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THE NUCLEOPORIN mRNA EXPORT PROTEIN, RAE1, EXERTS PLEIOTROPIC EFFECTS ON MITOTIC AND MEIOTIC CELL CYCLE, AND VIABILITY IN *DROSOPHILA MELANOGASTER*

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Meiosis, spermatogenesis, fertility, cell cycle

Drosophila is a particularly suitable organism to study the complex events of male germ cell differentiation and meiosis that culminate in mature sperm formation. Here, we report the identification of the gene responsible for the fully viable, male sterile phenotype of an EMS-induced mutant strain. Immunofluorescence assays revealed early defects of nuclear envelope morphology and chromosome condensation in primary spermatocytes. Upon meiosis, these mutants display a unique behavior since they execute a strongly impaired first meiotic division and skip the second one, resulting into onion stage spermatids that, nonetheless, attempt a highly defective spermiogenesis. By combining traditional gene mapping techniques and DNA sequencing with RNA interference experiments, we identified the locus affected by EMS treatment in *rae1* (ribonucleic acid export) gene. Rae1 is a nucleoporin that has been shown to be required for nuclear mRNA export and mitotic spindle assembly from yeast to mammals. Driven knockdown of Rae1 by RNAi in *Drosophila* neuroblasts and imaginal discs surprisingly altered the normal progression of mitotic cell cycle eventually resulting into lethality. The missense mutation we identified in *Z2-5584* line brings about a substitution of an evolutionarily highly conserved amino acid on the third putative WD40-repeat domain, that accounts for a very severe phenotype in testis whereas it has no effect on development and viability of *Drosophila*. As a whole, these results lead us to speculate that the domain affected by the mutation in RAE1 protein is specifically required for meiotic cell cycle, thus providing the first evidence of the RAE1 involvement in *Drosophila* male germ line differentiation, where its function is strictly necessary to ensure male fertility.