



# CDB SEMINAR

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16:00~17:00 A7F Conference Room

### Selective elimination of mRNA provides a novel paradigm for the regulation of meiosis

#### Summary

Compared to mitosis, much remains unknown about molecular regulation of meiosis. Here we show in fission yeast that some transcripts required exclusively for meiosis are eliminated selectively if expressed in cells growing mitotically. These transcripts carry a cis-acting region responsible for this elimination, which we name DSR. A novel RNA-binding protein Mmi1p binds specifically to DSR RNA and is essential for the elimination of these transcripts. Deletion of the *mmi1* gene impairs cell growth severely, apparently due to detriments brought by untimely expression of meiotic messages. Microarray analysis using a temperature-sensitive *mmi1* mutant has revealed that at least a dozen of meiosis-specific transcripts are governed by the DSR-Mmi1p system. Thus, selective elimination of mRNA appears to play a crucial role in preventing the incidence of meiotic events during the mitotic cell cycle.

The master regulator of meiosis in fission yeast, Mei2p, is also an RNA-binding protein, which binds to meiRNA, an RNA species required specifically for the promotion of meiosis I. The Mei2p-meiRNA complex forms a peculiar dot structure in the nucleus during meiotic prophase. Our study now demonstrates that the function of the Mei2p dot is intimately related to the DSR-Mmi1p system. Mmi1p interacts physically with Mei2p and meiRNA. Whereas Mmi1p is scattered in the nucleus during the mitotic cell cycle, it gathers to the nuclear Mei2p dot at prophase of meiosis I. Moreover, arrest of meiosis due to a lack of the Mei2p dot formation can be rescued by a reduction of the Mmi1p activity. From these observations we propose that Mei2p suppresses the function of Mmi1p by sequestering it to the nuclear dot, and thereby allows effective expression of DSR-containing meiosis-specific mRNAs.

#### References

1. Izawa, D., Goto, M., Yamashita, A., Yamano, H. & Yamamoto, M. *Fission yeast Mes1p ensures the onset of meiosis II by blocking degradation of cyclin Cdc13p*. Nature 434, 529-33 (2005).
2. Shimada, T., Yamashita, A. & Yamamoto, M. *The fission yeast meiotic regulator Mei2p forms a dot structure in the horse-tail nucleus in association with the sme2 locus on chromosome II*. Mol Biol Cell 14, 2461-9 (2003).
3. Yamashita, A., Watanabe, Y., Nukina, N. & Yamamoto, M. *RNA-assisted nuclear transport of the meiotic regulator Mei2p in fission yeast*. Cell 95, 115-23 (1998).

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