

2. Recombination and complementation of fly mutants.

Mutations in genes that causing stupidity were isolated in flies. (We knew the flies were stupid because they kept flying into a window with a frogs tongue painted on it.)

A. From the table below, describe how many genes were identified that regulated stupid behavior. Indicate which mutants are recessive and are dominant. For any dominant mutant, cite the observation(s) that indicates they are dominant.

The horizontal genotypes represents the dads chromosome contribution to the progeny, and the vertical line represents the moms chromosome contribution to the progeny.

	wt	m1	m2	m3	m4	m5	m6
wt	+	-	+	+	+	+	+
m1		-	-	-	-	-	-
m2			-	+	+	-	+
m3				-	-	+	-
m4					-	+	-
m5						-	+
m6							-

At least 2 genes are identified, that identified by m2 and m5, and a second by m3, m4 and m6.

m1 is dominant, so you don't know if it is in the same gene as the other mutations or not.

m1 must be dominant because it fails to complement even a wildtype allele. (It also fails to complement all the rest of the mutations...though if all those are linked (unlikely) the failure to complement could be because m1 is a larger deletion)

B. Can you tell from this data where the mutations are in the genome?

NO--this is a complementation tests that yields no information on gene location which requires a recombination test.

C. Suppose you've identified a mutation 7. Mutation 7 when inherited from a female failed to complement any of mutations 1-6, and showed mutant behavior when crossed with a wildtype male. Yet, when mutation 7 was inherited from a male it complemented all the mutations and was recessive to wildtype. How can you explain this behavior (Hint: this sort of genetic phenomenon was brought up in Bruce's section, not mine).

Imprinting is a possible cause for this; if the wildtype male gene is silenced in the offspring, then only the female allele is expressed. If the female allele is mutant, then it will always yield mutant offspring. (This was a little tricky just to make it more interesting...I don't usually do things like this on an exam...and if I do, they are worth a point or two, not more.)