Advanced Genetics
Yeast  March, 2017
Homework Problem Set

1. For the following tetrad data (PD: NPD:T), state if the genes are:
   A. linked or unlinked
   B. If linked, the map distance between the genes
   C. Centromere linkage, if possible

   a. 47: 53:0
   b. 45:4:51
   c. 20: 20: 60
   d. 10:0:90

2. Draw chromosomes in Meiosis I to explain 1d in the question above. What property (ies) of meiosis are altered in this cross.

3. You perform tetrad analysis on two newly isolated mutants. The tun1 mutant confers resistance to Tunicamycin. The ani1 mutant confers resistance to anisomycin. In the tetrads you obtain, you find 50 parental ditypes. You get 10 tetrads that have only two viable wild-type progeny and 40 tetrads that have only three viable progeny.

   a. What are the likely genotypes of the three viable progeny in the last set of 40 tetrads?

   b. How do you explain the inviability in the cross?

4. You isolate a wild yeast strain and cross it by both MATa and MATα lab strains. You find that it mates with the MATα parent. When you dissect the tetrads, you get only about 5% viable progeny.

   a. What is the likely explanation of the high level of inviability?

   b. How would you test your explanation for part a?
5. You decide to brew some beer because you cannot afford to buy Urban Chestnut STLIPA. You get a yeast strain (LAB1) from a friend. When you mix it with a wild-strain, the wild strain dies. You get a second strain from a different friend (LAB2) and when you mixed it with the wild strain, no death occurred and you made some beer.

You decide to determine what is the cause of the killing phenotype of LAB1. You do a cross of LAB1 by LAB2. Luckily they have the right mating-type alleles. You dissect 25 tetrads. For each of the 100 meiotic progeny, you mix them with the wild strain. You find that all 100 progeny kill the wild-type strain.

a. How do you explain this result?

b. What experiment will you do to test your idea?

6. Linear tetrads are useful for centromere mapping in Aspergillus and Neurospora. The order can be used to map centromeres. The spores above the midline arise from one meiosis I daughter and the spores below the midline arise from the other meiosis I daughter. A rare *Saccharomyces cerevisiae* strain gives linear tetrads rather than tetrahedral tetrads that have no order. The two phenotypes are shaded and unshaded.

Below are tetrads in the order that they were found and scored. Determine if shaded gene is linked to its centromere and what is the distance from the gene to its centromere if it can be determined.

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30                  8                     27               11               9                     7
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7. Describe the screen used to find autophagy mutants in yeast. How would you use multicopy suppression to find genes involved in autophagy?