Advanced Genetics

Incomplete Dominance, Co-dominance, and Sex Linked Traits

Incomplete Dominance

Kolreuter studied carnations instead of pea plants and tried to follow Mendel's Experiments.

He developed homozygous red (RR) and Homozygous white (rr) plants

Experiment 1: mated the P1 plants (RR x rr)

He got 100% pink plants (Rr)

Conclusion: sometimes one allele is not dominant over the other and you get a blending of the two instead = **incomplete dominance**

Incomplete Dominance

Experiment 1:

Red (RR) x White (rr)

	R	R
r	Rr Pink	Rr Pink
r	Rr Pink	Rr Pink

Experiment 2:

Pink (Rr) x Pink (Rr)

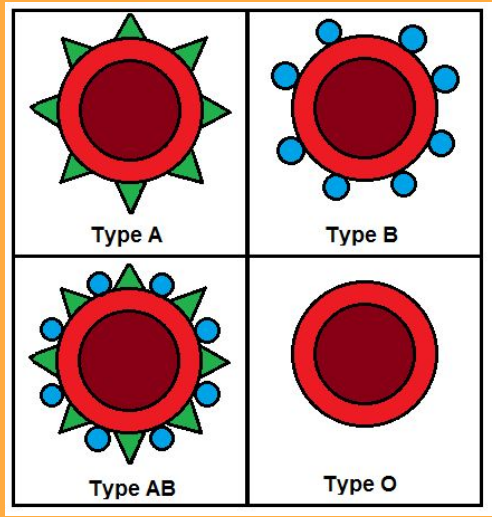
	R	r
R	RR Red	Rr Pink
r	Rr Pink	rr White

Codominance (Blood Typing)

There are 4 human blood types → A, B, AB, and O

Blood types correspond with what proteins are found on surface of the red blood cells

- Type A - has A proteins
- Type B - has B proteins
- Type AB - has both A and B proteins
- Type O - has no proteins



Genes That Control Blood Type

I = have proteins on red blood cell

i= have no proteins on blood cells

II= have proteins (Type A, B, AB)

Ii = have proteins (Type A, B)

ii= have no proteins (Type O)

Blood Type Genotypes

Blood Type	Genotype(s)
A	I^AI^A or I^Ai
B	I^BI^B or I^Bi
AB	I^AI^B
O	ii

Codominance (Blood Typing)

Blood typing is an example of two genetic terms:

<u>Multiple alleles</u> - more than 2 forms of the gene

Ex. I^A, I^B, i

<u>Codominance</u> - both alleles have their traits show equally (no masking or blending)

Ex. I^AI^B = blood cells with both A and B proteins on the blood cells

How Blood Types are Inherited.

Do Punnett Squares to solve the following problems.

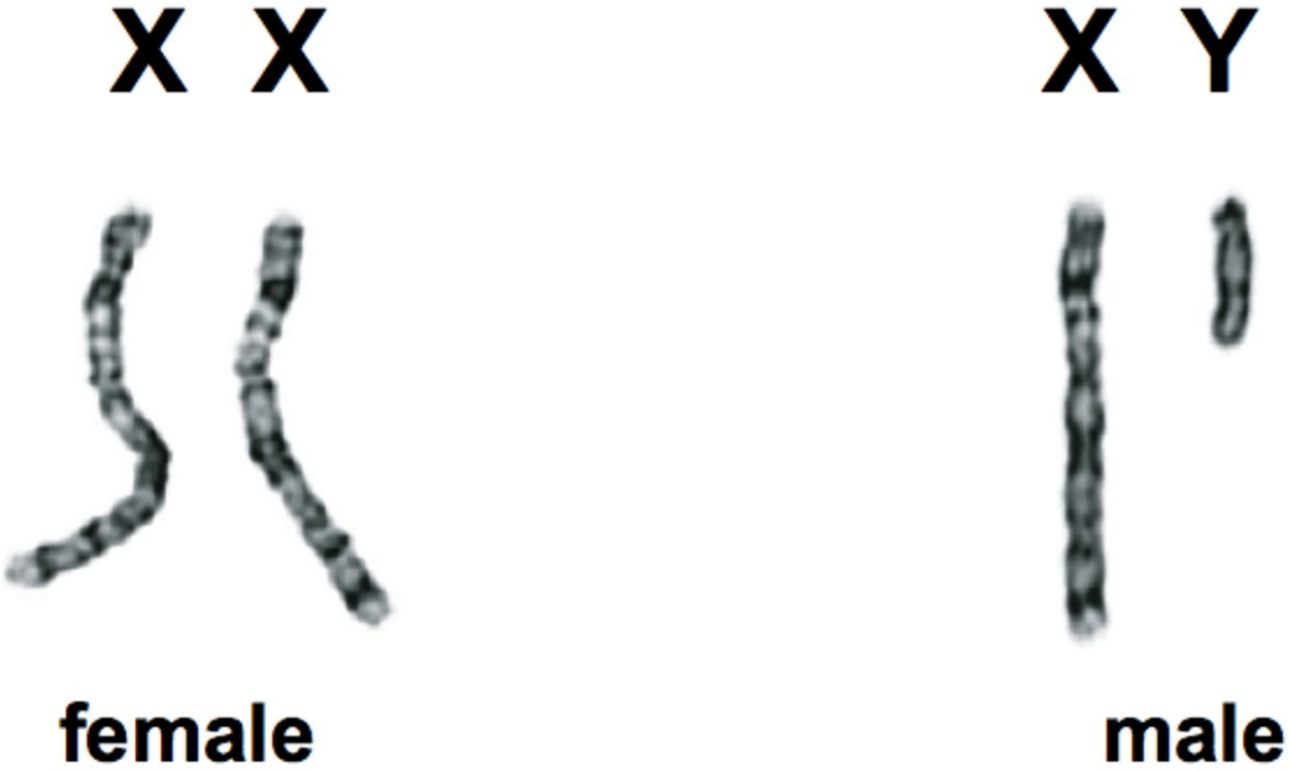
1. Type AB mother mates with type O father, what possible types are the children?
2. Type A woman accuses a man of fathering her baby. The man pleads innocent, claiming that he has type B blood so could not be the father of a type O child. Could he be the father?

Sex-linked Traits

The X chromosome is larger than the matching Y chromosome so has genes that the Y chromosomes do not have.

This makes males more vulnerable to recessive genes on the X chromosome as they do not have matching genes on the Y chromosomes to counteract that gene.

Ex. red-green colorblindness, hemophilia, pattern baldness


X X
X Y
female
male

Sex-linked Traits

Women can have the recessive gene, but may not express the trait if they have the matching dominant gene. This means they are **carriers** of the recessive gene and can pass the trait onto their male children.

Ex. X^C = normal color vision X^c = colorblindness

X^CX^c = normal vision female (carrier) X^cX^c = colorblind female

X^CX^C = normal vision female (not carrier)

X^CY = normal vision male X^cY= colorblind male

Sex-linked Traits

Use Punnett Squares to solve the following problems

1. A woman who is a carrier for color blindness marries a man with normal vision. What are the chances that
   a. Sons will be colorblind?
   b. Daughters will be colorblind?
   c. A child will be colorblind?

2. Do the same analysis for a carrier woman and colorblind man.