Biol 322 Fall 2013 Homework Assignment 1 (15 pts.)

This assignment is due Tuesday Oct 1 at the <u>beginning</u> of lab period.

- *No late submissions will be accepted.*
- *Feel free to talk through this exercise with your classmates and a textbook in hand but be sure to write up your answers on your own.*
- *This exercise can be submitted in a neatly handwritten form or word-processed.*

Basic Ce reproductive info

All of the strains of C. elegans that we will work with this quarter are diploid (2n =12). A C.elegans hermaphrodite has 5 pairs of autosomes and a pair of X chromosomes—indicated as XX. Males have 5 pairs of autosomes and a single X chromosome – indicated as XO. <u>Like mammalian and fruitfly males, C. elegans males are hemizygous for all X-linked genes and show the same patterns of sex-linkage as mammals and fruitflies</u>.

Hermaphrodites produce both sperm and eggs; "her" gametes (both sperm and eggs) have 6 chromosomes—one copy of each of the 5 autosomes and one copy of the X. Males produce sperm only; half of the gametes produced by a male contain 6 chromosomes (including the X) and the other half have 5 chromosomes --the autosomes but no X chromosome.

*Eggs produced by the hermaphrodites can be fertilized by her own sperm to produce <u>**self-progeny**</u> or by the sperm from* a male to produce *<u>**cross-progeny**</u>. A mated hermaphrodite will produce types of progeny: XX hermaphrodites and XO) males.*

Homework Assignment:

Gene A (equivalent to the *dpy-11* gene in your lab exercise) is located on autosome number V. You isolate a mutation in the lab which defines a new gene which you call gene B (equivalent to *unc-32* in your laboratory exercise). *Following the instructions on the next page, you are write out how you would set up and interpret data from the crosses which address these two questions:*

1. Is Gene B located on an autosome or on the X-chromosome?
2. Assuming Gene B is autosomal, is it located on chromosome V?

You have two strains to work with:

Wild-type for both genes A and B: hermaphrodites and males
Doubly mutant for recessive allele of genes A and B: hermaphrodites only (the males can't mate anyway).

Step 1: Assign Allele Symbols. You should use a simple set of symbols that respect conventions, such as Mendel's style of upper and lower case letters or Drosophila style of indicating a wild-type allele with a + superscript. When writing out the genotypes of the P, F1 and F2 generations use a genotype symbolism appropriate for the question. For example, in part 3, use generic symbolism (with no inference about linkage) since you are making no assumption about chromosomal location of gene B:

Generic symbolism with no inference about linkage:

AaBb or Aa• Bb symbolizes that the F1 is doubly heterozygous for two genes that may or may not be linked

Hold off on using " / " and " ; " for the time being.

Part 2: Assuming gene B is X-linked, indicate genotypes and phenotypes (including sex) of parents, F1 cross progeny and ***self progeny of parental*** hermaphrodites. Do you need to go beyond the F1 generation to assess X-linkage? Be sure to indicate the X chromosome in your genotype: use allele symbol X^B or X^b. Include the genotypes for both Genes A and B.

Part 3: Assuming gene B is autosomal, write out genotypes and phenotypes (including sex) of the parents, the F1 cross progeny and the self-progeny of the Parental hermaphrodites.

Part 4: Assuming gene B is autosomal, how will the results of an *F1 self-cross* differ from a test cross (of the F1 animals) assuming that gene B is not on chromosome V? Indicate expected ***genotypes and phenotypes (including sex)*** of parents and progeny (and genotypic and phenotypic progeny ratios) for an F1 self cross and an F1 test cross.

For parts 2, 3 & 4 be sure to label each generation

Feel free to consult a genetic text for help with this assignment