CFAI & Dept Plant Sci Plant Virology Seminar

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"AGO5 restricts virus vertical transmission in plant gametes"

Date: 10:30am-12:00am, 7 April, 2025

Venue: Lecture Room #1 @ Aobayama commons

Abstract

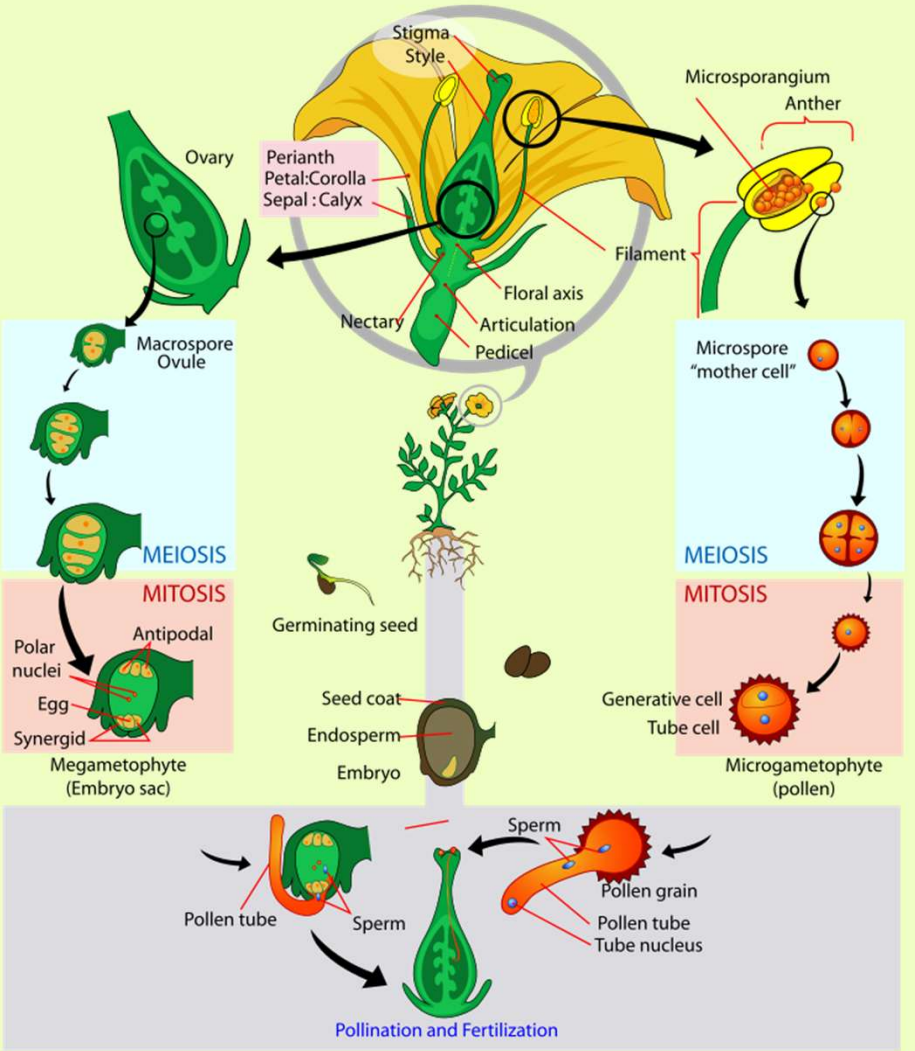
Viruses are intracellular parasites that rely on transmission to new hosts to ensure their continued existence. Vertical transmission—the passage of viral infection from parent to progeny—is a key mechanism for virus persistence across generations and geographical regions. This mode of transmission is especially significant in plants, where viruses spread both locally and globally via pollen and seeds. However, vertical transmission in plants is often inefficient or entirely absent, suggesting the existence of potent transgenerational antiviral barriers which remain unknown. It is believed that the ability of meristematic stem cells, which generate reproductive tissues and germline, to remain virus-free during many infections is linked to a plant preventing vertical transmission. We have recently described the role of RNA interference and the hormone salicylic acid in mediating antiviral immunity in stem cells. Here, we establish a model system to effectively investigate vertical transmission in Arabidopsis. We demonstrate that AGO5, an RNA interference factor specifically expressed in stem cells and gametes, plays a crucial role in restricting the vertical transmission of Turnip yellow mosaic virus (TYMV). We use a series of experiments involving different zygocity of the ago5 mutation along with gamete-specific expression of AGO5 and small RNA to pinpoint where and when AGO5 restricts vertical transmission. We find that AGO5 suppresses viral transmission through both male and female parents, post-meiosis and pre-fertilization during host reproduction, emphasizing its gamete-specific antiviral activity while excluding involvement in the zygote or embryo. Collectively, our findings unveil the first known antiviral mechanism restricting RNA virus transmission from parent to progeny through gametes, a significant advance that will increase our toolkit in the management of viral diseases.

Author summary

In our lab we investigate the molecular mechanisms behind the extraordinary ability of plant stem cells and reproductive tissues to keep viral infections under control, ultimately preventing the propagation of infection from parent to progeny. I will describe our recent discoveries on a small RNA effector protein that acts in gametes to stop infection of the host offspring.

（概訳）

植物の幹細胞と生殖細胞は、ウイルス感染を抑制する能力が他の細胞より格段に高く、それにより感染した親個体から子世代への感染を防いでいます。我々の研究室ではその分子機構を研究しています。今回のセミナーでは、配偶子で機能して子世代のウイルス感染を阻止する小分子RNA関連タンパク質について、最近明らかにしたことをご紹介します。



ご参考 For your reference：

“Angiosperm life cycle diagram” (from Wikipedia)

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