

S005 Molecular dialogues between pollen and pistil:
gamete fusion regulates sperm delivery

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In double fertilization, a reproductive system unique to flowering plants, two immotile sperm are delivered to an ovule by a pollen tube. One sperm fuses with the egg to generate a zygote, the other with the central cell to produce endosperm. This process depends on a series of complex cell - cell interactions and is central to seed crop production. These interactions need to be understood in molecular detail in order to improve yields and control fertilization. A mechanism preventing multiple pollen tubes from entering an ovule would ensure that only two sperm are delivered to female gametes. We used live-cell imaging and a novel mixed-pollination assay that can detect multiple pollen tubes and multiple sets of sperm within a single ovule to show that *Arabidopsis* efficiently prevents multiple pollen tubes from entering an ovule. However, when gamete-fusion defective *hap2(gcs1)* or *duo1* sperm are delivered to ovules as many as three additional pollen tubes are attracted. When gamete fusion fails, one of two pollen tube-attracting synergid cells persists, enabling the ovule to attract more pollen tubes for successful fertilization. This mechanism prevents the delivery of more than one pair of sperm to an ovule, provides a means of salvaging fertilization in ovules that have received defective sperm, and ensures maximum reproductive success by distributing pollen tubes to all ovules. We will discuss models for how gamete fusion could initiate a block to polytubey and our progress toward identifying new components of mechanisms required for gamete fusion and optimal reproductive efficiency in Angiosperms.