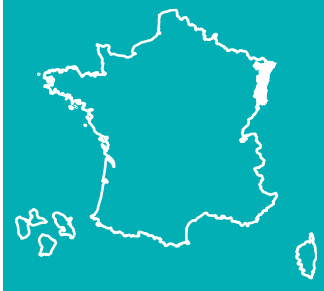
Vector Behavior Platform
ELECTROPENETROGRAPHY

Grand Est - Colmar

Centre INRAE Grand Est-Colmar
28 rue de Herrlisheim
F - 68000 Colmar



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https://www.inrae.fr/centres/grand-est-colmar

Manager
Quentin Chesnais

Funding
ANR, Région Grand-Est

Mission and objectives

For the past two decades, UMR SVQV 1131 has been working to understand the mechanisms of viral transmission by vectors. More specifically, the unit studies host-virus-vector interactions and the underlying mechanisms in various pathosystems, including the viruses responsible for beet yellows, transmitted by aphids, and the viruses responsible for grapevine? leafroll, transmitted by mealybugs. One of the programs studies the modifications induced by viruses on the phenotypes of host plants and the behavior of vectors, in ways that favor their transmission.

The platform maintains 11 species of aphids and a few species of mealybug in a controlled manner, avoiding inter-clone and inter-species contamination, thanks to a system set up in the 1980s. This corresponds to several hundred thousand aphids in continuous rearing. This is the 1st large-scale collection of different aphid species in France. The platform is equipped with electrical penetration graph (EPG) tools, enabling us to track the penetration of insect stylets into plant tissue, and thus determine and analyze all phases of the feeding process involved in virus transmission.

Organization

The platform, managed by the Virology and Vection team (ViVe), is organized into different sub-assemblies dedicated respectively to the rearing of different aphid species, and to experimentation (laboratories C1 and C2 for the preparation of plant material and the analysis of insect behavior)

- a set of hermetically sealed ventilated cages (~20) for rearing aphids on their respective host plants
- C2 laboratory dedicated to the preparation of plant material and equipped with three electrical penetration graph devices (Giga-8dd basic 8 channel EPG), each capable of studying the behavior of 8 aphids (or other piercing sucking insects) in parallel.

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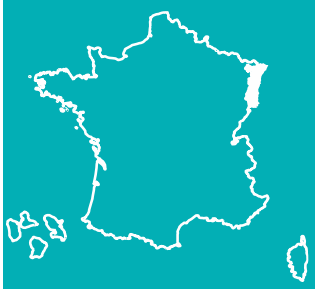

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(Photo by Ian Wright)


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Partnerships

The platform is at the heart of numerous national and international collaborations and partnerships. The main partners benefiting from the facilities within the framework of collaborations are :

- University of Strasbourg (IBMP-CNRS) and public research organizations
- University of Götttingen, Inst. of Sugar Beet Research
- Other INRAE research units (UMR PHIM in Montpellier, UMR IGEPP in Rennes, etc.)
- Institut Technique de la Betterave, Private partners (Strube-Deleplanque, Limagrain...).

Recent results

Thanks to its equipment and the expertise of its staff, the platform has contributed to several recent publications:

- Verdier M., Chesnais Q., Pirolles E., Blanc S., Drucker M. (2023). The cauliflower mosaic virus transmission helper protein P2 modifies directly the probing behavior of the aphid vector Myzus persicae to facilitate transmission. **PLoS Pathogens** 19(2): e1011161.
- Krieger, C., Halter, D., Baltenweck, R., Cognat, V., Boissinot, S., Maia-Grondard, A., Erdinger, M., Bogaert, F., Pichon, E., Hugueney, P., Brault, V., & Ziegler-Graff, V. (2023). An Aphid-Transmitted Virus Reduces the Host Plant Response to Its Vector to Promote Its Transmission. **Phytopathology**®, 113(9), 1745–1760.
- Chesnais Q., Golyaev V., Velt A., Rustenholz C., Verdier M., Brault V., Pooggin M., Drucker D. (2022). Transcriptome responses of the aphid vector Myzus persicae are shaped by identities of the host plant and the virus. **Peer Community Journal** 2, e82.
- Chesnais Q., Verdier M., Burckbuchler M., Brault V., Pooggin M., Drucker M. (2021) Cauliflower mosaic virus protein P6-TAV plays a major role in alteration of aphid vector feeding behaviour but not performance on infected Arabidopsis. **Molecular Plant Pathology** 22: 911–920.
- Bogaert F., Marmonier A., Pichon E., Boissinot S., Ziegler-Graff V., Chesnais Q., Villeroy C., Drucker M., Brault V. (2020) Impact of Mutations in Arabidopsis thaliana Metabolic Pathways on Polerovirus Accumulation, Aphid Performance, and Feeding Behavior. **Viruses** 12, 146.