

Lesson: What is Your Epigenetic IQ?



Overview of Lesson Plan: Students test their knowledge and understanding of epigenetics by answering 18 true and false questions.

Big Understanding: The epigenome is a set of chemical switches and markers that influence gene expression. Diet, environmental stressors, physical activity, and exposure to toxins can activate these chemical switches that regulate gene expression without changing the underline genetic code. Epigenetics is the study of changes in gene activity that do not involve changes to the genetic code.

Essential Questions: How much do you know about epigenetic?

Grades: 5-8

Subjects: General

Time required: 15 minutes

Background: [Online Resources](#)

Objectives: Students test their knowledge and understanding of epigenetics

Materials: Each student needs copies of [“HOW MUCH DO YOU KNOW ABOUT EPIGENETICS?”](#)

Preparation: Can be used as a pre-assessment or post-assessment activity

Activities/Procedures: Have students answer the true and false questions and “What can change your epigenome?”

Assessment/Reflection: All of the answers are TRUE and ALL of the items listed can change your epigenome

Activity Extension: Have each student chose 3 statements from “HOW MUCH DO YOU KNOW ABOUT EPIGENETICS?” the and explain why the statement is true using epigenetics



HOW MUCH DO YOU KNOW ABOUT EPIGENETICS?

Take this TRUE or FALSE quiz and find out

	1. A parent's experiences, in the form of epigenetic tags, can be passed down to future generations.
	2. In a pregnant mother, three generations are directly exposed to the same environmental conditions at the same time.
	3. Identical twins are genetic carbon copies, yet physically they become increasingly different over time.
	4. An epigenetic change that was triggered by environmental conditions may be reversed when environmental conditions change again.
	5. Epigenetic changes can happen in many individuals at once.
	6. The effects of smoking on health can also be passed to grandchildren, as evidenced from studies where grandmothers but not mothers smoked.
	7. The amount and quality of food a grandfather had between the ages of 9-12 can be especially important in how faithfully the epigenome is copied for future generations.
	8. Rat pups who receive high or low nurturing from their mothers develop epigenetic differences that affect their response to stress later in life.
	9. Stress, diet, behavior, toxins and other factors activate chemical switches that regulate gene expression.
	10. Your mother's diet during pregnancy and what you're fed as an infant can cause critical changes that stick with you into adulthood.
	11. Unlike behavior or stress, diet is one the more easily studied, and therefore better understood, environmental factors in epigenetic change.
	12. When researchers fed pregnant yellow mice a methyl-rich diet, most of the resulting pups were brown and healthy and stayed that way for life.
	13. Our diets and lifestyles can change the expression of our genes.
	14. Epigenomes can change in function of what we eat, of what we breathe, or of what we drink.
	15. You can impact your genes and health as well as your future children and grandchildren's genes and health.
	16. The ability of environmental conditions to cause epigenetic changes varies with time during our life, and also with the amount of exposure at these vulnerable periods of time.
	17. Researchers have found that it takes only the addition of a methyl group to change an epigenome and the gene's expression.
	18. Epigenetics isn't evolution and doesn't change DNA. It represents a biological response to an environmental stressor that can be inherited via epigenetic marks.

Which of the following can change your epigenome? (Circle all that apply)

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|--------------|----------|--------------------|---------|--------------------|
| broccoli | smoking | sleep | obesity | malnutrition |
| strawberries | spinach | pollution | viruses | prenatal nutrition |
| anxiety | exercise | social interaction | stress | parents |



Online Resources for Epigenetics

VIDEO	Title	Source	Link
	<i>Epigenetics</i>	PBS - NOVA	http://www.pbs.org/wgbh/nova/body/epigenetics.html
	<i>Epigenetics I and II</i>	PBS - NOVA (via youtube)	http://www.youtube.com/watch?v=wFsxVkuChdU (7: http://www.youtube.com/watch?v=Xjq5eEslJhw (6:19)
	<i>Epigenetics</i>	scishow (via Youtube)	http://www.youtube.com/watch?v=kp1bZEUgqVI&feature=youtube_gdata_player
	<i>Epigenetics makes you unique: Courtney Griffins at TEDxOU</i>	TEDxTALKS (via Youtube)	http://www.youtube.com/watch?v=JTBg6hqueTg
	<i>(Audio slide show) A Tale of Two Mice</i>	PBS – NOVA	http://www.pbs.org/wgbh/nova/body/epigenetic-mice.html Audio slide show and supporting web page about the aguti mice and epigenetics.
	<i>Utah Twins</i>	The University of Utah - Genetic Science Learning Center	http://learn.genetics.utah.edu/content/epigenetics/twins/
ARTICLES	Title	Source	Link
	<i>How the First Nine Months Shape the Rest of Your Life</i>	<u>Time Magazine</u> - By Annie Murphy Paul	http://www.time.com/time/magazine/article/0,9171,2021065,00.html#ixzz2Wn5nO1wE
	<i>Why Your DNA Isn't Your Destiny.</i>	<u>Time Magazine</u> - By John Cloud	http://www.time.com/time/magazine/article/0,9171,1952313,00.html
	<i>Beyond DNA: Epigenetics - Deciphering the link between nature and nurture.</i>	Natural History - By Nessa Carey	http://www.naturalhistorymag.com/features/142195/beyond-dna-epigenetics
	<i>Epigenetics: Tales of Adversity.</i>	<u>Nature</u> - International Weekly Journal of Science	http://www.nature.com/nature/journal/v468/n7327_supp/full/468S20a.html
WEB SITES	Title	Source	Link
	<i>Learn Genetics and Teach Genetics</i>	The University of Utah - Genetic Science Learning Center	http://learn.genetics.utah.edu/content/epigenetics/

