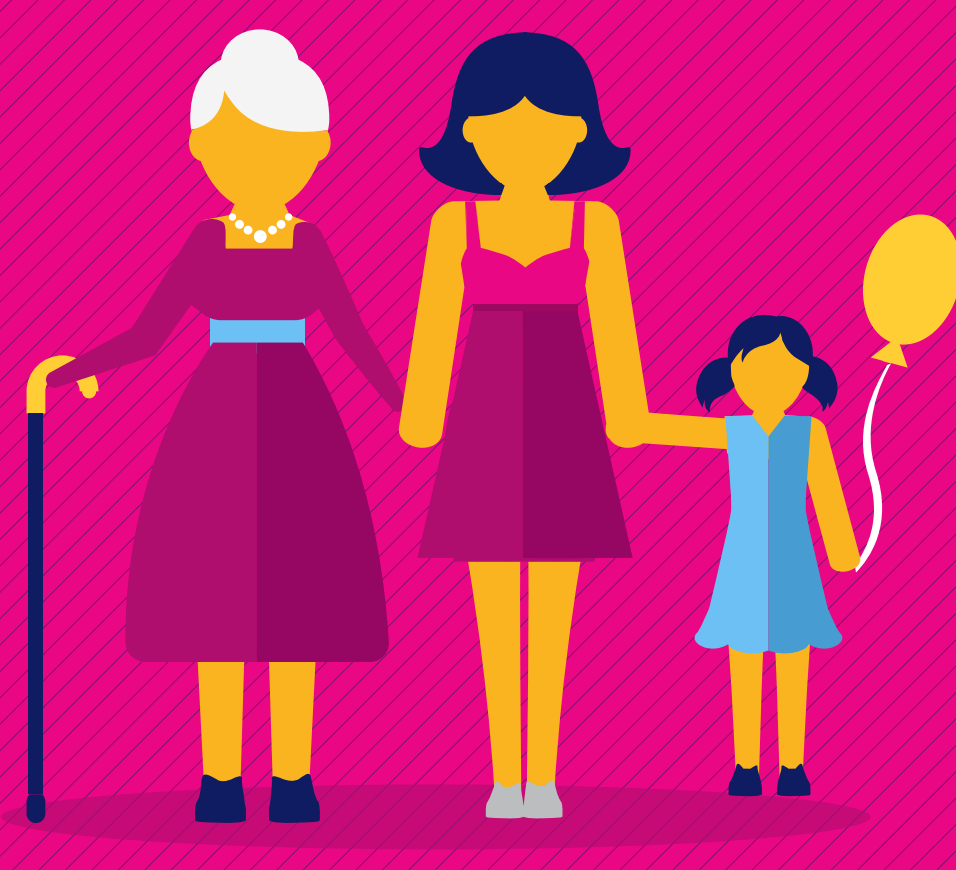


# EPIGENETICS

How the experiences of previous generations can affect who we are



## THE THEORY

Until recently, all our characteristics were thought to be shaped by two different factors

### 1 Nature

The genetic information that we inherit from our mother and father

### 2 Nurture

The influence of our environment



Epigenetics suggests a combination of these

The life experiences of our parents and grandparents may be passed down.

In other words...

what our parents and grandparents ate, how much exercise they did, and what chemicals they were exposed to, are all factors that could affect how our bodies look and work.

## AN EXAMPLE...

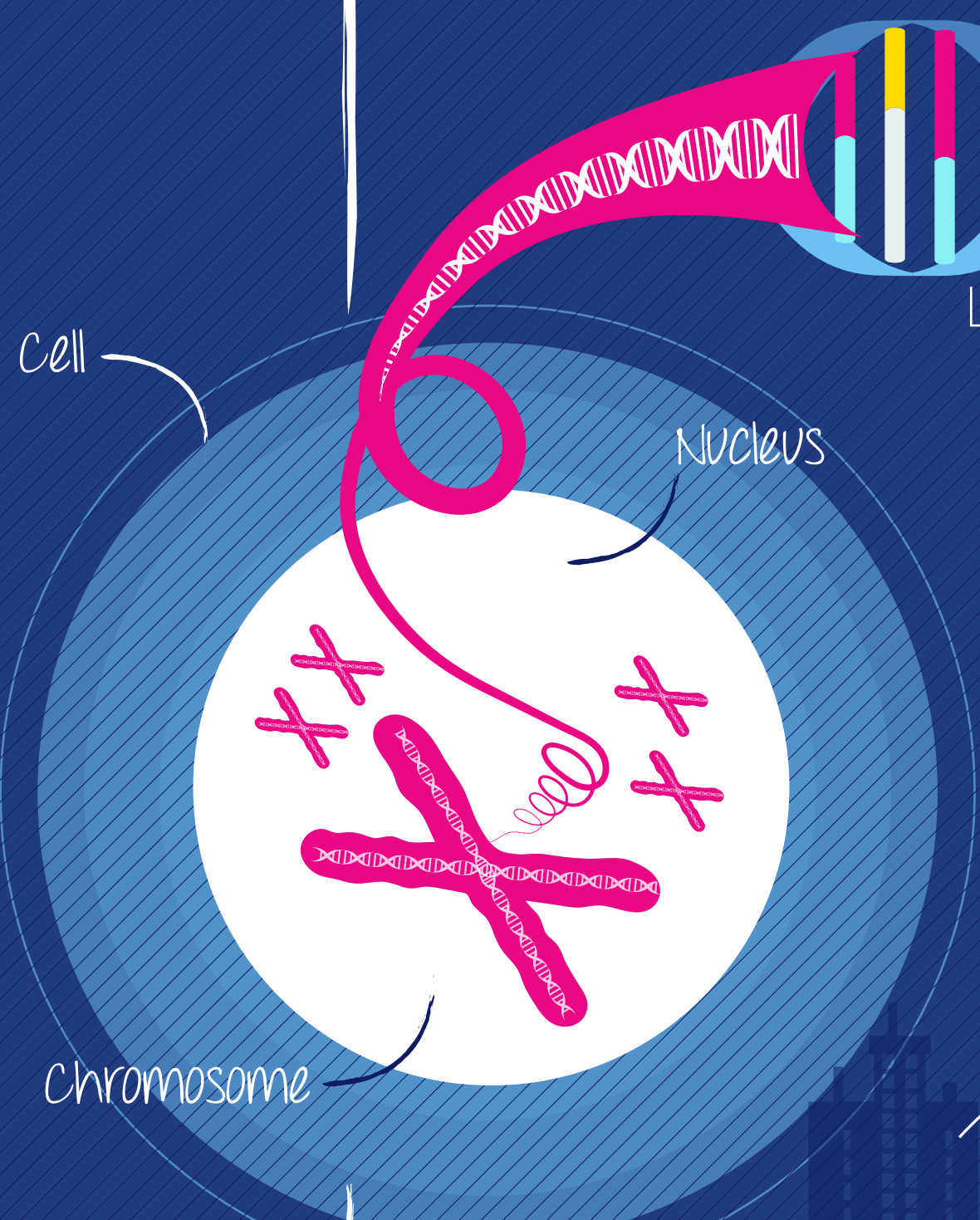
A joint US/European study found that prenatal exposure to famine can lead to epigenetic changes that may affect a person's health later in life.

The research suggests that children conceived during the Dutch Hunger Winter in 1944-45 suffered from persistent bad health six decades later, such as susceptibilities to heart and lung disease, glucose intolerance and other conditions.

## HOW DOES THIS HAPPEN?

Genes influence what we look like on the outside and how we work on the inside.

They act as a set of instructions for our cells, telling them how to build our bodies. Genes are short sections of DNA.



### What is DNA?

DNA is a long, ladder-shaped molecule, the famous 'double-helix'. Inside our cells, DNA contains all the information needed to make us grow and live. This information is organised into packages called chromosomes.

Humans have 46 chromosomes, organised into pairs. One member of the pair comes from our mother and the other from our father.

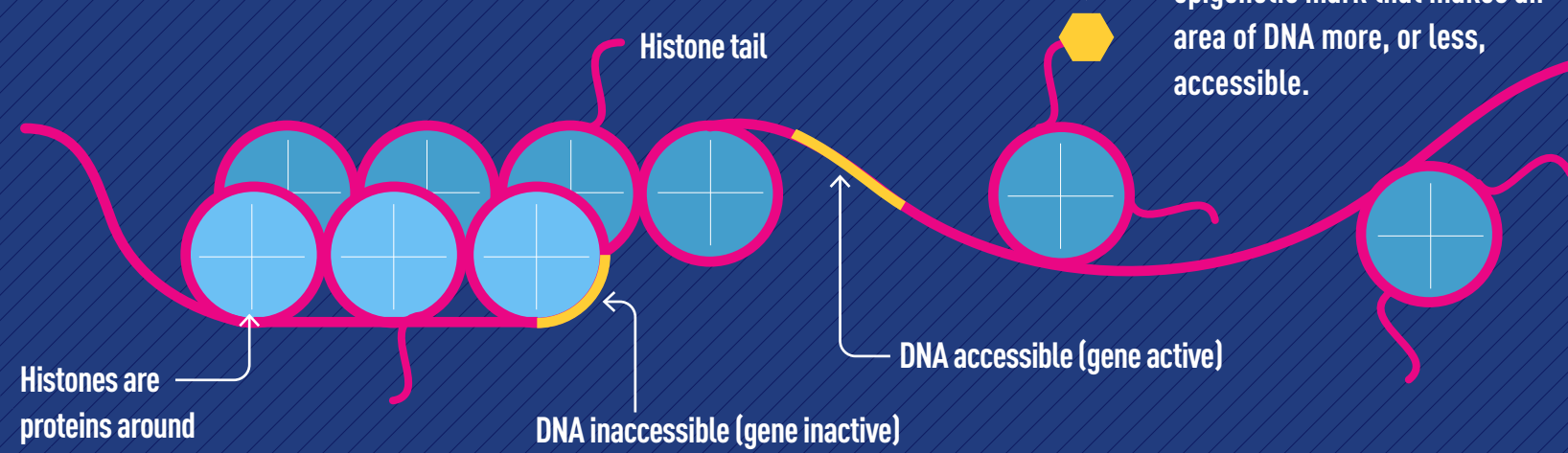
23 pairs of chromosomes



### How do genes work?

Although all our cells need the same DNA to function, over time, they don't use it all.

Throughout its life, and depending on specific conditions, each cell 'expresses', or switches on, only a selection of its genes. The rest are switched off. This process is known as gene regulation.



A chemical molecule binds to a histone 'tail' and creates an epigenetic mark that makes an area of DNA more, or less, accessible.

### What affects gene regulation?

There are many ways genes can be switched on or off. Sometimes long-term effects in gene regulation happen as a result of age, environment, lifestyle, or disease.

Some of these changes in gene regulation can be inherited, without altering the information contained in the genes. These changes are known as 'epigenetic markers'.

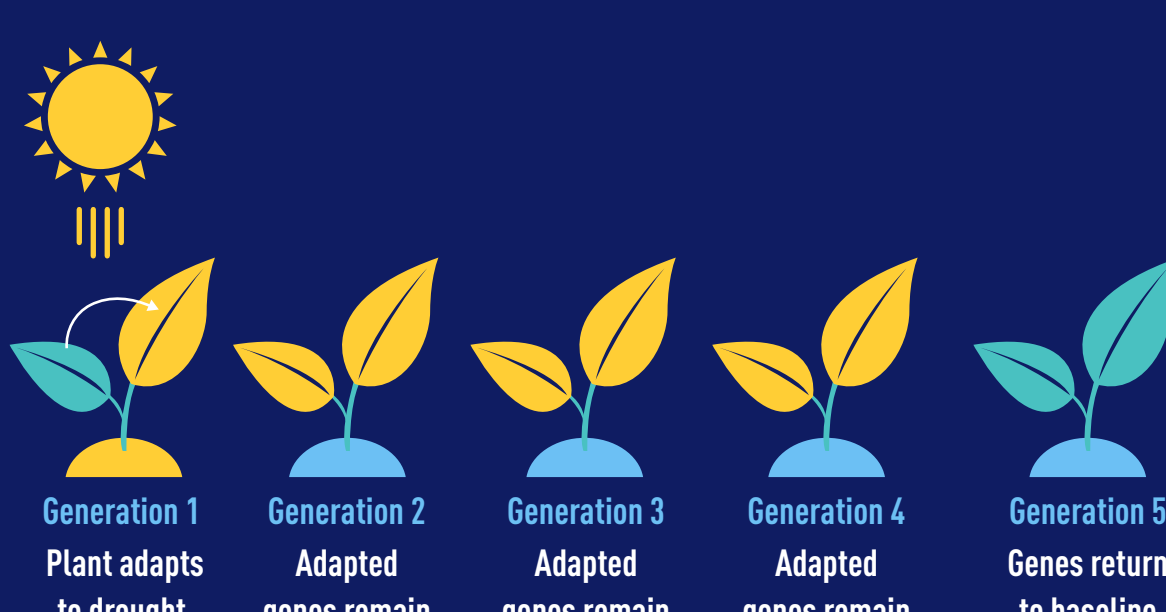
We used to think that these changes were erased from our DNA before being passed on to the next generation. It now seems that they remain and can be inherited by our children.

## ARE EPIGENETIC CHANGES PERMANENT?

Although epigenetic changes may be passed from one generation to another, we know they are dynamic and reversible. This is commonly observed in nature, even in plants.

During droughts, some plants adapt to survive and then pass those adapted genes to the next generation

If the next two or three generations don't experience another drought, the epigenetic changes are usually no longer passed on.



Scientists believe that the same is true for humans. Epigenetic changes can be 'undone' by changes in behaviour or environment.

## WHAT ARE THE IMPLICATIONS OF EPIGENETICS RESEARCH?

There is still much to learn about how acquired characteristics can be inherited. Scientists are trying to better understand how our environment can leave epigenetic 'marks' in DNA, and how this might have a positive, or negative impact on our health.

### We know that nutrition can change the way our genes are expressed

By studying the potential epigenetic effects of people's dietary habits, we might be able to help future generations start healthier, and stay healthier for longer.



### And so can exercise and other lifestyle habits

One study, by researchers from Lund University in Sweden, found that physical activity can cause epigenetic changes in the way cells store fat.



## HOW IS NESTLÉ CONTRIBUTING?

Nestlé's epigenetics research is primarily focused on maternal and early life nutrition and health:

**Before pregnancy**

What nutrients are most important for a mother (and a father) to consume to ensure their child has a healthy birth weight and adequate growth?

**During pregnancy**

How can we improve the nutrition of future mothers to optimise the health of their children early on, and then throughout life?

**After pregnancy**

What is the optimal nutrition for an infant to help them enjoy a long and healthy life?

For more information on what Nestlé is doing, see:

[www.nestle.com/Media/NewsAndFeatures/Nestle-research-epigenetics](http://www.nestle.com/Media/NewsAndFeatures/Nestle-research-epigenetics)

### Sources

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