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Mechanism of fertilization in plants: Live-imaging of sperm cell-egg cell interaction

Flowering plants have two sperm cells in a pollen. One of them fertilized to the egg cell and produce embryo, others fertilized to the central cell which is placed vicinity of egg cell produce endosperm. Because of these two fertilizations, it is called 'Double fertilization'. Though double fertilization has discovered in 1898, sperm cell movement during double fertilization are not well understood. Because egg cell and central cell are embedded deeply in female tissue, it is too hard to observe double fertilization in live.

We developed fluorescent marker line which labeled gamete, improved semi-*in vitro* fertilization assay, and developed confocal microscopy system. These improvements enabled us to image double fertilization of *Arabidopsis thaliana* in living tissue. We discovered that sperm delivery was composed of three steps. Sperm cells were projected together to the boundary between the egg cell and central cell. After a long period of immobility, each sperm cell fused with either female gamete in no particular order and no preference was observed for either female gamete. We photo-labeled individual isomorphic sperm cells before their release and analyzed their fate during double fertilization. Our results suggest that two sperm cells at the front and back are functionally equivalent and suggest unexpected cell–cell communications required for sperm cells to coordinate double fertilization of the two female gametes.

References

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