
Miscellaneous useful information about *Drosophila*

A diploid *Drosophila melanogaster* fruit fly has two sex chromosomes (XX in the female and XY in the male) and three pairs of autosomes, designated chromosomes 2, 3 and 4; the X is designated chromosome 1. Chromosome 4 is very small. The X is telocentric, meaning that the centromere is at one end. Centromeric heterochromatin is not amplified in polytene nuclei, and all polytene chromosomes are attached to the chromocenter (unamplified heterochromatin), so that a good squash of a polytene nucleus shows five arms extending from a central point. These arms are the euchromatic portions of X, 2L, 2R, 3L and 3R. The pattern of bands is reproducible, and Calvin Bridges devised a nomenclature for them in the 1930's. Each major chromosome arm is divided into 20 numbered sections (X = 1-20, 2L = 21-40, 2R = 41-60, 3L = 61-80, 3R = 81-100 and 4 = 101-102). Each numbered unit is divided into six lettered regions, A-F, and each letter into some number of bands, depending on what Bridges saw. The correlation of these polytene maps and cloned DNA can be accomplished by *in situ* hybridization, and polytene maps can be correlated with genetic maps based on recombination by testing for complementation between mutant alleles and cytologically visible deletions. A summary of such correlated information is available on Flybase, <http://flybase.bio.indiana.edu/>, and links available through flybase.

Genes are given a full name, like *speck*, and a symbol, like *sp*. In general, gene symbols are capitalized if the original allele was dominant. Thus, gene names are case-sensitive, so *b* and *B* denote different genes (*black* body color and *Bar* eye, respectively). Alleles are indicated by superscript, except when that is impossible (for example, when plain text format is used), in which case brackets are used (e.g. B[1] for *B¹*). The wild-type allele is indicated by a +. Thus, *B⁺* denotes the wild-type, or non-mutant, form of the *Bar* gene. Of course, wild-type alleles are generally omitted when giving genotypes. If not specified, the first allele of a gene is implied; thus, to simply write *B* implies *B¹*. Transgenes are enclosed in brackets. Thus, *P{w^a}6* refers to a specific insertion (number 6) of a *P{w^a}* transgene, which carries the apricot allele of the white locus within a P element transformation vector. Markers on separate linkage groups are separated by a semicolon (;) when specifying a genotype, and the chromosomes are listed in numerical order. The genotype of a fly carrying mutations in *white*, *speck* and *rosy* would therefore be *w; sp; ry*, since *w* is X-linked, *sp* is on the second chromosome, and *ry* is on the third. A comma (,) is used to separate genes on the same chromosome, so *CyO, cn²* indicates that *cn²* is on the *CyO* chromosome. If no comma is used, a gene order is implied: *cn bw sp* indicates that these three genes lie in that order (left to right) on the map of chromosome 2.

You need to know what a balancer chromosome is. Balancers are multiply inverted chromosomes containing a dominant visible mutation and (usually) one or more recessive lethal mutations. The multiple inversions serve to completely suppress exchange between the balancer and its homolog (in fact, exchanges occur, but are not recovered). Thus, the dominant visible marker indicates segregation of the entire chromosome. Balanced lethal stocks consist of a balancer chromosome in trans to a chromosome carrying the balanced lethal allele. Because both classes of homozygote are lethal, the stock is true-breeding, and all progeny are heterozygous for the balancer and the lethal. Because no recombination occurs, the balanced chromosome is stable. In essence, then, balancers can be used to clone a single chromosome of interest.