Nutrition permanently changes our children's Epigenetics

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The problem

Scientific facts

Because of the new nutritional habits our world has a weighty problem

WHO estimated: About 600 million people in the world are obese

diabetes

poor blood flow

blindness

cardiovascular diseases

alergies

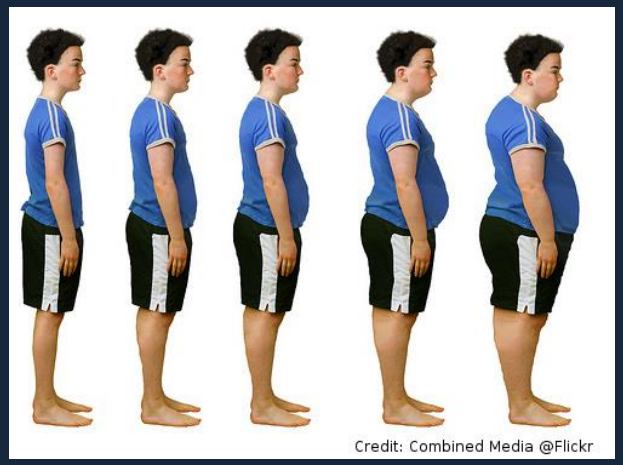
nerve damage

Chronically elevated blood sugar levels in obese people can lead to serious complications

The problem

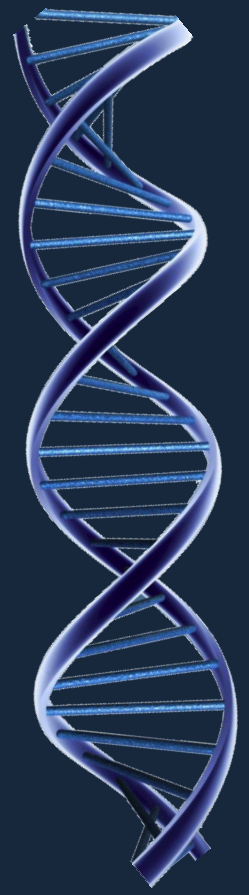
Childhood obesity and type 2 diabetes have increased at alarming rates since the 1960s

According to the CDC, childhood obesity is more than doubled in children, spiking from 7% in 1980 to 18% in 2012



Human genetics and adiposity

DNA



Adiposity is largely controlled by our DNA

More than 450 genes are responsible for the obesity

The increase in diabetic patients observed throughout the world can not be explained by mutations in genes

Our new understanding of human genetics

After the sequencing of the entire human genome in 2003:

20 000 genes and ……

99.95% equal in genes

Difference is coming from the different work of these genes

Epigenetics

Mechanisms of epigenetics

DNA methylation
Histone modifications
Chromatin organization
snRNA

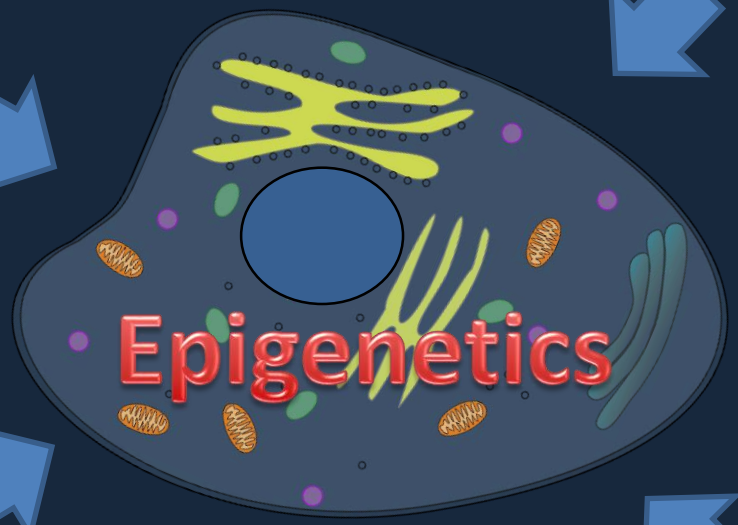
Do not change genes, but change gene activity

Physical activity

exercise
manual labor

Elements of nature

air, soil, water, smoking



Nutritional factors

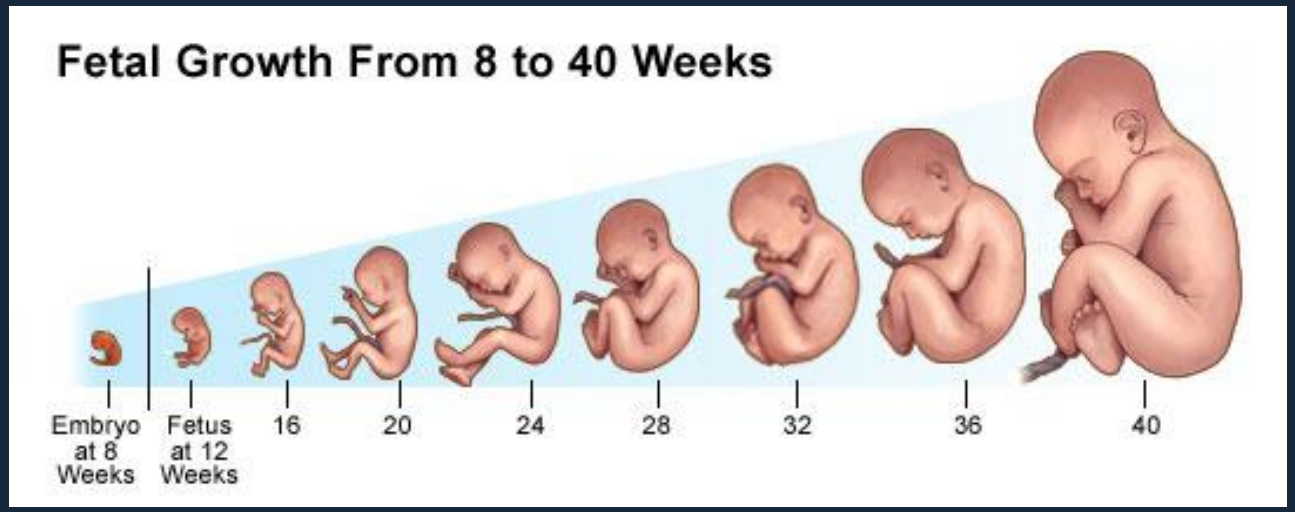
Nutritional elements
(macro- and micronutrients)
Drinking water
Calorie restriction
Diets (Mediterranean, Balkan, Paleo-, etc.)
Polyphenols
Food additives?

Psychological elements

Social climate
Family connections
Religion
Meditation

Embryo development

Huge epigenetic changes are happening during fetus development



Most of the genes are switched **on** and **off** leading to birth of a healthy baby

First 1000 days of a child's life

In the first 1000 days
nutrition can reprogram babies genes forever

Macro- and micro- nutrients grossly influence
switching **on** and **off** of the genes for brain development of a child
in the two and a half years of its life

NUTRITION
&
EPIGENETICS

2 500

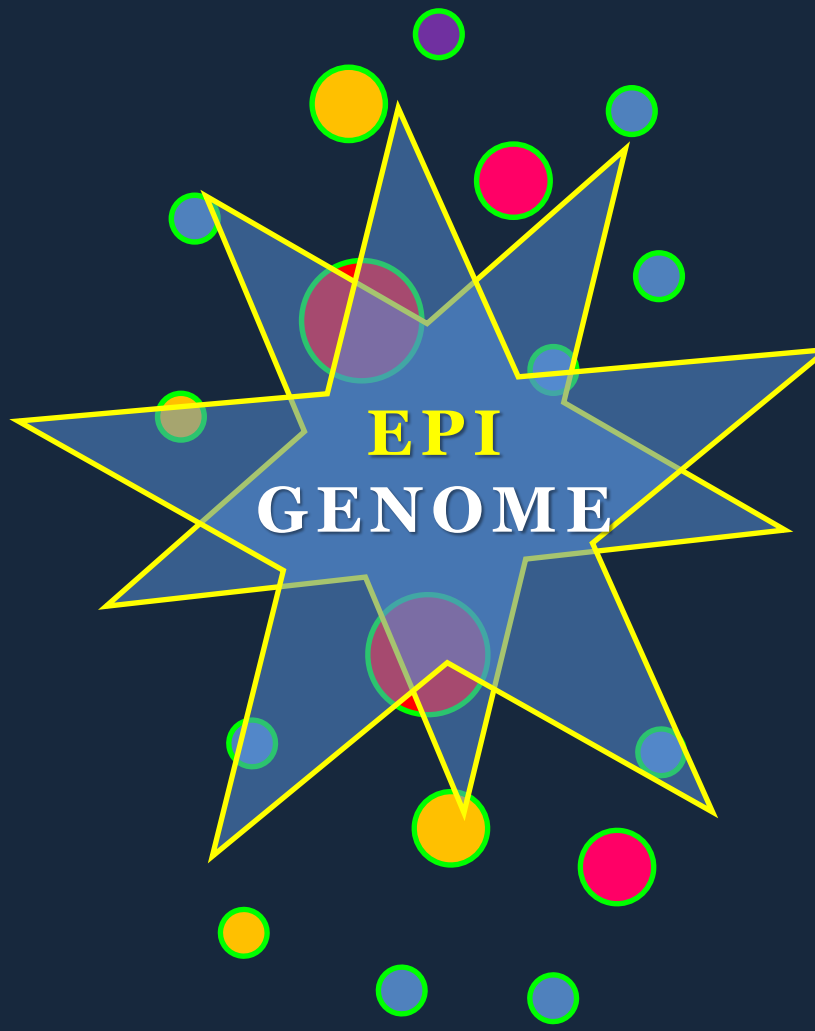
- **METABOLITIES**

1 200

- **BIOACTIVE SUBSTANCES**

3 500

- **NUTRIENTS**



The most powerful food substances which change epigenetics

Co-factors:

Folic acid

Folate

Betaine

Zn

spinach

Beef and Chicken meat

Pastry

Fish & Seafood

A healthy, balanced diet leads to optimal gene expression and proper baby and child development

The problem with *obesity*

A study of activity of Trim28 gene on a mouse model

Researchers found that *Trim28* expression was unusually low among obese children

Once the switch is triggered, it is a lifelong, epigenetically driven decision that ends in a stable, either a lean or obese phenotype

Take-home messages

- Nutritional diet of the fetus and the infant re-programs epigenome and if improper can lead to developing metabolic and cardiovascular disorders in later life

- Evidence exists that epigenetic re-programming during childhood can be inherited in the next several generations

- Large-scale further studies are absolutely required for the assessment of the proper children diet