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BIOLOGY TEACHER RESOURCES FROM BAYLOR COLLEGE OF MEDICINE

X or Y: Does It Make a Difference?

OVERVIEW
Detailed studies of the sequence and gene activity within the human X chromosome are providing interesting insights and raising questions about the differences between males and females. Women have two X chromosomes while men have an X and Y. The Y chromosome is relatively gene-poor. In women, one of the X chromosomes is partially shut down in each cell. Adding additional interest to the picture is that more than 300 diseases have already been associated with the X chromosome.

OBJECTIVE/PROFICIENCIES
- Students will describe functional differences of X and Y chromosomes.
- Students will explain the significance of differences in X and Y chromosomes in the human genome.

NATIONAL SCIENCE EDUCATION STANDARDS
The Cell
- Cells store and use information to guide their functions.
- Cell functions are regulated through selective expression of individual genes.

Molecular Basis of Heredity
- Instructions for specifying the characteristics of the organism are carried in DNA.
- There is a pair of chromosomes that determines sex.

GRADE LEVEL
9-12

TIME
55-minute class period

MATERIALS
Teacher Materials (see Setup)
- Computer, projector, projection screen
- PowerPoint® slide 8, "The Human Genome," and slide 14, "Structures and Functions of Genomes," from the BioEd Online slide set "Structures and Functions of Genomes."
- Overhead projector (optional, see Setup)
- Transparencies of slides (optional)

Materials per Group of Students

- Computer access for each group member, with four different articles per group preloaded (see Setup) OR one set of photocopied articles listed below (see Setup)

Materials per Student

- Copy of "Category Notes" and "3-2-1" student sheets

SETUP

1. Prepare to project the slides (see Teacher Materials, above) from a computer OR make transparencies of the slides and use an overhead projector.
2. Each student group member will read a different article (below). Have students read the articles online, OR make a photocopied set for each group and distribute before beginning the activity.
   - "Researchers Unravel Secrets of X Chromosome." Apr. 2005, *From the Labs* (BioEd Online)
   - "Y Chromosome Reveals Hidden Sequence." Jan. 9, 2005, *Nature News* (BioEd Online)
   - "Women Get Extra Dose of X Chromosome Genes." Mar. 16, 2005, *Nature News* (BioEd Online)
   - "Studies Expand Understanding of X Chromosome." Mar. 16, 2005, *NIH News*
3. If students will read the articles online, pre-load the articles before class.

PROCEDURE

Engage

1. Begin a class discussion. Ask students, *What do you know about the X and Y chromosomes in humans?*
2. Have students record at least one question they have about the X and Y chromosomes in the space provided on the "Category Notes" page.
3. Project and discuss the slide, "The Human Genome," followed by the slide, "Regulation of the Human Genome IV."
4. Prompt students to add notes to the first column of their "Category Notes" page.

Explore

Divide students into groups of four. Have each student group member to read a different article, either online or a photocopied version (see Setup).

- "Researchers Unravel Secrets of X Chromosome"
- "Y Chromosome Reveals Hidden Sequence"
- "Women Get Extra Dose of X Chromosome Genes"
- "Studies Expand Understanding of X Chromosome"

Explain

Distribute and ask each student to complete the "3, 2, 1" activity sheet. Have students list three things they learned, two things that surprised them, and one new question they have after reading their articles.

Elaborate/Extend
As a group or class, decide on and add information to the second column of the notes.

Evaluate
Ask each student to highlight the most important information in the first two columns of the "Category Notes" page. In the third column, have each student explain the significance of the highlighted information he or she chose.

EXTENSION
- Not all animals have the same genetic strategy for determining sex. Have students read and then discuss the article, "Duck-billed Platypus Boasts Ten Sex Chromosomes." Oct. 25, 2004, *Nature News* (BioEd Online).
- Have students investigate other organisms. This is a great time to discuss adaptation and evolutionary successes. For example, ask students, *Why is there an evolutionary advantage to having two sexes?*

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Name_____

Topic_____ Date _____

Question:

Lecture Notes	Information From Group Articles	Evaluate

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3-2-1 Activity

Name _____ Date _____

New things learned:

3

Things that surprised you:

2

Questions you have:

1

3-2-1 Activity

Name _____ Date _____

New things learned:

3

Things that surprised you:

2

Questions you have:

1