# Chapter 13-Inheritance Patterns

1. Introduction
   1. Inheritance Patterns
      1. Ways in which traits (\_\_\_\_\_) are inherited from \_\_\_\_\_to generation.
      2. There are many relationships which \_\_\_\_\_can exhibit in nature that are \_\_\_\_\_of a \_\_\_\_\_/\_\_\_\_\_nature.
      3. Exceptions to \_\_\_\_\_ principles
         1. Not all genes show a pattern of \_\_\_\_\_.
         2. For some genes, there are more than \_\_\_\_\_. Many times, traits are controlled by more than one \_\_\_\_\_.
      4. Different relationships which alleles can exhibit in nature:
         1. \_\_\_\_\_ dominance
         2. \_\_\_\_\_ Alleles and Codominance
         3. Sex Determination and Sex-\_\_\_\_\_ Genes
         4. \_\_\_\_\_ \_\_\_\_\_ causing \_\_\_\_\_ variation
         5. \_\_\_\_\_ (Modifier genes)

B. \_\_\_\_\_ Dominance

1. Description

* + - 1. Occurs when there are no forms of the gene that are \_\_\_\_\_.
      2. F1 hybrids have an appearance somewhat \_\_\_\_\_ the \_\_\_\_\_ of the two parental varieties.
      3. The resulting trait is a \_\_\_\_\_ of the \_\_\_\_\_.

2. \_\_\_\_\_ Inheritance, Co-Dominance Inheritance, Incomplete Dominance

* + - 1. The \_\_\_\_\_ ratios and \_\_\_\_\_ ratios are always the same.
      2. One can always tell that blending is involved if there are TWO EXTREMES and a “\_\_\_\_\_” intermediate of these two extremes to make up the third characteristics.
      3. If a phenotype shows 3 traits, it involves blending.
      4. Type of inheritance in which the \_\_\_\_\_ individuals show the effects of both alleles.

C. \_\_\_\_\_ Alleles and Codominance

1. Description

* + - * 1. Although each individual carries, at most, two different alleles for a particular gene, in cases of Multiple Alleles, more than \_\_\_\_\_ possible alleles exist in a Population.
        2. Human \_\_\_\_\_ Blood Group phenotypes involve \_\_\_\_\_ alleles for a single gene (in the same locus).
        3. The four human blood groups, \_\_\_\_\_ result from combinations of these three alleles.
        4. The A and B alleles are both expressed in heterozygous individuals, making both alleles \_\_\_\_\_.

2. Human ABO Blood Typing

|  |  |
| --- | --- |
| IA | I = \_\_\_\_\_ (protein) on the Red Blood Cell; “A” is a polysaccharide |
| IB | “B” is a polysaccharide on the immunoglobulin |
| i | Neither polysaccharide (“A” or “B” is present on the immunoglobulin of the red blood cell |

|  |  |
| --- | --- |
| Blood Type | Possible Genotype |
|  | IA IA or IA i |
|  | IB IB or IB i |
|  | IA IB |
|  | i i |

a. A person with blood type A will produce the A \_\_\_\_\_ (polysaccharide). The body produces antibodies against antigen \_\_\_ (polysaccharide.

b. A person with blood type \_\_\_ will produce the B antigen (polysaccharide). The body produces antibodies against antigen \_\_\_ (polysaccharide).

c. A person with blood type \_\_\_ will produce \_\_\_\_\_ antigen A and antigen B (different polysaccharides). The body does \_\_\_\_\_ produce \_\_\_\_\_ against either antigen A and antigen B (Polysaccharides)

d. A person with blood type \_\_\_ will produce \_\_\_\_\_ antigen A or antigen B (polysaccharides). The body produces \_\_\_\_\_ against both antigen A and antigen B (Polysaccharides).

3. Antibodies

a. Our bodies possess antibodies which fight “foreign” substances called “\_\_\_\_\_”.

b. Polysaccharides A and B are considered foreign substances (antigens) in a different person.

c. Typing Blood is extremely important when receiving \_\_\_\_\_ from others.

d. Antibodies will cause \_\_\_\_\_ in the blood when the polysaccharide is attacked by the antibody.

4. Blood Donation and Receiving

|  |  |
| --- | --- |
| Recipient | Donors |
| A |  |
| B |  |
| O |  |
| AB |  |

a. A person with blood type \_\_\_ is a \_\_\_\_\_ \_\_\_\_\_ (can donate to any blood type) because type O forms antibodies against type A & B, *but does not have any* \_\_\_\_\_ *for others to attack*.

b. A person with blood type \_\_\_ is a universal \_\_\_\_\_ (can receive any blood type) because type AB forms NO \_\_\_\_\_.

5. \_\_\_\_ Factor

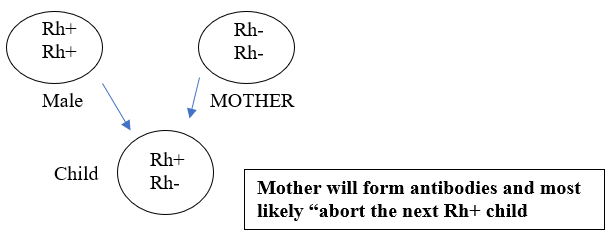
a. There is another factor to consider, however (*Rh factor*).

b. Blood type is actually given as: O+, O-, A+, A-, B+, B-, AB+, AB-.

c. Discovered first in the \_\_\_\_\_ monkey, hence “Rh” factor.

d. Mothers can form antibodies against the “Rh factor” after having a child with the factor.

e. \_\_\_\_\_ alleles: Rh+ has the factor, Rh- does not have the factor.



D. Sex Determination

1. The determination of sex is due to an accumulation of a number of genes located on \_\_\_\_\_ Chromosome.

2. Sex determination was first discovered in Fruit Flies (*Drosophila melanogaster*).

3. Body cells vs. gametes in humans

* \_\_\_\_\_ homologous pairs of \_\_\_\_\_ (44 chromosomes) – *determine non-sex related traits*
* \_\_\_\_\_ homologous pair of \_\_\_\_\_ chromosomes (2 chromosomes) – *determine sex related traits*

4. Gametes

* \_\_\_\_\_ chromosome number (\_\_\_\_\_ chromosomes)
* sex is determined by the sex chromosomes

5. The sex of the offspring is determined by the \_\_\_\_\_ gametes:

* Sperm has TWO kinds of chromosome possibilities (\_\_\_\_\_)
* Eggs have only ONE kind of chromosome (\_\_\_\_\_)

E. Sex-\_\_\_\_\_ Genes

1. Description

a. Traits that are inherited directly based on the \_\_\_\_\_ chromosomes \_\_\_\_\_ on the autosomes.

b. Traits are most commonly carried on the \_\_\_ chromosome.

c. Sex-Linked Traits – carried only on the \_\_\_\_\_ -homologous portion of the X chromosome (*where there is no matching allele in the y chromosome for the male*).

d. Where ever there is a sex-linked trait, \_\_\_\_\_ always possess it, but females must be homozygous recessive to show the trait.

* The Y chromosome has very little genetic information and therefore, carries very little sex-linkage.
* \_\_\_\_\_ Traits – carried only on the y chromosome and therefore only appears in males (e.g. baldness)

e. Sex-Linked \_\_\_\_\_ are located on either of the \_\_\_\_\_ chromosomes.

f. All the other chromosomes (autosomes) are present but do \_\_\_\_\_ affect the transmission of the trait.

2. Example: \_\_\_\_\_ in the fruit fly is an X-linked recessive trait.

3. Human Sex-Linked Disorders affect mostly \_\_\_\_\_

a. Most sex-linked human disorders are due to \_\_\_\_\_ alleles seen mostly in males

b. A male receiving a single X-linked recessive allele from his mother will have the disorder.

c. A \_\_\_\_\_ must receive the allele from both parents to be affected.

4. Recessive and Sex-Linked human disorders include:

a. \_\_\_\_\_, characterized by excessive \_\_\_\_\_ because hemophiliacs lack one or more of the proteins required for blood clotting.

b. \_\_\_\_\_ \_\_\_\_\_, a malfunction of light-sensitive cells in the eyes.

c. Duchenne \_\_\_\_\_ \_\_\_\_\_, a condition characterized by a progressive weakening of the muscles and loss of coordination.

F. \_\_\_\_\_ Inheritance: a \_\_\_\_\_ Character may be Influenced by \_\_\_\_\_ Genes

1. Many characters result from Polygenic Inheritance

* a single phenotypic characteristic results from the \_\_\_\_\_ effects of two or more genes scattered on various homologous chromosomes.
* in different \_\_\_\_\_.

2. Many genes affect one individual trait, showing a \_\_\_\_\_ or gradient of small differences in expression. This is known as \_\_\_\_\_ Variation in the phenotype.

* There is no clear-cut distinction in the genes – the number of genes involved is not known

3. Human \_\_\_\_\_ Color

a. This is controlled by as many as 6 genes, each with its own alleles

b. The alleles control the production of \_\_\_\_\_, which is a pigment that colors skin

c. In the example, the calculation is performed with 3 genes each with 2 alleles.

d. The cross is between two individuals heterozygous for all 3 genes.

4. Human \_\_\_\_\_

a. Assume that 4 pairs of genes are involved (8 alleles).

b. \_\_\_\_\_ are represented by only a \_\_\_\_\_ individuals.

c. Multiple Gene Inheritance has been found with up to 5 different genes involved.

G. E\_\_\_\_\_

1. Description

a. Occurs when one or more genes that \_\_\_\_\_ modify the way the trait is expressed.

b. \_\_\_\_\_ Genes do not code directly for a trait, but \_\_\_\_\_ how the gene or genes that do code for the trait are expressed.

c. So even though an organism may have a gene coding for a trait, the trait may not be expressed because of the epistatic interaction causing \_\_\_\_\_ of the trait for which the gene codes.

2. Mice \_\_\_\_\_ Colors

a. Mice have two coat colors: Black and Brown.

b. Black (BB/Bb) is dominant to the Brown (bb).

c. A mouse homozygous dominant or heterozygous will have black coat.

d. A mouse homozygous recessive will have Brown coat.

e. However, there is another gene that determines whether the pigment will be deposited or not.

3. Male & Female Pattern \_\_\_\_\_

* The recessive trait causes hormone \_\_\_\_\_ of the \_\_\_\_\_ trait.

II. Genes and the Environment

A. Gene expression is always the result of the interaction of \_\_\_\_\_ with the \_\_\_\_\_,

B. In other words, the presence of the gene is not all that is required for the expression of a trait. The gene must be present along with the proper environmental conditions.

C. The \_\_\_\_\_ of any organism is the result of interaction between Genes and the Environment.

D. Environmental factors \_\_\_\_\_ change the genetic material.

E. Changes in an organism due to environmental factors are \_\_\_\_\_ passed from \_\_\_\_\_ to \_\_\_\_\_.