

Incomplete Dominance, Codominance, and ABO Blood Types

Review of Simple Mendelian Genetics

- ✦ Law of Segregation: each gene has two different alleles that are separated when gametes form
 - ✦ One allele goes to one gamete and the other allele to a different gamete
- ✦ Law of Independent Assortment: genes for different traits are inherited independently from each other

Review of Simple Mendelian Genetics

- ✦ Dominant vs. Recessive alleles for a gene
 - ✦ The dominant allele masks the recessive one, so you see the dominant trait (for RR or Rr)
 - ✦ The only way to see a recessive trait is to have two recessive alleles (rr)
 - ✦ Dominant allele is represented as a capital letter (R)
 - ✦ Recessive allele is represented as a lowercase letter (r)

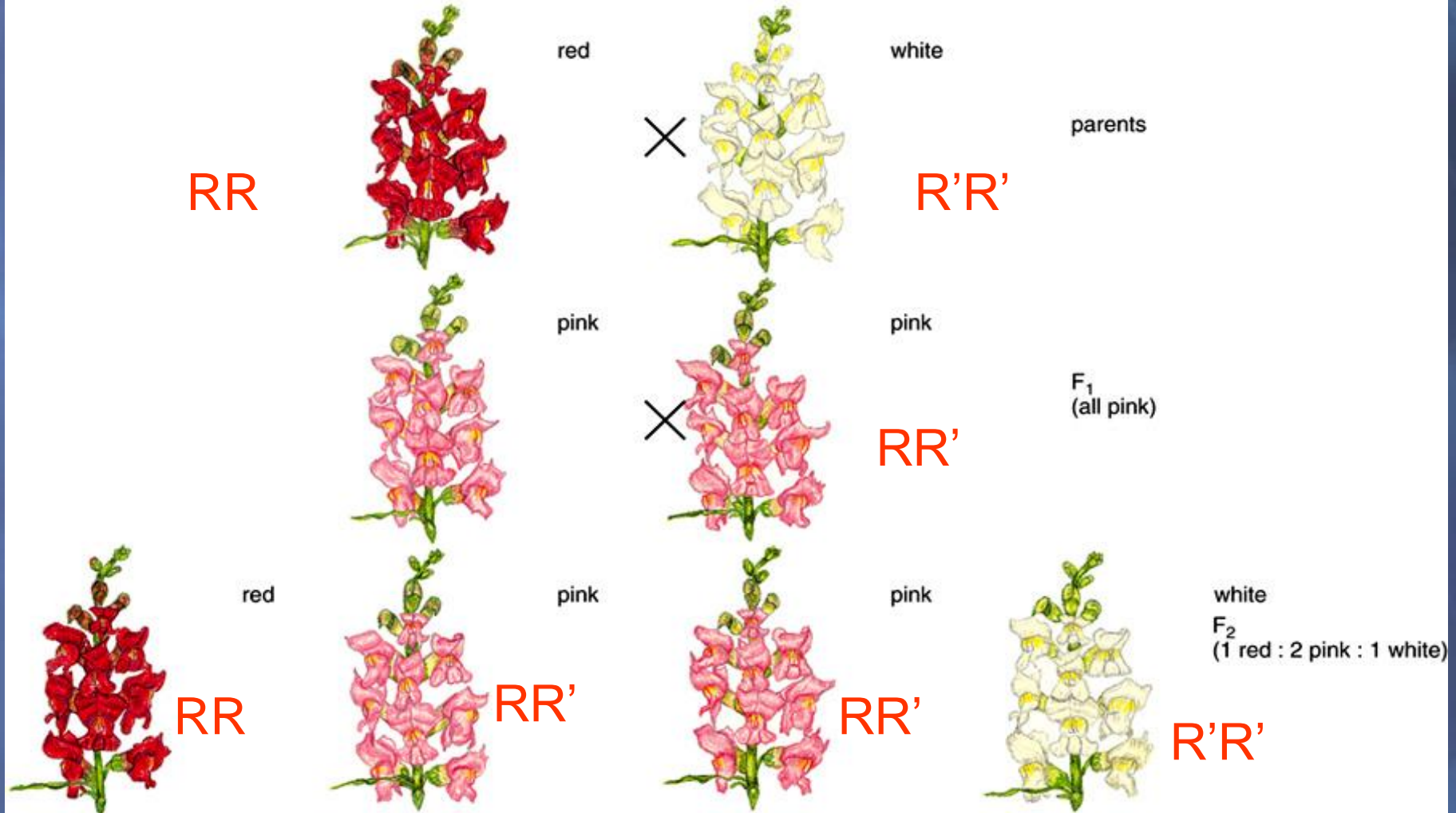
Unfortunately, it's not all
that easy...

Incomplete Dominance

- ✦ Sometimes neither allele is fully dominant over the other
- ✦ Incomplete Dominance: neither allele is dominant but combine and display a new trait that is a mixing of the two alleles

Incomplete Dominance

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Incomplete Dominance

- ✦ In incomplete dominance, the two alleles are represented as
 - ✦ Two capital letters
 - ✦ When these two alleles come together, they portray a mixing of the two phenotypes!

Codominance

- ✦ Other times both alleles are fully dominant
- ✦ Codominance: both alleles of a gene are dominant and the heterozygous phenotype has both traits equally expressed

Codominance



BB

x



WW



BW

Codominance

- ✦ In codominance the two alleles are represented as
 - ✦ Two capital letters: Use the first letter of one trait (B for Brown) and the first letter of the other trait (W for White)
- ✦ When they come together as a heterozygote, both traits show as the phenotype

Let's Stop and Think...

- ✦ Let's say there are two alleles for the hair color trait- red and blue
 - ✦ What would be the resulting phenotype of a heterozygous pair if the alleles showed incomplete dominance?
 - ✦ A. Red
 - ✦ B. Blue
 - ✦ C. Purple
 - ✦ D. Red and Blue patches

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Multiple Alleles

- ✦ Sometimes there are more than two alleles that govern the phenotype of a trait
- ✦ Multiple Alleles: the presence of more than two alleles for a genetic trait

Multiple Alleles

✦ Blood Type

- ✦ Human blood type is governed by the presence of 3 different alleles:

 - ✦ A

 - ✦ B

 - ✦ O

- ✦ However, each person only has 2 of these 3 alleles in their DNA

ABO Blood Type

- ✦ Blood types follow both Codominant and simple Dominant inheritance
 - ✦ The A allele and B allele are codominant with each other
 - ✦ The A allele and B allele are both purely dominant over the O allele
 - ✦ The O allele is recessive

Which blood type are you if you have...

✦ AA

✦ Type A blood

✦ BB

✦ Type B blood

✦ AB

✦ Type AB blood

✦ AO

✦ Type A blood

✦ BO

✦ Type B blood

✦ OO

✦ Type O blood

ABO Blood Types

- ✦ The blood type gene and alleles are represented differently than you have seen before
- ✦ The blood type gene is I
- ✦ For this I gene you can have the following alleles:
 - ✦ For A: I^A
 - ✦ For B: I^B
 - ✦ For O: i

Let's stop and think...

✦ What are the two allele combinations you can have for type A blood?

✦ $I^A I^A$ and $I^A i$

✦ What are the two allele combinations you can have for type B blood?

✦ $I^B I^B$ and $I^B i$

Let's Stop and Think...

✦ What is the only allele combination you can have for type AB blood?

✦ $I^A I^B$

✦ What is the only allele combination you can have for type O blood?

✦ ii