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.

Estimated time

Class time 20 minutes

Prep time 10 minutes

Materials

Copies of student worksheets

Instructions

1. 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.
2. Discuss (see Discussion points below).
3. (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).

Discuss

- 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?

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Environmental Effects on Epigenome

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/Other Leafy Vegetables	Methionine, 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.