MCB 142 Discussion

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1 Announcements

The second midterm will be handed back at the end of section. The class average was 96.1 and the standard deviation was 22.7.

Due to the Thanksgiving holiday, sections next week are optional for those sections meeting on Tuesday and Wednesday. Students in Thursday and Friday sections are nevertheless encouraged to attend earlier sections in the week.

2 Practice Problem

2.1 Chapter 11, Problem 22

The pedigrees indicated here were obtained with three unrelated families whose members express the same completely penetrant disease caused by a dominant mutation that is linked at a distance of 10 cM from a marker locus with three alleles numbered 1, 2, and 3. The marker alleles present within each live genotype are indicated below the pedigree symbol. The phenotypes of the newly born labeled individuals–A, B, C, and D– are unknown. What is the probability of the disease expression in each of these individuals?

3 Population genetics

3.1 Terminology

- genotype frequency
- allele frequency
- DNA profiling
- Wahlund effect
- selection (positive vs. negative, balancing vs. directional/purifying)
- genetic drift

3.2 Hardy-Weinberg equilibrium

We can expect Hardy-Weinberg genotype frequencies in a population undergoing random mating. For a biallelic polymorphism with alleles A and a with frequencies p and q, the genotype frequencies are as follows:

$P(AA) = p * p = p^2$
$P(Aa) = 2 * (p * q) = 2pq$
$P(aa) = q * q = q^2$

One generation of random mating is sufficient to establish Hardy-Weinberg equilibrium. These genotype frequencies are maintained in successive generations of random mating. Note that the allele frequencies are not changed under these conditions either.

The frequencies can be generalized to multiple alleles. Note that the frequencies above are terms of the binomial expansion of $(p+q)^2$. For a gene with n alleles, take the terms of the expanded polynomial $(p_1 + ... + p_n)^2$.

Hardy-Weinberg usually serves as a null hypothesis. When do we see deviations from Hardy-Weinberg equilbrium?

- self-fertilization
- inbreeding
- assortative mating
- mutation
- migration or admixture
- selection