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EXAMINING HOW RIBOSOMAL PROTEINS AFFECT GORWTH AND BODY SIZE

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INTRODUCTION

All animals need adequate nutrition to grow and develop. Although the regulation of animal growth and size has fascinated many biologists, the underlying mechanisms still remain unclear. Getting a better understanding of the role of ribosomal proteins and rRNA in growth and development may help in diagnosing and treating disease related to abnormal development such as cancer and obesity.

The purpose of this study was to look at the role of 5 specific ribosomal proteins in growth and development using *Drosophila* minutes. *Drosophila* was used because it is a powerful genetic model system to study cell and organismal responses to growth cues. Over a 4-day period, *Drosophila* larvae can grow over 200 fold in mass in response to nutrient availability. Minutes are flies that harbour mutations in different ribosomal proteins. They are lethal as homozygous mutants, however as heterozygotes they have a slow rate of development.

It was hypothesized that mutations in ribosomal proteins would result in decreased levels of ribosome and protein synthesis resulting in a decrease in overall body growth.

METHODS

The 5 Minute and control flies were propagated at 25ºC on standard *Drosophila* media and were then crossed. 1 day old larvae were transferred to vials containing food, from overnight egg collections. These larvae were allowed to pupate and were then measured using Axiovision software. Pupal volume was used as an indicator of body size.

RESULTS

Out of the five minute strains tested, three showed an increase in growth in comparison to control while the other two showed no difference in size with respect to control (Figure 1).

DISCUSSION AND CONCLUSIONS

The major finding in this project was that the five minute strains tested didn't decrease in size, rather increased or had no effect on body growth in comparison to control.

Minute genotype vs control	Minute Pupal volume (mm^3)	Control Pupal Volume (mm^3)	P values from t-test
rps13+ vs w1118 (*)	1.60	1.43	$9.60x10^{-3}$
rps21+ vs w1118 (*)	1.58	1.36	$3.60x10^{-9}$
rps26+ vs w1118 (*)	1.63	1.47	$4.27x10^{-9}$
rps24+ vs w1118	1.39	1.37	0.58
rpl11+ vs w1118	1.43	1.43	0.43

Table 1. Pooled pupal volume of multiple sets of experiments for each minute strain. Rows 1,3 & 5 show pooled data of 3 replicates and rows 2 & 4 show pooled data of 2 replicates. (*) indicates statistical significance calculated from t-test.

A previous study showed a different minute strain, rps6, increase in body growth in comparison to control [1]. This study showed that these flies were delayed in reaching the pupal stage allowing for a longer growth period, providing an explanation to a larger body phenotype. The same developmental delay was seen in the minutes tested in this project, providing a possible explanation to an increase in body size. It was also shown that reduced ribosomal protein levels in the prothoracic gland decreases abundance of ecdysone, a steroid hormone [1]. This decrease causes an increase in the final size of pupae due to a delay in development, allowing additional time for body growth [1]. Similar to the rps6 minute, reduced ribosomal protein expression of the three minutes that had an increased body size may exert its effect on a specific tissue resulting in decreased signalling hormones such as ecdysone, allowing prolonged development ultimately leading to an increase in body size.

A possible explanation for the two minutes that had no difference in body size with respect to control may be that these ribosomal proteins don't play an important role in regulating body growth; rather they might have an alternative purpose in Drosophila. Further experiments will need to be conducted to find the specific role of these two minutes.

REFERENCES

1. Lin JI, et al. *PLoS Genet.* **7**:1-12, 2011.