



# EPIGENETICS

## Your Environment, Your Epigenome

### ABSTRACT ↴

Using a checklist, students record some of the epigenome-influencing factors present in their environments.

### LEARNING OBJECTIVES ↴

- Factors from your environment such as diet, physical activity, and stress influence the epigenome.

### LOGISTICS ↴

#### TIME REQUIRED

- Class time: 20 min.
- Prep time: 10 min.

#### MATERIALS

- copies of student worksheets

#### PRIOR KNOWLEDGE NEEDED

The epigenome is a set of chemical switches and markers that influence gene expression.

#### APPROPRIATE FOR

Primary    Intermediate    Secondary    College



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### CLASSROOM IMPLEMENTATION ↴

#### TO ENGAGE STUDENTS IN THIS TOPIC

- Explore epigenetics-related activities on the Learn.Genetics website.

#### ACTIVITY INSTRUCTIONS

- Give each student a copy of the *Your Epigenome, Your Environment* worksheet. Designate a 24 hour period to which your students should refer when filling it in.
- Discuss (see Discussion points below).
- (optional) Share the table explaining the epigenetic role of the foods (page 3) included in the worksheet. Discuss situations where gene inactivation could be advantageous (ex. genes that promote un-checked cell growth) and situations where it could be disadvantageous (ex. tumor suppressor genes).

#### DISCUSSION POINTS

- Factors from our environment influence gene expression through the epigenome.
- Gene products maintain our bodies and keep them functioning. Therefore, changes in gene expression affect us throughout our lives, not just during fertilization and development. For example, genes regulating cell growth, division and programmed cell death often have a different epigenetic profile in cancer cells.
- Sometimes, the factors that influence the epigenome aren't necessarily under our control. Think about cases when this is so, and what the implications are for the individual and society as a whole.
- Complex diseases such as obesity, diabetes, heart disease, hypertension and cancer may be influenced by the epigenome. How might this change public health campaigns against these diseases?

### ACKNOWLEDGEMENTS ↴

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### PERMISSIONS ↴

Please see: <http://learn.genetics.utah.edu/permissions/> to read our Permissions Policy.

### QUANTITIES ↴

#### PER STUDENT:

- One copy of the *Your Epigenome, Your Environment* worksheet, page 1



## EPIGENETICS

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## Answer Key

FOOD	CHEMICAL	EPIGENETIC ROLE
Sesame Seeds	Methionine	Methylates DNA (gene silencing)
Nuts	Folic Acid	Methylates DNA (gene silencing)
Sunflower Seeds	Folic Acid	Methylates DNA (gene silencing)
Peppers	Methionine	Methylates DNA (gene silencing)
Spinach and Other Leafy Vegetables	Methionine and Folic Acid	Methylates DNA (gene silencing)
Broccoli	Sulphoraphane	Acetylates Histones (activating genes)
Other Vegetables	Vitamin B6	Methylates DNA (gene silencing)
Garlic	Diallylsulphide (DADS)	Acetylates Histones (activating genes)
Soy or Soy Products	Choline, Genistein	Methylates DNA (gene silencing)
Milk	Vitamin B12	Methylates DNA (gene silencing)
Bakers Yeast	Folic Acid	Methylates DNA (gene silencing)
Whole Grain Products	Vitamin B6	Methylates DNA (gene silencing)
Fish	Methionine	Methylates DNA (gene silencing)
Shellfish	Vitamin B12	Methylates DNA (gene silencing)
Beef	Vitamin B12	Methylates DNA (gene silencing)
Veal	Choline	Methylates DNA (gene silencing)
Chicken	Choline	Methylates DNA (gene silencing)
Liver	Folic Acid	Methylates DNA (gene silencing)
Egg Yolk	Choline	Methylates DNA (gene silencing)

**PHYSICAL ACTIVITY**

The overall effect of physical activity on the epigenome is not yet fully understood, yet there is initial evidence that hormones produced during physical activity may alter epigenetic tags. Studies are also implicating the epigenome in obesity and perhaps even preference for exercise.

**STRESS**

Many studies are focusing on the effect of the stress hormone cortisol, and how it influences epigenetic tags during gametogenesis, in utero, after birth, and throughout our lifetime.

NAME \_\_\_\_\_

DATE \_\_\_\_\_



# Your Environment, Your Epigenome

Without changing the underlying genetic code, the epigenome interacts with DNA and changes how some genes are expressed. The epigenome reacts to factors from our environment throughout our lifetime. In some cases the epigenomes of future generations can be affected as well. What factors from your environment are influencing your epigenome?

## Diet

Below are just some of the foods containing compounds that become part of the epigenome or work closely with it. Record how many times you eat the foods below in a 24 hour period.

FOOD	TIMES PER DAY
Sesame Seeds	
Nuts	
Sunflower Seeds	
Peppers	
Spinach and Other Leafy Vegetables	
Broccoli	
Other Vegetables	
Garlic	
Soy or Soy Products	
Milk	
Bakers Yeast	
Whole Grain Products	
Fish	
Shellfish	
Beef	
Veal	
Chicken	
Liver	
Egg Yolk	

## Physical Activity

The chemicals released in your body during exercise also affect the epigenome in complicated ways. Place an "X" on the scale below to indicate your level of physical activity in a 24 hour period.



## Stress

Chemicals released in the body in times of stress interact with the epigenome. Place an "X" on the scale below to indicate your overall stress level most of the time.

