

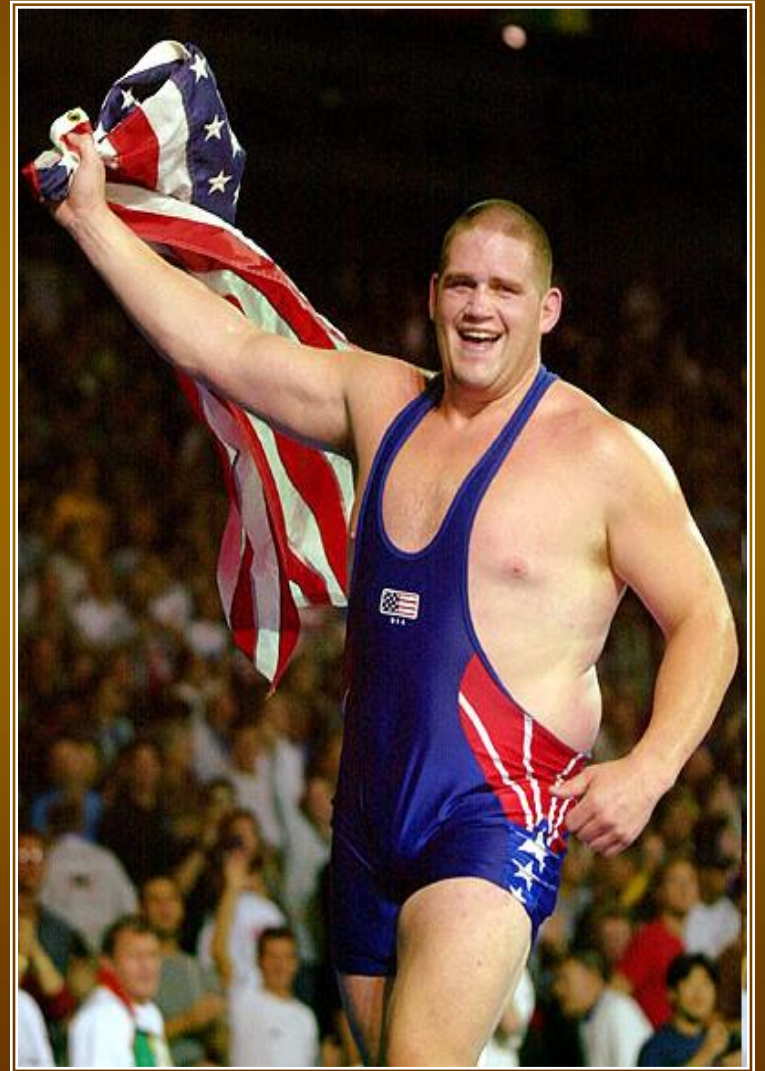
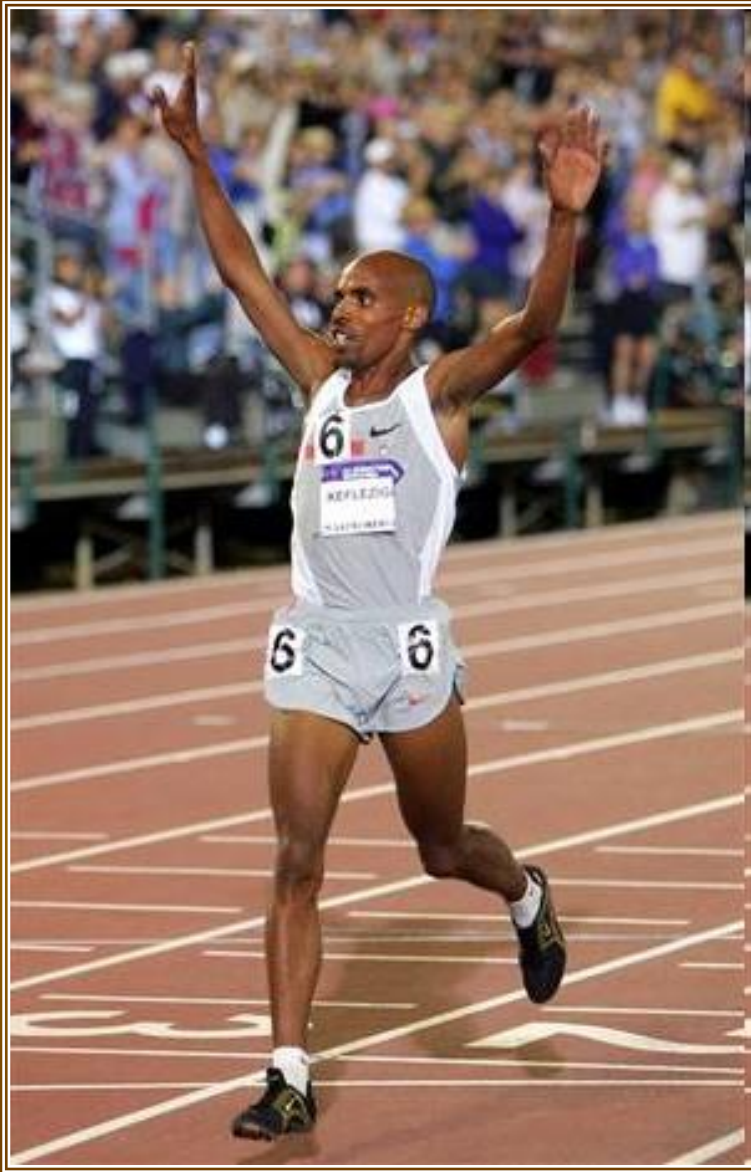


What  
about  
genome?

# Are we different?







# NUTRIGENETICS and NUTRIGENOMICS

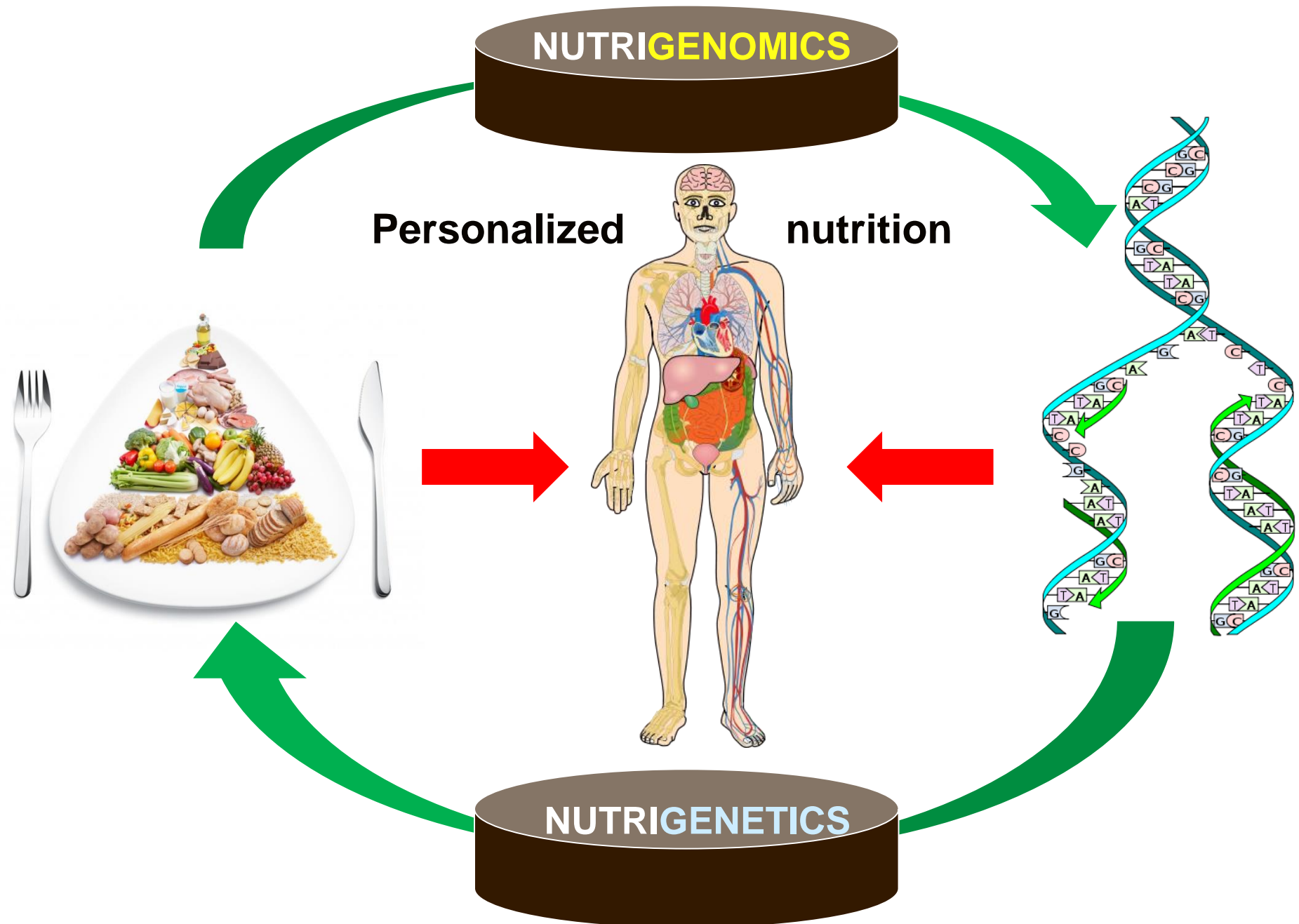


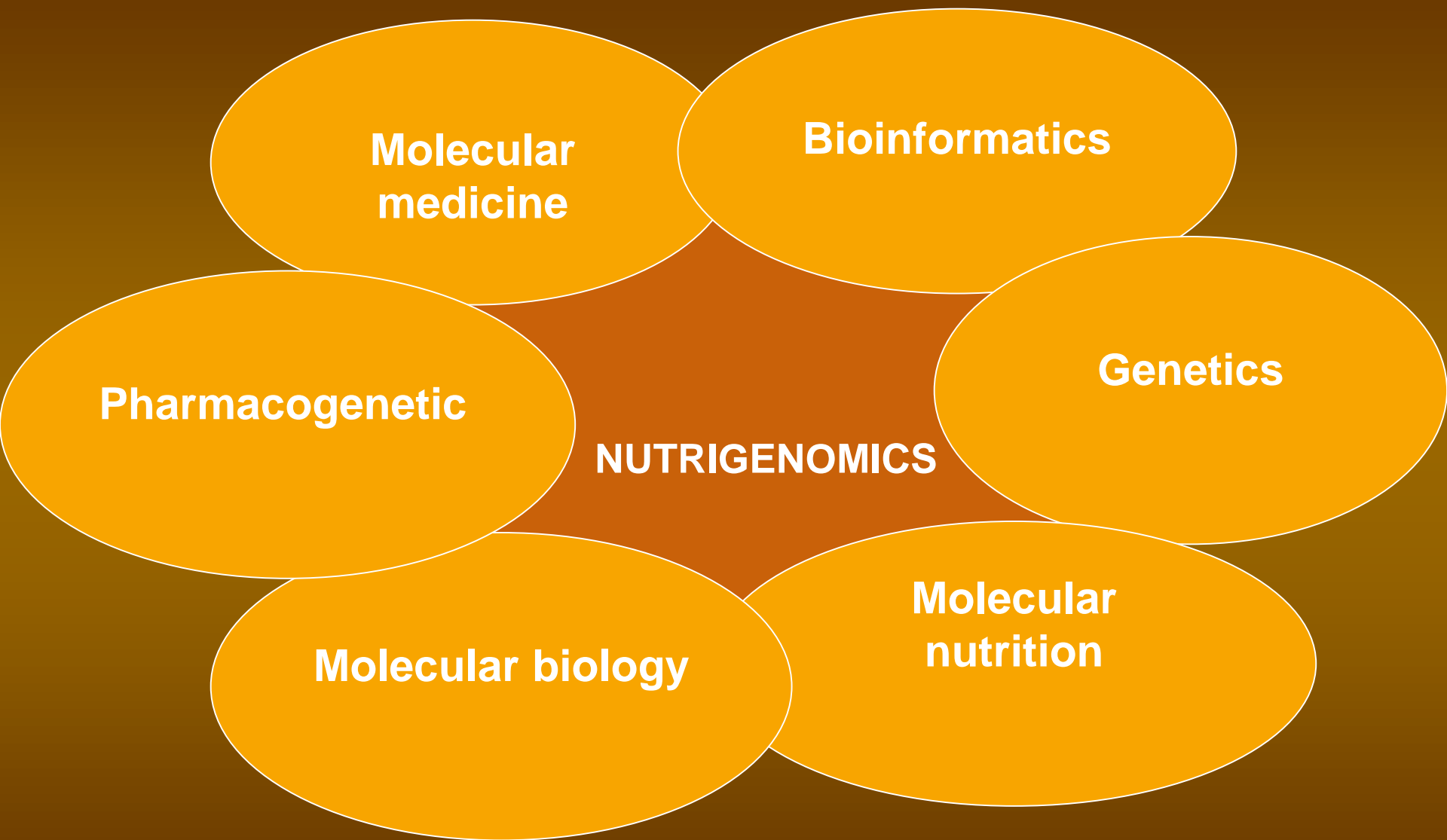
## ■ **Nutrigenomics**

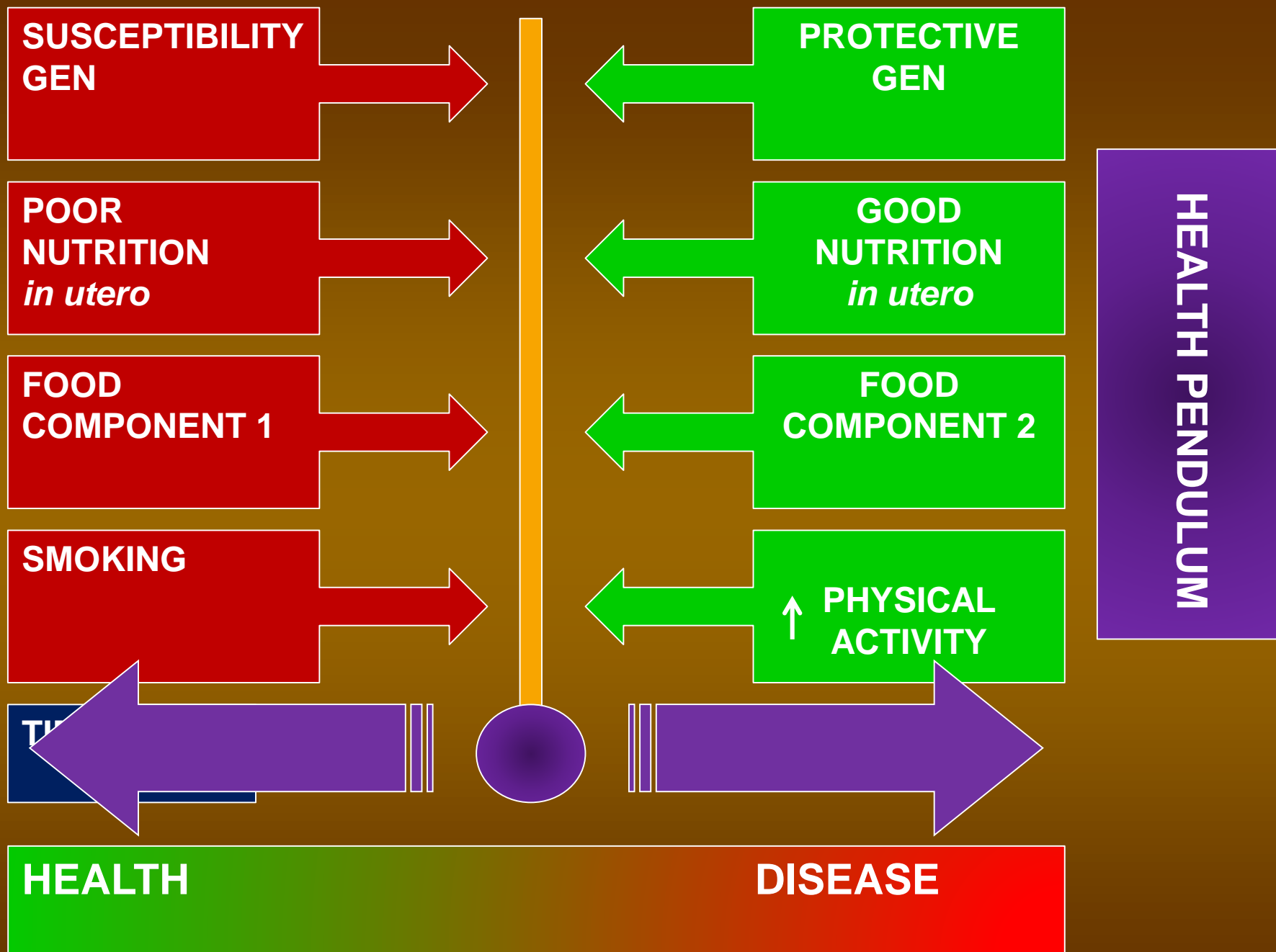
The science of the effect of nutrients and bioactive components on gene expression.

## ■ **Nutrigenetics**

The science of the effect of genetic variation on dietary response.

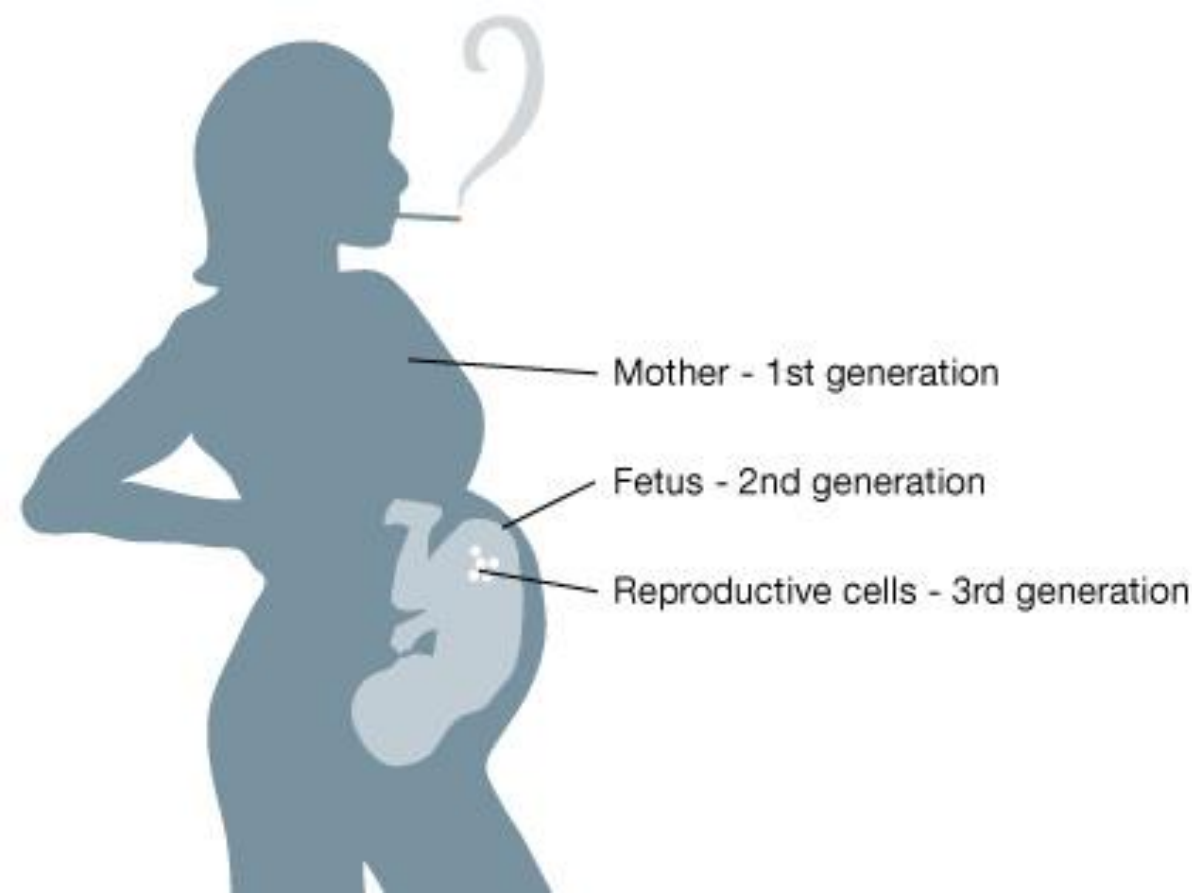




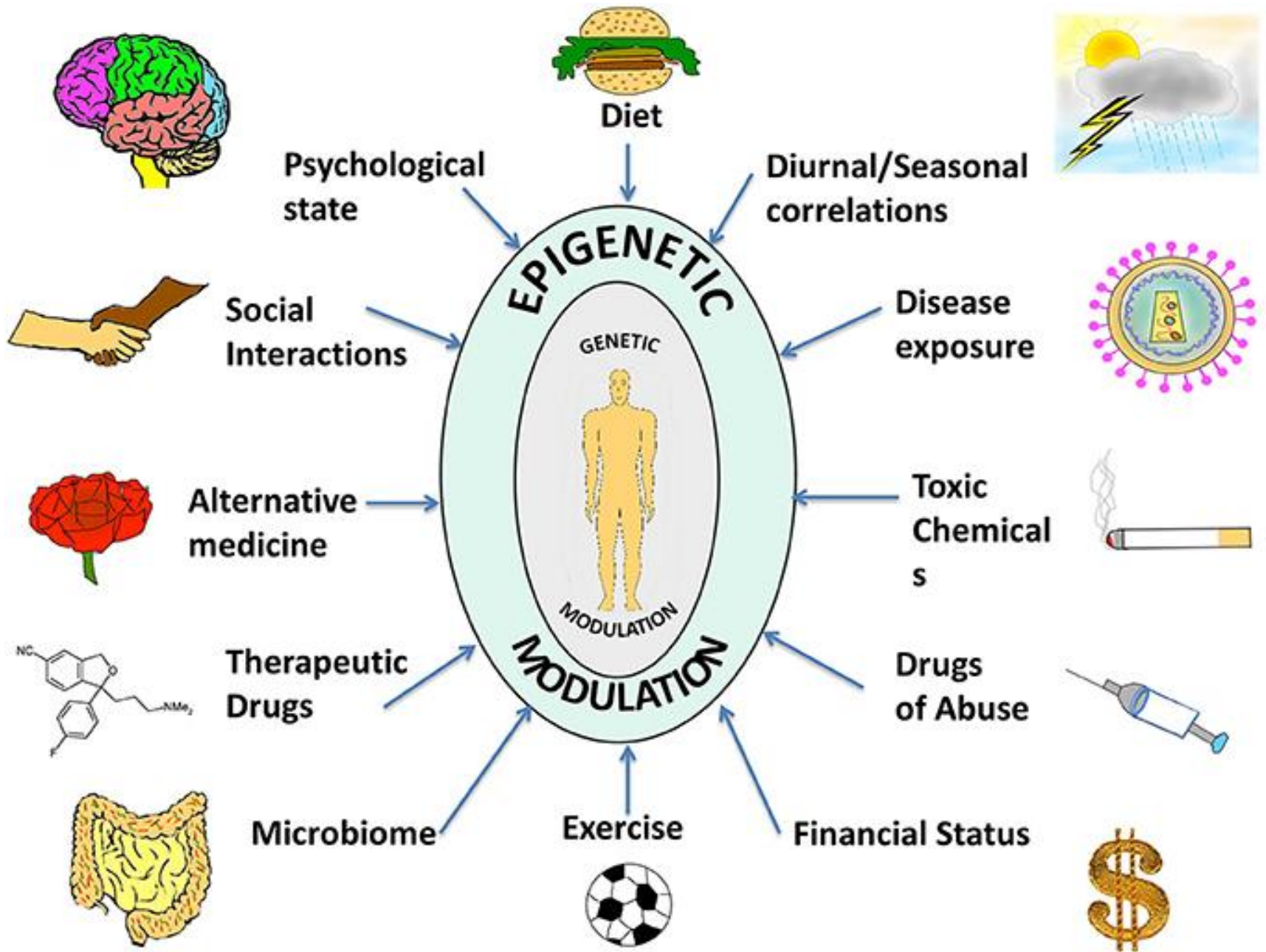




# EPIGENETICS



- Three generations at once are exposed to the same environmental conditions (diet, toxins, hormones, etc.). In order to provide a convincing case for epigenetic inheritance, an epigenetic change must be observed in the 4th generation.



“Dolgost življenja našega je kratka.”

France Prešeren



e

growing

reproduction

oldness



BIRTH

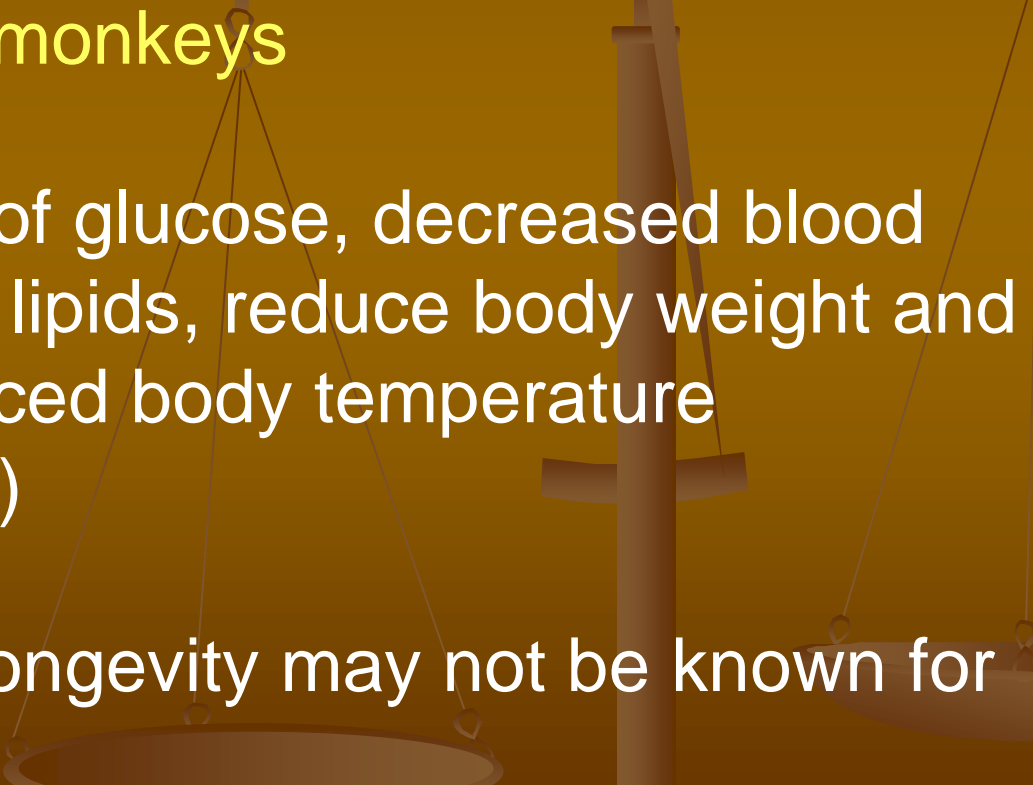
FERTILIZATION



DEATH

# Will Eating Less Make You Live Longer?

## Calorie restriction (CR)

- Research: **Rhesus monkeys**
  - **30 % CR diet**
  - improve regulation of glucose, decreased blood pressure and blood lipids, reduce body weight and abdominal fat, reduced body temperature (possible anti-aging)
  - long-term CR and longevity may not be known for several decades
- 



Clinical and Translational Report

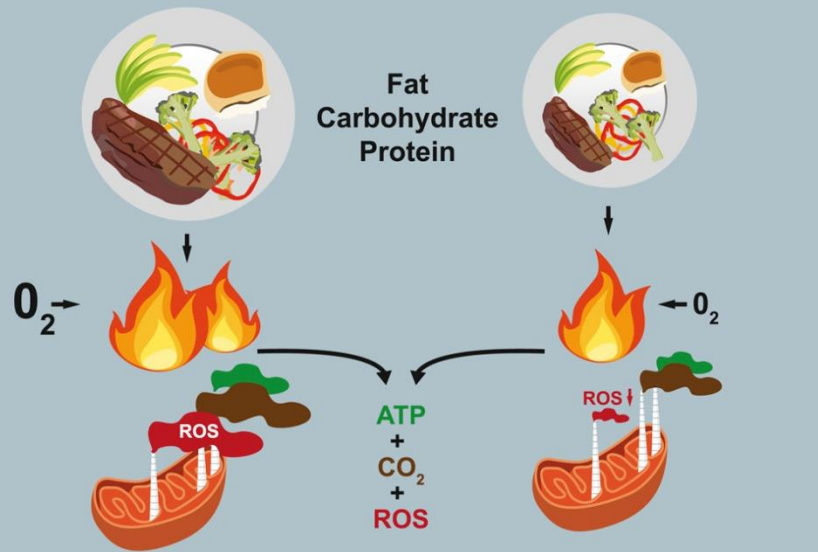
## Metabolic Slowing and Reduced Oxidative Damage with Sustained Caloric Restriction Support the Rate of Living and Oxidative Damage Theories of Aging

Leanne M. Redman<sup>1,4</sup> , Steven R. Smith<sup>2</sup>, Jeffrey H. Burton<sup>1</sup>, Corby K. Martin<sup>1</sup>, Dora Il'yasova<sup>3</sup>, Eric Ravussin<sup>1</sup>

### CALORIC RESTRICTION & LONGEVITY



Ad-Libitum >>>>> 2 Years Caloric Restriction



### Highlights

- Calorie restriction (CR) extends maximum lifespan in most species
- Young, healthy individuals achieved 15% CR and 8 kg weight loss over 2 years
- Energy expenditure (24 hr and sleep) was reduced beyond weight loss
- Oxidative stress was also reduced, supporting two long-standing theories of aging

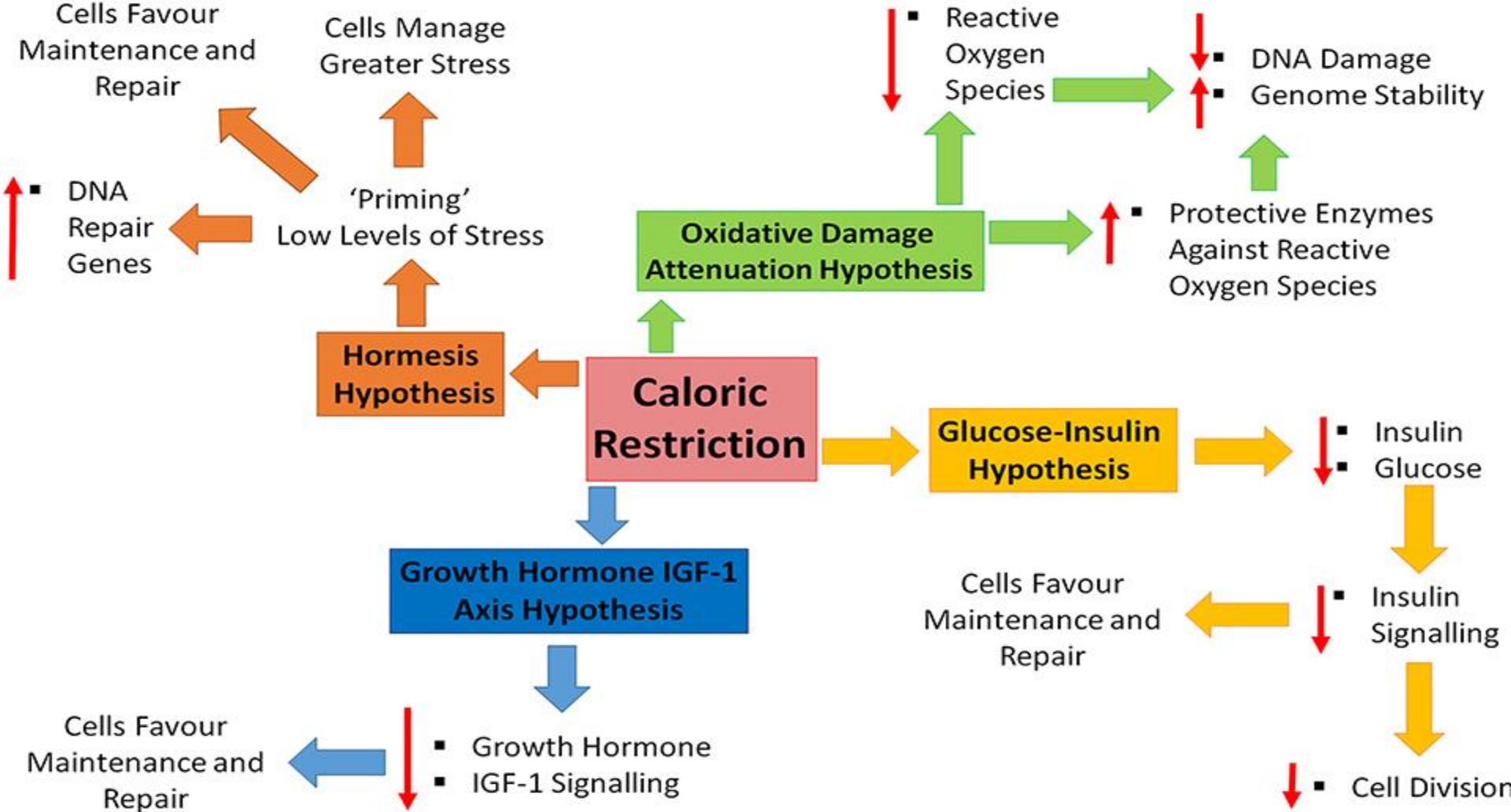


CrossMark

# Better Living through Chemistry: Caloric Restriction (CR) and CR Mimetics Alter Genome Function to Promote Increased Health and Lifespan

*Zoe E. Gillespie<sup>1</sup>, Joshua Pickering<sup>2</sup> and Christopher H. Eskiw<sup>1,2\*</sup>*

*<sup>1</sup> Department of Food and Bioproduct Sciences, University of Saskatchewan, Saskatoon, SK, Canada, <sup>2</sup> Department of Biochemistry, University of Saskatchewan, Saskatoon, SK, Canada*



**Figure:** **Caloric restriction and the four hypotheses of aging.** Four major theories of aging; oxidative damage attenuation hypothesis (**green**), glucose-insulin hypothesis (**yellow**), growth hormone and insulin-like growth factor (IGF)-1 (**blue**), and the hormesis hypothesis (**orange**).

OPINION

## Caloric restriction and human longevity: what can we learn from the Okinawans?

**D. Craig Willcox · Bradley J. Willcox ·  
Hidemi Todoriki · J. David Curb ·  
Makoto Suzuki**

Received: 20 January 2006 / Accepted: 20 January 2006 / Published online: 30 June 2006

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# Okinawa

- Year 2006:  
740 centenarians
- 50 centenarians/100 000 inhabitants
- Slovenija (2010): 196 centenarians  
(8/100 000 inhabitants); (2016, 209)



**625 centenarians / 10.5 million  
6,25 / 100 000**

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## Number of centenarians rising in Czech Republic

ČTK | 14 OCTOBER 2011

Prague, Oct 13 (CTK) - A total of 625 centenarians, 534 women and 91 men, lived in the 10.5-million Czech Republic as of the end of September and their number has been gradually rising in the country, Czech Social Security Authority (CSSZ) spokesman Pavel Gejdos told CTK Thursday.

At present, 70 more people aged 100 and more live in the Czech Republic than two years ago and about 160 more than in July of 2006.

The oldest inhabitants of the Czech Republic are two women born in 1904. The oldest man was born in 1905.

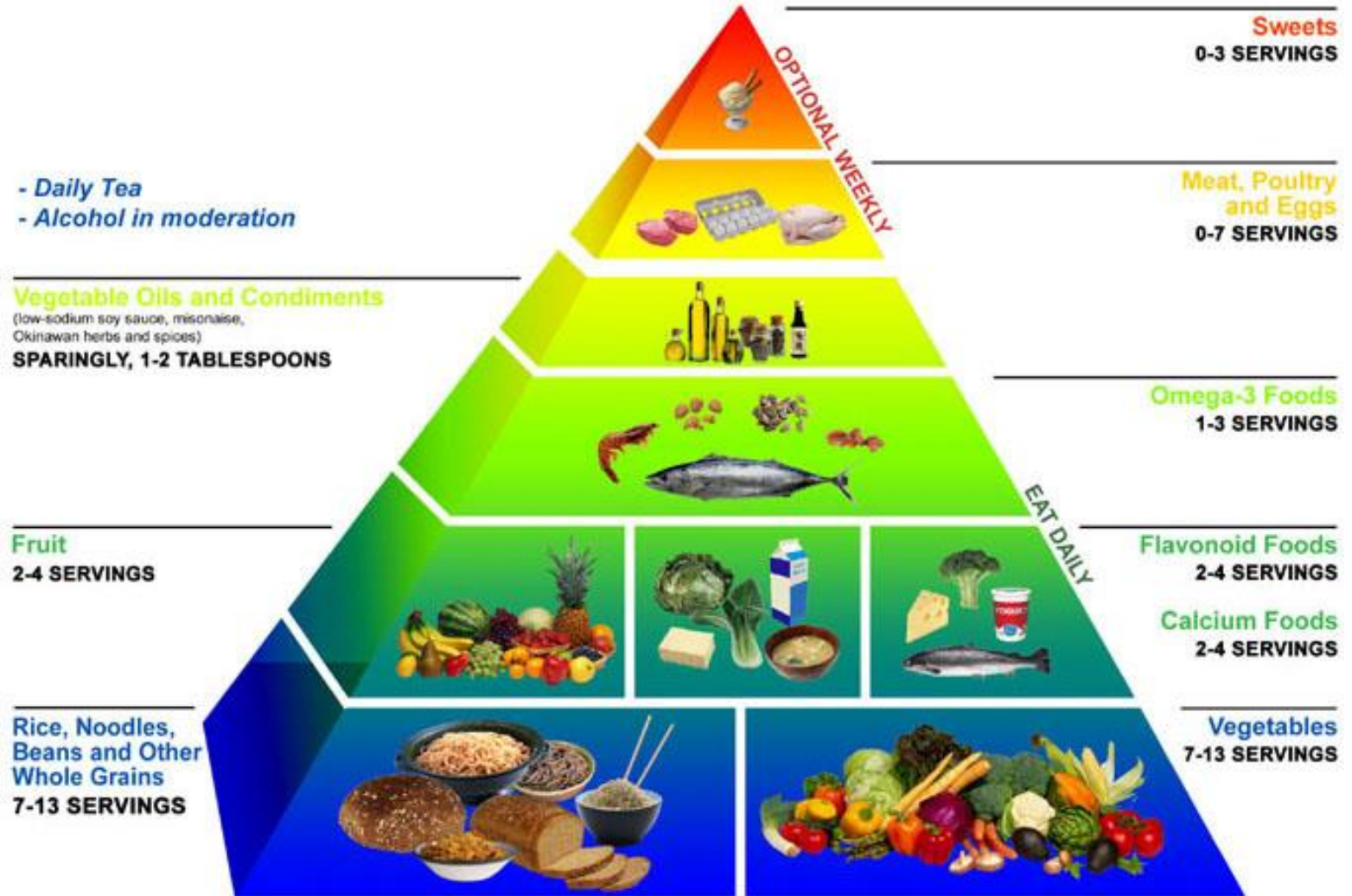
IDEA #409 - H  
HAPPY HOUR C

Zinc  
Members: 390 C



# Okinawa

Energy intake: 1 800 do 1 900 KCal/day





*“Hara hachi-bu”*

腹八分

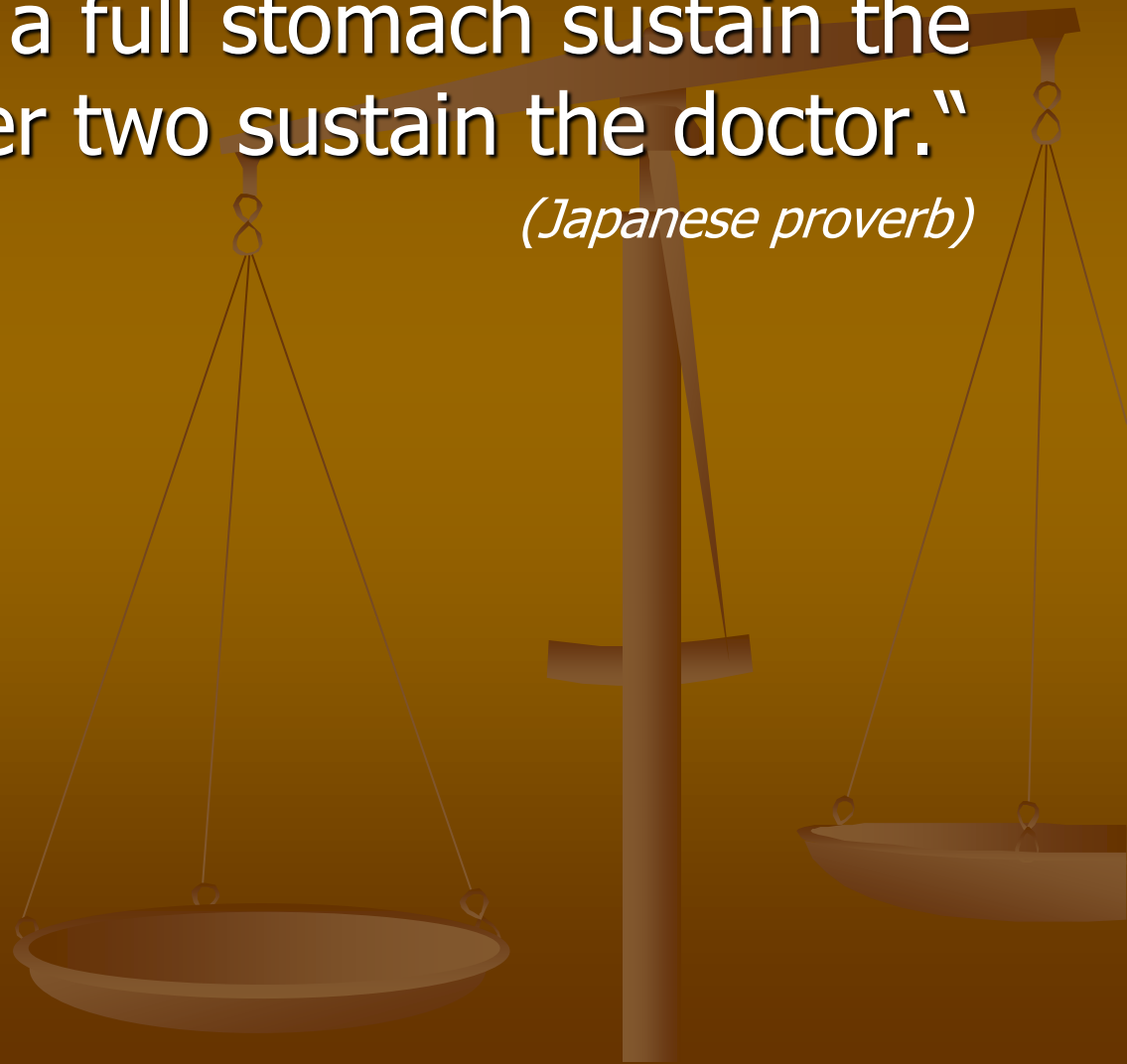


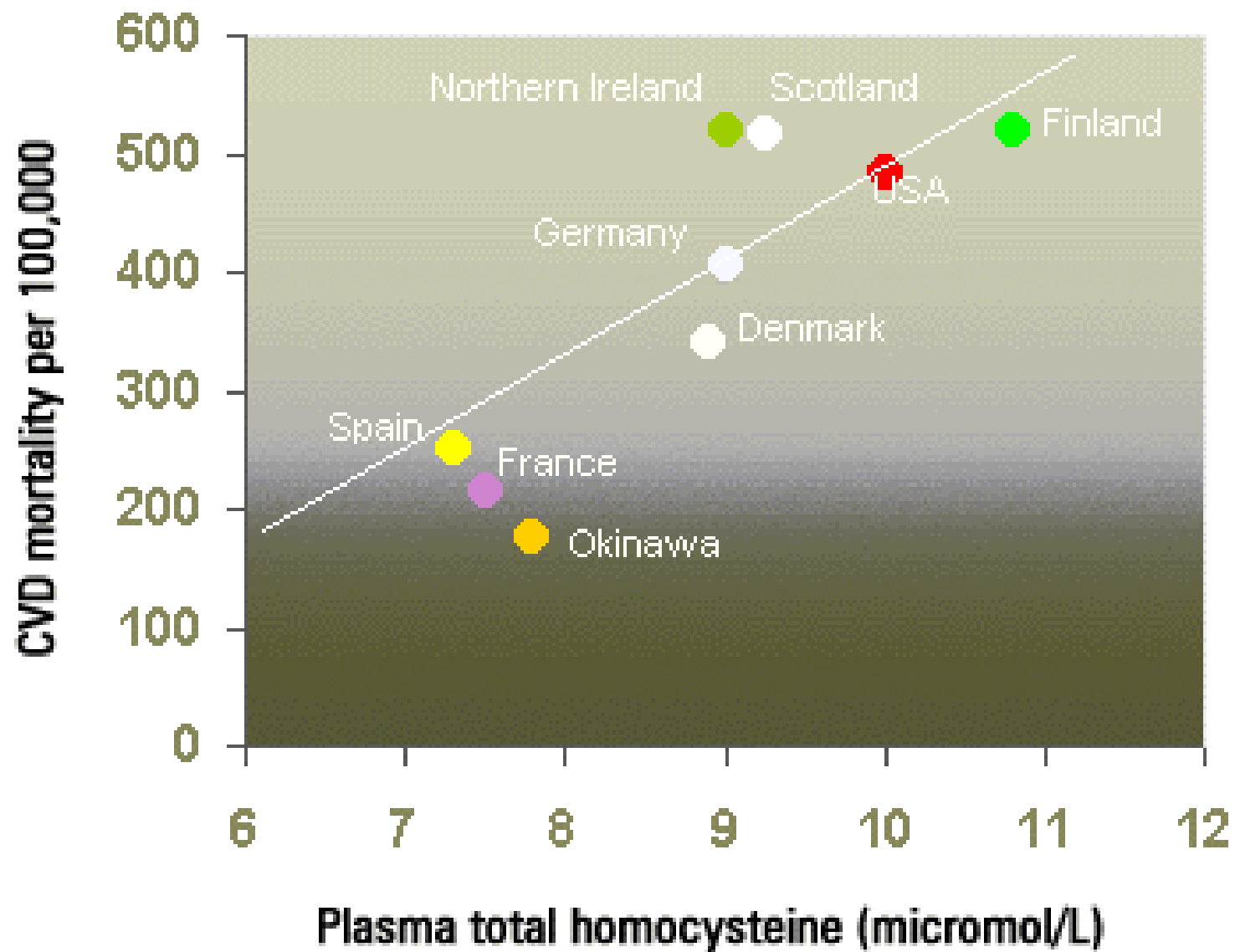
“Eat until you are eight parts  
(out of ten) full”



“Eight parts of a full stomach sustain the man; the other two sustain the doctor.”

*(Japanese proverb)*





Adapted with permission from:  
Alfthan, G., et al. *Lancet* 1997;349:397

## Laboratorijski izvid

Končni izvid

### Pacient

Laboratorijska št.: 3035      Spol: M  
Priimek in ime: **KOSTANJEVEC STOJAN**      Datum roj.: 01.02.1972

### Naročilo

Naročnik: **Samoplačnik**      Čas sprejema: 03.11.2017 08:49:07  
Zdravnik: / [/]      Čas zaključka: 03.11.2017 13:36:53

### Imunološke preiskave

Preiskava	Orientacijske referenčne vrednosti za odrasle	Enota	Rezultat	
S-Homocistein	5.08 - 15.39	μmol/L	10.91	
S-Vitamin D	> 30.0	μg/L	<b>22.5</b>	<b>L</b>

## Laboratorijski izvid

Končni izvid

### Pacient

Laboratorijska št.: 3144      Spol: M  
Priimek in ime: **KOSTANJEVEC STOJAN**      Datum roj.: 01.02.1972

### Naročilo

Naročnik: **Samoplačnik**      Čas sprejema: 25.11.2020 12:34:32  
Zdravnik: / [/]      Čas zaključka: 25.11.2020 15:55:41

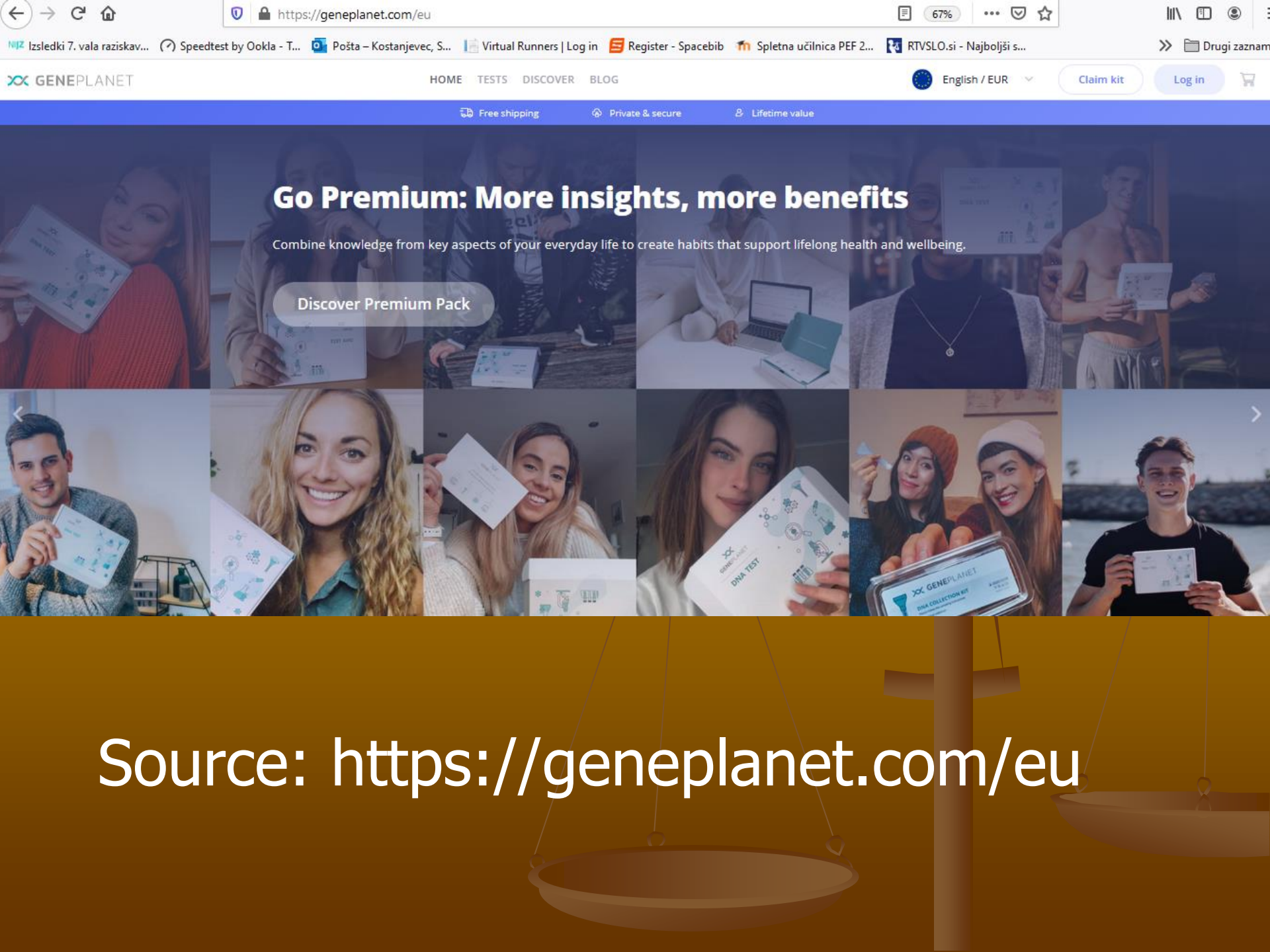
### Imunološke preiskave

Preiskava	Orientacijske referenčne vrednosti za odrasle	Enota	Rezultat	
S-Homocistein	5.08 - 15.39	μmol/L	<b>15.56</b>	<b>H</b>
S-Vitamin D	> 30.0	μg/L	38.1	

DNA test...







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Source: <https://geneplanet.com/eu>

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# WHAT ABOUT MICROBIOTA?





# Getting to know your gut microbiota

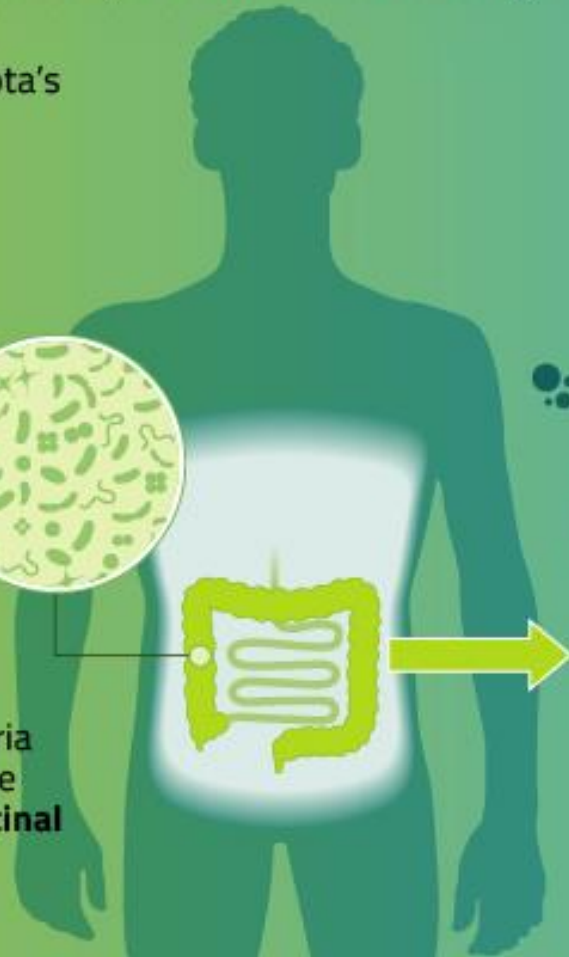
A huge quantity (hundreds of trillions) of bacteria and other microorganisms inhabit your intestines fulfilling key functions for your health and wellbeing

Gut microbiota's **weight** can reach up to

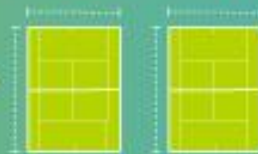
1 to 2 Kg

95%

of our bacteria located in the **gastrointestinal (GI) tract**



The **GI tract** surface is as big as 2 tennis courts  
**400 m<sup>2</sup>**



Bacteria are **10 to 50** times smaller than human cells



In our body, **microbes outnumber** human cells by

**10:1**



Laid end to end, our body's bacteria would **circle the Earth**

**2,5** times

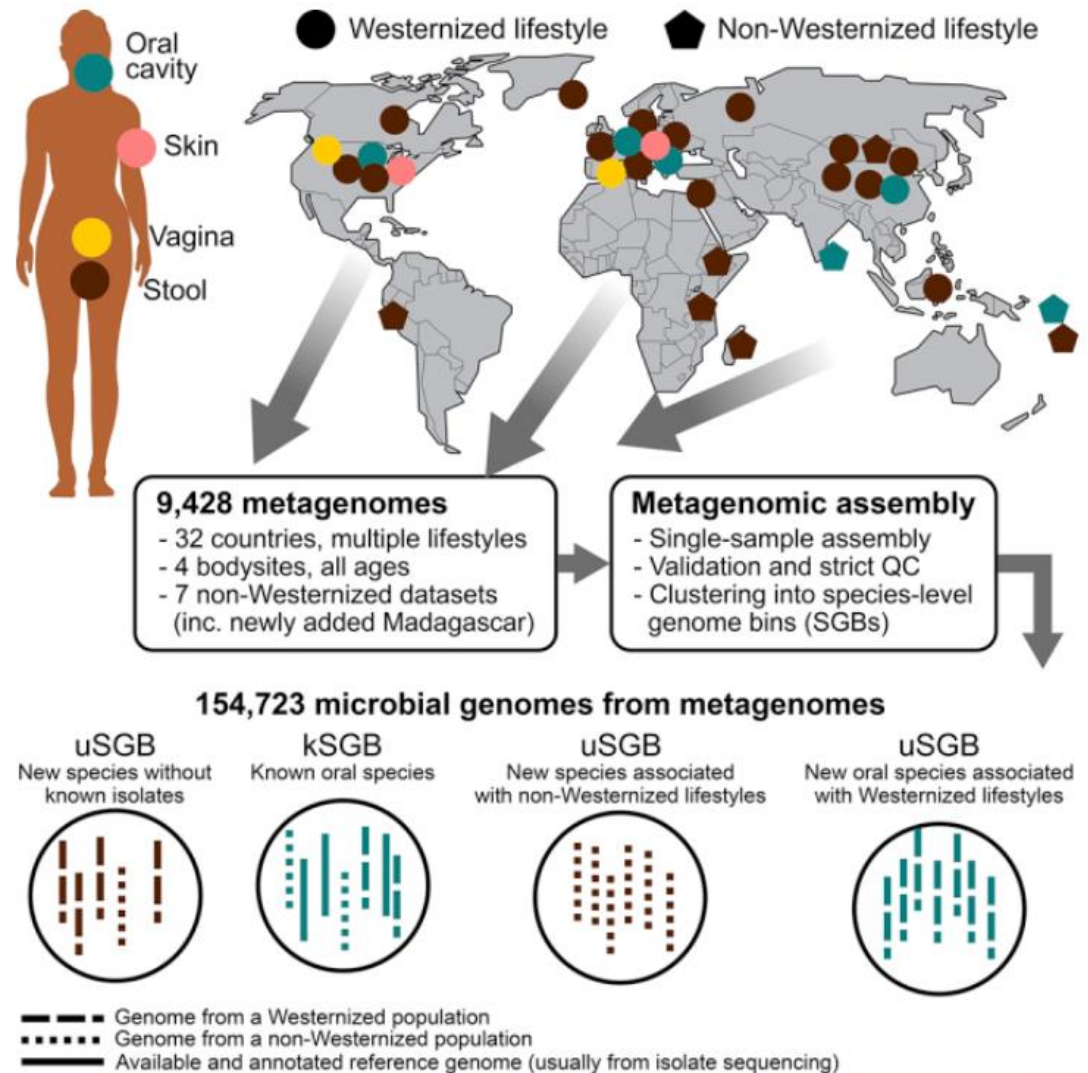




PMC full text: [Cell, 2019 Jan 24; 176\(3\): 649–662.e20.](#)

doi: [10.1016/j.cell.2019.01.001](#)

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Researchers found two types of bacteria—[\*Methanobrevibacter\*](#), the main methane-producing microbe in the human gut, and [\*Akkermansia\*](#)—were more abundant in MS patients. In contrast, those with MS had lower levels of others, such as *Butyricimonas*, in comparison with healthy individuals. The levels of microorganisms that differ in MS patients are thought to drive inflammation or have been associated with autoimmunity.



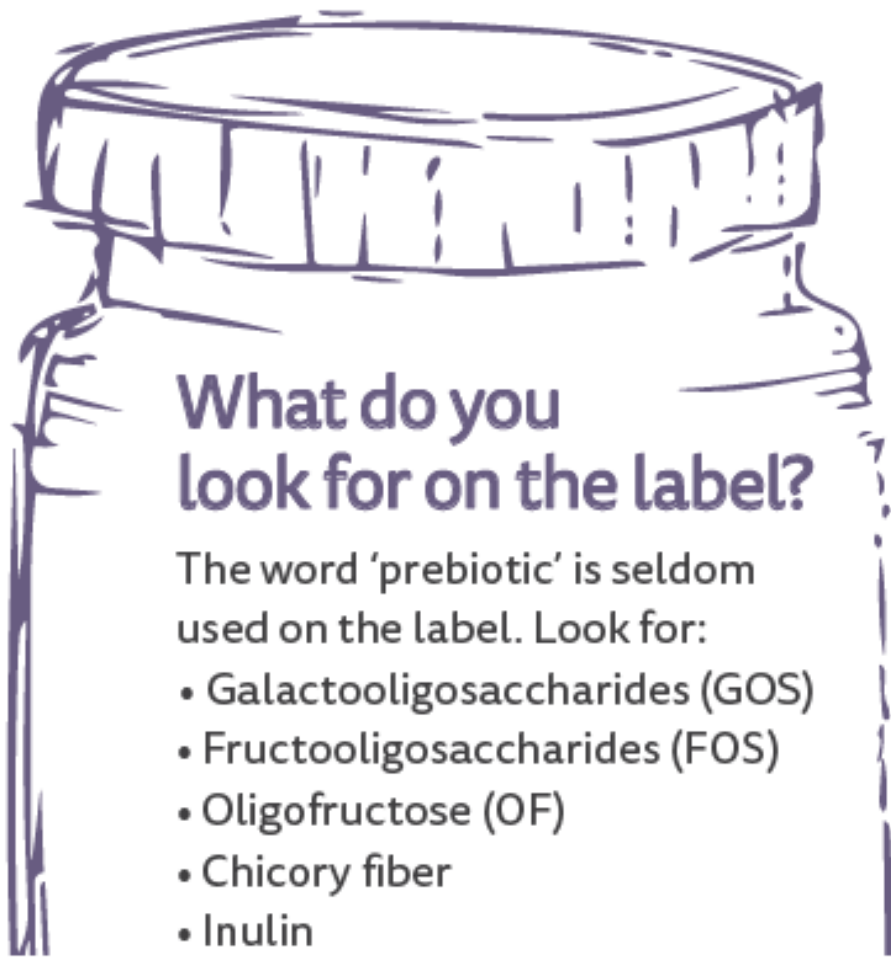
ARTICLE

Received 6 Sep 2015 | Accepted 20 May 2016 | Published 28 Jun 2016

DOI: 10.1038/ncomms12015 OPEN

Alterations of the human gut microbiome in multiple sclerosis

Sushrut Jangi<sup>1\*</sup>, Roopali Gandhi<sup>1\*</sup>, Laura M. Cox<sup>1</sup>, Ning Li<sup>2</sup>, Felipe von Glehn<sup>1</sup>, Raymond Yan<sup>1</sup>, Bonny Patel<sup>1</sup>, Maria Antonietta Mazzola<sup>1</sup>, Shirong Liu<sup>1</sup>, Bonnie L. Glanz<sup>1</sup>, Sandra Cook<sup>1</sup>, Stephanie Tankou<sup>1</sup>, Fiona Stuart<sup>1</sup>, Kirsy Melo<sup>1</sup>, Parham Nejad<sup>1</sup>, Kathleen Smith<sup>1</sup>, Begüm D. Topçuoğlu<sup>3</sup>, James Holden<sup>3</sup>, Pia Kivisäkk<sup>1</sup>, Tanuja Chitnis<sup>1</sup>, Philip L. De Jager<sup>1</sup>, Francisco J. Quintana<sup>1</sup>, Georg K. Gerber<sup>2</sup>, Lynn Bry<sup>2</sup> & Howard L. Weiner<sup>1</sup>



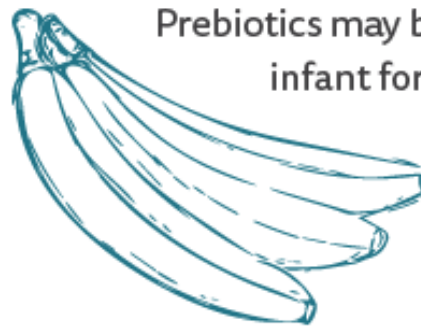
## What do you look for on the label?

The word 'prebiotic' is seldom used on the label. Look for:

- Galactooligosaccharides (GOS)
- Fructooligosaccharides (FOS)
- Oligofructose (OF)
- Chicory fiber
- Inulin

## Prebiotics in food

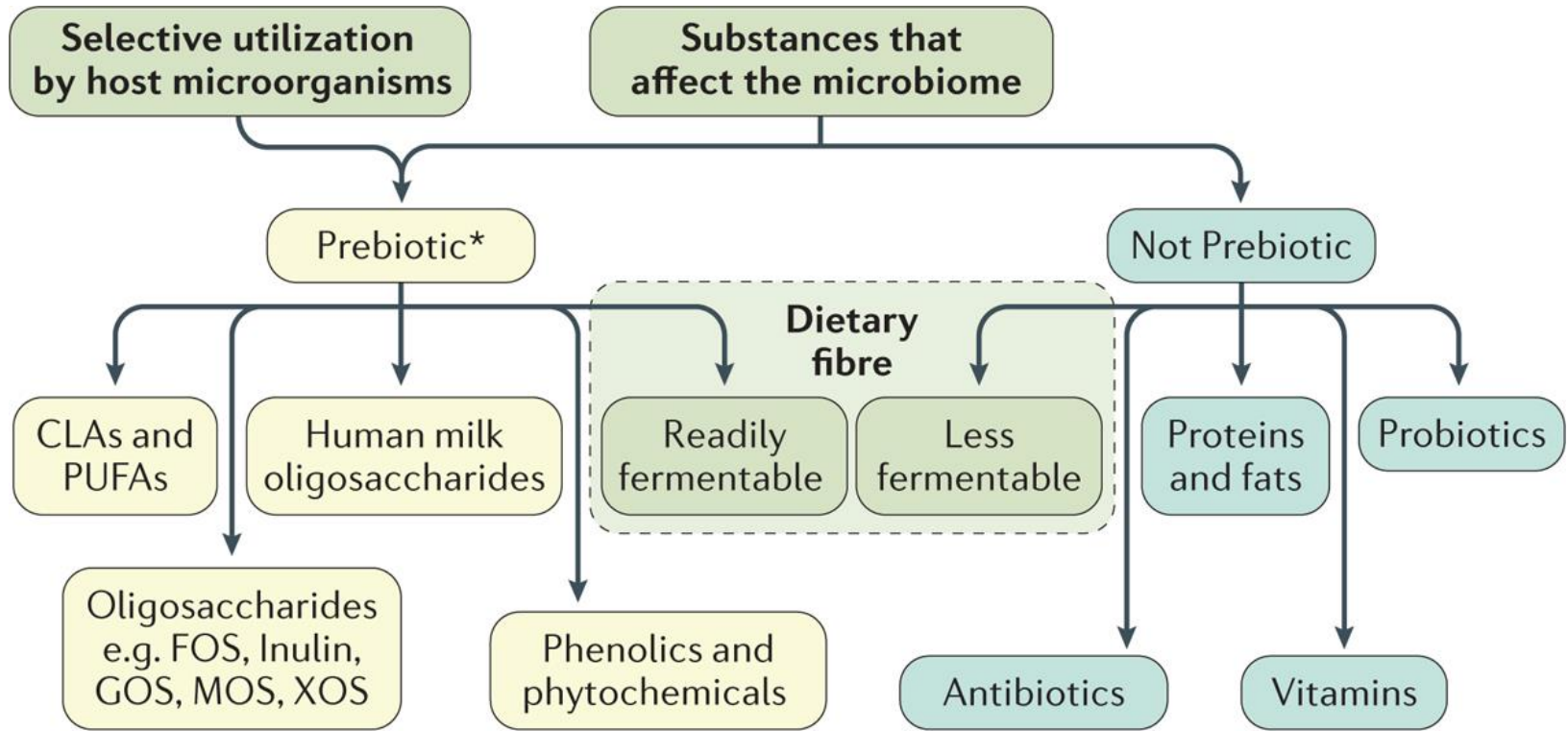
Some prebiotics (oligofructose and inulin) can be found in onions, garlic, bananas, chicory root, Jerusalem artichokes, but typically are present at low levels. To increase your daily intake, include prebiotic supplements or foods with added prebiotics as part of your diet.



Prebiotics may be added to yogurts, infant formula, cereals, breads, biscuits/cookies, desserts or drinks.

Try to get at least 5 grams of prebiotics in your diet every day. Eating whole grains, fruits and vegetables, and other fiber-rich foods can help.

**Figure 1** Distinguishing what is considered a prebiotic with the proposed definition



**Nature Reviews | Gastroenterology & Hepatology**

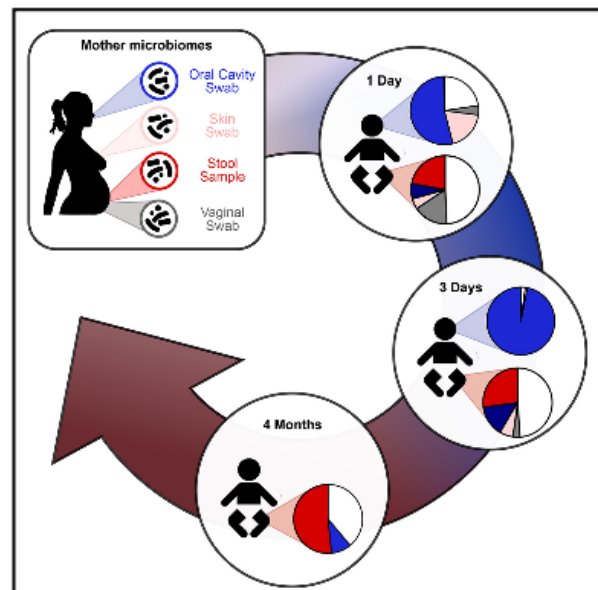
Prebiotics must be selectively utilized and have adequate evidence of health benefit for the target host. Dietary prebiotics must not be degraded by the target host enzymes. \*The figure shows candidate as well as accepted prebiotics in that levels of evidence currently vary, with FOS and GOS being the most researched prebiotics. CLA, conjugated linoleic acid; PUFA, polyunsaturated fatty acid; FOS, fructooligosaccharides; GOS, galactooligosaccharides; MOS, mannanoligosaccharide; XOS, xylooligosaccharide.



# Cell Host & Microbe

## Mother-to-Infant Microbial Transmission from Different Body Sites Shapes the Developing Infant Gut Microbiome

### Graphical Abstract



### Authors

Pamela Ferretti, Edoardo Pasoli,  
Adrian Tett, ..., Curtis Huttenhower,  
Peer Bork, Nicola Segata

### Correspondence

nicola.segata@unitn.it

### In Brief

Ferretti et al. use metagenomics with strain-resolved computational profiling to characterize the transfer of microbes from mothers to their infants during their first 4 months of life. Multiple maternal body sites contribute to the developing infant microbiome, with maternal gut strains providing the largest contribution of colonizing microorganisms.

### Highlights

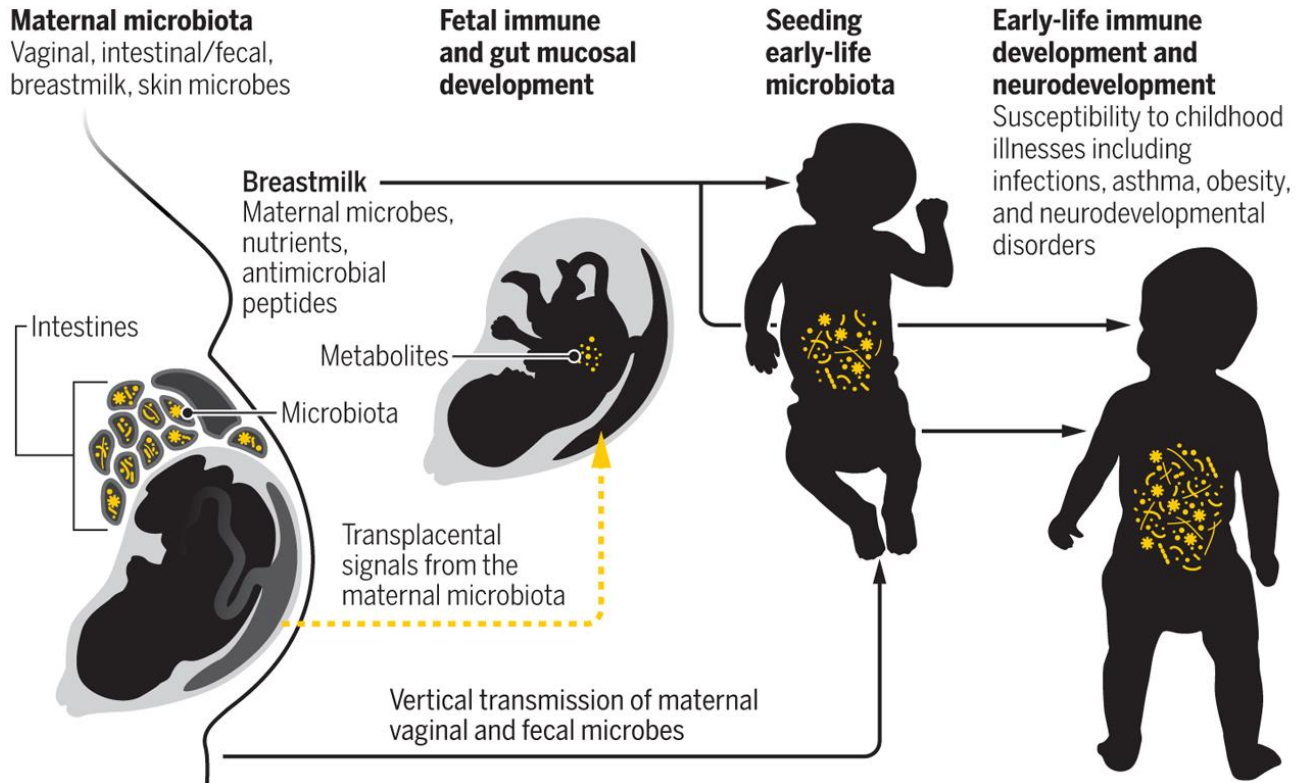
- Strain-resolved metagenomics was used to track mother-to-infant microbiome transfer
- Microbial strains from multiple maternal body sites transfer to the infant microbiome
- The early microbial diversity in the infant gut is rapidly shaped by niche selection
- The maternal gut microbiome is the source of the majority of transmitted strains



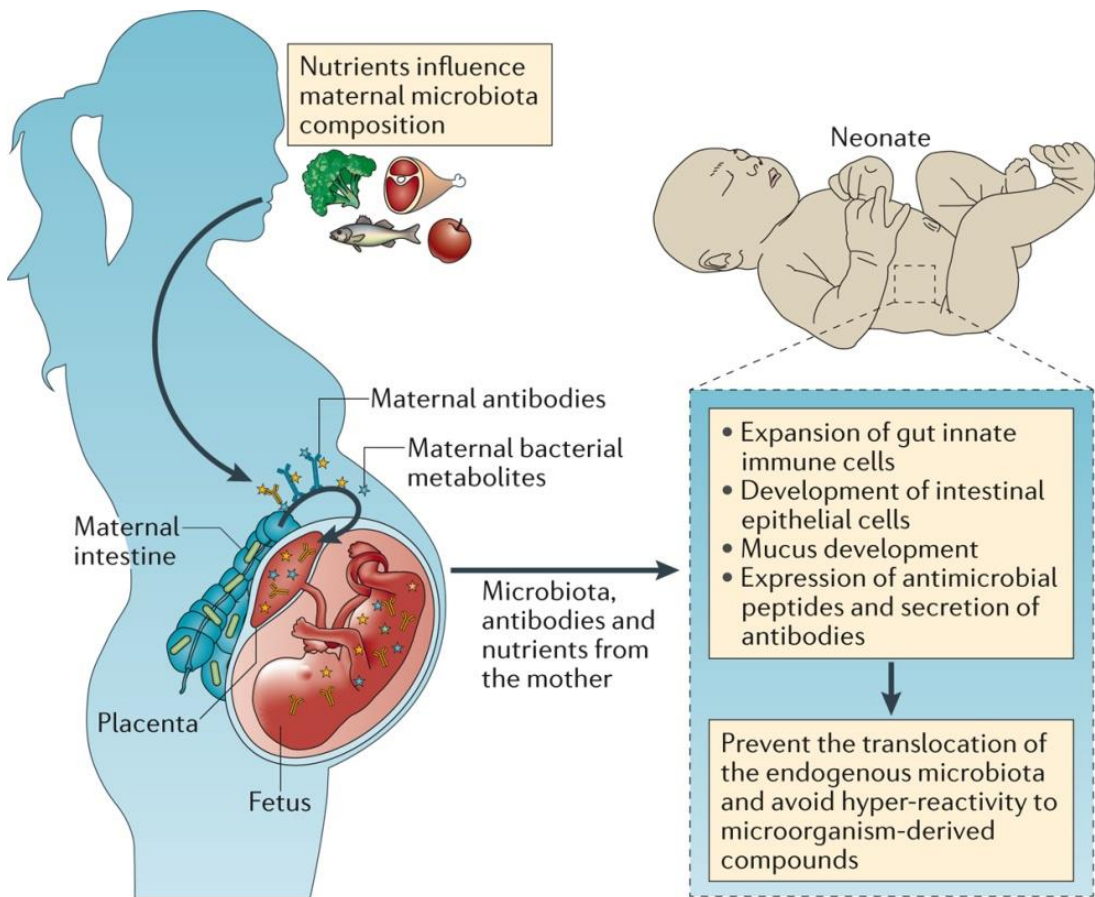
# Effects of the maternal microbiota in pregnancy and early life

## Effects of the maternal microbiota in pregnancy and early life

Through effects on early-life colonization, immune development, and neurodevelopment, the maternal microbiota regulates susceptibility to a number of childhood illnesses and can vertically transmit dysbiosis-mediated pathologies.



Braedon McDonald, and Kathy D. McCoy *Science*  
2019;365:984-985




Nature Reviews | Immunology

nature  
REVIEWS IMMUNOLOGY

Review Article | Published: 12 June 2017

## How nutrition and the maternal microbiota shape the neonatal immune system

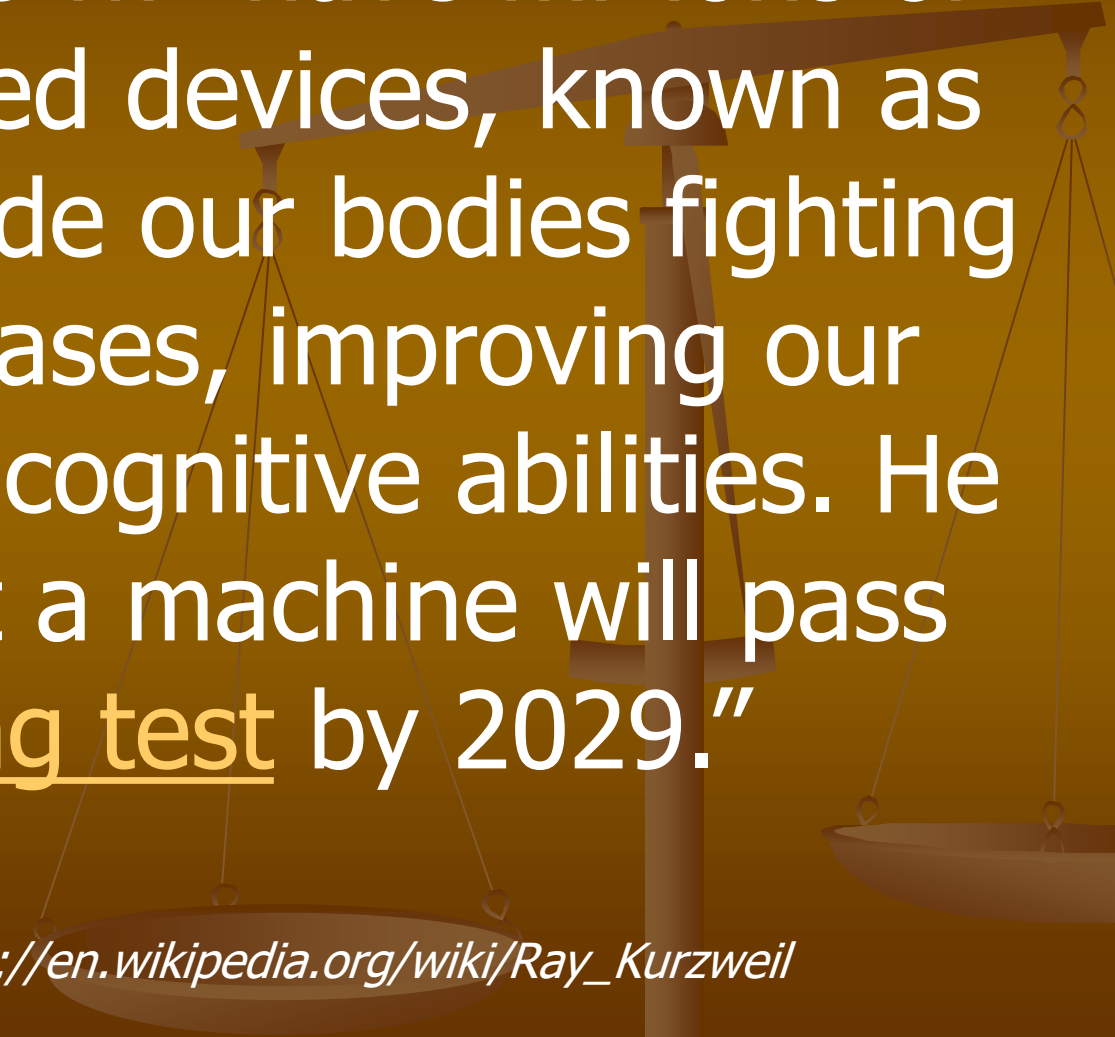
Andrew J. Macpherson , Mercedes Gomez de Agüero & Stephanie C. Ganal-Vonarburg 

Nature Reviews Immunology **17**, 508–517 (2017) | Download Citation 



- **USA (1948 - )**
- inventor (text-to-speech synthesis, speech recognition technology...)
- futurist
- a director of engineering at Google

- Low carbohydrate diet
- Avoid high-glycemic-index carbs
- Fish and other omega-3 fats and a lot of protein
- Minimum five cups of green tea
- 150 (250) pills per day



“He believes that 20 to 25 years from now, we will have millions of blood-cell sized devices, known as nanobots, inside our bodies fighting against diseases, improving our memory, and cognitive abilities. He believes that a machine will pass the turing test by 2029.”

Source: [http://en.wikipedia.org/wiki/Ray\\_Kurzweil](http://en.wikipedia.org/wiki/Ray_Kurzweil)