Metcalfe, J.A. University of York, Heslington, England. A dumpy lethal affecting larval moulting in D. melanogaster.

The change from one larval instar to the next is far from fully understood. The transition is under the control of the moulting hormone (ecdysone) and involves not only the actual physical process of moulting (ecdysis) but also the duplication of chitinous structures which precedes it.[1,2] That both these processes require ecdysone for at least their initiation, has been demonstrated by Hanser[3] in Ephestia.

Both the events - duplication and ecdysis - are affected in "Lethal Stuck". These larvae homozygous for one of the dumpy alleles, $dp^{lm\ 4}$, fail to complete these processes. Death usually occurs at the first/second larval boundary, and, rarely at the second/third larval boundary. The majority of lethals attempt to free themselves from their old chitin coat, but the coat itself always remains intact. The suspensoria of the mouthparts always remain within the body although the jaws are almost always thrown off. Many larvae withdraw from their posterior spiracles which remain attached to the tracheal trunks (figure 1); and, some withdraw from the old chitin coat incompletely, for, certain regions of the body wall, usually the anterior and/or the ventro-posterior tips, still remain attached to it. These regions of the body become stretched as the larvae contract while attempting to free themselves (figure 1).


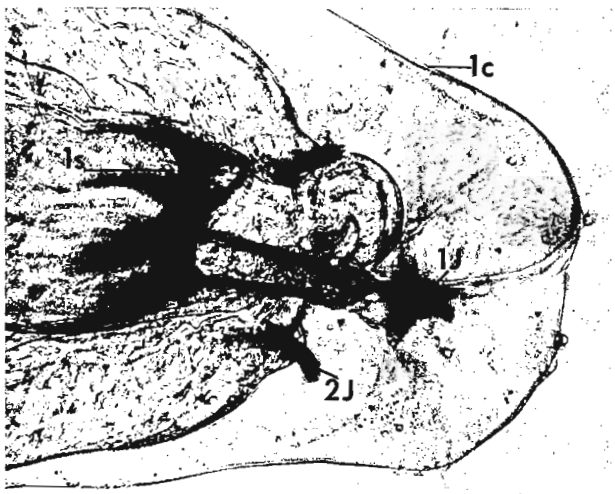


Figure 1. "Lethal Stuck" withdrawn from posterior spiracles (p) and still attached to the ventroposterior part of body wall (b).

Figure 2. Anterior region of a "Lethal Stuck" with incompletely duplicated mouthparts, i.e. second instar jaws only (2J); withdrawn from first instar coat (1c); thrown off first instar jaws (1J); first instar suspensoria still within the body (1s).

The duplication of chitinous structures viz., mouthpart apparatus, tracheae, posterior spiracles and chitin coat may also be incomplete. The lethals show a wide variation in the amount of duplication and differentiation of these structures. It is interesting that the individuals attempt to moult even in the absence of duplicated chitinous structures (figure 2). But even where the structures are fully duplicated, ecdysis is not brought to completion.

The "Lethal Stuck" shows that these two processes - duplication and ecdysis - can be separated because they can vary independently of each other. Such lethals may prove to be useful in providing information about the mode of action of hormones involved in moulting, the target organs of the hormones and their response.

The expression of other dumpy lethals is to be reported elsewhere[5]

References: 1. Bodenstein, D. 1944, The induction of larval moults in D., Biol. Bull., Wood's Hole 86: 113-124. 2. Novák, V.J.A. 1966, "Insect Hormones". Methuen & Co. Ltd. 3. Hanser, G. 1957, Wirkung eines Metamorphose - Hormons bei Ephestia kühniella. Zool. Anz., 20: 209-215. 4. Lindsley, D.L. and Grell, E.H. 1967, Genetic Variations of D. melanogaster. Carnegie Inst. Publ. 627. 5. Metcalfe, J.A. (in press) Development and complementation patterns of lethal alleles at the dumpy locus of D. melanogaster.