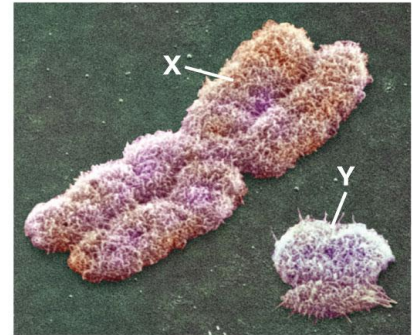


KEY CONCEPTS:

- Inheritance patterns are often more complex than predicted by simple Mendelian genetics
- Mendelian inheritance has its physical basis in the behavior of chromosomes
- Sex-linked genes exhibit unique patterns of inheritance
- Linked genes tend to be inherited together because they are located near each other on the same chromosome
- Some inheritance patterns are exceptions to the standard chromosome theory



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READ:

- Chapter 15

KEY TERMS: Here is a list of key terms and concepts you will hear about and see during the chapter readings. Get to know them!

<i>Complete dominance</i>	<i>Polygenic inheritance</i>	<i>Barr body</i>	<i>Genetic map</i>
<i>Incomplete dominance</i>	<i>Multifactorial</i>	<i>Linked genes</i>	<i>Linkage map</i>
<i>Codominance</i>	<i>Chromosome theory of inheritance</i>	<i>Genetic recombination</i>	<i>Map units</i>
<i>Multiple alleles</i>	<i>Sex-linked gene</i>	<i>Parental types</i>	<i>Genomic imprinting</i>
<i>Pleiotropy</i>	<i>X Inactivation</i>	<i>Recombinant types</i>	<i>Mitochondrial DNA</i>
<i>Epistasis</i>		<i>Crossing over</i>	

QUESTIONS FOR YOUR BILL:

Extending Mendelian Genetics

1. Give an example of incomplete dominance and explain why it does not support the blending theory of inheritance.
2. Explain how phenotypic expression in the heterozygote differs with *complete dominance*, *incomplete dominance*, and *codominance*.
3. Explain why genetic dominance does not mean that the dominant allele subdues a recessive allele. Illustrate your explanation with the example of round versus wrinkled pea seed shape.
4. Explain why dominant alleles are not necessarily more common in a population. Illustrate your explanation with an example.
5. Describe the inheritance of the *ABO blood system*, an example of *multiple allele inheritance*, and explain why the I^A and I^B alleles are said to be *co-dominant*.
6. Define and give real world examples of *pleiotropy* and *epistasis*.
7. Describe a simple model for *polygenic inheritance* and explain why most polygenic characters are described in quantitative terms.
8. Describe how *environmental conditions* can influence the phenotypic expression of a character. Explain what is meant by “*a norm of reaction*.” Explain what it means if a trait is considered *multifactorial*.

Locating Genes Along Chromosomes / Work of Thomas Morgan

9. What is the chromosomal theory of inheritance?

10. Describe how sex is genetically determined in humans and how the SRY gene plays a role in sex determination.
11. Use *Thomas Morgan's* work with the eye color of fruit flies to explain how the heredity of *sex-linked (X-linked) traits* work.
12. Describe the process of *X inactivation* in female mammals. Include a discussion of *methylation* and *Barr bodies* in your description.
13. Explain how this phenomenon of X inactivation produces the tortoiseshell coloration in cats.
14. Explain how each of the following phenomena differs from the work done by Gregor Mendel and classical Mendelian inheritance patterns.
 - a. Incomplete Dominance
 - b. Codominance
 - c. Pleiotropy
 - d. Epistasis
 - e. Polygenic Inheritance
 - f. Sex Linkage
 - g. Gene linkage

Linked Genes

13. Distinguish between *linked genes* and sex-linked genes.
14. Describe the independent assortment of chromosomes during Meiosis I. Explain how independent assortment of chromosomes produces genetic recombination of unlinked genes.
15. Distinguish between parental type and recombinant type chromosomes. Draw a diagram that illustrates the difference between the two.
16. Explain why linked genes do not assort independently. Explain how *crossing over* can unlink genes.
17. How can linked genes be used to map the locations of genes on chromosomes?
18. State the relationship between the distance between two genes and the probability that the genes will recombine due to crossing over.
19. Genes A, B, and C are located on the same chromosome. Test crosses show that the recombination frequency between A and B is 28% and that between A and C is 12%. Can you determine the linear order of these genes? Explain.

Chromosomal Mutations

20. Genes A, B, and C are located on the same chromosome. Test crosses show that the recombination frequency between A and B is 28% and that between A and C is 12%. Can you determine the linear order of these genes? Explain.
21. What happens during **nondisjunction**? When and where might nondisjunction take place?
22. How does a zygote develop a condition known as **aneuploidy**? How do the terms **monosomic** and **trisomic** relate to this condition?
23. How is **polyploidy** different from aneuploidy?
24. Errors in meiosis or damaging agents such as radiation can cause breakage of a chromosome, which can lead to four types of changes in chromosome structure. Use sketches and captions to distinguish between these four changes: **deletion**, **duplication**, **inversion**, and **translocation**.
25. Discuss how chromosomal mutations may lead to **Down Syndrome**.
26. Compare and contrast Klinefelter syndrome and Turner syndrome.

SUPPLEMENTARY RESOURCES: Click the links below for more information to help you learn more about this lesson.

Interactives

- University of Arizona Biology Project: [Sex-Linked Problem Set](#)
- WH Freeman: [Linked Genes](#)
- Utah Learn Genetics: [Genomic Imprinting](#)
- U of Miami Animation: [Genomic Imprinting](#)

- [The Blue People of Troublesome Creek](#): interesting story about a family from Kentucky with methemoglobinemia
- [Queen Victoria and Hemophilia](#): Trace the passage of hemophilia through the royal families of Europe
- NCBI: [Linkage Maps](#)

Lectures

- Bozeman Biology's "[Chromosomal Genetics](#)" video.
- Bozeman Biology's "[Advanced Genetics](#)" video.
- Bozeman Biology's "[Blood Types](#)" video.
- Bozeman Biology's "[X Inactivation](#)" video.
- Bozeman Biology's "[Linked Genes](#)" video.