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Enhancer of *dumpy-vortex* [$e(dp^v)$] also enhances *dumpy-oblique* (dp^{ov1}).

Thompson, Steven, and Ross MacIntyre. Molecular Biology and Genetics, Cornell University and Ithaca College, Ithaca, New York 14853. Corresponding Author: Ross MacIntyre; email address: rjm18@cornell.edu.

The complex *dumpy* gene (Wilkin *et al*., 2000) is an important component of the extracellular matrix of epithelial cells throughout development. *Dumpy* mutants fall into three classes, those that affect wing shape (oblique mutants), those that affect tendon cell attachment to the adult dorsal thoracic cuticle (vortex mutants), and those that affect viability (lethal mutants). Single mutants can affect one, two, or all three of these phenotypes. Following Grace *et al*. (1980), we have developed a scoring system for the oblique phenotype (Carmon *et al*., 2010). Wild type wings are scored as zero, whereas dumpy mutant wings are scored from one to five with five indicating the most severe truncation and/or distorted wing shape.

As part of our ongoing study of dumpy's interactions with other genes, we have examined the extent of the interaction between dumpy mutants and a gene discovered about 100 years ago by Calvin Bridges (Bridges and Mohr, 1919) originally called "enhancer of dumpy vortex" and now designated as $e(dp^v)$ in flybase. We made double mutant combinations of $e(dp^v)$ and the canonical dumpy oblique mutant, dpy^{ov1}, which shows an intermediate expression of the oblique phenotype but variable expression of dumpy vortex. Our results, using the scoring system described above are shown in the table below:

1. dp^{ov1}/dp^{ov1} ; $e(dp^{v})^{+}/e(dp^{v})^{\pm}$ females (79) 1.9 males (65) 2.3

2. dp^{ov1}/dp^{ov1} ; $e(dp^{v})/e(dp^{v})^{+}$ - females (23) 1.9 males (21) 2.6

3. dp^{ov1}/dp^{ov1} ; $e(dp^{v})/e(dp^{v})$ - females (53) 3.4 males (74) 3.4

Clearly, $e(dp^{v})$ also enhances the dumpy oblique phenotype as well, indicating the interaction is recessive for both mutants and taking place in both the developing wing disc and the tendon cells of the thoracic flight muscles. To date, the $e(dp^{v})$ gene, which maps at 40.4 on the third chromosome, has not been annotated nor has the lesion producing the dumpy interaction been identified.

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Temperature shock effects on *dumpy* wing expression.

Thompson, Steven R., and Ross J. MacIntyre. Department of Molecular Biology and Genetics, Cornell University, Ithaca, NY 14853 and Department of Biology, Ithaca College, Ithaca, NY 14850. Corresponding author: Steve Thompson; email address: thompson@ithaca.edu.

Introduction

The *dumpy* locus is a complex gene and developmental system. Through alteration of its' primary product, a large extracellular protein, three major mutant phenotypic effects have been noted. These are a truncated wing termed *oblique* (dp^{o}), a rearrangement of thoracic bristle pattern termed *vortex* (dp^{v}), and lethality (dp^{l}). Different *dumpy* alleles can exhibit a single one of these phenotypes or a combination, *e.g.*, both *oblique* and *vortex* (dp^{ov}). Phenotypic expression of *dumpy* can be modified by a number of genetic factors, among them are single second site enhancer or suppressor genes, *e.g.*, $en^{(dpv)}$, the accumulative effects of polygenic modifiers, and position effect. Not yet examined are the effects of environmental factors such as temperature shock during pupal development on the phenotypic expression of *dumpy* mutants in the adult fly. This approach was used in the 1960's in a number of studies on the genetics and development of the posterior crossvein (Thompson, 1967). In these studies both enhancement and suppression of the mutant phenotype, missing portions of the posterior crossvein, was dependent on the time during pupal development when heat shock was applied, age response, and the length of the heat shock treatment, dose response. This study shows that the wing phenotype of *dumpy-oblique* mutants can be altered by high temperature shock in a fashion similar to that observed with *crossveinless-like* mutants.

Materials and Methods

The four different *dumpy* mutations, dp^{ov1}, dp^{ov7b}, dp^{ov56a}, and dp^{ovA12}, used in this study are a part of the *dumpy* stocks maintained in the laboratory of Dr. Ross J. MacIntyre of Cornell University. Stocks were maintained on a standard medium at room temperature, 23°C. Experimental cultures were handled as described by Thompson (1967).

White prepupae were collected and placed on the inside walls of plastic shell vials (25 × 95 mm), plugged with moist cotton and allowed to continue development at 23°C. Whiteness of the prepupae indicates that it was collected in less than one hour after the onset of puparium formation, and the time of collection is