

# **Parent Background on Epigenetics**

Let's Get Healthy! in partnership with Oregon Heath and Science University is working to bring the latest health related research to Oregon schools. As part of this effort, a new module was developed for the Let's Get Healthy! fair to educate students, parents and teachers about a new area of science called epigenetics. Epigenetics studies the environment's influence on how DNA is expressed.

## What your child will be doing

To learn about this, your child will attend a health fair where one station will teach through an interactive game about the basics of epigenetics. Later, in the classroom the teacher may use some lessons OHSU offers to teach more aspects and more detail about the subject. We hope this increases student awareness of epigenetics and understanding of how choices made now and throughout life can impact their own health and that of their future children and grandchildren.

## Why is it important

DNA is made up of genes that are the codes for proteins. Genes can be turned "on" or "off", a process called gene regulation. Gene regulation is required for normal development throughout our lives. Genes that are expressed instruct cells what to become, how our organs form, how we remember material for a math test, how our bodies respond to disease and infection, and much, much more. Epigenetics is the study of how environmental factors impact gene regulation which controls gene expression. Gene regulation influences our health throughout our lifespan and new research is suggesting that epigenetic changes may extend across multiple generations to affect the health of our children, grandchildren, and possibly even great-grandchildren. Epigenetic changes are reversible, so our life choices may reverse or mitigate the effects of early epigenetic marks and prevent them from being transmitted to further generations. This is like playing a card game. Even if you are dealt a bad hand it is possible to play it well. It is also possible to mess up a good hand with the wrong life choices. This is an important concept for adolescents because it suggests that we aren't just a product of our genes, but our environment and the choices that we make, too. We need to "nurture our nature".

## How is a person impacted by epigenetics

Epigenetics affects our bodies throughout our lives because gene expression occurs every day throughout our lifespan. The epigenetic effects on our health depend on when (in our development) and where (in our bodies) our genes are turned "on" and "off". We have learned from historical famines and population-wide studies that long-term health effects



can be observed following a variety of environmental exposures. Current research suggests that the following environmental factors can affect how our genes are regulated.

Sun (ultraviolet light) Drinking water pollutants Auto exhaust Radiation Diet (methionine, choline, folate, B12) Social interaction Hormones (bisphenol A, DES, estrogen, dioxins) Pesticides Metals (Ni, Cr, As, Cd, Hg) Tobacco Smoke

### Future research and unanswered questions

There are bound to be many news stories about epigenetics in the next few years. It is important to consider the credibility of the sources of these stories. Carefully designed studies from respected institutions with a clear statement of the limitations of the investigation backed up through review of other scientists are more credible than extreme claims made through the popular press without details of how the investigation was conducted or reviewed. Especially suspicious are claims made in relation to products which claim to have health benefits through epigenetic effects. Other than general dietary recommendations, it is just too early to be able to manufacture such products. Such things will take a number of years of development and would be tested in carefully controlled studies. Currently, there is solid scientific evidence of epigenetic impacts on vulnerability to hypertension, kidney disease, obesity, type II diabetes, cholesterol problems, stroke, and osteoporosis. Under investigation are links between epigenetics and vulnerability to autism, depression, and schizophrenia. Right now, the best advice is to eat a healthy diet, sleep well, avoid stress, and avoid exposure to environmental toxins. All these are familiar bits of advice that your grandmother may have given you, but now we are beginning to understand the deep molecular biology for how they work and we will be able to use that understanding to give more specific epigenetic help.