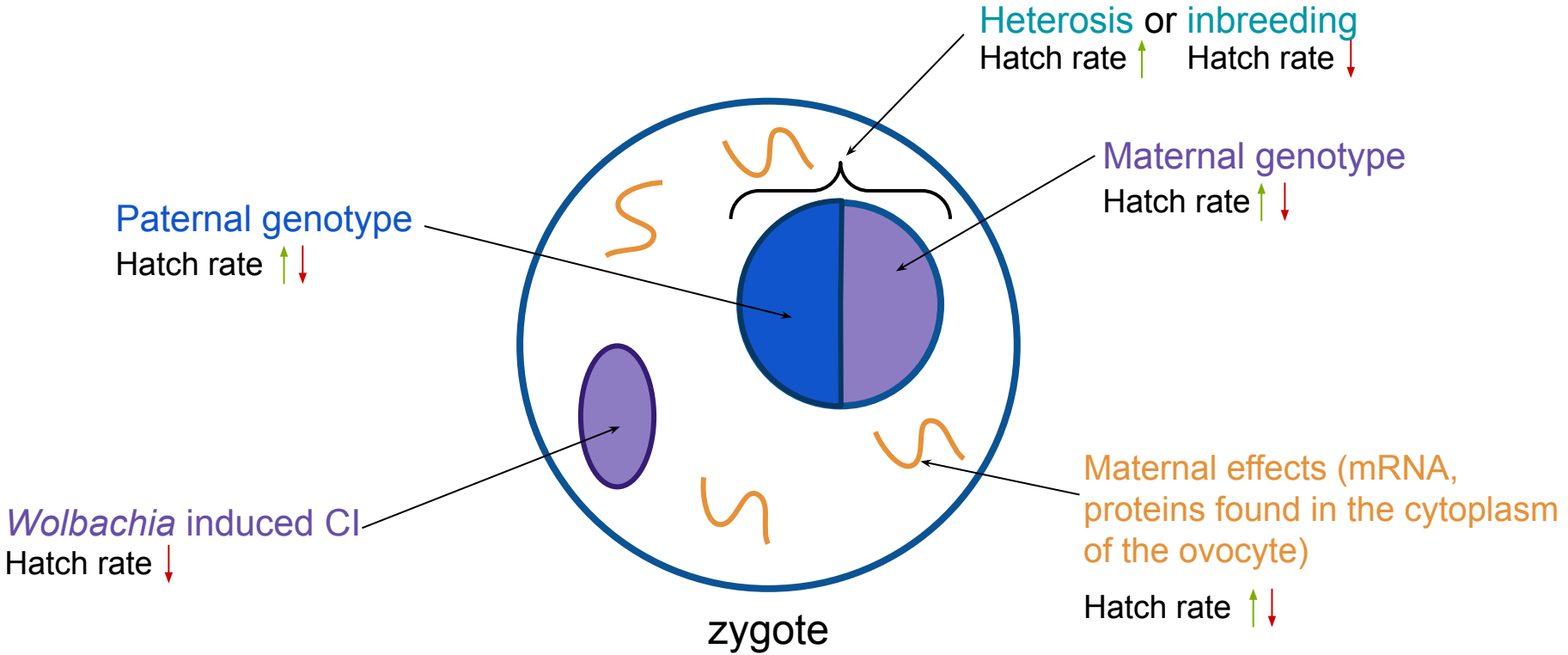
# Conclusion and perspectives

- Cytoplasmic incompatibility is heavily influenced by the male host's genetic background
  - **L6** genotype contributes little variation to CI levels (weak interaction between host genotype and CI)
  - **Rennes** genotype contributes little variation to CI levels (weak interaction between host genotype and CI)
  - **Trento** genotype contributes a lot to variation in CI levels (strong interaction between host genotype and CI)
  - **Bal** genotype contributes a lot to variation in CI levels (very strong interaction between host genotype and CI)
  
- Next step: Find the genetic architecture of susceptibility to *Wolbachia*-induced incompatibility (either one strong-effect locus or several weak-effect loci)

Thank you for your attention !



# Hatch rate can be influenced by other factors



# Methods and material: CI assay



Collection of males and virgin females

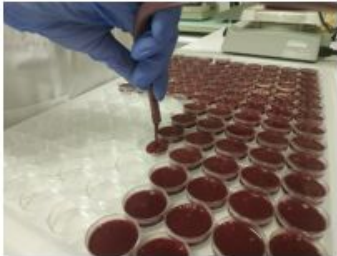
For each strain tested two types of crosses:  
W+x W- (compatible)  
W- x W+ (incompatible)



Crossing  
5 days-old female x up to 3 days old male

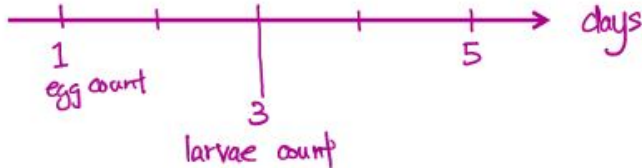
20 couples per cross

Laying eggs on blackberry medium



Hatch rate estimation

$$\text{Hatch rate} = \frac{\text{Number of larvae}}{\text{Number of eggs}}$$



5 Petri dishes per couple