



Apis mellifera resistance to *Varroa destructor* across continents

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Beaurepaire, A. Antúnez, K., Branchiccela, B., Castelli, L., Invernizzi, C.,
Le Conte, Y., Mondet, F., Dalmon, A.

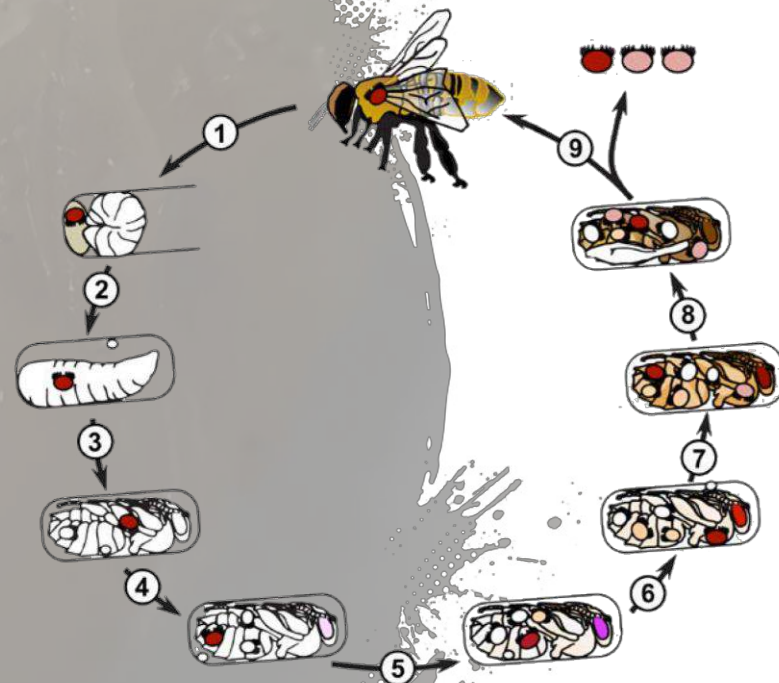
Varroa destructor

Is the most devastating parasite of *Apis mellifera*

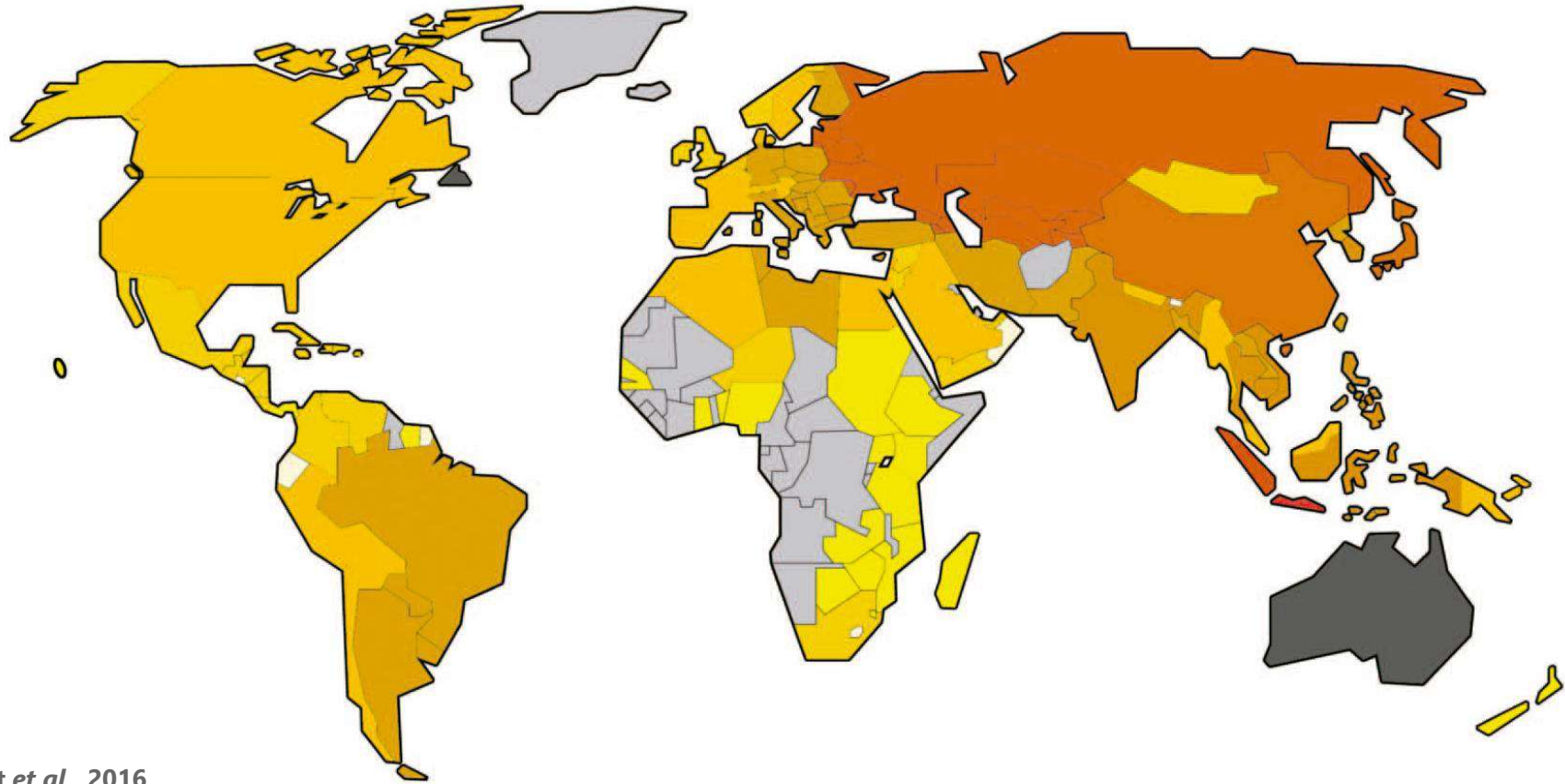
Spends its life inside the hives and reproduces inside the brood cells that contain pupae

Also causes damages because it transmits viruses

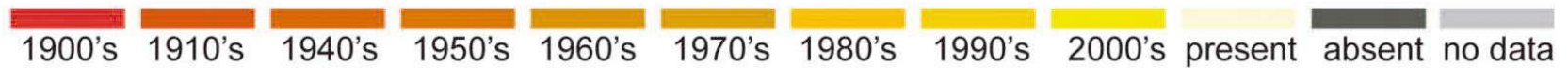
Colonies that are not treated normally die after a few years



Global spread of *V. destructor* in *A. mellifera*



Wilfert *et al.*, 2016



Some populations of *A. mellifera* survive varroa infestation without treatment





Signif. diff. from mite-susceptible population

Non signif. diff.

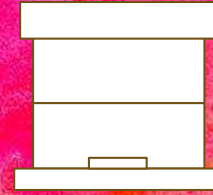
Not yet been measured

AHB africanized honey bees**EHB** european honey bees**AHB****EHB****EHB****EHB****EHB****AHB**

Brazil

South Africa

Fernando de
NoronhaPrimorsky,
RussiaGotland,
SwedenAvignon,
FranceArnot Forest,
NY, USATreinta y Tres
UruguayHygienic
behaviourGrooming
behaviourSmall colony
sizeReduced
development
timeReduced mite
reproduction**In Uruguay honey bees are africanized**



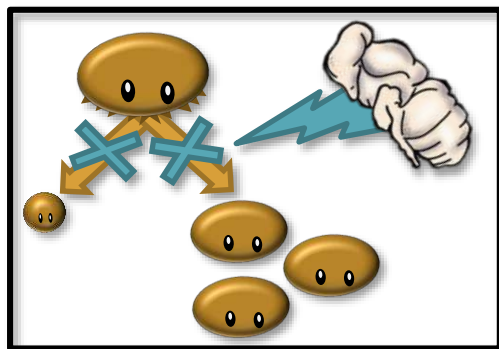
The aim of this work was to
characterize possible traits associated
with the natural survival of these
populations



Grooming



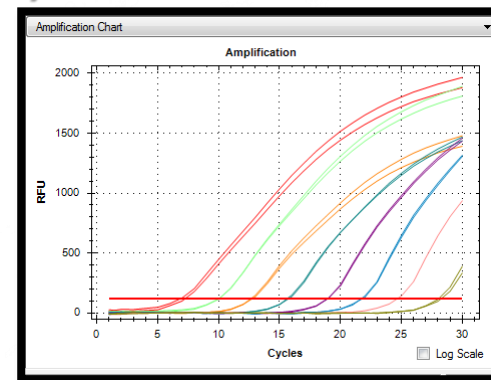
Varroa-Sensitive Hygiene (VSH)



Suppression of Mite Reproduction (SMR)



Differences of varroa (Genotyping)

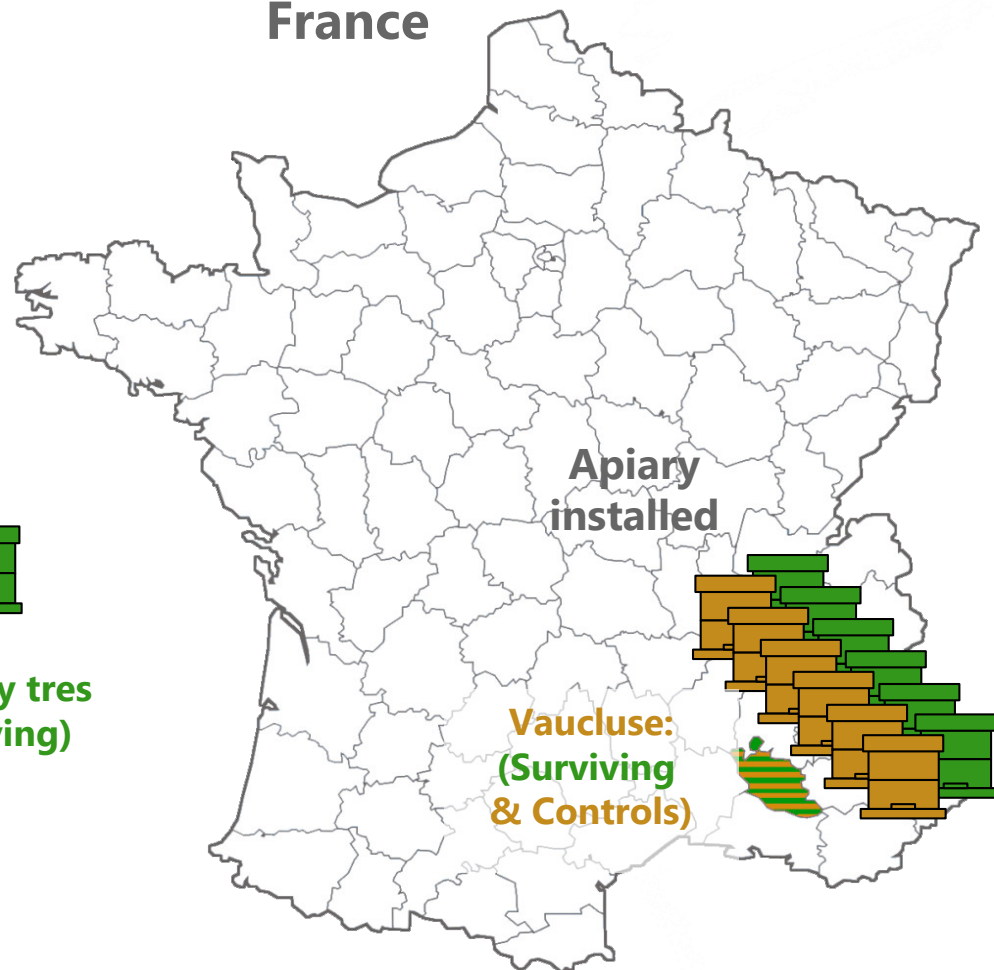


DWV quantification and sequencing

Uruguay



France



Artificial infestation:

Morning



Find old larvae



Mark cells

Afternoon

Open the hive



Collect mites



Find cells

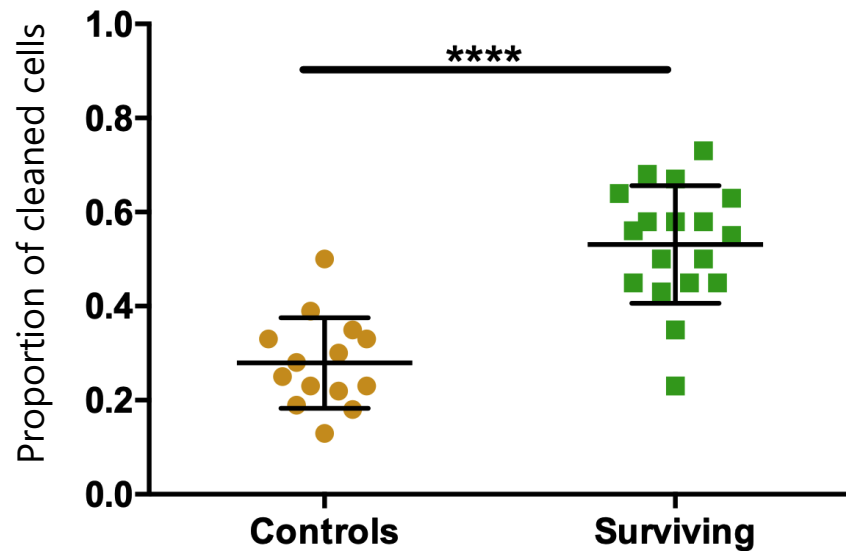


Infest cells

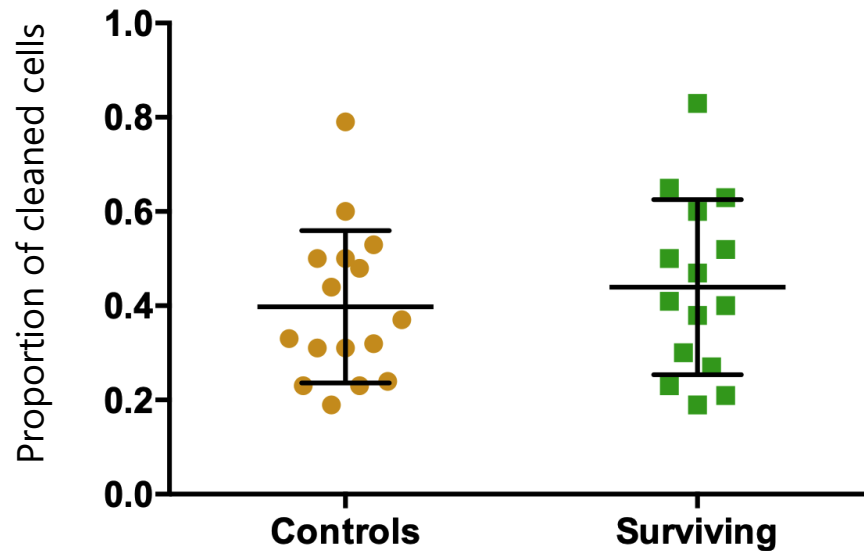
7 days later: VSH Index



Uruguay



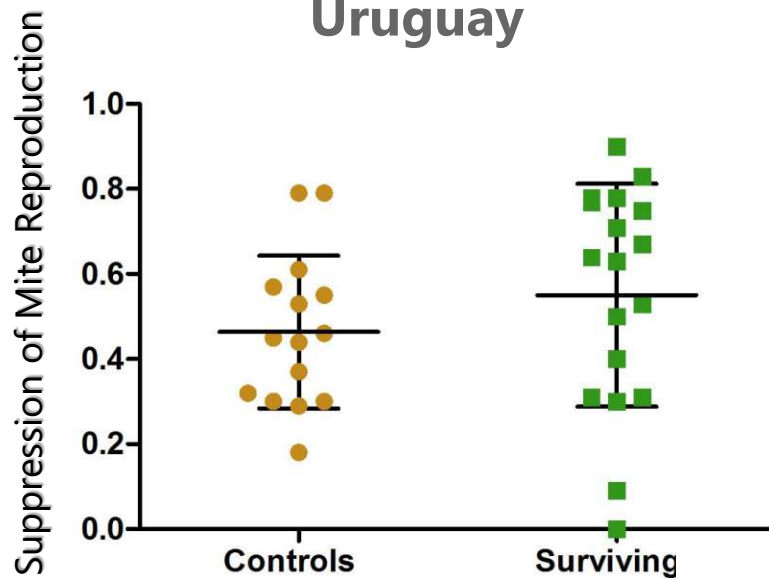
France



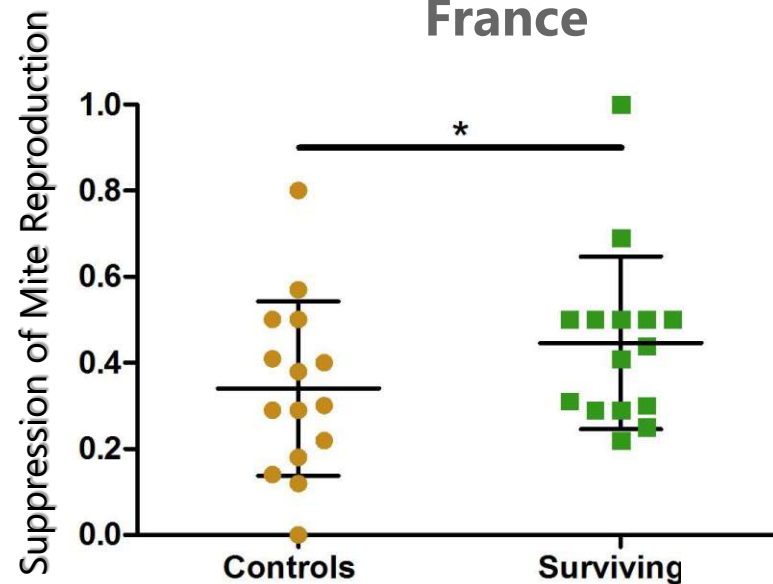
7 days later: SMR index



Uruguay

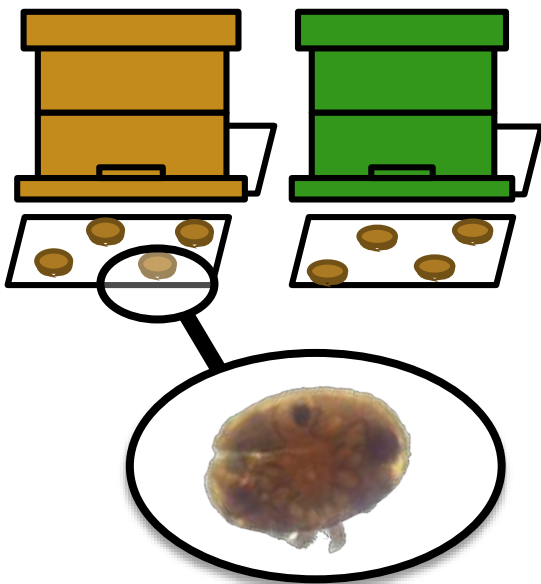


France



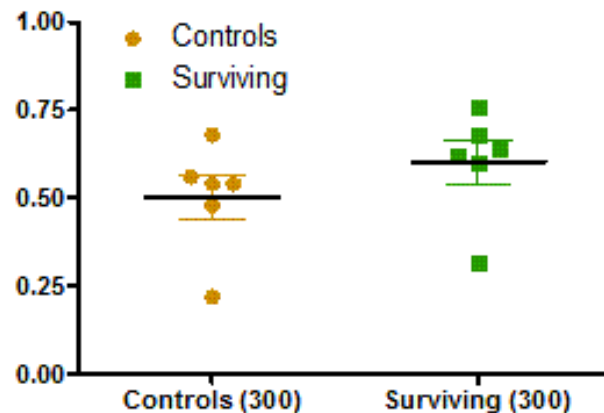
Grooming

...1 week...

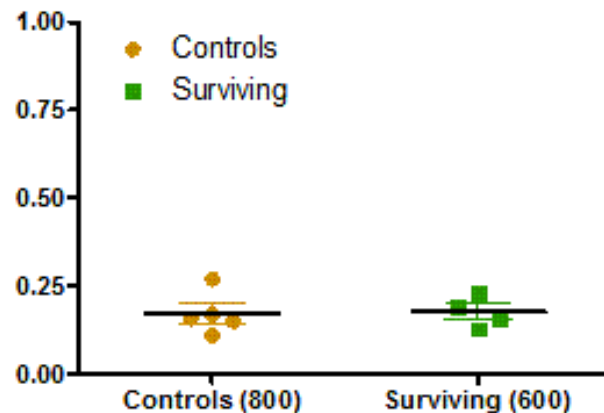


Controls
Surviving

Proportion of damaged mites (mean \pm SEM)



(N Varroa = 1400)

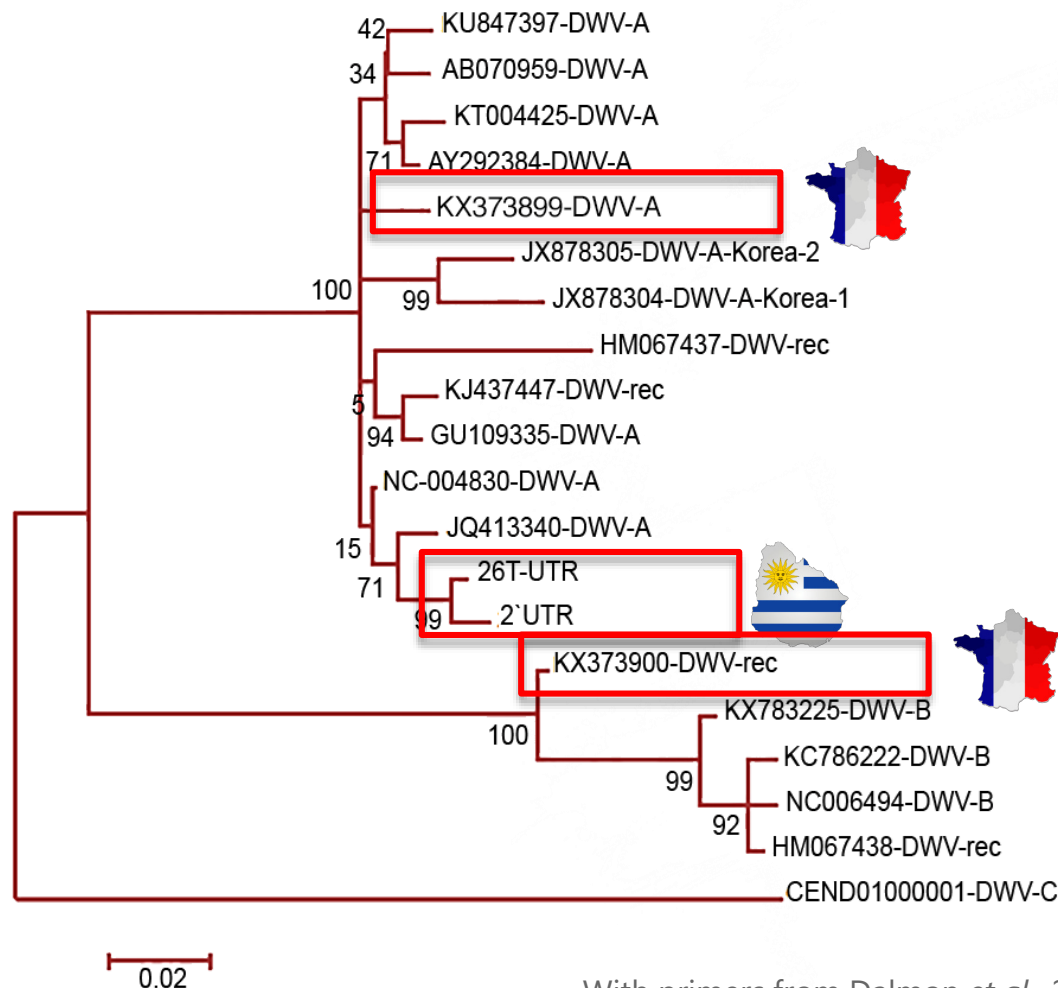
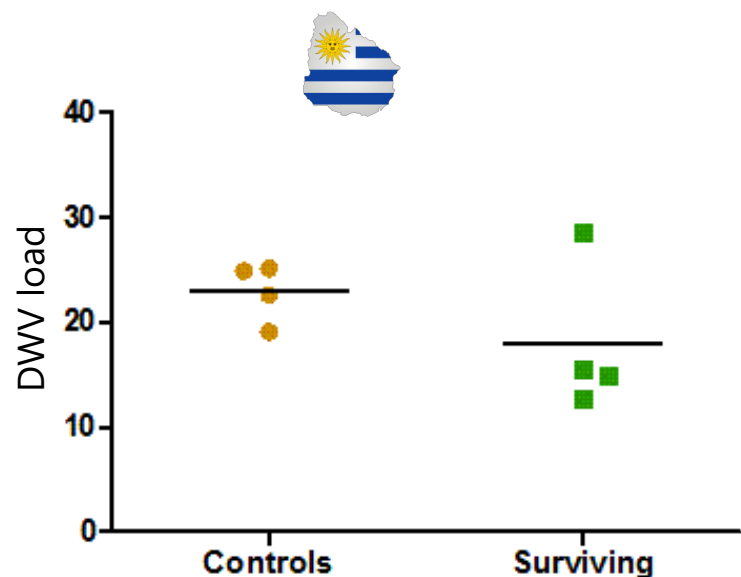


(N Varroa = 908)

* Mann-Whitney test $p < 0,05$

DWV quantification and sequencing

Absolute quantification by RT-qPCR

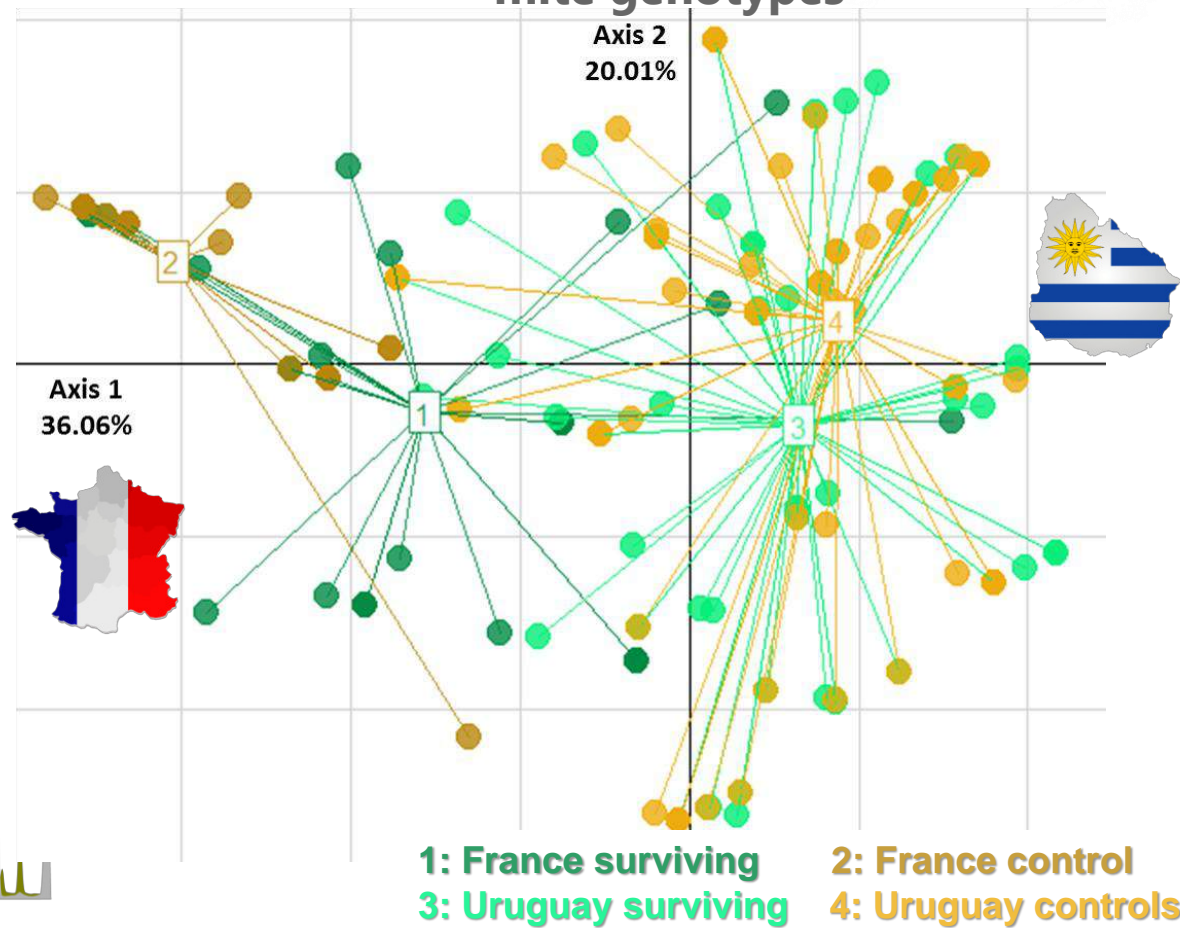
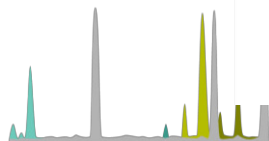
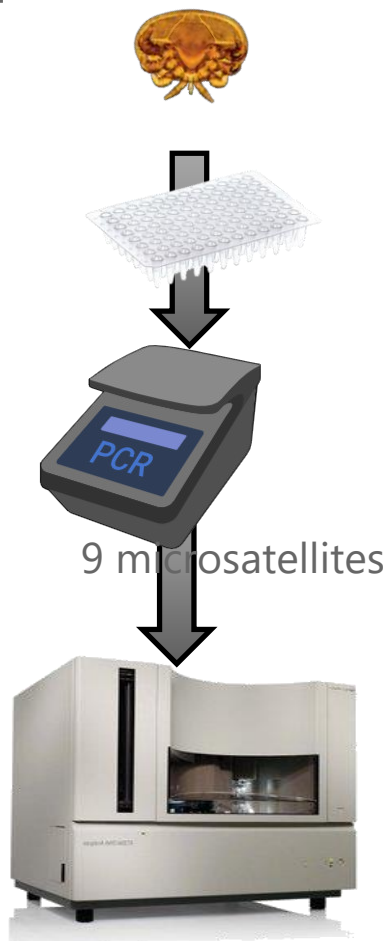


With primers from Kevill *et al.*, 2017
DWV circulating in Uruguay is DWV-A

With primers from Dalmon *et al.*, 2017

Population structure of varroa

Principal Component Analysis based on mite genotypes





Signif. diff. from mite-susceptible population



Non signif. diff.



Not yet been measured

Different behaviors are contributing to colony survival in the two surviving honeybee populations

| | Brazil | South Africa | Fernando de Noronha | Primorsky, Russia | Gotland, Sweden | Avignon, France | Arnot Forest, NY, USA | Treinta y Tres Uruguay |
|-------------------------------|--------|--------------|---------------------|-------------------|-----------------|-----------------------|-----------------------|------------------------|
| Hygienic behaviour | | | | | | | | |
| Grooming behaviour | | | | | | | | |
| Reduced mite reproduction | | | | | | | | |
| Divergence in mite population | | | | | | | | |
| DWV population | | | | | | DWV-A VDV-1 REC | | DWV-A |

Thanks!

Any questions?

Alexis Beaurepaire
Karina Antúnez
Belén Branchiccela
Loreley Castelli
Ciro Invernizzi
Yves Le Conte
Fanny Mondet
Anne Dalmon
Cristina Sann
Carlos Silva
Gustavo Ramallo
Pablo Cracco
Arnoldo Moreni

