

February 20, 2015

## Patterns of Inheritance

### Outline

- Announcements
  - Quiz 4 due Sunday
  - Exam 2 on Monday
    - Bring Scantron
- Mendel's 4 hypotheses
- Patterns of Inheritance
- Punnett Square Practice Problems

### Mendel's Four Hypotheses

1. There are alternate forms of genes (alleles) and these account for the variation of inherited characters
  2. Offspring inherit 2 alleles for each character, one from each parent
  3. When alleles are different, one allele masks the other allele
  4. Allele pairs separate during gamete production and gametes carry one allele for each inherited character
1. Alternate forms of genes (alleles) account for variation
    - Alleles: alternative form of genes
      - Variation of genes is due to alleles
    - Flower Color: 2 Forms
    - Human blood types 3 Forms (A, B, O)
  2. Offspring inherit 2 alleles for each character, one from each parent

- 1 chromosome with alleles for genes are inherited from mom and one from dad
- Alleles can be the same or different
  - o Homozygous: alleles same
    - Same allele on both chromosomes
  - o Heterozygous: alleles different
    - Different alleles on each chromosome

### 3. When alleles are different, dominant allele masks recessive allele

- Complete Dominance
  - o If the dominant allele is there it will show in the phenotype
- Dominant Alleles (uppercase letters)
  - o Determines appearance of offspring if present
    - Homozygous Dominant: Two dominant alleles (PP)
    - Heterozygous Dominant: one dominant, one recessive (Pp)
- Recessive Alleles (Lowercase letters)
  - o Masked by dominant allele
  - o Only determines appearance if both alleles are recessive
    - Homozygous recessive (pp)

### 4. Mendel's Law of Segregation

- Tested so many times it became a law
- Came to conclusions without fully understanding processes
  - o Didn't know what meiosis was
- Allele pairs separate during gamete production and sex cells carry one allele for each inherited character

- o Meiosis: haploid number of chromosomes
- o Fertilization: fusion of egg and sperm result in diploid offspring
- Genotype: alleles present in offspring for character
  - o Ex) PP, Pp, pp
- Phenotype: physical appearance as a result of alleles
  - o Purple flowers, white flowers

#### Punnet Square: Monohybrid Cross

- Used to predict potential traits in offspring
  - o 4 possible combinations of alleles
- Based on type of gametes produced by parent
  - o Genotype: alleles for character
    - Each gamete has one allele
  - o Cross Bb x Bb
 

|   |    |    |
|---|----|----|
|   | B  | b  |
| B | BB | Bb |
| b | Bb | bb |

    - Gametes: B or b

#### Inbreeding

- Breeding with closely related organisms/family
  - o Expose more recessive conditions
- In a large population, chance of mating with a relative is low because there are many choices
- Sexual reproduction between non-related individuals increases or maintains high genetic diversity