## S13-5

### THE ROLE OF THE UNIQUE MITOCHONDRIAL DERIVATIVE IN CASPASE RESTRICTION DURING SPERM TERMINAL DIFFERENTIATION

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In both insects and mammals differentiating spermatids undergo dramatic cellular organization that includes extensive mitochondrial remodeling and elimination of the bulk cytoplasmic contents. In Drosophila, the latter process, also known as "individualization", requires apoptotic proteins including active caspases. How spermatids avoid the lethal activity of caspases is an unresolved question. We have previously identified a ubiquitin ligase complex required for caspase activation in spermatids. More recently, we reported a gradient-based regulatory mechanism of this complex, which dictates temporal restriction of caspase activation in spermatids. Here, I will describe our new unpublished results about the identification of an unexpected function for the ADP-forming beta subunit of the mitochondrial Krebs cycle enzyme, Succinyl-CoA synthetase (SCS) . We identified SCS-βA as a direct binding activator of the ubiquitin ligase complex in spermatids, and we showed that its levels significantly increase at the onset of spermatid individualization. Inactivation of scs-βA abrogates caspase activation and spermatid individualization, a phenotype reminiscent of mutations in the ubiquitin ligase complex. Interestingly, we revealed that a relatively large portion of the ubiquitin ligase complex is also localized to the mitochondria in an SCS-βA-depends manner, and that the mitochondrial portion of this complex was preferentially activated. We then identified two major isoforms of SCS-βA and showed that the testis-specific isoform is localized to the surface, instead of the matrix, of the mitochondria. Altogether, our results support a model in which the unique, 2 mm-long, spermatid mitochondrial derivative functions as a rate limiting factor in the activation of caspases in spermatids.

## S13-6

### USING A HOLIDIC MEDIUM TO STUDY NUTRIENT HOMEOSTASIS IN DROSOPHILA MELANOGASTER

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Animals choose which macronutrient to eat according to their current internal nutrient and mating status and optimize the protein to carbohydrate ratio in their diet to maximize their evolutionary fitness in terms of lifetime egg production. In the field it is well accepted that yeast is mainly used by Drosophila melanogaster as a protein and therefore amino acid source but a detailed nutritional analysis of this food source remains hampered by its chemically complexity. To disentangle the different nutritional contributions of yeast on life history traits and feeding behavior we have used a novel holidic medium that is adequate for fly development as well as adult traits, such as behavior, fecundity and lifespan. Using detailed and quantitative behavior analyses of food choice and feeding behavior we show that specifically removing amino acids from the adult diet leads to a foraging phenotype which fully mimics a lack of dietary yeast. Furthermore this effect can be triggered by the lack of single essential amino acids while removing non essential amino acids from the diet has no effect on food choice. Interestingly, flies raised in the absence of yeast preferred yeast when amino acids deprived, suggesting the existence of an innate system for yeast valuation. These data shed light on the exquisite behavioral sensitivity of Drosophila to the lack of single nutritional components and the foraging strategies used to achieve nutrient homeostasis. Our study also exemplifies the power of using a holidic diet for examining nutrient sensitive traits such as nutrient homeostasis.