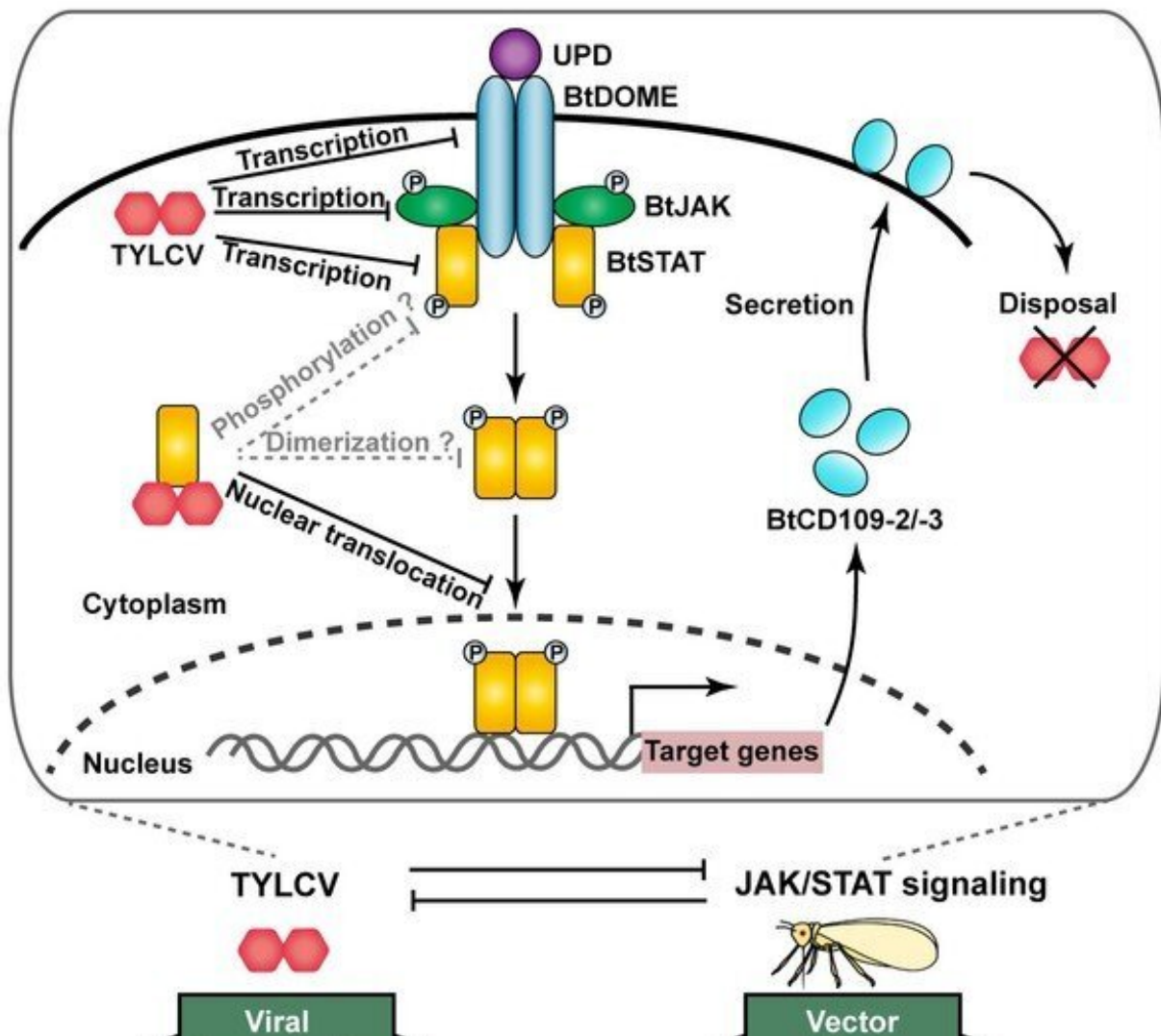


Scientists discover molecular mechanisms for virus-vector co-evolution

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Model depicting the JAK/STAT-dependent TYLCV–whitefly arms race. Credit: Zhejiang University

On October 3, the team led by Prof. Wang Xiaowei at the Zhejiang University College of Agriculture and Biotechnology published a research article entitled "A balance between vector survival and virus transmission is achieved through JAK/STAT signaling inhibition by a plant virus" in the *Proceedings of the National Academy of Sciences*.

Viruses constitute a tremendous threat to crops, with many being dependent on insect vectors for transmission between hosts. While the virus–host race has been well established, how viruses and [insect vectors](#) adapt to each other remains poorly understood. A detailed analysis of the molecular mechanisms will improve our understanding of virus–[vector](#) co-evolution.

Begomoviruses comprise the largest genus of plant-infecting DNA viruses and are exclusively transmitted by the whitefly *Bemisia tabaci*. The authors showed that the vector Janus kinase/signal transducer and activator of transcription (JAK/STAT) pathway plays a crucial role in mediating adaptations between the begomovirus tomato yellow leaf curl virus (TYLCV) and whiteflies.

They found that the JAK/STAT pathway in *B. tabaci* functions as an antiviral mechanism against TYLCV infection in whiteflies as evidenced by the increase in viral DNA and coat protein (CP) levels after inhibiting JAK/STAT signaling. Two STAT-activated effector genes, BtCD109-2 and BtCD109-3, mediate this anti-TYLCV activity. To counteract this vector immunity, TYLCV has evolved strategies that impair the whitefly JAK/STAT pathway.

Infection of TYLCV is associated with a reduction of JAK/STAT pathway activity in whiteflies. Moreover, TYLCV CP binds to STAT and blocks its nuclear translocation, thus putting an end to the STAT-

dependent transactivation of target genes.

The study also demonstrated that inhibition of the whitefly JAK/STAT [pathway](#) facilitates TYLCV transmission but reduces whitefly survival and fecundity, indicating that this JAK/STAT-dependent TYLCV–whitefly interaction plays an essential role in striking a balance between whitefly fitness and TYLCV transmission.

This study sheds light on the virus–vector arms race and provides insights into how [viruses](#) and vectors can coexist with each other.

More information: Yu-Meng Wang et al, A balance between vector survival and virus transmission is achieved through JAK/STAT signaling inhibition by a plant virus, *Proceedings of the National Academy of Sciences* (2022). [DOI: 10.1073/pnas.2122099119](https://doi.org/10.1073/pnas.2122099119)

Provided by Zhejiang University

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