Highly dynamic pattern of cell organelles in meiocytes

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Meiosis is key to sexual reproduction by reducing the chromosome set by half so that the genome size of a species does not increase after fertilization. Moreover, meiosis is key for genetic diversity due to the new composing of chromosome sets and meiotic recombination during which segments of homologous chromosomes are exchanged resulting in novel and unique allelic combinations. In the past, the focus of meiotic research has been placed on chromosomes to understand recombination and the reductional division process. However, for a meiocyte to function, all cellular components and processes have to closely collaborate building an intricate network of cellular functions that has not much been explored. We have recently established a life cell imaging approach that allows us to follow the entire meiotic process in male meiocytes of the model plant Arabidopsis thaliana. This has led to the identification of cellular landmarks that indicate the progression through meiosis and can be used to quantitative and qualitatively dissect meiosis. Here, we present live cell imaging data on cell organelles, which have not attracted much attention in the past despite their central role for cellular functions, including the generation of energy needed for the demanding tasks of meiosis. Unexpectedly, we find that cell organelles have a highly dynamic localization pattern that appears to be coupled to the behavior of chromosomes. Here, we present a detailed analysis of this pattern in the wild type and selected meiotic mutants to understand the genetic underpinnings of organelle dynamics in meiosis.

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