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Aula 11. Determinação do sexo. Influência de endosimbiontes

Table 1. Bacterial endosymbionts associated with reproductive parasitism

<i>Endosymbiont</i>	<i>Bacterial group</i>	<i>Infected arthropod host groups</i>	<i>Manipulation phenotypes*</i>
<i>Wolbachia</i>	α -Proteobacteria	Insects, crustaceans, mites, spiders	F, PI, CI, MK
<i>Cardinium</i>	Bacteroidetes	Insects, mites, spiders	F, PI, CI
<i>Rickettsia</i>	α -Proteobacteria	Insects, spiders	PI, MK
<i>Spiroplasma</i>	Mollicutes	Insects	MK
<i>Flavobacteria</i>	Mollicutes	Insects	MK
<i>Arsenophonus</i>	γ -Proteobacteria	Insects	MK

*F, feminization of genetic males; PI, parthenogenesis induction; CI, cytoplasmic incompatibility; MK, male killing.

Cordaux et al.(2011) Trends in Genet 27: 332-341

Wolbachia – 50 a 60 % das espécies de artrópodes, nematodes

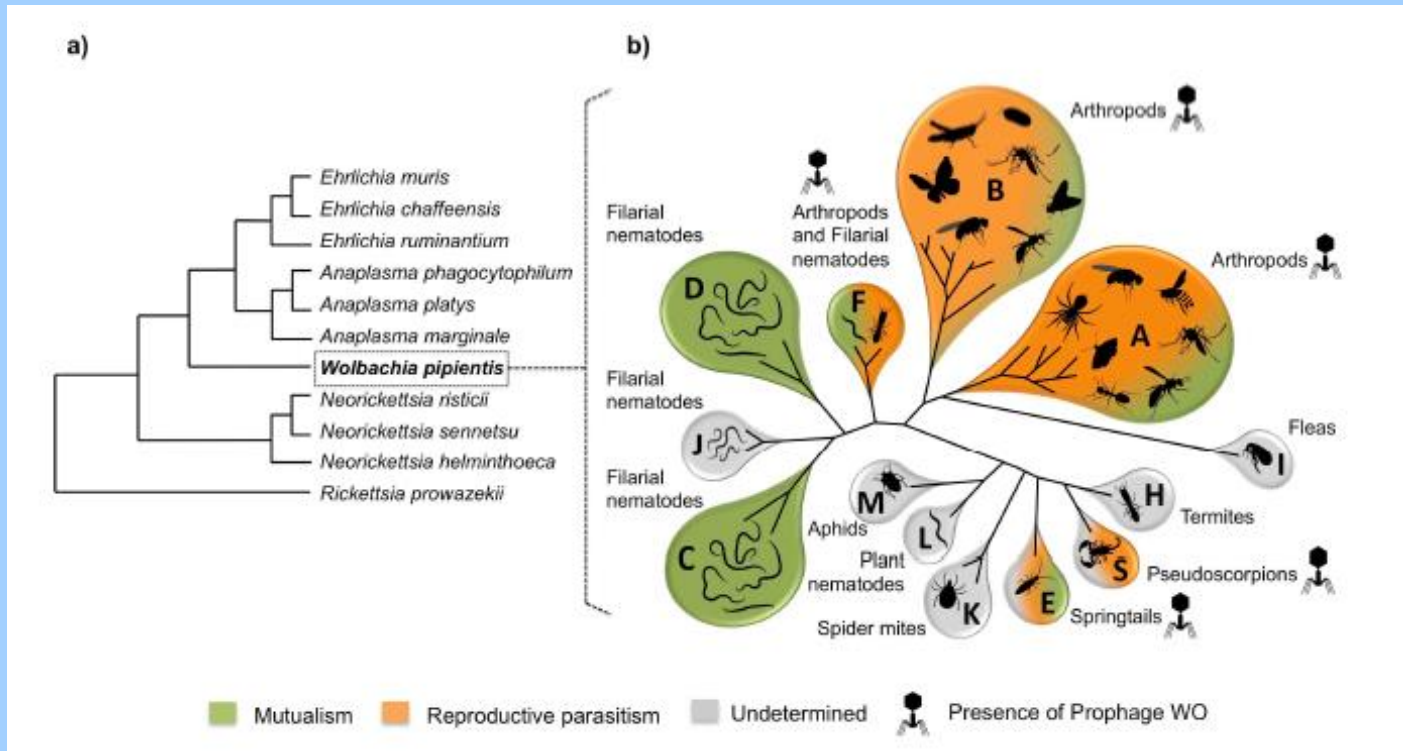
Kaur et al. (2021) doi: 10.20944/preprints202103.0338.v1

Wolbachia pipientis

Hertig & Wolbach (1924)
Registro em *Culex pipiens*

Hertig (1936)
Wolbachia pipientis

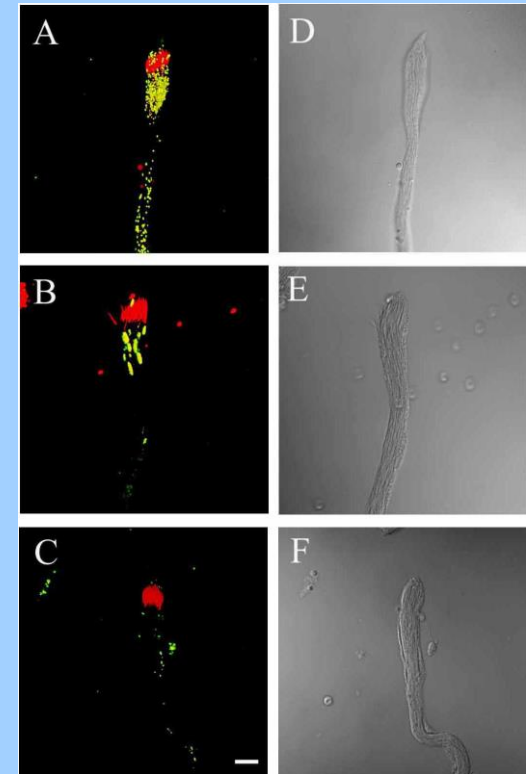
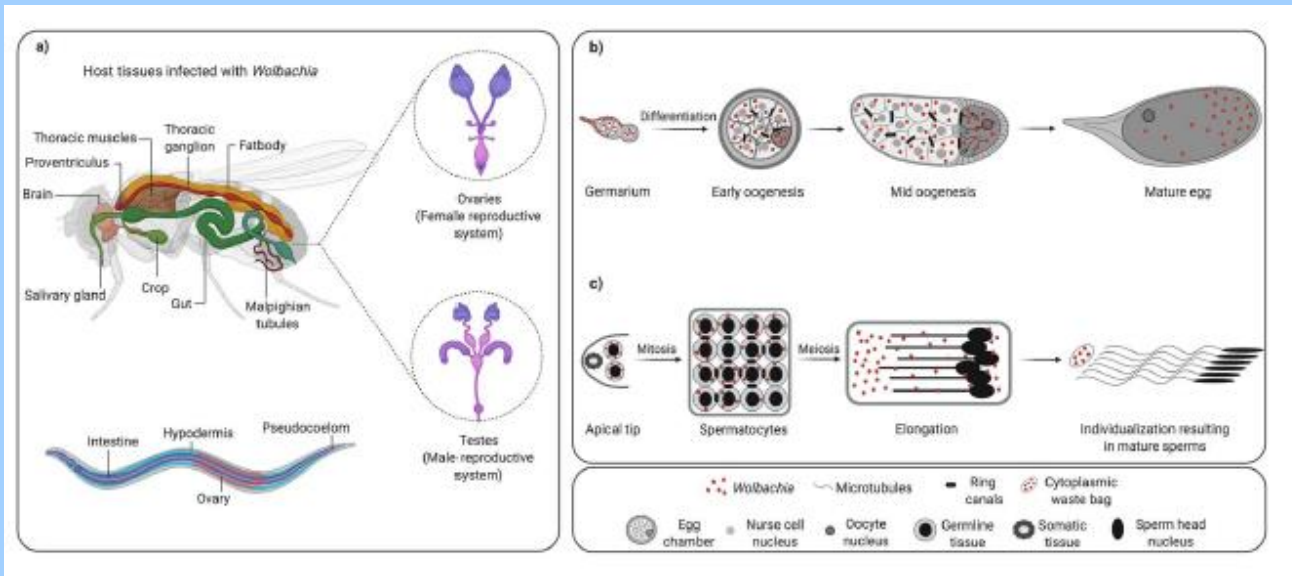
Década de 90
Análises 16S rDNA



Transmissão da *Wolbachia*

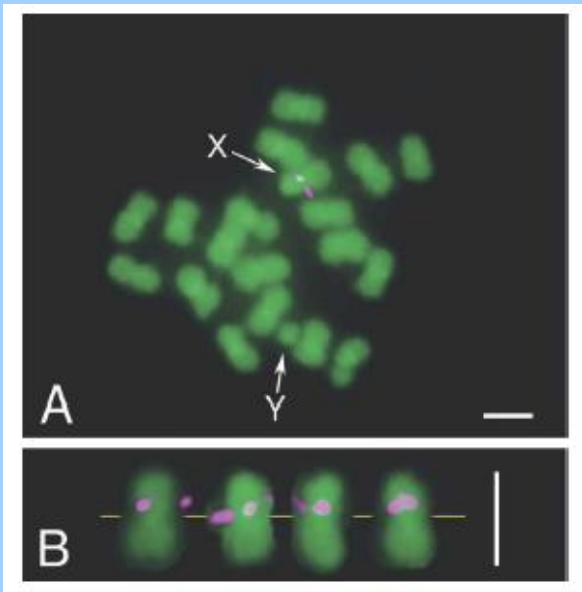
Vertical – Fêmeas para a prole via citoplasma dos ovos

Horizontal – Entre hospedeiros distintos (predação; contato; etc)



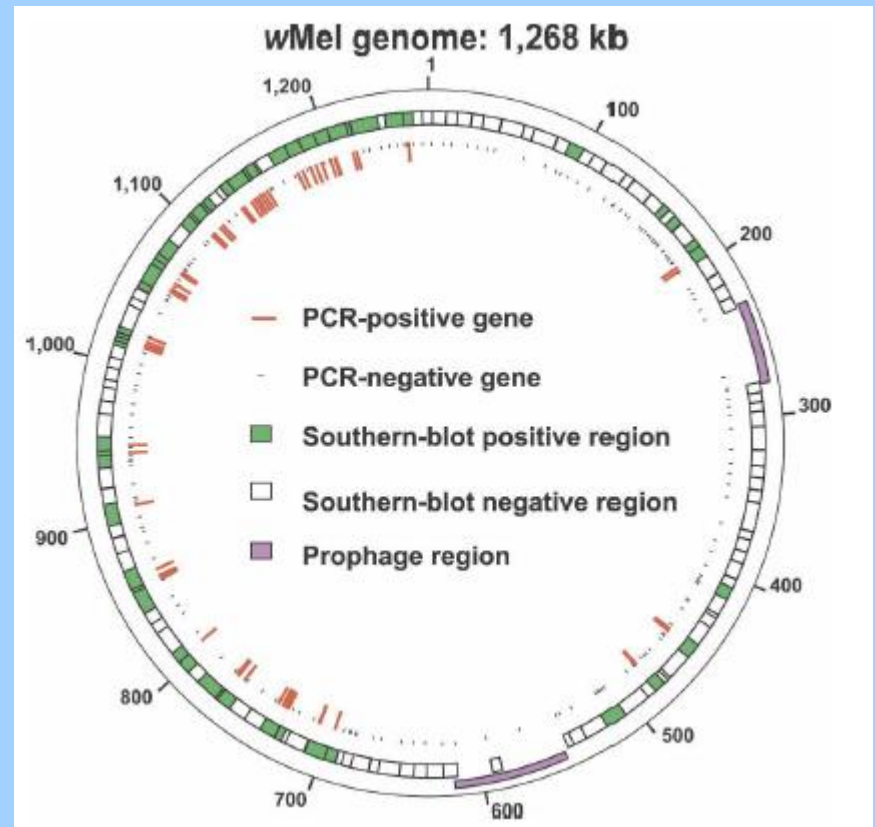
Cromossomos

Wolbachia



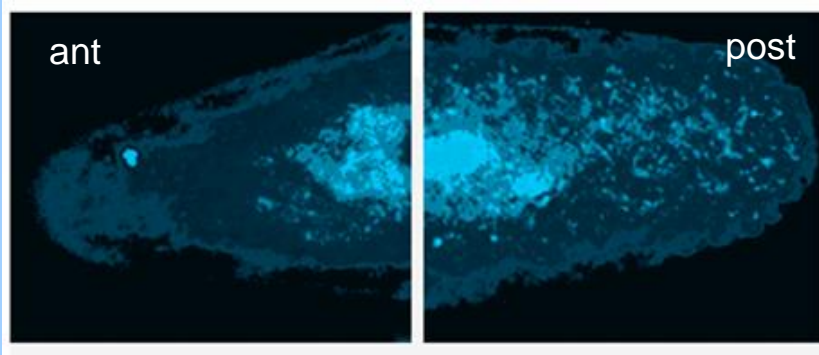
Callosobruchus chinensis

Genoma



Nikoh et al. (2008) Genome Res 18: 272-280

Wolbachia em ovos de *Anastrepha*



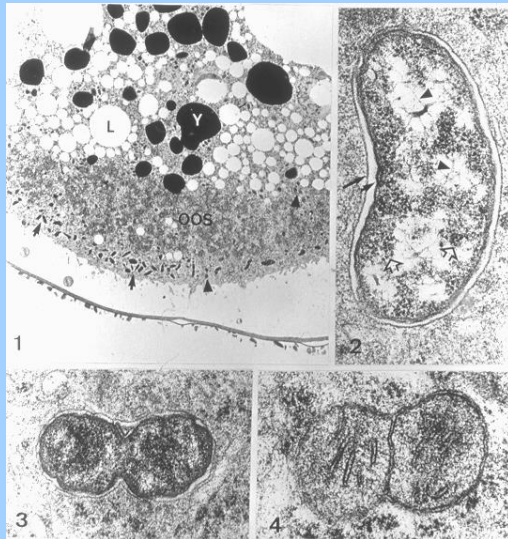
Efeito das *Wolbachia* nos hospedeiros



Alterações reprodutivas

- Partenogênese
- Feminização
- Incompatibilidade citoplasmática
- Morte dos machos

OVO

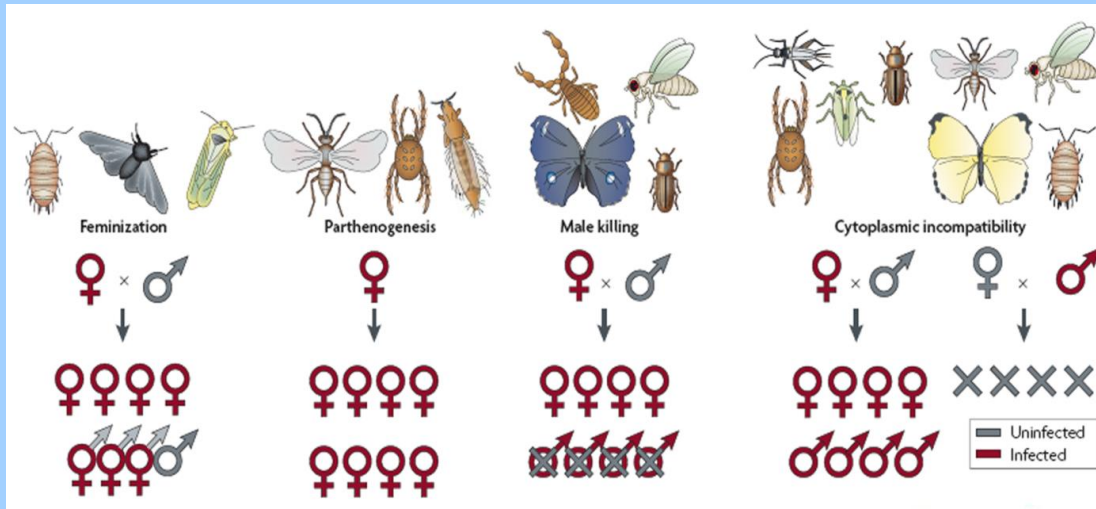


Wolbachia

Wolbachia

mitocôndrias

Laven (1951, 1959) IC em *Culex pipiens*
herança citoplasmática
Yen & Barr (1971) associação de IC com *Wolbachia*



INCOMPATIBILIDADE CITOPLÁSMICA UNIDIRECIONAL

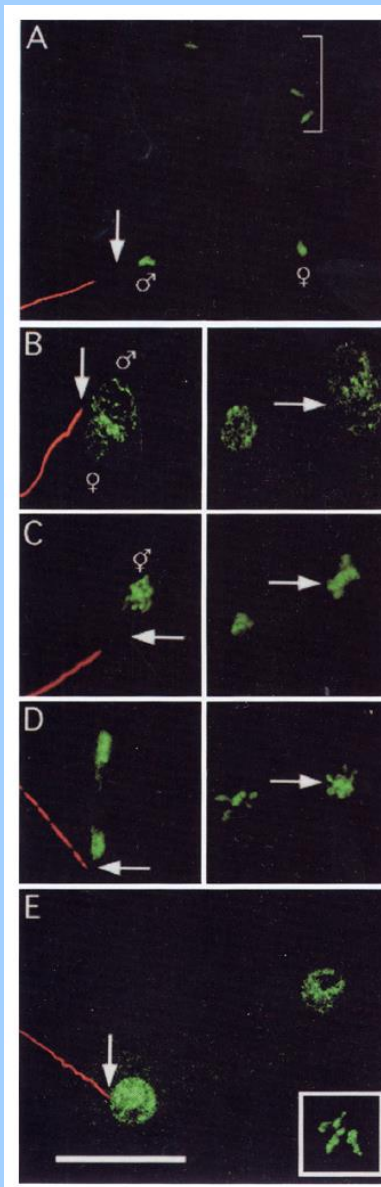
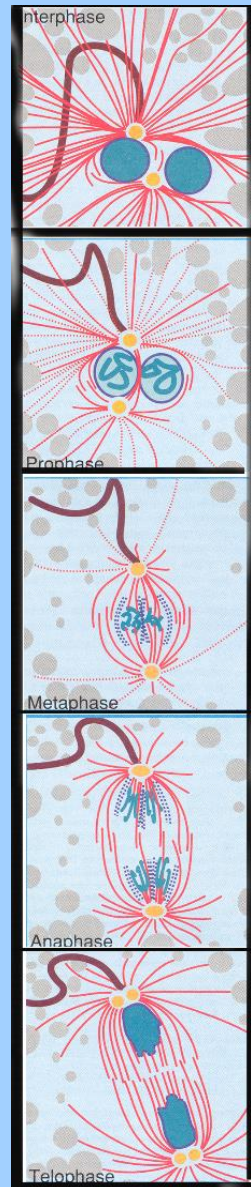
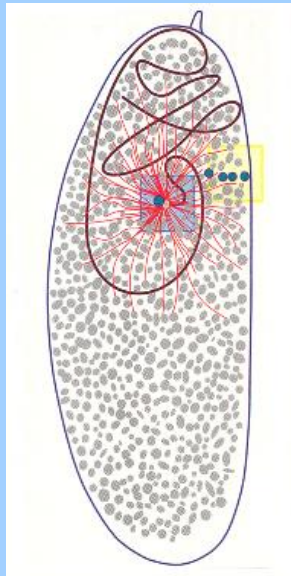


INCOMPATIBILIDADE CITOPLÁSMICA BIDIRECIONAL

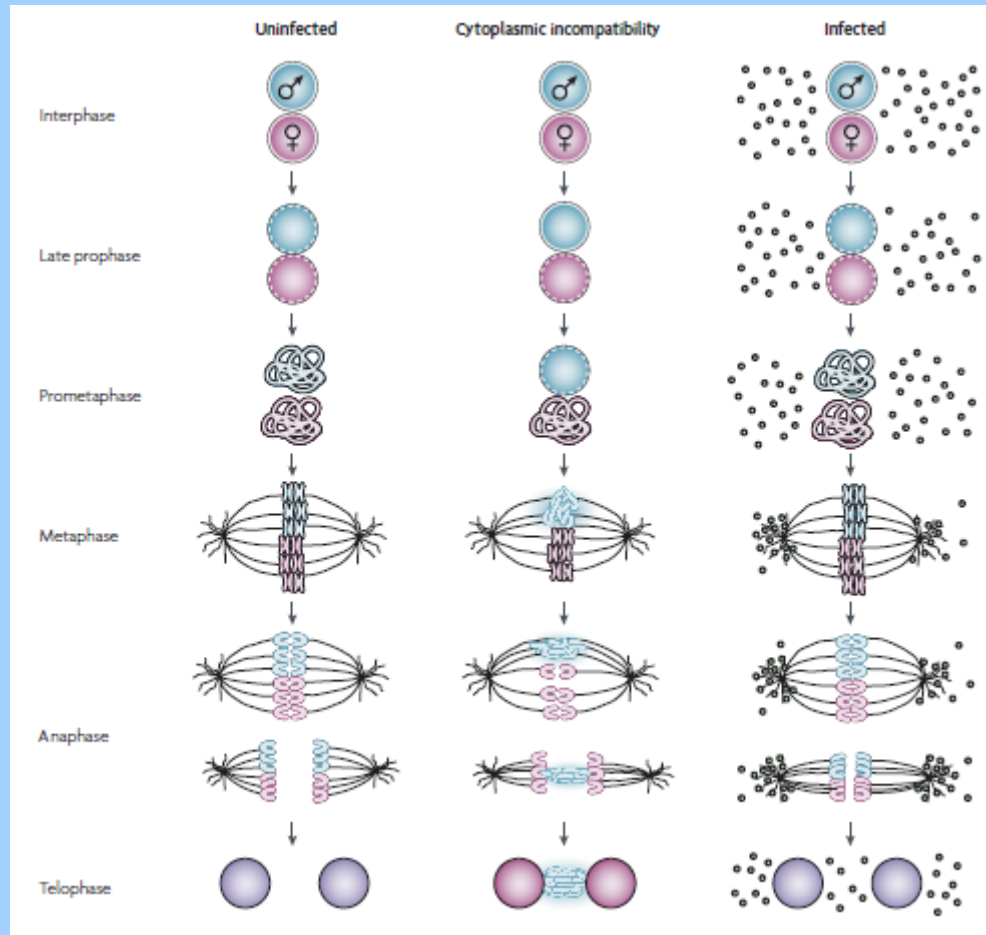


Macho W+ X Fêmea W-

Singamia e primeira divisão
do zigoto em *Drosophila*

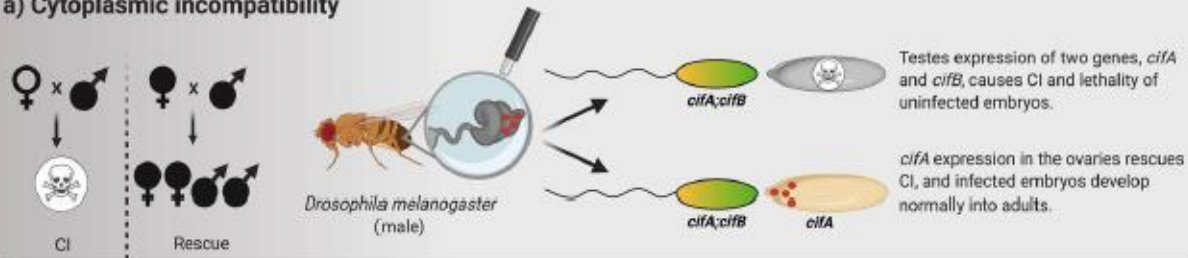


Lassy & Karr (1996) Mech Dev 57: 47-58

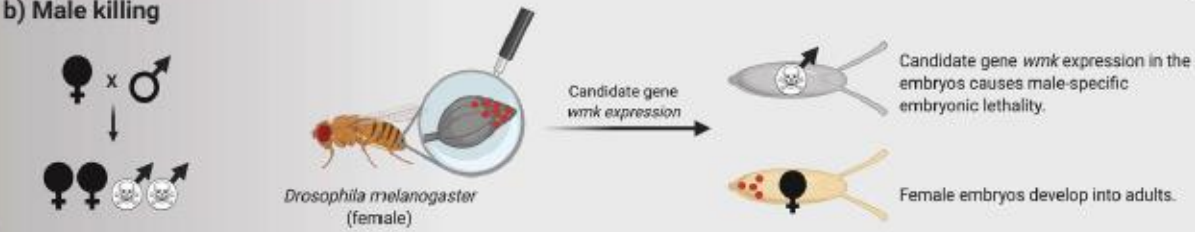


Werren et al (2008) Nature Rev Microbiol 6: 741-751

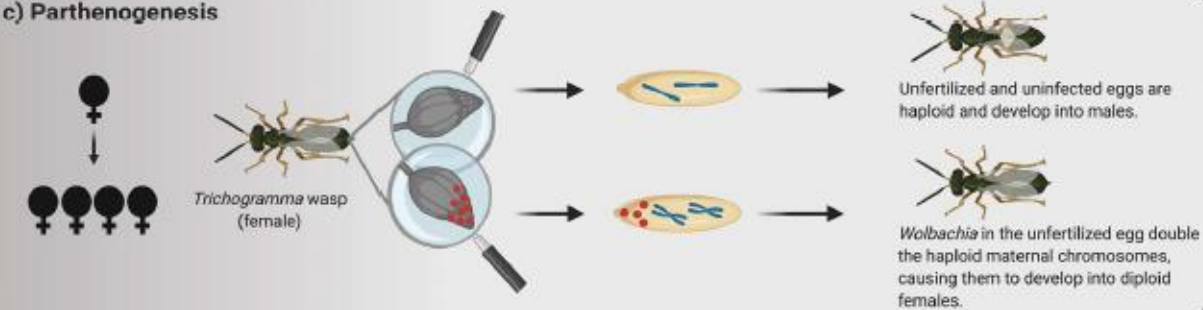
a) Cytoplasmic incompatibility



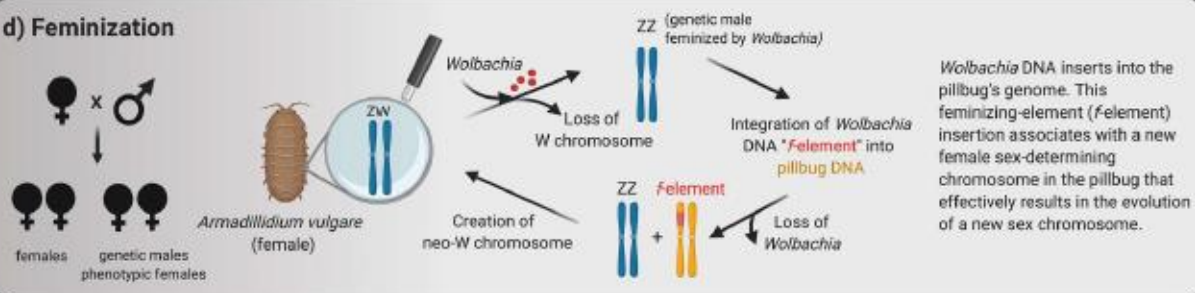
b) Male killing



c) Parthenogenesis

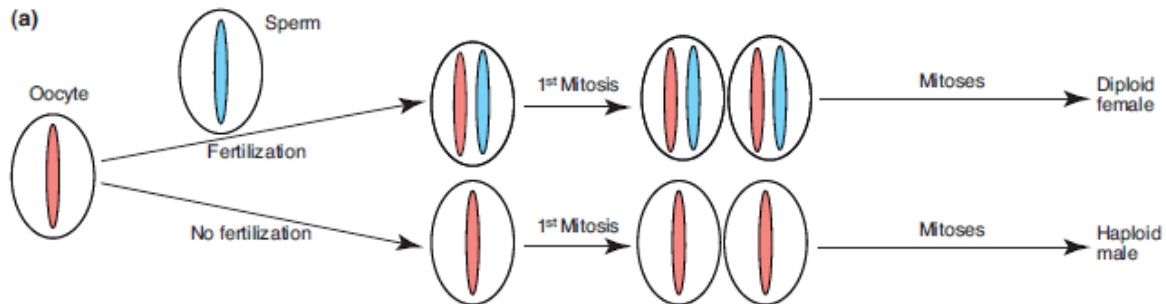


d) Feminization

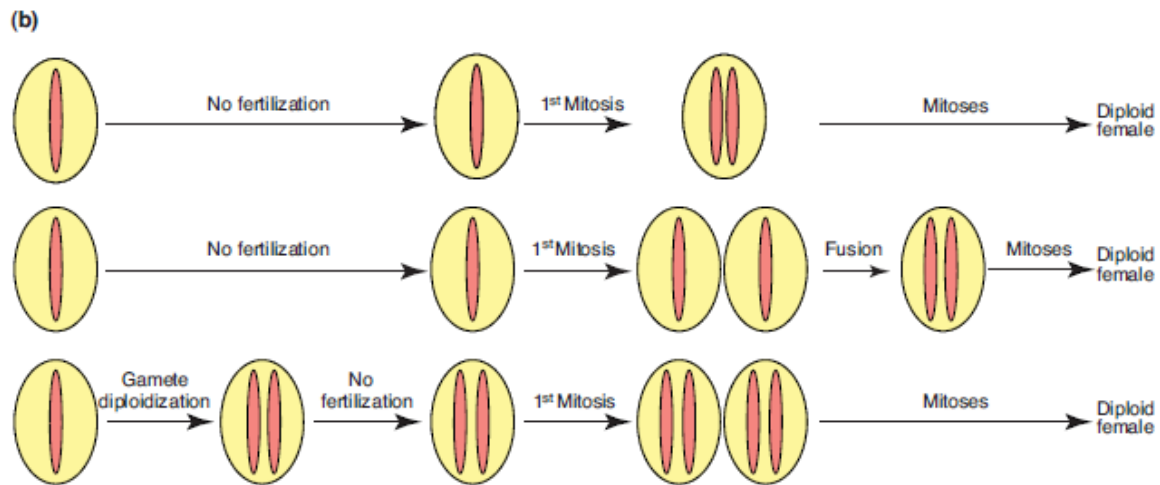


Indução de partenogênese - Himenópteros

Normal

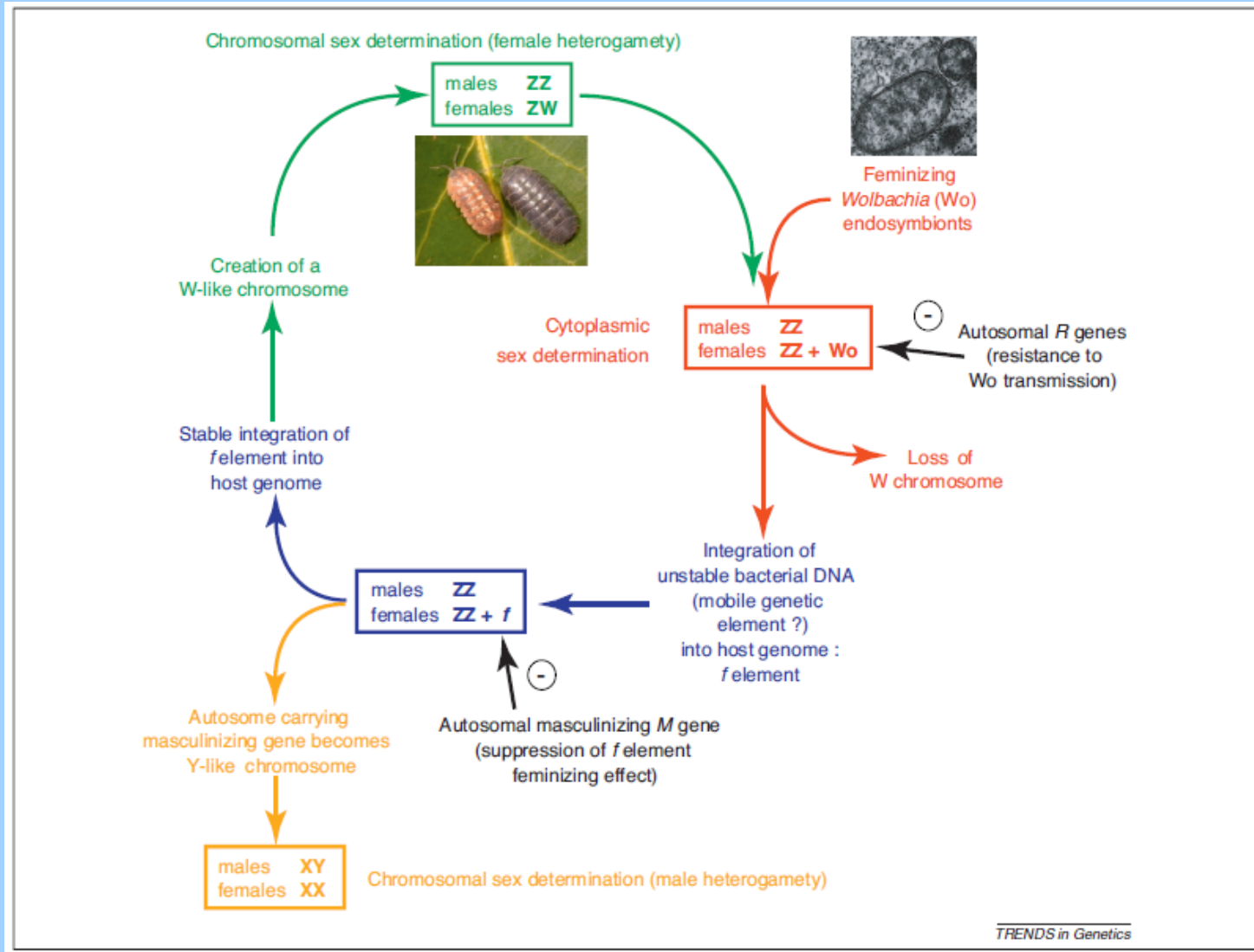


Infectado



TRENDS in Genetics

Feminização de machos – *Armadillidium vulgare*



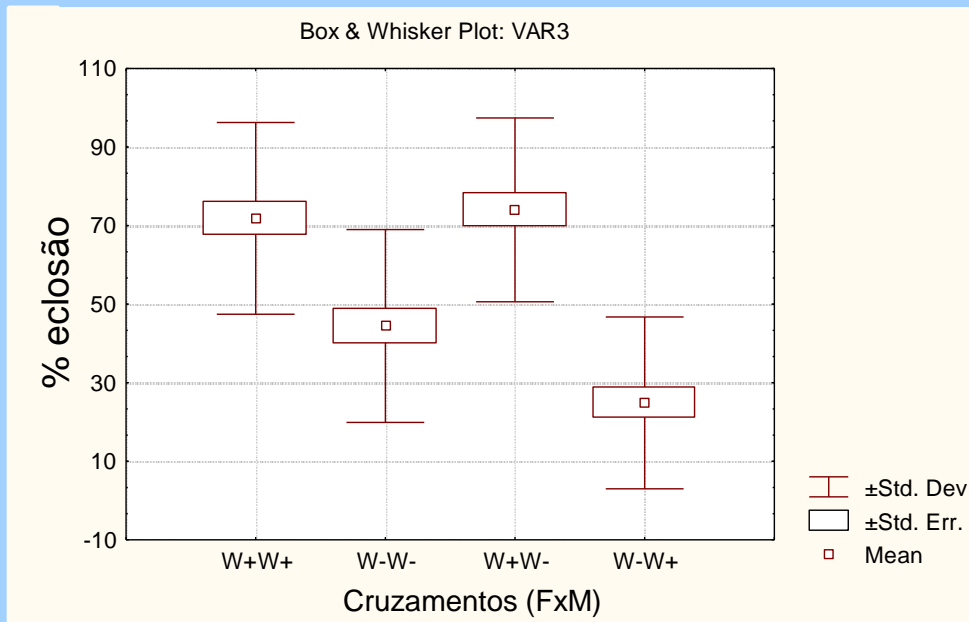
Incompatibilidade citoplasmática unidirecional

Macho infectado X fêmeas não infectada

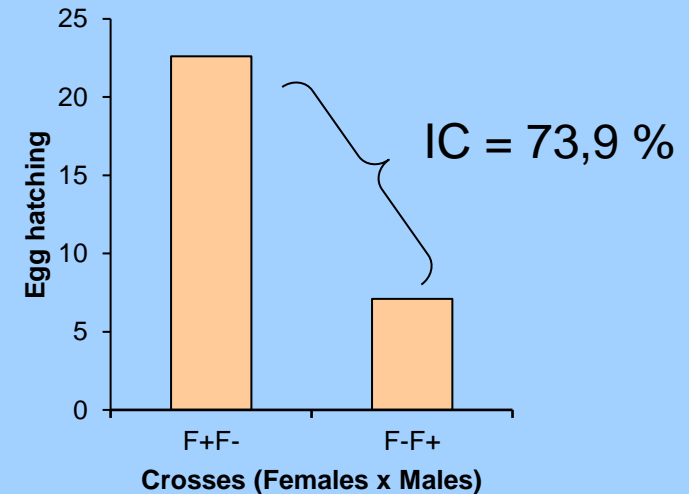
Genes *cifA* e *cifB* (*Drosophila*)

Machos W+ → expressão de *cifA* + *cifB* → induz IC

Fêmeas W+ → expressão de *cifA* → recupera

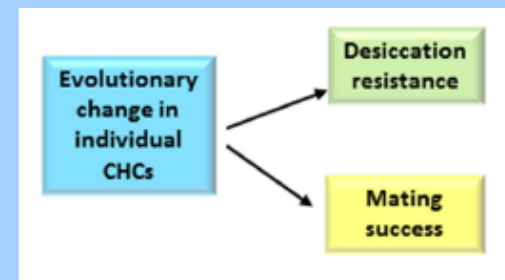
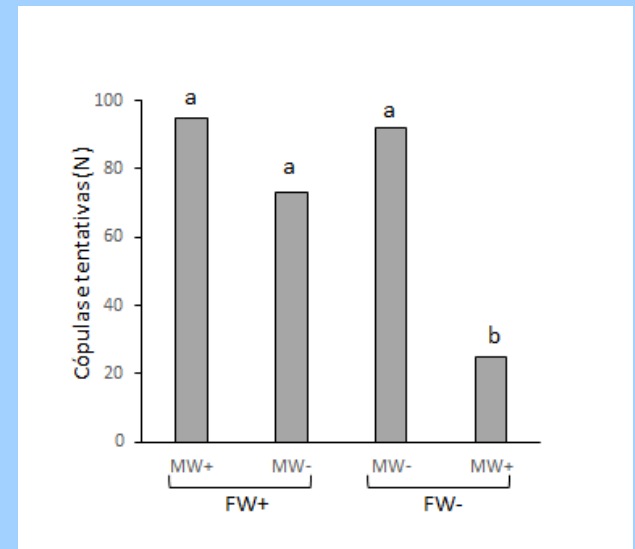
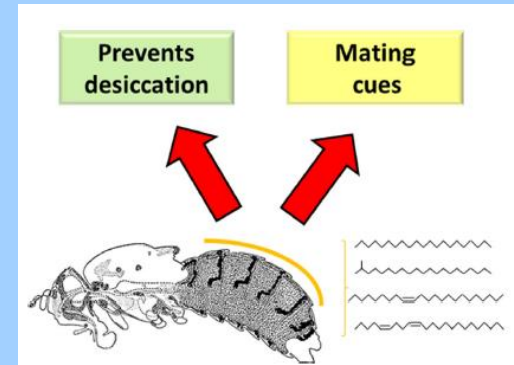


Anastrepha sp.1 fraterculus

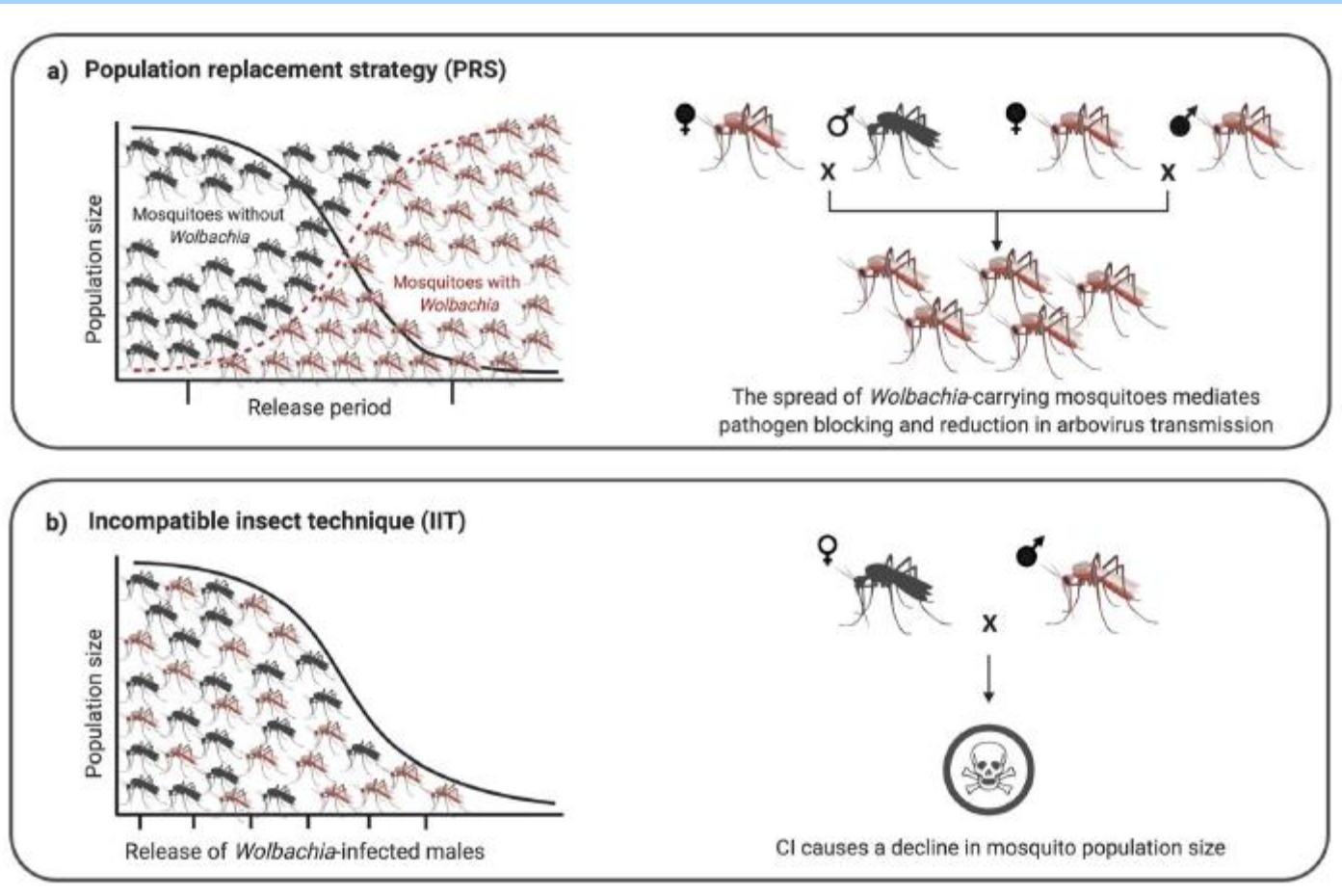


Hidrocarbonetos cuticulares (alcanos)

SP1 W-			SP1 W+		Significativo
T. R. min	% do total	Desvio Padrão	T. R. min	% do total	
40,722	15,566%	0,06%	40,722	13,212%	sim
40,906	6,502%	0,30%	40,907	5,608%	sim
41,205	8,127%	0,56%	41,203	6,097%	sim
41,612	0,453%	0,24%	41,611	0,627%	não
			41,668	0,420%	
			41,739	0,562%	
42,177	1,805%	0,15%	42,181	1,603%	sim
43,246	6,308%	0,24%	43,247	5,295%	sim
43,349	6,684%	0,08%	43,352	6,235%	sim
43,542	13,913%	0,43%	43,543	14,091%	37: 822-830,
43,806	1,228%	0,22%	43,807	1,028%	não
			44,218	0,759%	
45,711	1,349%	0,20%	45,716	1,618%	sim
45,779	3,489%	0,15%	45,785	3,815%	sim
45,867	2,254%	0,19%	45,872	2,817%	sim
			45,948	1,200%	
46,043	2,389%	0,06%	46,048	2,396%	não
			47,027	0,247%	
48,201	17,776%	0,05%	48,220	22,231%	sim
			48,288	8,477%	
48,322	8,225%	0,55%			
48,409	1,059%	0,09%	48,412	0,992%	não
			50,543	0,670%	
	Total SP1 W-		Total SP1 W+		
	97,13%		100,0%		



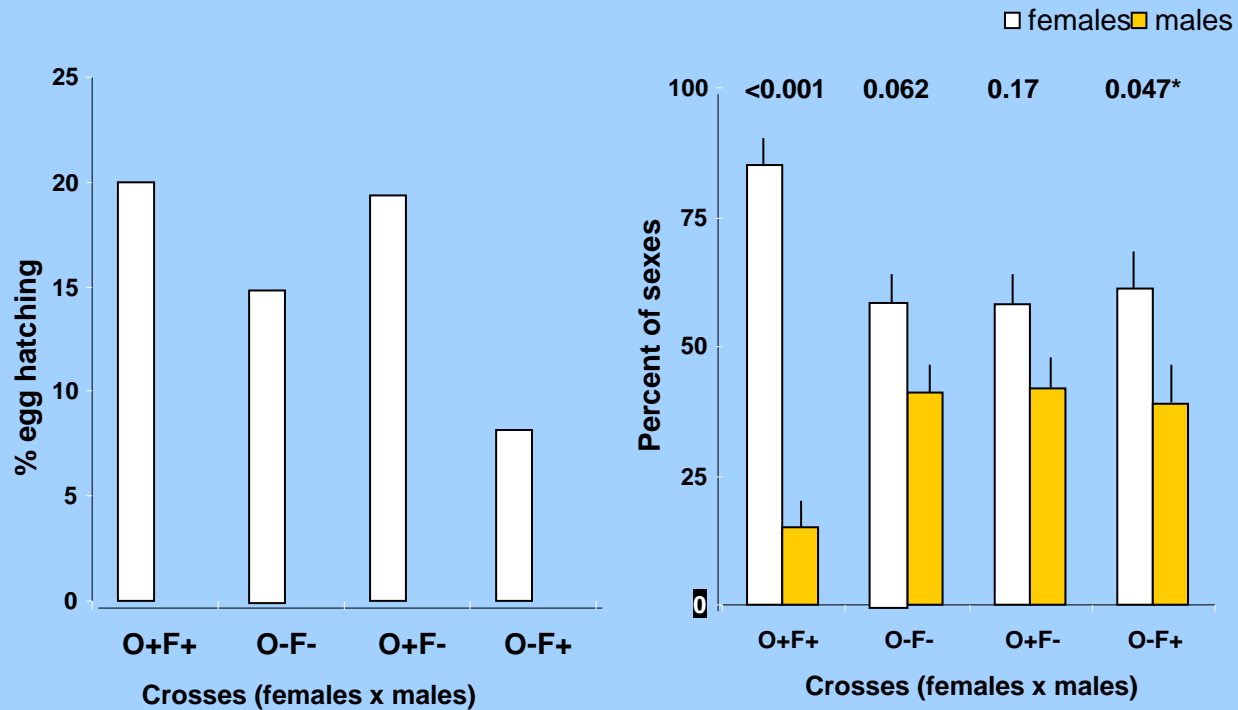
Wolbachia - controle populacional de insetos



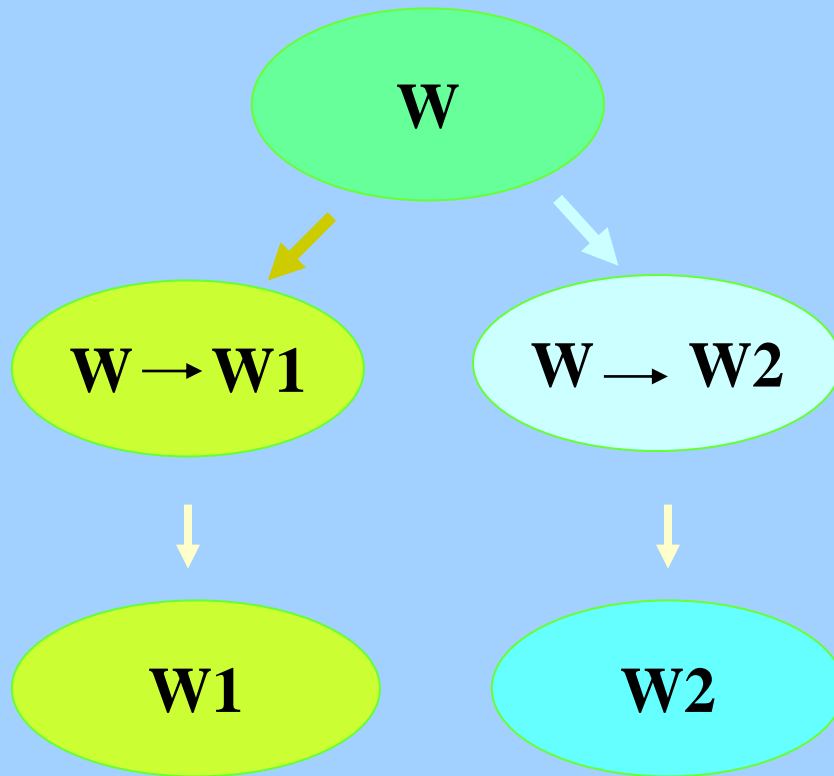
cruzamento entre espécies – *Anastrepha* sp1 X *A. obliqua*

F sp1 X M obl → eclosão ~5%; somente fêmeas

F obl X M sp1 → eclosão ~20%; fêmeas > machos



Evolução da incompatibilidade em populações alopátricas



	macho	fêmea	progênies
	W	W1	compatível
	W1	W	incompatível
	W	W2	compatível
	W2	W	incompatível
	W1	W1	compatível
	W1	W2	incompatível
	W2	W1	incompatível
	W2	W2	compatível

W = *Wolbachia*