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Ph.D. THESIS DEFENSE

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MENTOR: Sean Ryder, PhD
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"UNDERSTANDING THE SEQUENCE-SPECIFICITY AND RNA TARGET RECOGNITION PROPERTIES OF THE OOCYTE MATURATION FACTOR, OMA-1, IN *CAENORHABDITIS ELEGANS*"

Maternally supplied mRNAs encode for necessary developmental regulators that pattern early embryos in many species until zygotic transcription is activated. In *C. elegans*, post-transcriptional regulatory mechanisms guide early development during embryogenesis. Maternal transcripts remain in a translationally silenced state until fertilization and a suite of RNA-binding proteins (RBP's) regulate these maternally supplied mRNAs during oocyte to embryo transition. Identifying the target specificity of these RNA-binding proteins will reveal their contribution to patterning of the embryo. We are studying post-transcriptional regulation of maternal mRNAs during oocyte maturation, which is an essential part of meiosis that prepares oocytes for fertilization.

OMA-1 and OMA-2 are essential CCCH-type tandem zinc finger RBP's that function redundantly during oocyte maturation. In the research described here, I defined the RNA-binding specificity of OMA-1, and demonstrated that OMA-1/2 are required to repress the expression of 3UTR reporters in developing oocytes. The selected sequences from in vitro selection demonstrated that OMA-1 binds UAA and UAU repeats in a cooperative fashion. Subsequently, using a library adaptation of MosSCI transgenesis in combination with rapid RNAi screening identified new RBP-mRNA interactions with a functional consequence.

In conclusion, in this dissertation I show that OMA-1 is a sequence specific RNA-binding protein that is involved in regulation of six different mRNA targets. Extending our strategy to map functional interactions between mRNA targets and RNA-binding proteins in will help reveal how multiple regulatory binding events coordinate complex cellular events such as oocyte-to-embryo transition and cell-fate specification.

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