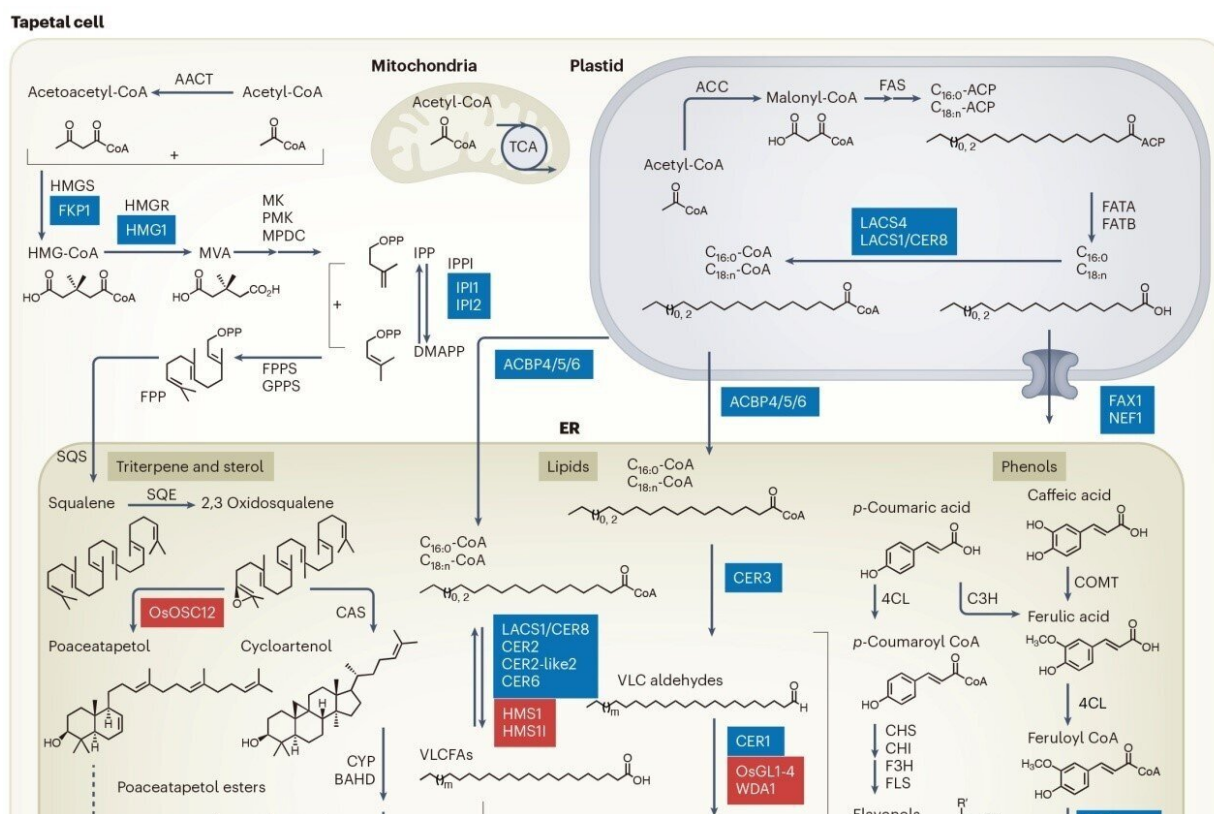


Study sheds light on biosynthesis and transport of pollen coat precursors in angiosperms

June 8 2023, by Zhang Nannan



A diagram of the biosynthesis and transport of pollen coat formation in monocotyledons and dicotyledons. Credit: Qi Xiaoquan

Researchers led by Prof. Qi Xiaoquan from the Institute of Botany of

the Chinese Academy of Sciences have systematically demonstrated that pollen coat biosynthesis and transport are complex processes involving compartmentalized biosynthesis, coordinated transport, and precise regulation between organelles and cell types.

The [review](#) was published online in *Nature Plants*.

Previously, the researchers found that a tapetum-specific triterpene metabolic pathway regulates the pollen coat formation in Poaceae, and that a lost-of-function mutation in OsOSC12, a key enzyme for triterpene biosynthesis, leads to humidity-sensitive genic male sterility (HGMS).

The study of the mechanism of pollen coat formation can not only clarify the basic scientific question of the formation of important reproductive organs formation, but also the genetic and molecular mechanisms of HGMS, providing valuable male-sterile lines and a theoretical basis for the utilization of crop heterosis.

In this review, the researchers made a detailed comparison of the morphology, composition, and function of pollen coat among plant species with different pollination types, they found that the morphology and composition of pollen coat are related to the pollination modes of different [plant species](#) with clear lineage specificity. Pollen coat proteins and [small molecules](#), including long and very long chain [fatty acids](#) and their derivatives, are important pollen coat components.

They summarized the genes and coding proteins involved in the biosynthesis of pollen coat precursors, and confirmed that they are mainly involved in the metabolism of lipids, phenols, triterpenes and sterols in the middle and late stages of anther development. Among them, the triterpene and sterol metabolism varied widely among different species, indicating possible lineage specificity.

They compared the processes of tapetum degradation with pollen wall formation between monocotyledons and dicotyledons at the [cellular level](#) with special attention to the morphological changes of two oil-enriched organelles at the late anther development stage.

They also discussed several pressing scientific questions. For example, what are the exact components of the pollen coat? How are the pollen coat precursors synthesized and transported? And how are the biosynthesis and transport of pollen coat precursors coordinately regulated during anther development? These questions will be addressed with improved methods such as extensive plant genome mining, [single cell](#) and spatial multiomics, and tracking of pollen coat proteins and metabolites.

Finally, the application of [pollen](#) coat-defective mutants with HGMS in crop heterosis utilization was discussed. HGMS lines could be used as a male-sterile female parent to produce hybrid seed in arid areas (such as Xinjiang, China), and self-pollinated in humid and rainy areas (southern China). This would expand the geographical range of two-line hybrid seed production and make extensive use of plant heterosis for crop production.

More information: Yuyuan Qiao et al, Biosynthesis and transport of pollen coat precursors in angiosperms, *Nature Plants* (2023). [DOI: 10.1038/s41477-023-01413-0](#)

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