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Analysis of Meiotic Metaphase I Arrest in Egg of the Sawfly, *Athalia rosae ruficornis* (Hymenoptera)*

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In animal eggs, the meiotic cell cycle arrests at several stages, and it resumes upon fertilization and/or egg activation. In most vertebrate eggs the meiosis arrests at the metaphase of meiosis II. Cytostatic factor (CSF) and M-phase promoting factor (MPF) play central roles in the regulation of meiotic arrest. In contrast, in most insect eggs, the meiosis arrests at the metaphase of meiosis I, however the mechanisms are still unclear even in *Drosophila melanogaster* due to the difficulty in controling fertilization and egg activation artificially in insects.

In the turnip sawfly *Athalia rosae ruficornis* (Hymenoptera, Sympyta, Tenthredinidae), artificial fertilization by intracytoplasmic sperm injection (ICSI) has been achieved, unfertilized eggs can be easily activated *in vitro* and the germline transformation is feasible (Oishi *et al.*, 1998; Sumitani *et al.*, 2003). Thus we have been using *A. rosae* as an experimental model organism for studies on the regulation of meiotic arrest in insect eggs.

The protooncogene *c-mos* product, Mos plays the role of CSF, activates the MAP kinase cascade and regulates the MPF activity during vertebrate egg maturation. Recently, invertebrate Mos protein was isolated from for the first time starfish and it was proposed that Mos-MAP kinase cascade was conserved in vertebrates and invertebrates (Tachibana *et al.*, 2000).

First, we examined the MAP kinase activities upon egg activation in *A. rosae* to analyze whether Mos-MAP kinase cascade exists during insect egg maturation. In immature egg that retained a germinal vesicle, the MAP kinase was inactivated, while in mature unfertilized eggs in which germinal vesicle break down had occurred, the MAP kinase was consistently activated. Once the egg was activated and meiosis was reinitiated, the MAP kinase was then inactivated. These results suggested that the MAP kinase cascade took part in insect meiosis. Next, we examined whether a heterospecific Mos acts as an upstream regulator of MAP kinase cascade. The starfish Mos protein was synthesized, purified and injected into *A. rosae* eggs right after activation. Many of the Mos-injected eggs stopped development. It is possible that the heterospecific starfish Mos activates MAP kinase in *A. rosae* eggs.

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