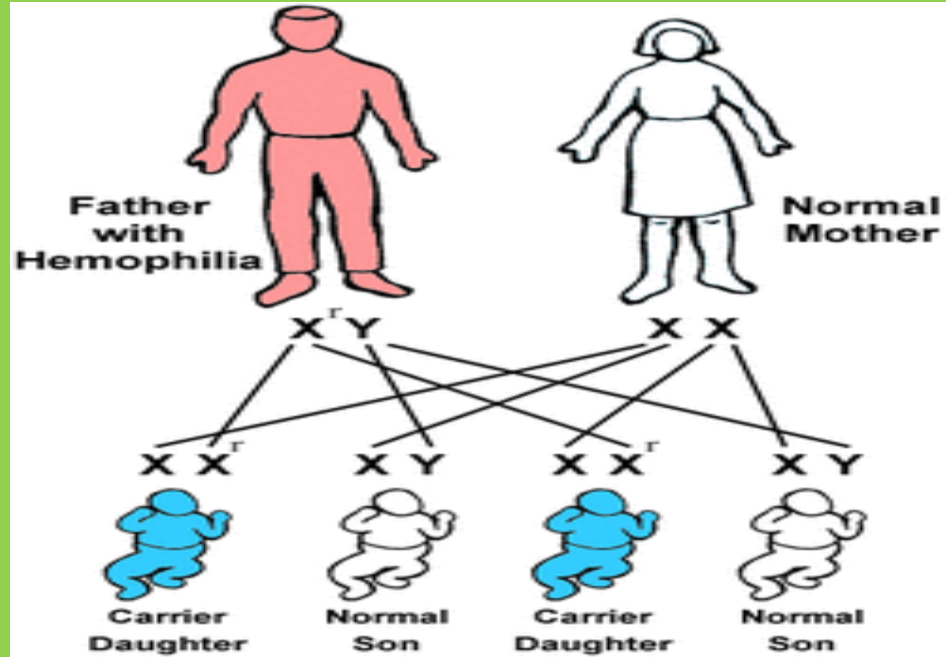


Polygenic Traits

Multiple Alleles

Sex-Linked Genes



Multiple Alleles

- A gene (characteristic) with more than two alleles is said to have multiple alleles.

Ex: coat color in rabbits, blood types.

- Most characteristics we've dealt with so far have two alleles (R and r). Multiple Alleles have more than two (ex: A, B, O in blood types).

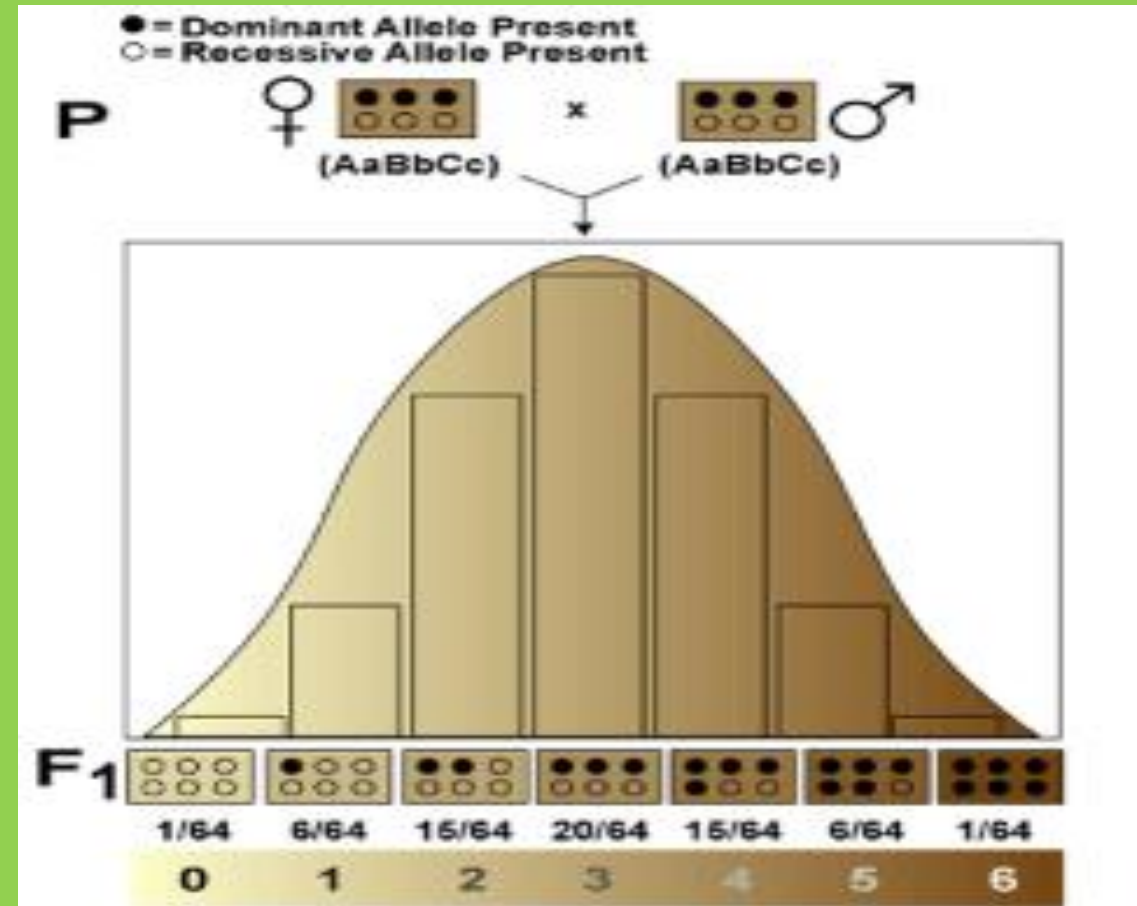
*****There can be multiple alleles for a certain trait, but each individual STILL ONLY HAS 2 → ONE FROM MOM, ONE FROM DAD.*****

Polygenic Traits

A trait that is controlled by two or more genes (each with two alleles)

- Ex: AaBbCc

Polygenic inheritance usually shows up as a range of variation such as height, skin color or eye color.



Continuous Variation and Rh Blood Factor
Multiple Gene (Polygenic) Inheritance

Gametes	ABC	ABc	AbC	Abc	aBC	aBc	abC	abc
ABC	6	5	5	4	5	4	4	3
ABc	5	4	4	3	4	3	3	2
AbC	5	4	4	3	4	3	3	2
Abc	4	3	3	2	3	2	2	1
aBC	5	4	4	3	4	3	3	2
aBc	4	3	3	2	3	2	2	1
abC	4	3	3	2	3	2	2	1
abc	3	2	2	1	2	1	1	0

Human Blood Types

Human Blood Types

- There are 4 different blood phenotypes
 - A
 - B
 - AB
 - O
- 3 alleles are in the pool instead of just two (A, B, O)
- You still only get ONE from Mom and ONE from Dad.



Genotypes for blood type

ALLELE	CODES FOR
I^A	Type A Blood
I^B	Type B Blood
i	Type O Blood

Type O is the recessive blood type, which is why it gets a lowercase (i).

Genotypes & Phenotypes of Blood

Genotype	Phenotype
$I^A I^A$	Type A - Homozygous
$I^A i$	Type A - Heterozygous
$I^A I^B$	Type AB - Heterozygous
$I^B I^B$	Type B - Homozygous
$I^B i$	Type B - Heterozygous
ii	Type O – Homozygous recessive

Example Problem:

Dad is homozygous for Type A blood. Mom is heterozygous for Type B blood.
Do a Punnett Square to find out the offspring.

	I^B	i
I^A	$I^A I^B$	$I^A i$
I^A	$I^A I^B$	$I^A i$

What are the new genotypes?
Phenotypes?

- $I^A I^B$ Type AB
- $I^A i$ Type A
- $I^A I^B$ Type AB
- $I^A i$ Type A

Blood Donors & Receivers

Group O can donate red blood cells to anybody. It's the universal donor.

Group A can donate red blood cells to A's and AB's.

Group B can donate red blood cells to B's and AB's.

Group AB can donate to other AB's, but can receive from all others.

DONOR

O



A



B



AB



RECIPIENT

O



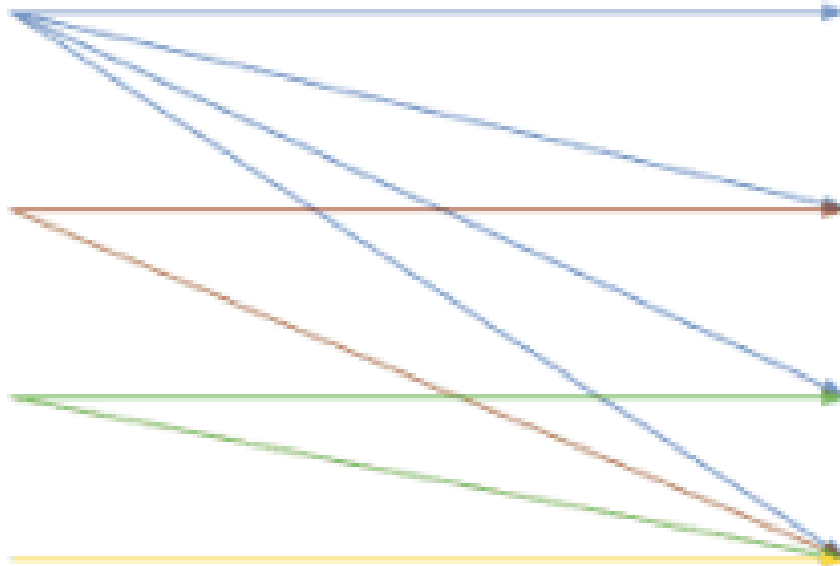
A



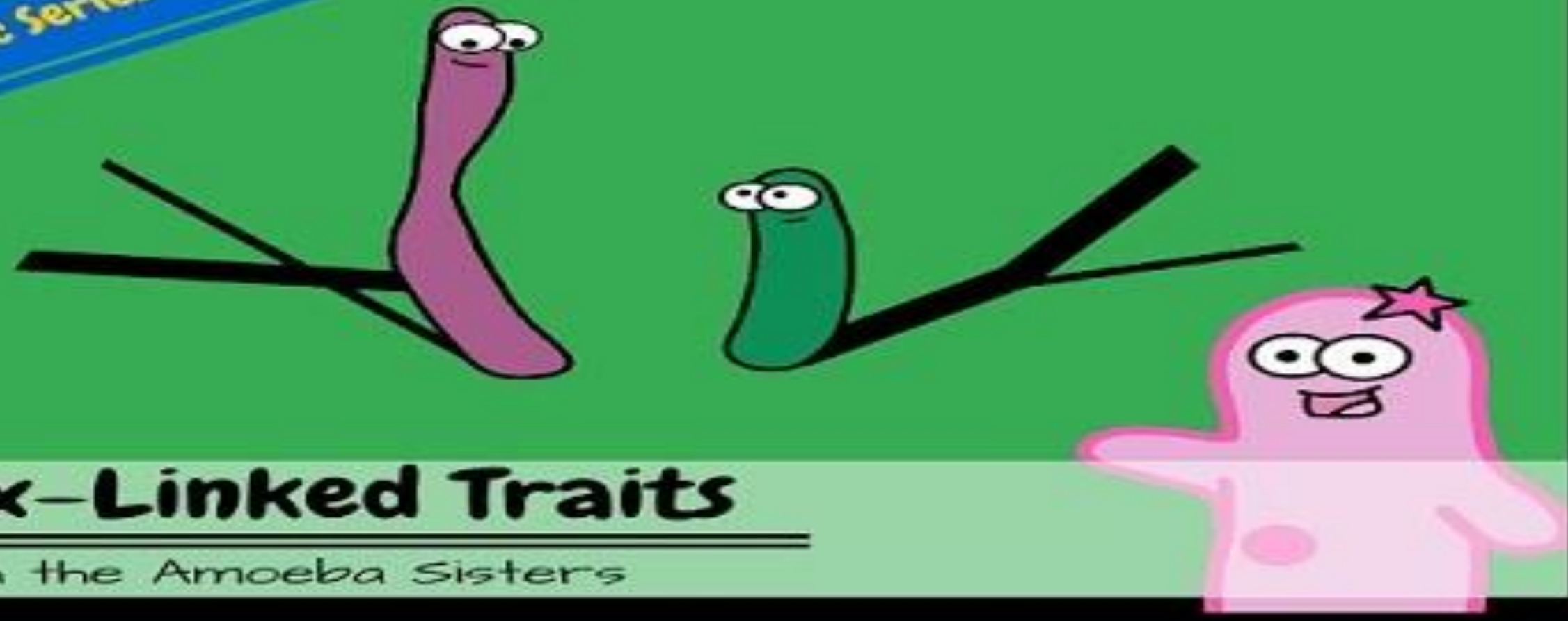
B



AB



Genetic Series - Video 2



Sex-Linked Traits

With the Amoeba Sisters

Sex – Linked Genes

- We each have two sex chromosomes (one donated from mom, one donated from dad).
 - Females: X X
 - Males: X Y
- Genes on the first X chromosome are shared traits between the sexes, and is inherited from your mother.
- Genes on the Y chromosome contain very few instructions (primarily just for male development).

Sex-Linked Disorders

Two of the most common sex-linked disorders are

- Colorblindness
- Hemophilia

The genes that cause these disorders is located on the X chromosome (usually passed from mother to son)

- This makes it very rare for a colorblind father to pass the gene onto his son.

Sex-linked Genotypes

Genotype	Codes for:
$X^R X^R$	Female – Homozygous – Dominant
$X^R X^r$	Female – Heterozygous – Dominant
$X^r X^r$	Female – Homozygous – Recessive
$X^R Y$	Male – Dominant
$X^r Y$	Male – Recessive

Example Problem:

- Colorblindness is an X-linked recessive disorder. Show a cross between a heterozygous mother and a father who is colorblind.

	X^r	Y
X^R	$X^R X^r$	$X^R Y$
X^r	$X^r X^r$	$X^r Y$

- What are the new genotypes?
Phenotypes?

- $X^R X^r$ – (F) Not Colorblind
- $X^R Y$ – (M) Not Colorblind
- $X^r X^r$ – (F) Colorblind
- $X^r Y$ – (M) Colorblind