MCB 142 Discussion

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1 Practice Problems

1.1 Hardy-Weinberg I

About 70 percetn of all white North Americans can taste the chemical phenylthiocarbamide, and the remainder cannot. The ability to taste this chemical is determined by the dominant allele T, and the inability to taste is determined by the recessive allele t. If the population is assumed to be in Hardy-Weinberg equilibrium, what are the genotype and allele frequencies in this population?

1.2 Hardy-Weinberg II

In a large natural population of *Mimulus guttatus*, one leaf was sampled from each of a large number of plants. The leaves were crushed and subjected to gel electrophoresis. The gel was stained for a specific enzyme X. Six different banding patterns were observed.

bands	frequency
1	0.04
2	0.09
3	0.25
1 and 2	0.12
1 and 3	0.20
2 and 3	0.30

1. Assuming that these patterns are produced by a single locus, propose a genetic explanation for the six types.
2. How can you test your hypothesis?
3. What are the allele frequencies in this population?
4. Is the population in Hardy-Weinberg equilibrium?

1.3 Directional Selection

In a large experimental *Drosophila* population, the fitness of a recessive phenotype is calculated to be 0.90, and the mutation rate to the recessive allele is $5 \cdot 10^{-5}$. If the population is allowed to come to equilibrium, what allele frequencies can be predicted?

1.4 Balancing Selection

The fitnesses of three genotypes are $W_{AA} = 0.9$, $W_{Aa} = 1.0$ and $W_{aa} = 0.7$. If the population starts at the allele frequency $p = 0.5$, what is the value of p in the next generation? What is the predicted equilibrium allele frequency?