Argonaute 1 regulates germ cell division and oocyte determination in *Drosophila melanogaster*

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Summary

Argonaute 1 (Ago1) is a member of the Argonaute/PIWI protein family that involves in small RNA-mediated gene regulation. In *Drosophila melanogaster,* Ago1 plays a specific role in microRNA biogenesis. Previous studies have demonstrated that Ago1 regulates the fate of germline stem cells. However, the function of Ago1 in other aspect of oogenesis is still elusive. Here we report the distribution of Ago1 protein in *Drosophila* egg chambers. We find that Ago1 protein is enriched in the oocytes and also distributed in the cytoplasm of follicle cells. Using mitotic clonal analysis, we analyze multiple *ago1* mutant alleles. Here, we find that the oocyte do not form in many mutant clones. Approximately 30% of the mutant clones have only 8 nurse cells and they do not develop an oocyte. These results indicate that the level of Ago1 affects the number of cystoblast divisions and oocyte determination.

D. melanogaster microRNA biogenesis

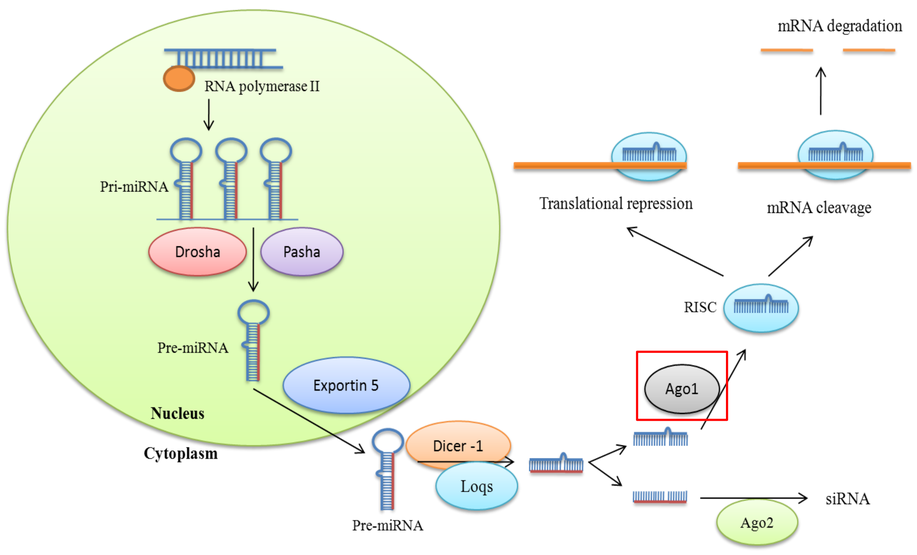


Figure 1: **microRNA biogenesis in *Drosophila melanogaster***. Ago1 (highlighted in the red box) plays an important role of binding to the miRNA and incorporating it into the RISC.

Ago1 affects oocyte determination

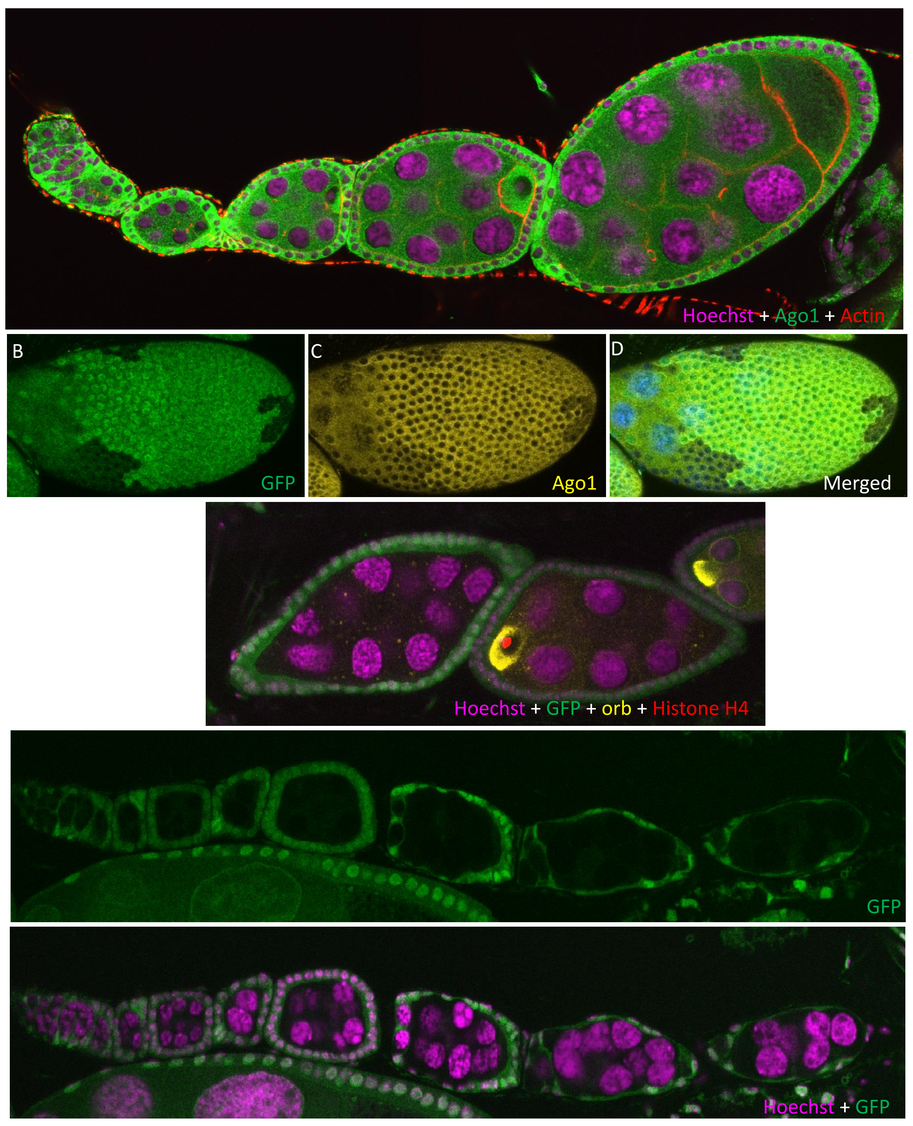


Figure 2: **Ago1 mutant clones have oocyte determination defect.** (A) Ago1 protein trap line showing the distribution of Ago1 (green) in egg chambers. Enrichment of Ago1 in the developing oocyte is seen in the stage 7 egg chamber. Heat-shock induced mitotic recombination generates Ago1 homozygous mutant clones (GFP -ve). (B-G) Mitotic clones. (B-D) Follicle cell clones. GFP (green) and Ago1 (yellow). (H-I) *ago1* severe phenotype where follicle cells in egg chambers above stage 5 begin to deteriorate and there is no oocyte formation.

Ago1 affects germ cell division

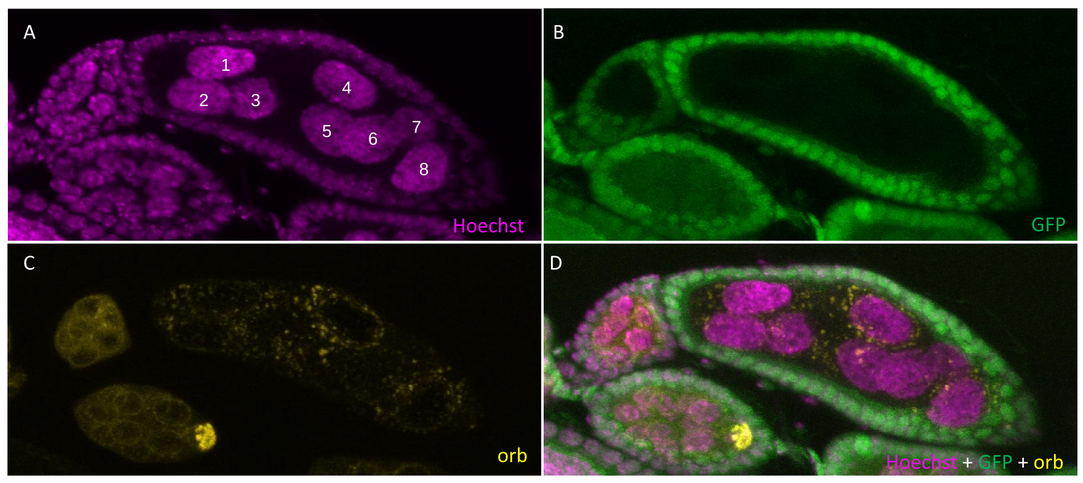
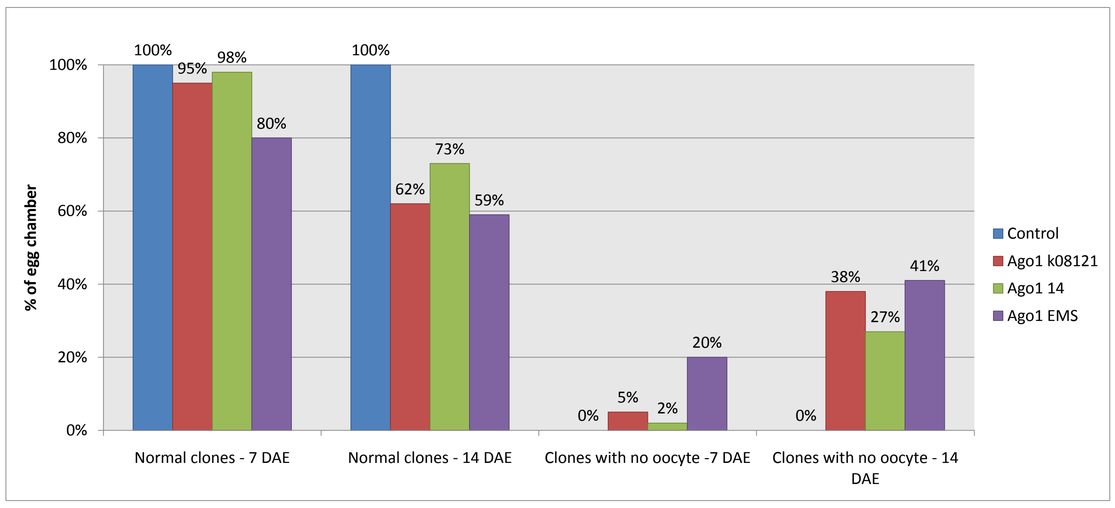


Figure 3: **Loss of Ago1 results in fewer cyst cell divisions.** (A-D) Projection of an egg chamber clone (GFP –ve) with only 8 nurse cells and no oocyte. This phenotype is the most common occurring in the mutants.

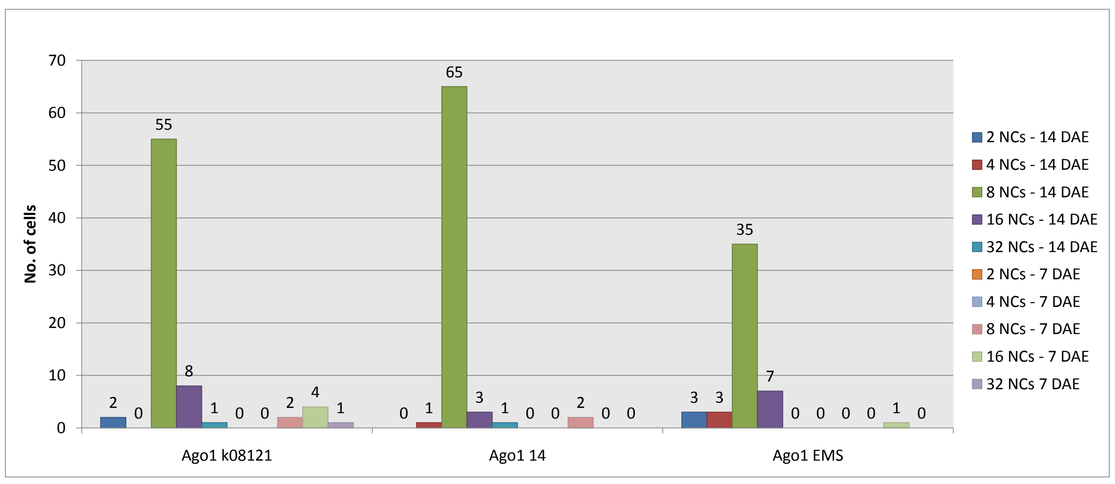
Ago1 phenotypic severity increases with age

Clones with and without oocyte



*DAE – Days after eclosion (hatching)

Comparison of phenotype between 7 DAE and 14 DAE



Conclusion

- Ago1 affects cyst cell division in the germarium resulting in 8 germline cells per egg chamber in the Ago1 mutants.
- Oocyte determination is affected in the absence of Ago1.
- Older flies have more severe phenotypes than younger flies.

Acknowledgements

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