

Alternatively, one can view the *lxd* gene as a regulator of the activity of either the *ma-1⁺* gene or its product. In this case, the pyridoxal oxidase would be a polymer composed of only M polypeptides, CRM would again be any polymer containing R polypeptides, while xanthine dehydrogenase activity would be a polymer of M and R polypeptides. Another possibility is that only the *ry⁺* locus codes for a subunit of xanthine dehydrogenase, while the products of the *ma-1⁺* and *lxd⁺* loci are regulators or activators, not only of the R polypeptide which forms xanthine dehydrogenase, but also of other polypeptides which form pyridoxal oxidase and other unknown enzymes.

Muller, H. J. Indiana University. An improved stock, "vix," for scoring visible mutations that arise at specific loci in the X of the female.

The fertile females of this stock have X-chromosomes of the same composition as those of the "Maxy-v" stock (number f30 of the 1957 Bloomington stock list in DIS 31), except that in this stock the recessive genes *ptg* and *oc* and the dominant *B* are in the X-chromosome having

most of the recessive mutants, while the balancing X-chromosome is supplied with *lz^S* instead of *ptg oc*. Moreover, the fertile females contain a Y-chromosome, of normal type. The X-chromosome of the fertile males has the composition *y oc ptg lz f*. As in the stocks "jynd" and "plond" (f72 and f88, respectively, of DIS 31), but even more so because of the additional pressure of the *B^{M1}* inversion in one X, the combination of heterozygous inversions in the presence of a free Y causes a high frequency of non-disjunction of the X's, with resultant matroclinous daughters, bearing both the mother's X's, that can be scored for visible mutations arising in the originally wild-type loci of the non-multiple-recessive X, while at the same time the only fertile sons (in this case, in fact, the only viable sons) are patroclinous. One kind of disjunctionally produced daughter, of phenotype *y oc ptg B f*, is sterilized by *oc*, while the other kind, of phenotype *lz B⁺*, is rendered highly infertile by the *lz/lz^S* combination and, if it should breed, would produce virtually no crossovers of a kind that would disturb the genetic system.

The reproducing individuals are as follows:

males: $Y^+/y \text{ oc ptg lz f}$

females: $\frac{Y^+/1J1 \text{ sc}^{J1(+)} \text{ In49 v lz}^S B^{M1} \text{ In}}{y \text{ sc}^{S1} \text{ car odsy B f g}^2 \text{ dy v ras}^2 \text{ ptg oc sn}^3 \text{ ct}^6 \text{ cm rb ec w pn l sc}^8$

Any mutant or suspected mutant daughter arising non-disjunctionally can be bred with her brothers for verification and for establishing a balanced stock. The phenotypes of the disjunctionally arising daughters present combinations of peculiarities that keep them from being mistaken, even at first sight, from mutant daughters of non-disjunctional origin.

The "vix" stock not only has the advantage over "jynd" and "plond" of giving no disjunctional males. Its normal Y gives rise to more non-disjunction of the X's (more than half of the daughters being non-disjunctional) than does the ring-Y (Y^{LC}) of "jynd". Moreover, the Y^+ , unlike the $y \cdot Y^L$ of "plond", leaves uncovered the deficiency of the left end of the X that arises when, occasionally, the X's undergo acrocentric attachment with one another, or when one of them exchanges with the Y (see the Valencias and Muller in DIS 23:99-103); it thereby results in the death of these exceptions which when viable are difficult to recognize for what they really are. It is also to be noted that the homozygosity for vermilion of the parental and non-disjunctionally produced females, which was recommended by Altenburg, makes the other eye color mutants here in question more conspicuous. That is, it sensitizes the observer, as it were, to these changes, and although the locus of vermilion is thereby sacrificed so far as the finding of mutations to *v* is concerned, more is gained than lost by the greater ease and reliability of the scoring for these other loci.

The loci in the non-multiple-recessive X-chromosome of the "vix" stock in which it is practicable to recognize mutants and test them genetically fall into the following phenotypic categories: eye color, 7 (car, g, ras, cm, rb, w, pn); eye form, 3 (sy, B, ec, although B makes sy and ec more difficult); wing conformation, 3 (od, dy, ct); body color, 1 (y, although ptg might perhaps be used also); in addition an extreme "minus" mutation in sc^8 could be recognized, and dominants such as N, Bx, Sc, Minutes, Tu and Tul (see my "New Mutants" report in this issue of DIS) would also be detectable. For comparison with visible mutations arising at specific loci in the X of the male, the above mentioned "Maxy-vermilion" stock provides a close counterpart to "vix".

In some of the work on specific-locus mutations it is desirable to know how many lethals are arising at the same time, so that the results may be calibrated to a given standard of spontaneous or induced mutation frequency, as was done in earlier work by the Valencias and myself and by Schalet. The "vix" stock lends itself to such tests by merely crossing the females (whose mothers should have been derived by random sampling from the same cultures as supplied the flies for the specific locus tests) to males that have a Y of the type $lJ1^+.Y$ or $sc^8.Y$, in order to "cover" the $lJ1$ of the X-chromosome to be tested and thus allow another lethal to be recognizable by the absence of sons having the X under investigation. Of course the mothers of the females thus tested should have been bred individually, so as to prevent pre-existing lethals from being confused with the newly arising ones that are to be scored.

Abrahamson, Seymour and Helen U. Meyer.
University of Wisconsin. Use of Minute
to facilitate studies of mutations in
second chromosomes.

The most laborious step when breeding for autosomal mutations is the collection of virgin females in the F_2 generation to cross with brothers of the same, balanced genotype. A new and rather simple method facilitates this step by having the unwanted type of F_2 heterozygous for Minute

while the class needed for inbreeding is non-Minute. Due to the fact that the Minute flies have a considerably longer period of development than the desired type of non-Minute, Curly flies, only the latter are present in the F_2 cultures during the first 2-3 days of hatching. By taking advantage of this period one eliminates the need for getting Curly virgin females. Mrs. Gloria Daniels of our laboratory has recently demonstrated that raising the F_2 cultures at $16-19^\circ C$ further extends the difference in developmental time between the Minute and the non-Minute flies. The stock used for this purpose ("M") has the composition $S\ M(2)S7\ bw^D / dp^{txI}\ Cy, Ins0\ pr\ cn^2\ sp$ and is of good viability. It is not necessary to have special second chromosomes in the P_1 generation; wild type or marked chromosomes may be used.

The simplest procedure is to cross the P_1 generation to the M stock, select Curly F_1 males and then cross these again, individually, to 2-3 virgin females from the M stock. Parents should be removed. In F_2 one should use offspring from the first 2-3 days of hatching. These are usually all of the desired, Curly type, although occasionally a Minute, brown fly may already be present. However, their offspring can readily be identified by these markers when scoring for lethals in F_3 .

We prefer to use a somewhat more elaborate scheme and combine this method with H. J. Muller's scheme of "criss-crossed" second chromosome lethals, S, Cy, dp^{tx} , and Sp. (Sp is now being incorporated into the "M" stock). The P_1 generation is first crossed to a stock $dp^{tx}\ Sp\ pr\ cn\ bw\ sp/S^2\ ls\ Cy, InL\ pr\ cn\ bw\ sp$. This has the advantage that both types of F_1 males, Curlies and non-Curlies, may be utilized. Then one proceeds as described above. A few, late hatching homozygous Curly survivors will appear along with the Minute, brown flies in F_2 . These can be distinguished from the regular Curlies by also being homozygous for pr and sp.

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