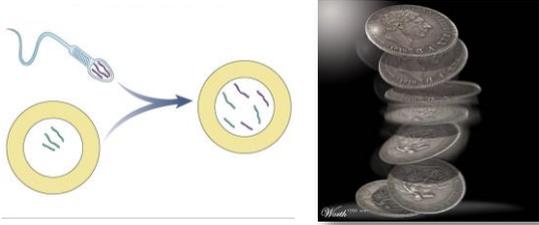


Chapter 12.1

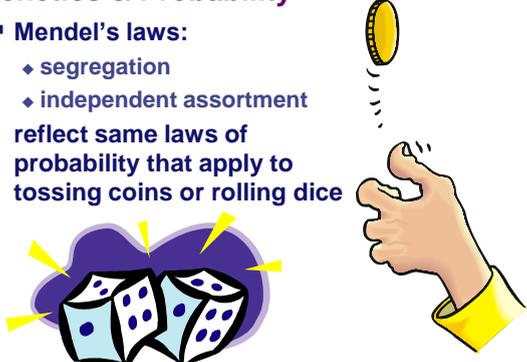
Probability & Genetics



Genetics & Probability

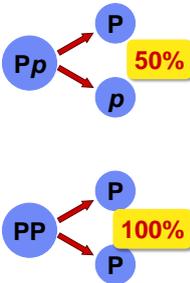
- Mendel's laws:
 - ♦ segregation
 - ♦ independent assortment

reflect same laws of probability that apply to tossing coins or rolling dice



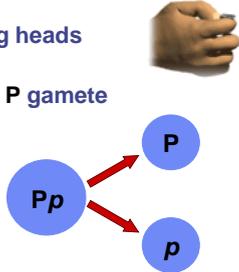
Genetics & Probability

- Calculating probability of making a specific gamete is just like calculating the probability in flipping a coin
 - ♦ probability of getting a P gamete?
 - ♦ probability making a P gamete?



Genetics & Probability

- Outcome of 1 toss has no impact on the outcome of the next toss
 - ♦ probability of tossing heads each time? 50%
 - ♦ probability making a P gamete each time? 50%



Rule of Multiplication

- Chance that 2 or more **independent events** will occur together
 - ♦ probability that 2 coins tossed at the same time will land heads up

$1/2 \times 1/2 = 1/4$
 - ♦ probability of Pp x Pp → pp

$1/2 \times 1/2 = 1/4$

Calculating Dihybrid Probability

- Rule of multiplication also applies to dihybrid crosses (as long as you don't have linked genes on the same chromosome)
 - ♦ heterozygous parents — YyRr
 - ♦ probability of producing yyrr?
 - probability of producing y gamete = 1/2
 - probability of producing r gamete = 1/2
 - probability of producing yr gamete = $1/2 \times 1/2 = 1/4$
 - probability of producing a yyrr offspring = $1/4 \times 1/4 = 1/16$

Rule of Addition

- Chance that an event can occur 2 or more different ways
 - sum of the separate probabilities
 - think of all the ways you can roll a 7!
 - probability of $Pp \times Pp \rightarrow Pp$

sperm	egg	offspring
P	p	Pp
$1/2 \times 1/2 =$		$1/4$
p	P	Pp
$1/2 \times 1/2 =$		$1/4$

\Rightarrow

$1/4$
$+ 1/4$
$1/2$

Calculating Probability

$Pp \times Pp$

male / sperm

P p

female / eggs

P	P	PP
$1/2 \times 1/2 =$		$1/4$
P	p	Pp
$1/2 \times 1/2 =$		$1/4$
p	P	Pp
$1/2 \times 1/2 =$		$1/4$
p	p	pp
$1/2 \times 1/2 =$		$1/4$

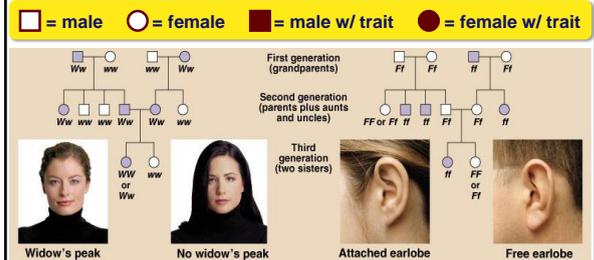
Chi-square Test (Analysis)

- Test to see if your data supports your hypothesis
- Compare "observed" vs. "expected" data

- H_0 is variance from expected due to "random chance"?
- H_A is there another factor influencing data?

Pedigree Analysis

- Pedigree analysis reveals Mendelian patterns in human inheritance
 - data mapped on a family tree



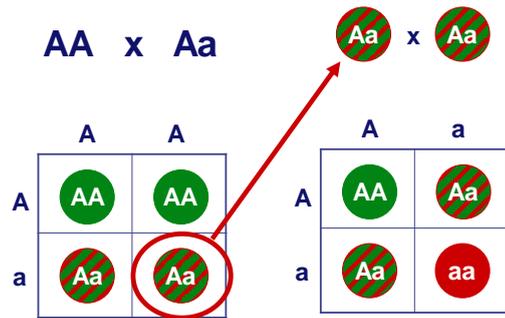
Genetic Counseling

- Pedigree can help us understand the past & predict the future
- Thousands of genetic disorders are inherited as simple recessive traits
 - benign conditions to deadly diseases
 - albinism
 - cystic fibrosis
 - Tay Sachs
 - sickle cell anemia
 - PKU

Recessive Diseases

- The diseases are recessive because the allele codes for either a malfunctioning protein or no protein at all
 - Heterozygotes (Aa)
 - carriers
 - have a normal phenotype because one "normal" allele produces enough of the required protein

How a hidden disease reveals itself...



Any Questions??

If none, let's work on some
Genetics Problems and check
on your flies!

(get out your binders...)