

INRAE



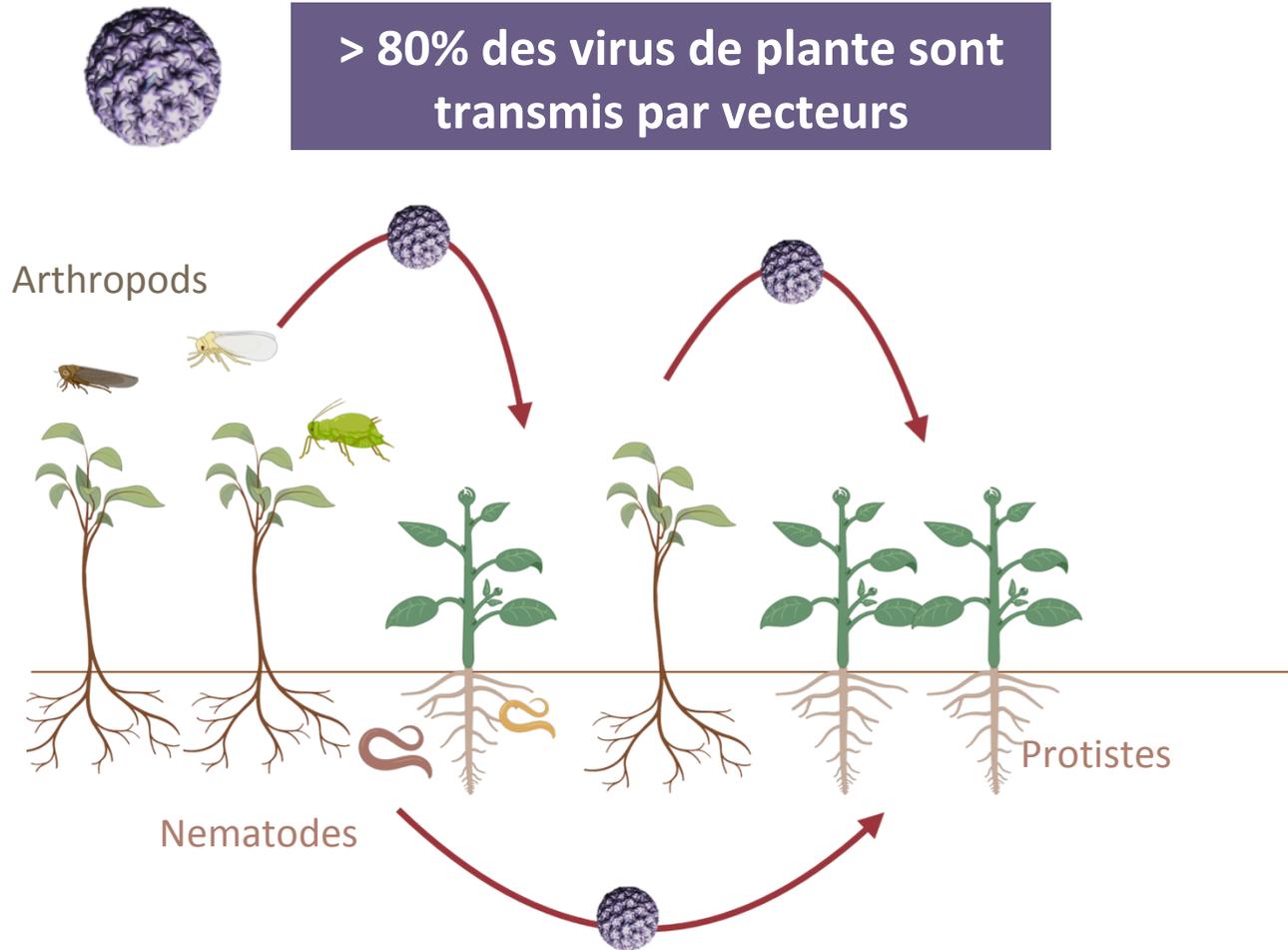
➤ Transmission non-circulante

Interactions moléculaires phytovirus-acrostyle chez les pucerons

Marilyne Uzest



➤ Pucerons, vecteurs virus de plante



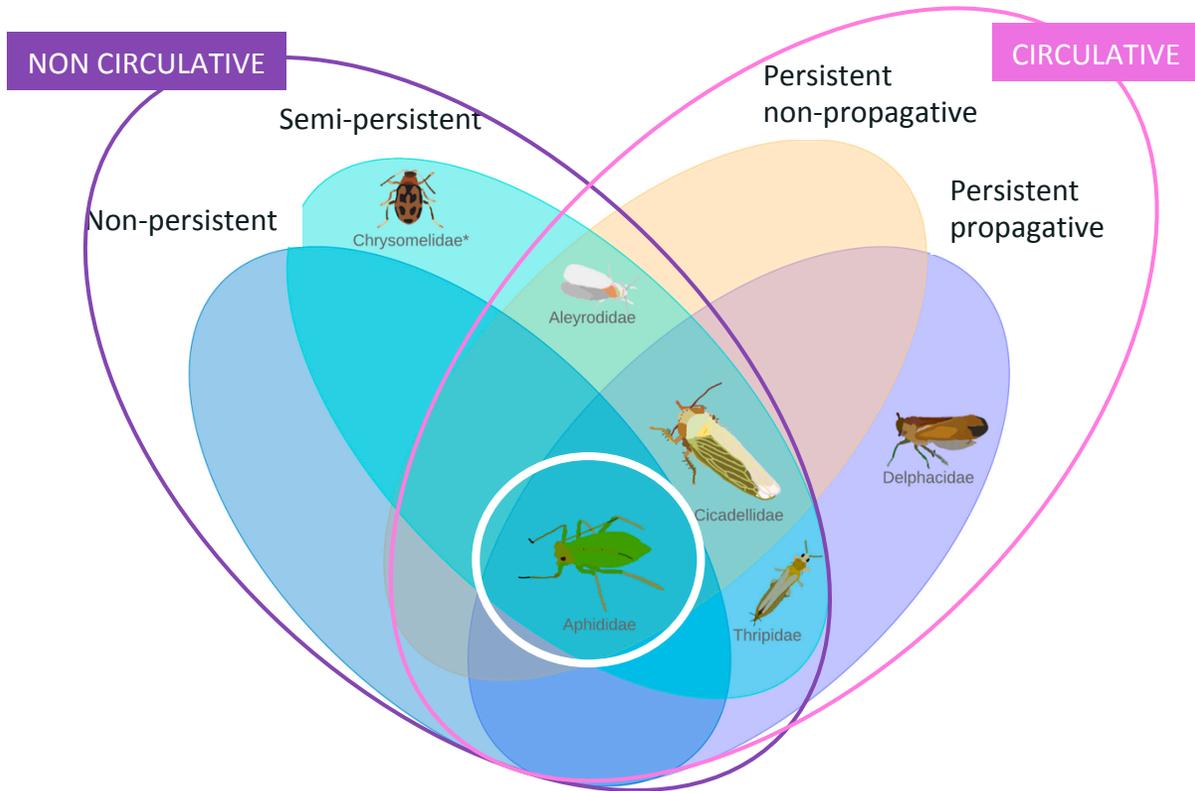
Principalement par des insectes piqueurs-suceurs

- Hémiptères **Aphididae - pucerons**
 - Aleyrodidae - aleurodes**
 - Cicadellidae - cicadelles
 - Coccoidea - cochenilles
 - Fulgoridae - fulgores
 - Membracidae – membracides
-
- Thysanoptères Thripidae – thrips



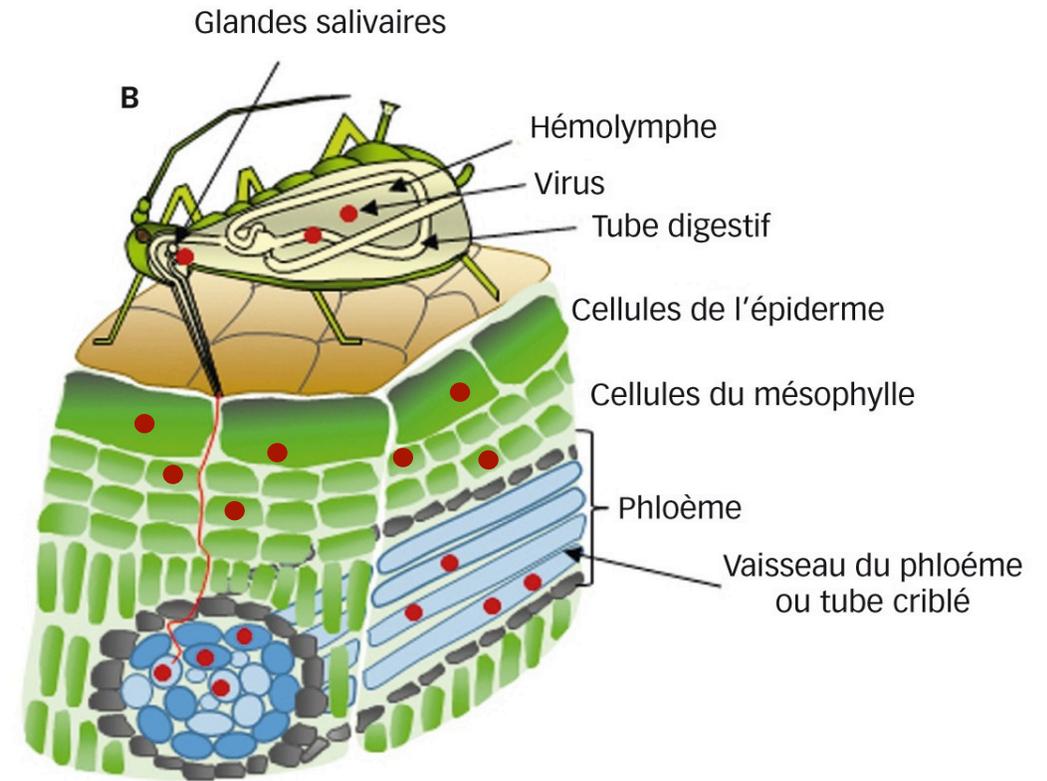
➤ Pucerons, vecteurs virus de plante

Modes de transmission les plus divers chez les pucerons



From Catto et al. 2022. *Cells*

Modes de transmission chez les pucerons



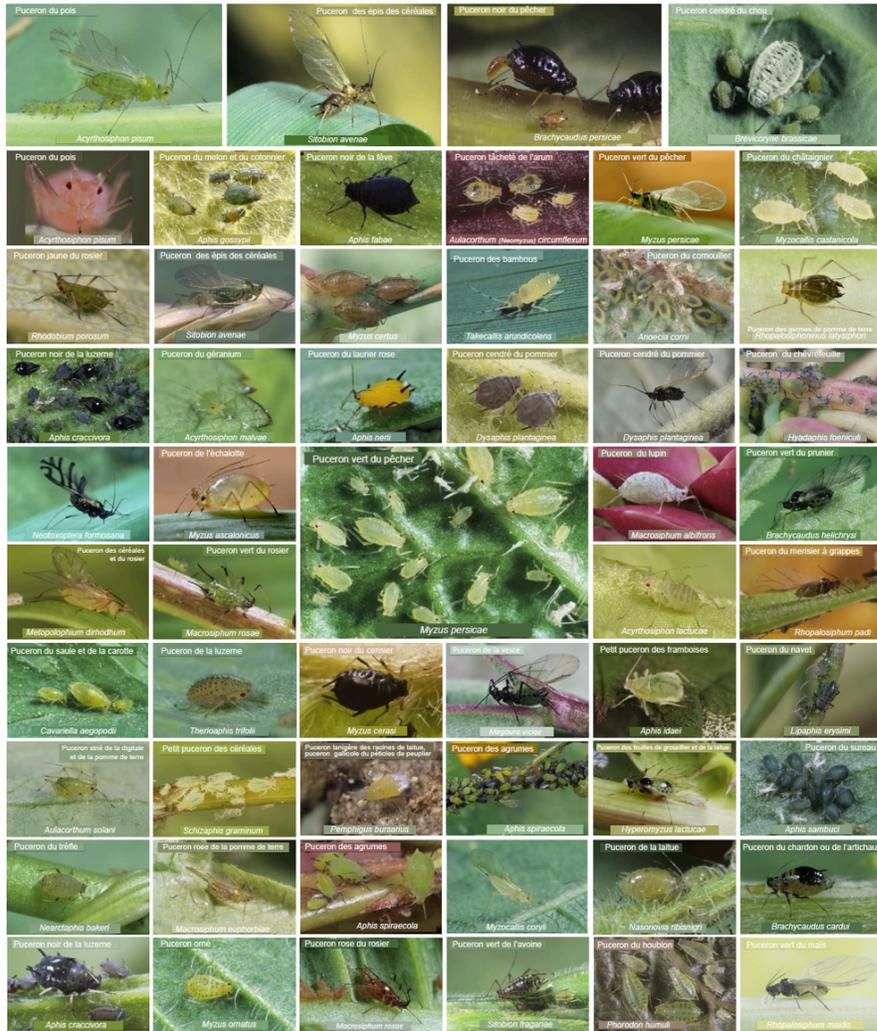
D'après Herrbach E. <https://passion-entomologie.fr/insectes-virus-plantes/>

➤ Transmission non circulante



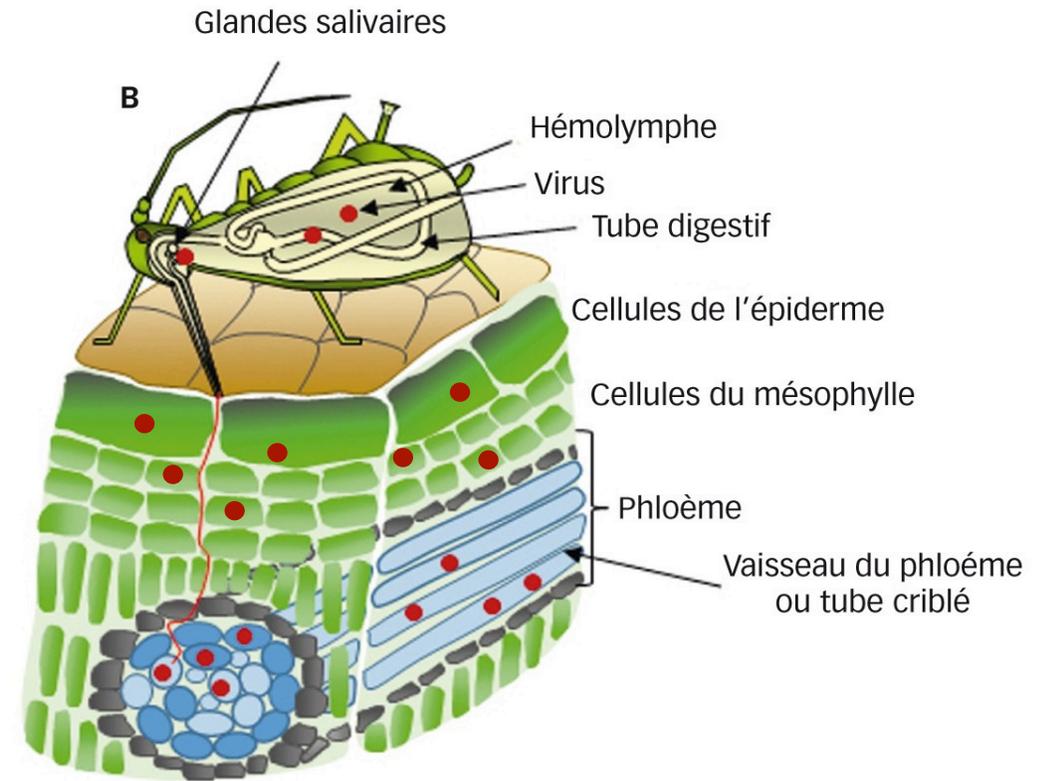
DIVERSITE DES PUCERONS VECTEURS

Sophie LE BLAYE & Marilyn UZEST - PHIM, INRAE, Montpellier



Toutes les images ©INRAE, Bernard Chaubet - <https://www6.inrae/encyclopedie-pucerons/>

Modes de transmission chez les pucerons



D'après Herrbach E. <https://passion-entomologie.fr/insectes-virus-plantes/>

➤ Transmission non circulante

Modèles d'étude

Puceron du pois
Acyrtosiphon pisum

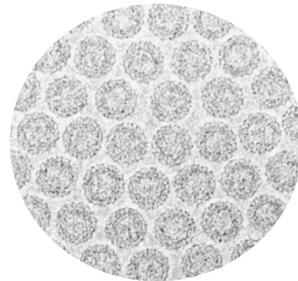


Puceron vert du pêcher
Myzus persicae



Cauliflower mosaic virus – CaMV

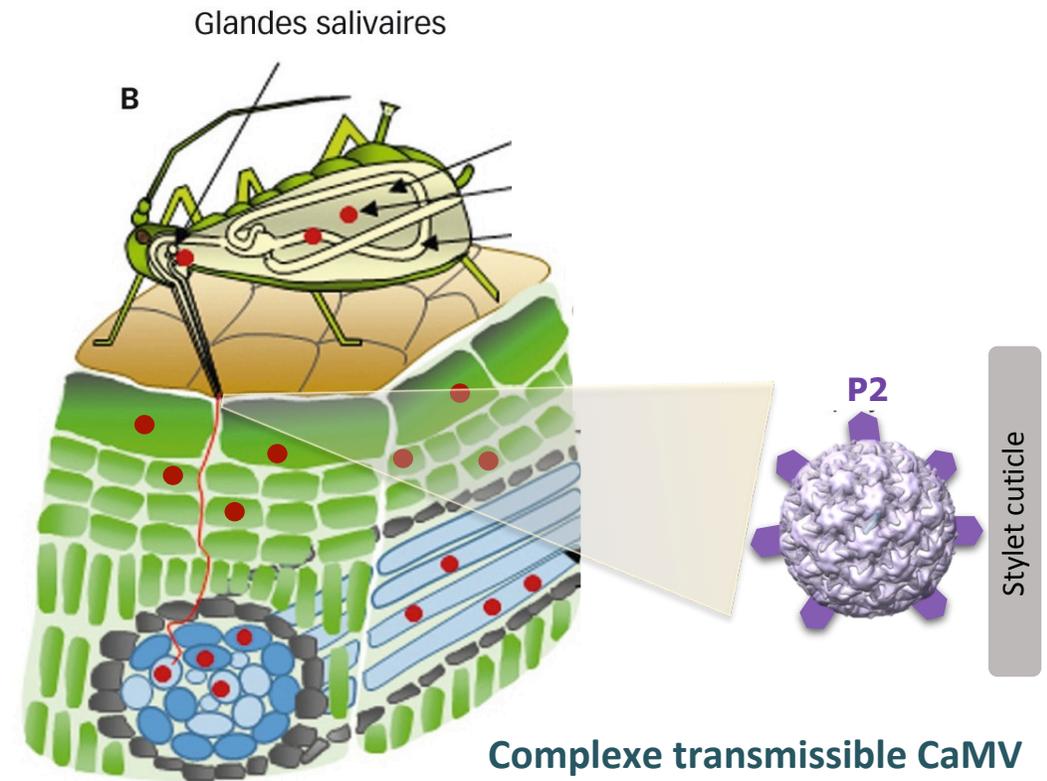
Caulimoviridae, *Caulimovirus*
dsDNA, 8k bp, 6 protéines
50 nm, icosaédrique, T=7



Infecte principalement *Brassicaceae*, *Solanaceae*

Transmis par puceron sous forme de complexe

Modes de transmission chez les pucerons



Complexe transmissible CaMV

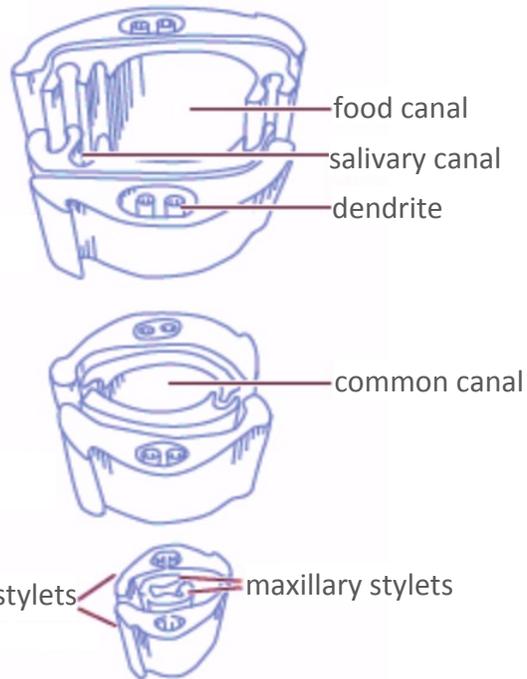
P4 Capsid protein
P3
P2 Helper protein

➤ Stylets de puceron & acrotyle

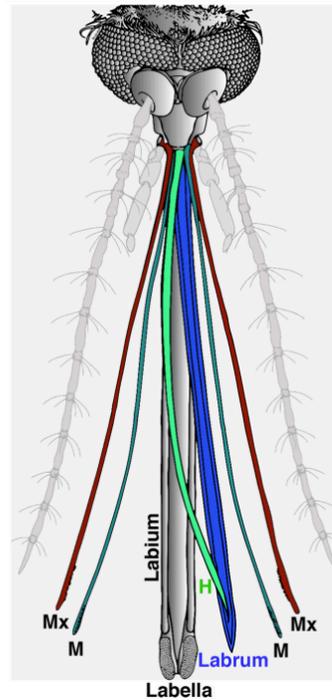
Modèles d'étude



Aphid
Stylet bundle



Mosquito



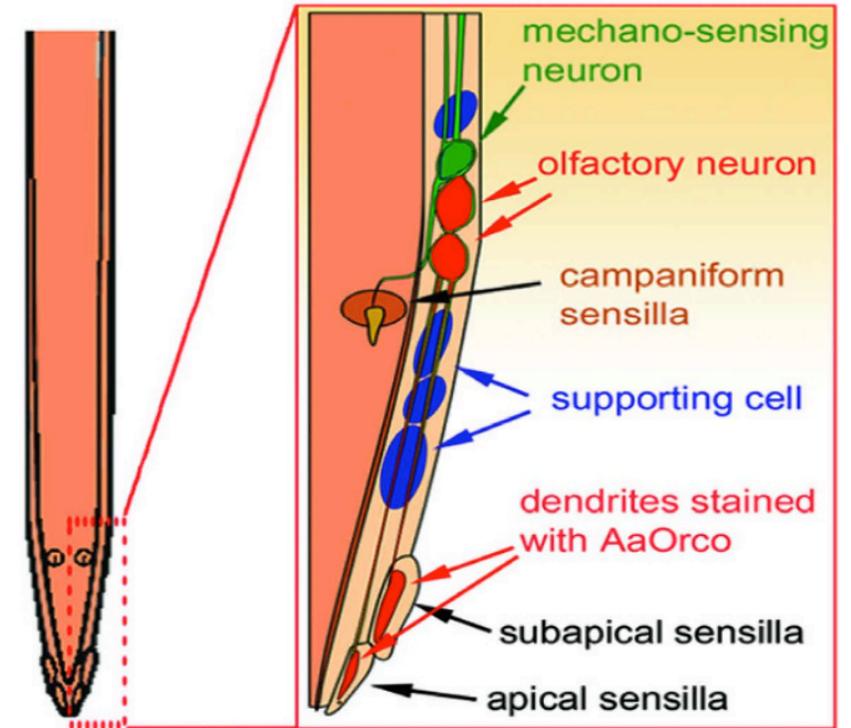
SCIENTIFIC REPORTS

OPEN

A novel olfactory pathway is essential for fast and efficient blood-feeding in mosquitoes

Received: 16 May 2014
Accepted: 27 July 2015
Published: 26 August 2015

Je Won Jung¹, Seung-Jae Baek¹, Haribalan Perumalsamy², Bill S. Hansson², Young-Joon Ahn¹ & Hyung Wook Kwon¹

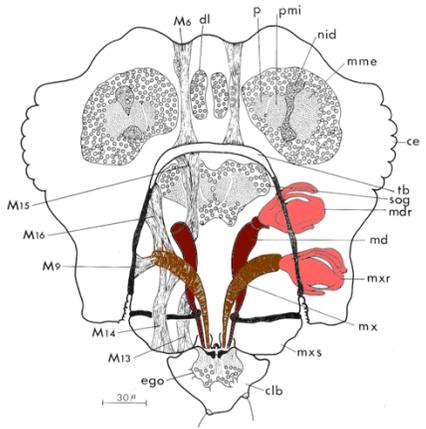


Taylor C.E. & Robertson W.M. 1974. *Phytopath. Z.*

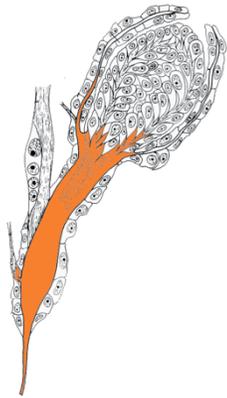


➤ Stylets de puceron & acrotyle

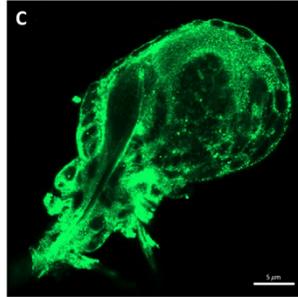
Styletogenèse



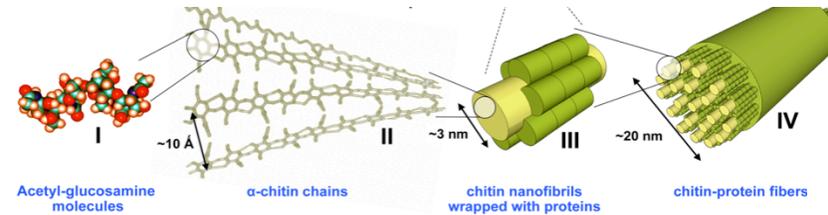
Ponsen, 1972



Guschinskaya et al. 2020. *iScience*



La cuticule des stylets de puceron : matériau composite sans cellule

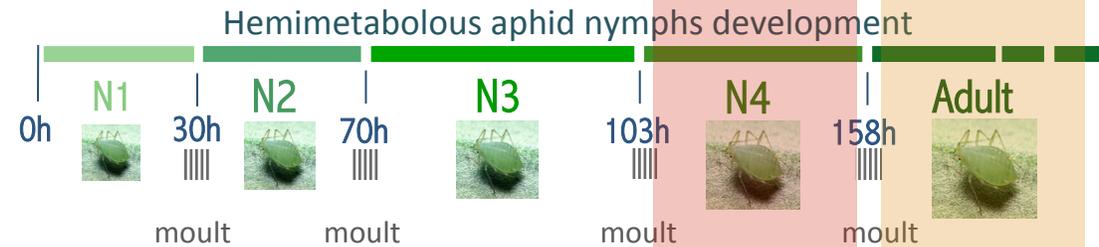


Nikolov S. et al. 2010. *Advanced Materials*

Stylets synthétisés avant chaque mue par 4 glandes sécrétrices spécifiques, les organes retortiformes (RO)

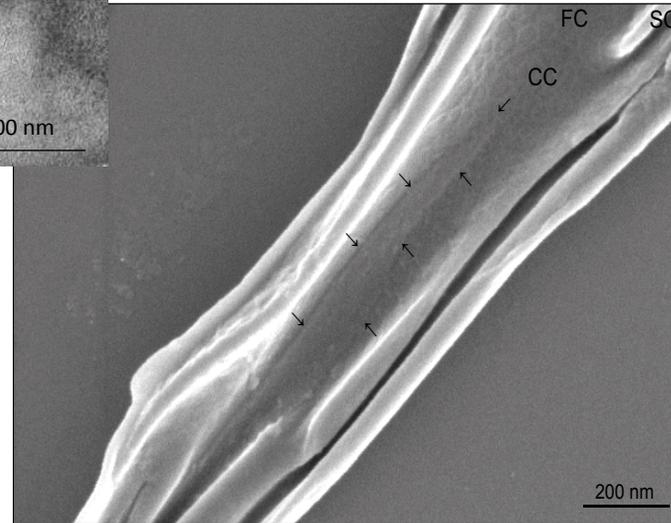
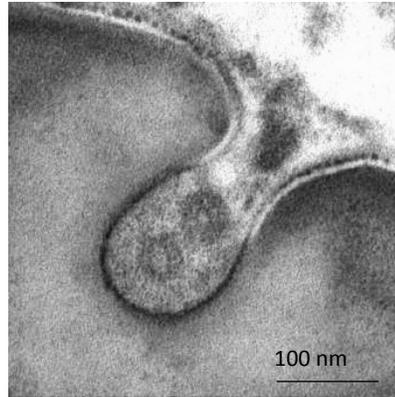
“Omics”
ROs

“Omics”
stylets

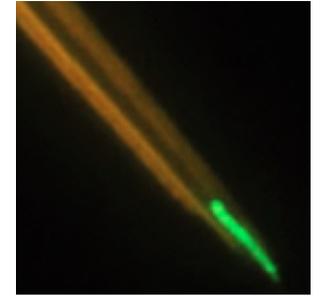


➤ Stylets de puceron & acrotyle

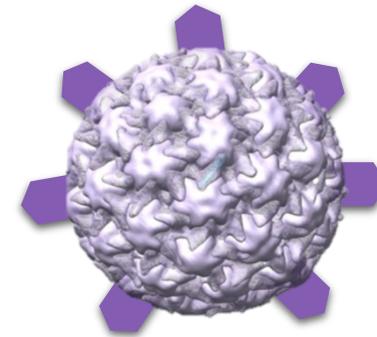
Caractérisation des récepteurs du CaMV



P2-GFP



P2



Stylet curcile

Récepteurs du CaMV = Protéines cuticulaires
accessibles en surface de l'acrotyle

Uzest et al. 2007. *PNAS*

Uzest et al. 2010. *Arthropod Struc. Dev.*

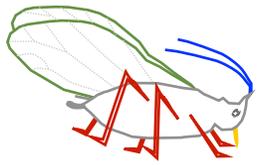


➤ Stylets de puceron & acrotyle

Composition protéique de l'acrostyle



- Analyse transcriptomique des glandes sécrétrices
129 gènes codant pour des protéines cuticulaires
Stylets = matériau composite complexe

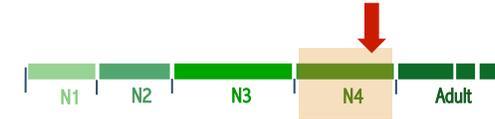


- Analyse protéomique des stylets
38 protéines cuticulaires identifiées dans les stylets

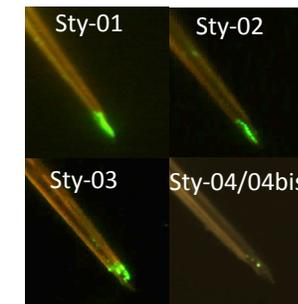


- Immuno-détection des protéines dans les stylets
Répertoire minimal des protéines cuticulaires de l'acrostyle

5 protéines candidates = Stylines



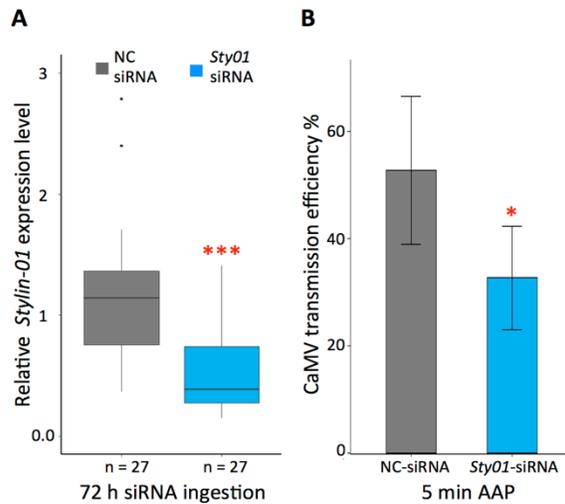
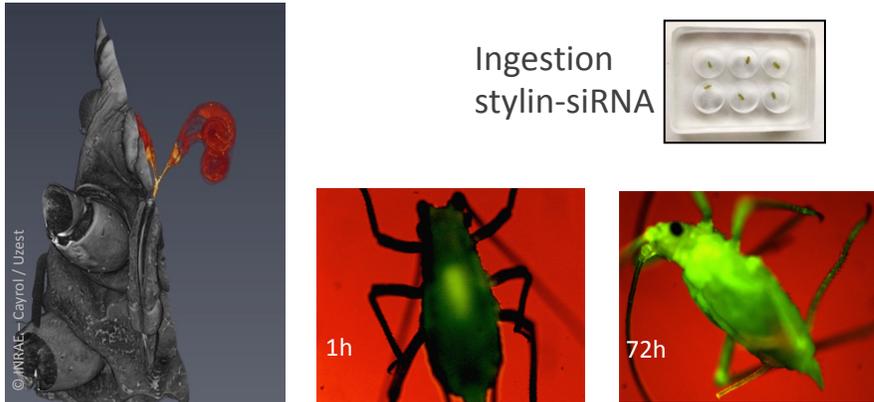
STYLINS



➤ Stylets de puceron & acrotyle

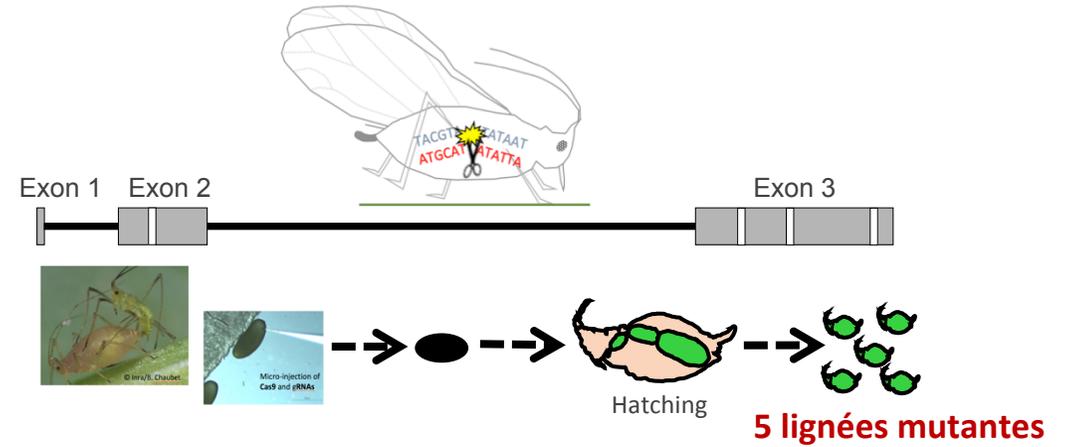
Validation fonctionnelle

RNAi silencing



Webster et al, 2018. *J Virol*.

Genome editing via CRISPR/Cas9
Knockout *stylin-01* gene



Le Trionnaire et al, 2019. *Insect Biochem Mol Biol*.

Styline 01, récepteur du CaMV

➤ Stylets de puceron & acrotyle

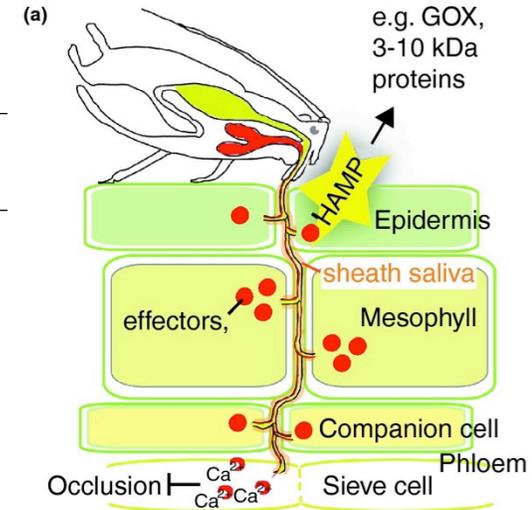
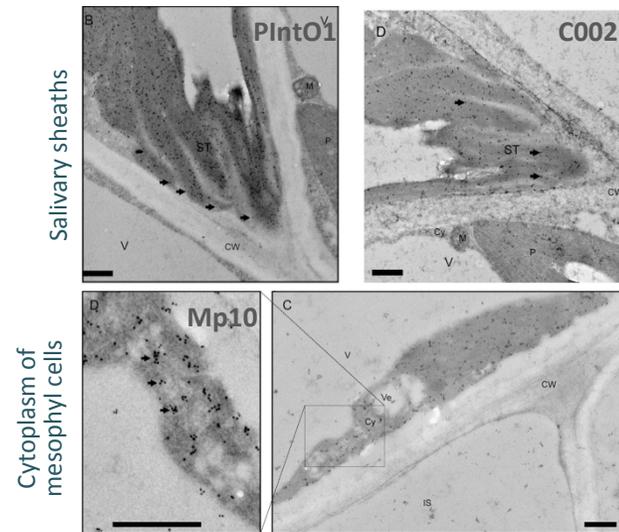
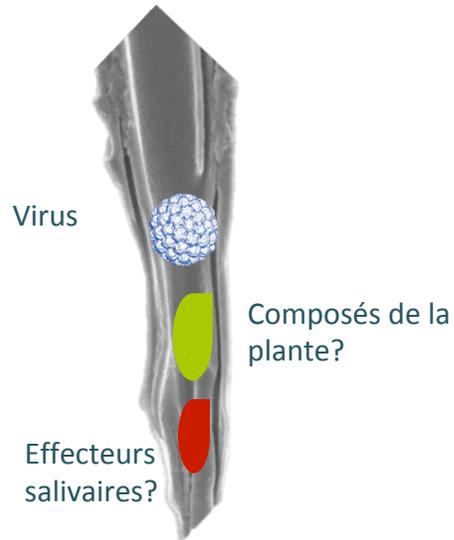
Rôle des stylines dans les interactions plantes-pucerons

MPMI Vol. 29, No. 11, 2016, pp. 854–861. <http://dx.doi.org/10.1094/MPMI-08-16-0168-R>

e-Xtra*

An Immuno-Suppressive Aphid Saliva Protein Is Delivered into the Cytosol of Plant Mesophyll Cells During Feeding

Sam T. Mugford, Elaine Barclay, Claire Drurey, Kim C. Findlay, and Saskia A. Hogenhout
Cell and Developmental Biology, John Innes Centre, Norwich, NR4 7UH, U.K.
Accepted 13 October 2016.



Hogenhout & Bos. 2011. *Curr. Op. Plant Biol.*
doi:10.1016/j.pbi.2011.05.003

Différents effecteurs de puceron délivrés dans des compartiments différents à l'intérieur de la plante hôte

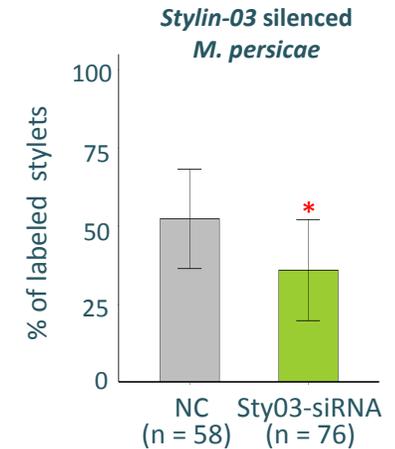
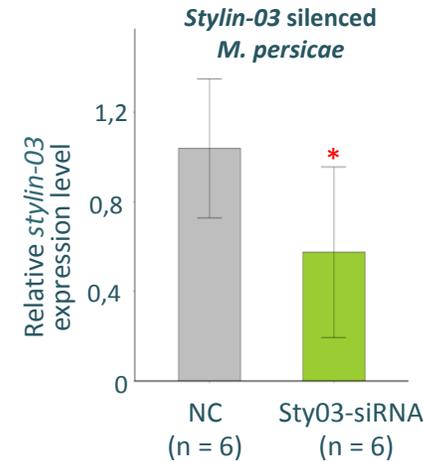
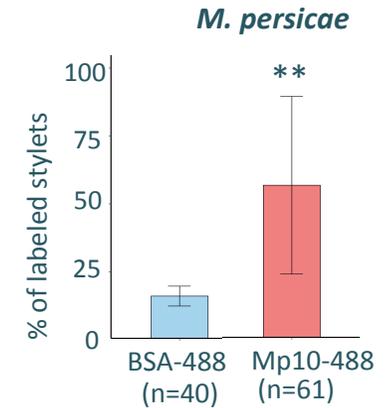
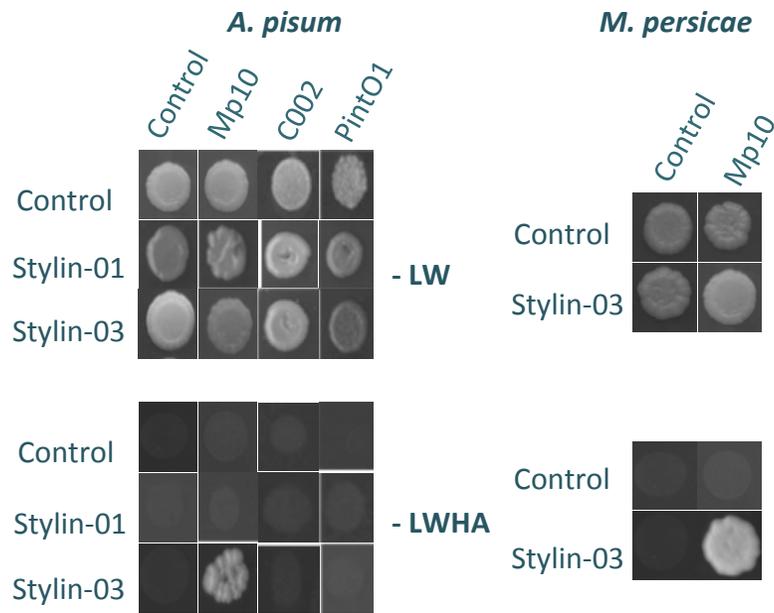
Est-ce que l'acrostyle peut participer à ce processus, interagir avec des effecteurs ?



➤ Stylets de puceron & acrotyle

Rôle des stylines dans les interactions plantes-pucerons

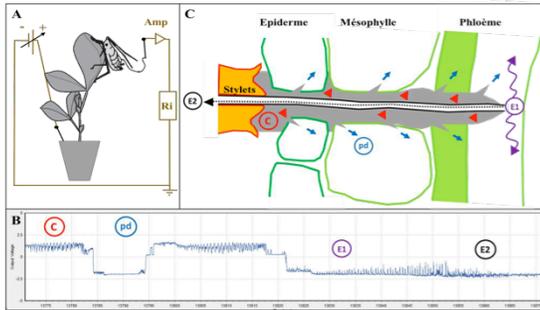
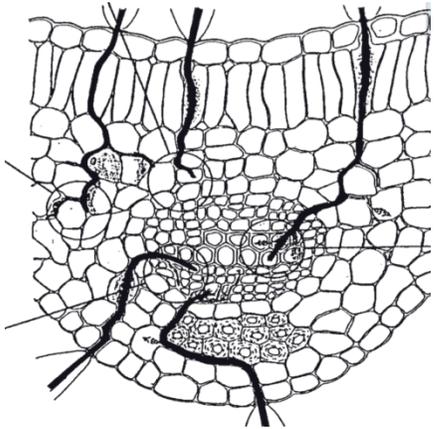
L'effecteur Mp10 interagit avec Styline 3



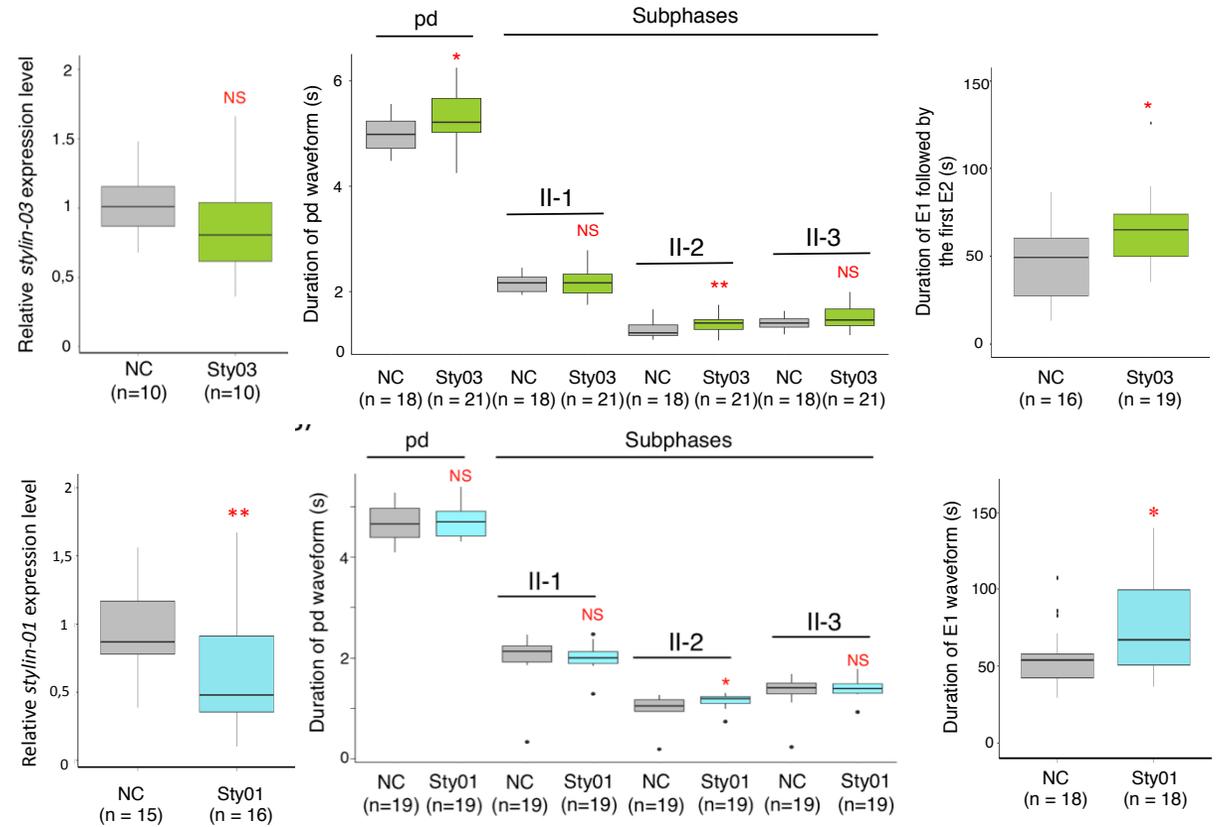
➤ Stylets de puceron & acrotyle

Rôle des stylines dans les interactions plantes-pucerons

Pucerons silencés (*stylin1*, *stylin 3*) = Comportement alimentaire altéré

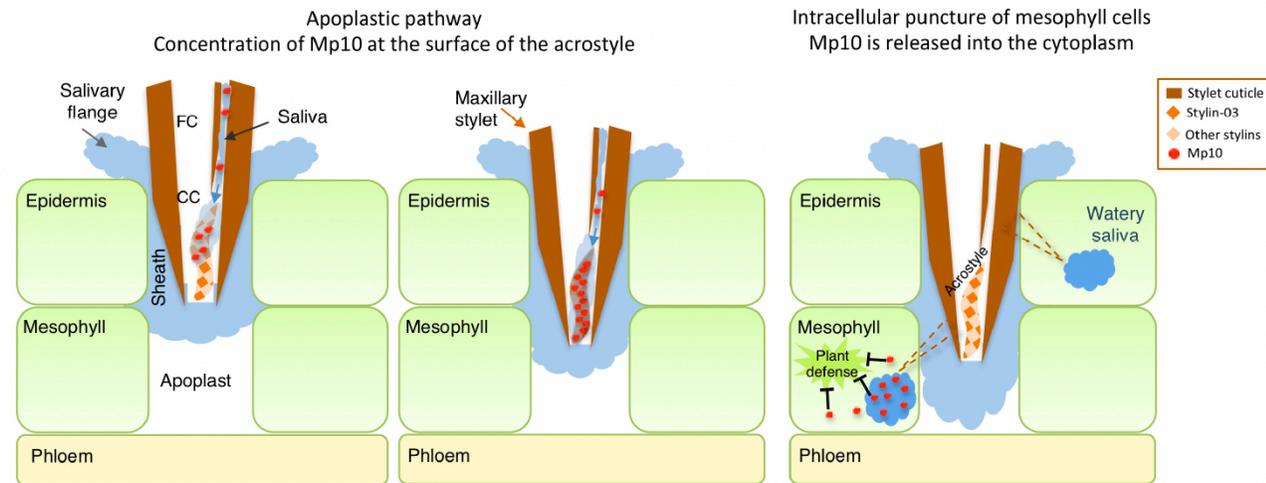


Sty-01_siRNA Sty-03_siRNA *M. persicae*



➤ Stylets de puceron & acrotyle

Rôle des stylines dans les interactions plantes-pucerons

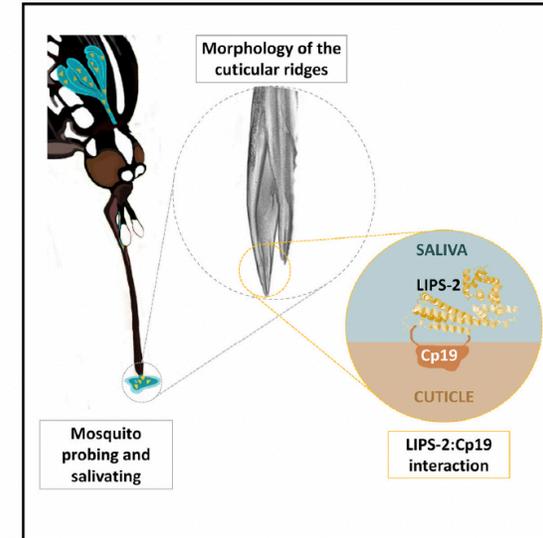


Deshoux et al. 2022. IJMS

Current Biology

A salivary factor binds a cuticular protein and modulates biting by inducing morphological changes in the mosquito labrum

Graphical abstract



Authors

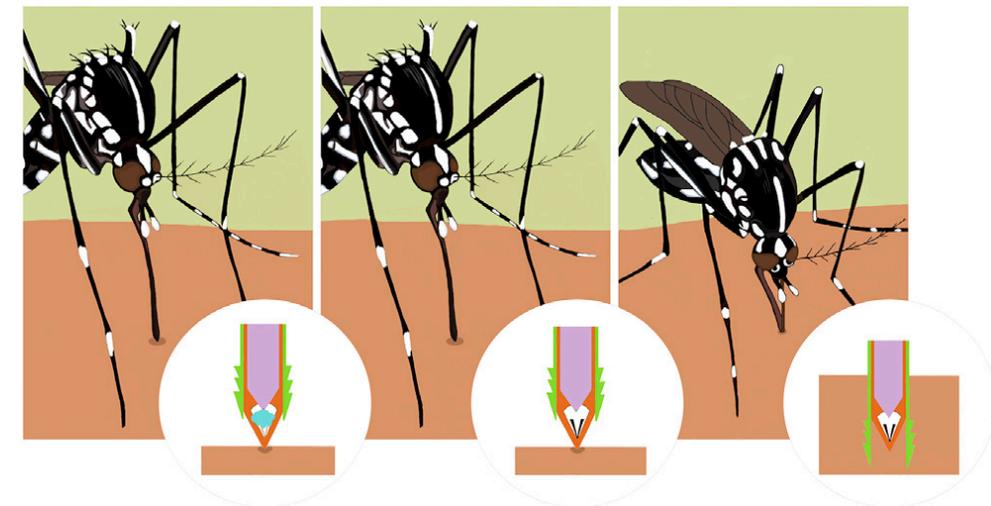
Irene Arnoldi, Giulia Mancini, Marco Fumagalli, ..., Paolo Iadarola, Federico Fomeris, Paolo Gabrieli

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In brief

Arnoldi et al. describe a novel role of the mosquito saliva, a feedback signaling pathway affecting intradermal probing preceding blood feeding. The initial trigger of this signaling pathway in *Aedes* mosquitoes is the interaction between LIPS-2, a salivary protein, and Cp19, a cuticular protein found at the tip of the mosquito mouth.



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