

A mini review on Microbiomes



DMZ Medical Center

March 2019

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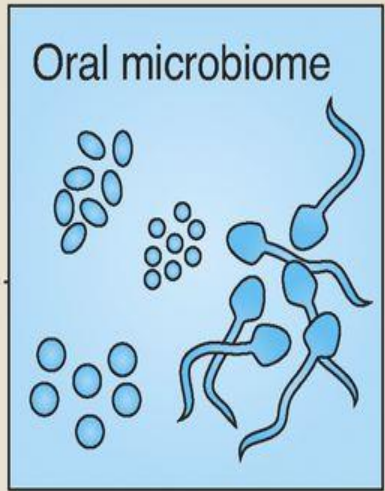
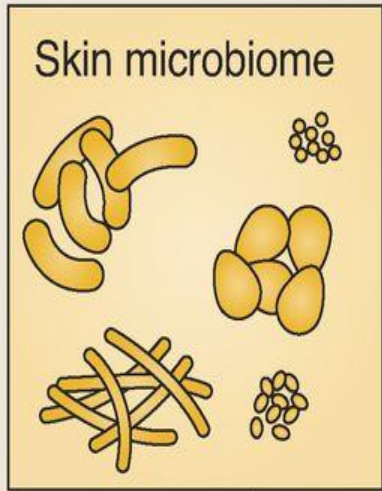
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What are microbiomes?

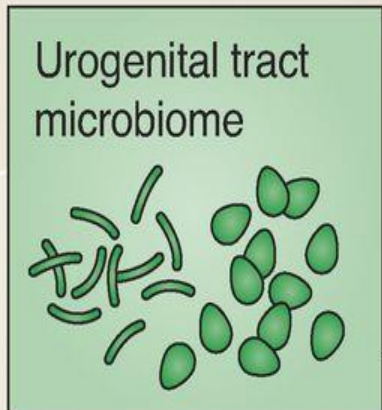
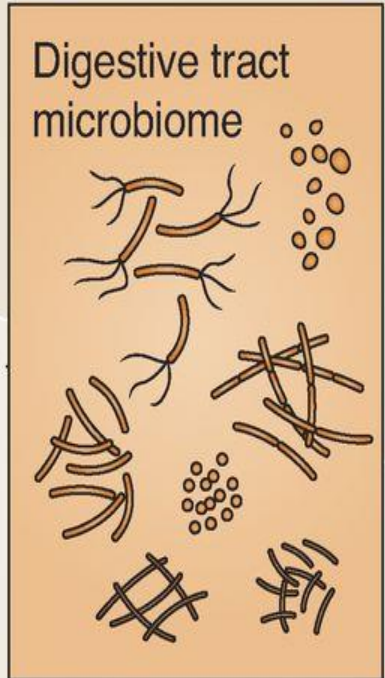
- Both **inside and out**, huge array of micro-organisms
- Bacteria are the biggest players
- Single-cell organisms (archaea), fungi, viruses
- Together: **the human microbiota**
- The body's **microbiome** is all the genes microbiota contains

Archaea



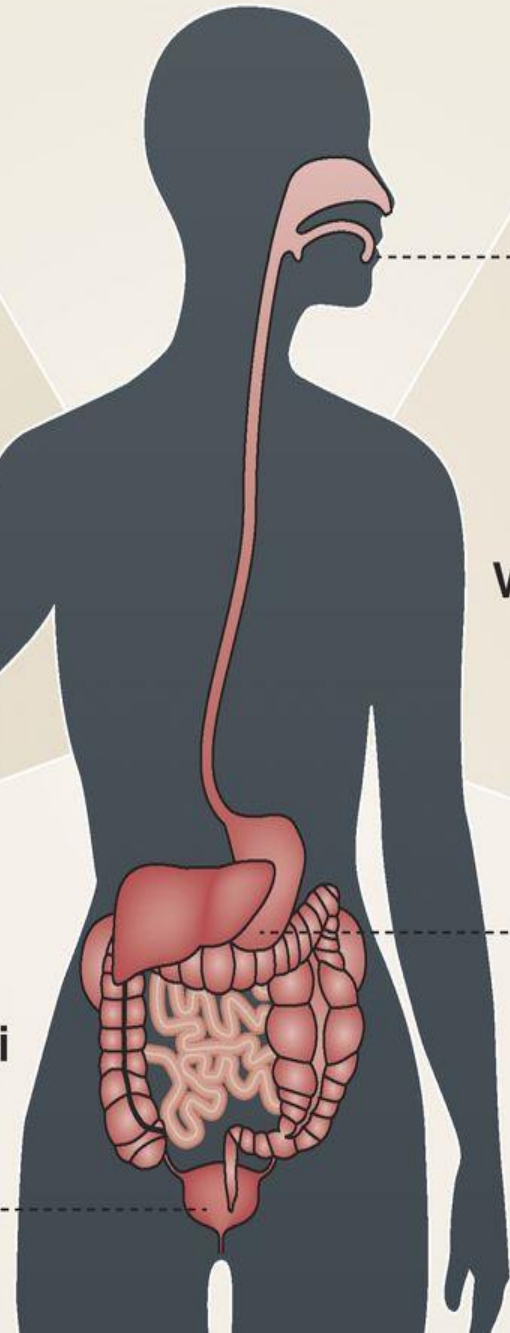
Bacteria

Viruses



Fungi

Parasites



How many are we talking about?

- Since **1970's** : microbes outnumber our own cells by about 10/1
- But a study from **2016** : in fact microbial cells and human cells coexist in somewhere around – suggesting they only **slightly outnumber our own cells**
- Although that doesn't count **viruses** and viral particles

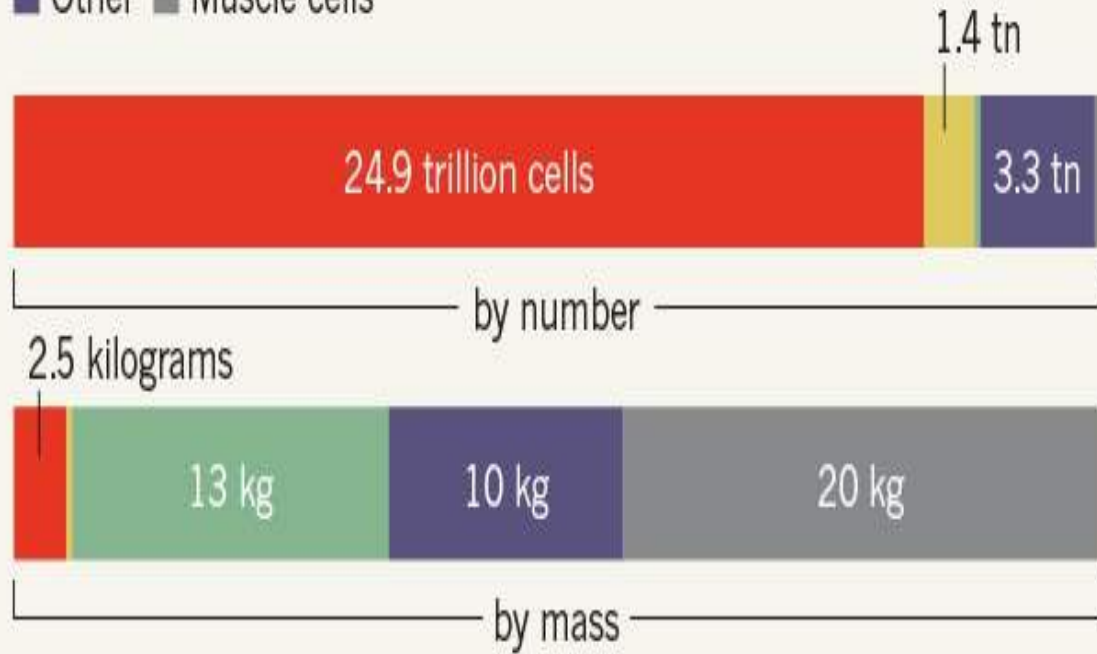
Microbiome and Cells

**1 trillion =
1 million million**

COUNTING HUMAN CELLS

Most of our body's cells are small red blood cells, although fat cells and muscle cells make up the majority by mass.

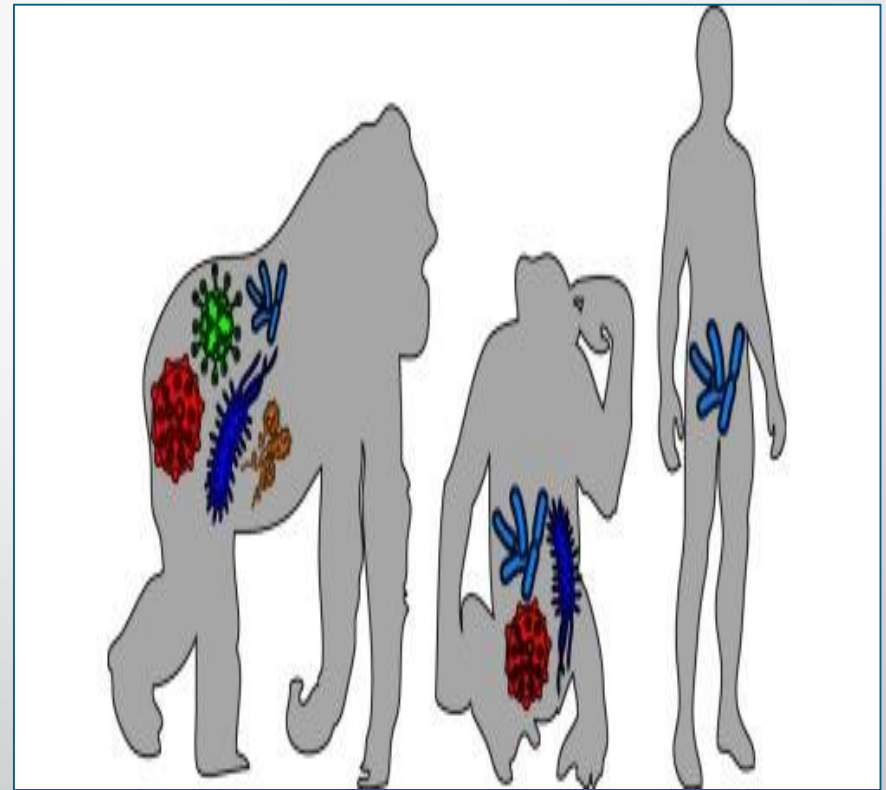
- Red blood cells (erythrocytes)
- Platelets
- Fat cells (adipocytes)
- Other
- Muscle cells



©nature

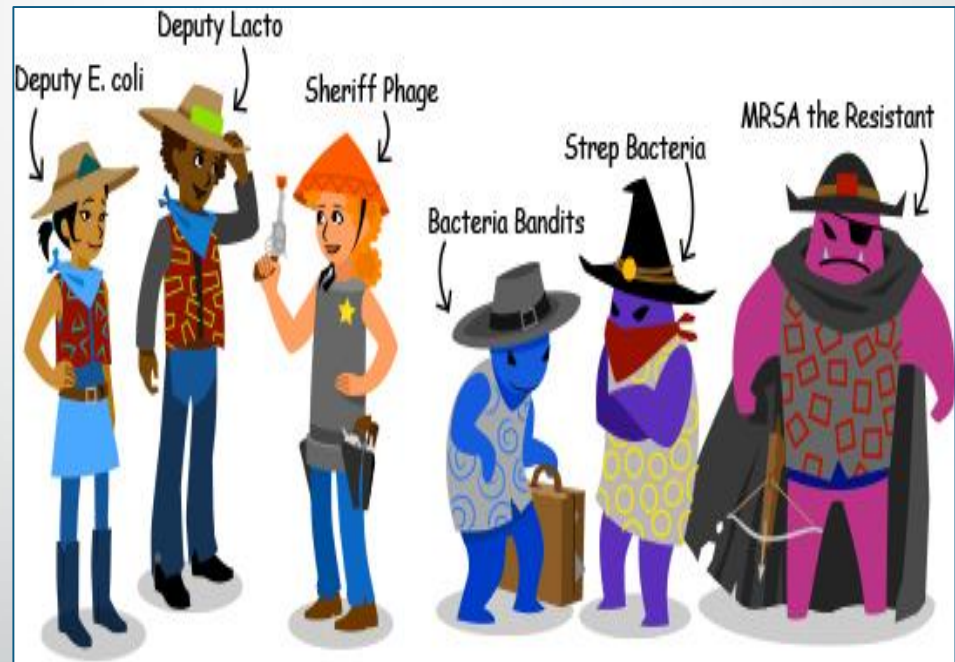
Our Microbiome Changes

- As we mature and age
- With puberty or pregnancy
- As our diet changes
- Medical conditions and Tx
- Pets in the home
- ... Many more factors are being investigated!



Each human becomes a unique community which is made up of

- Our own cells
- Bacteria
- Fungi
- Archea
- Viruses

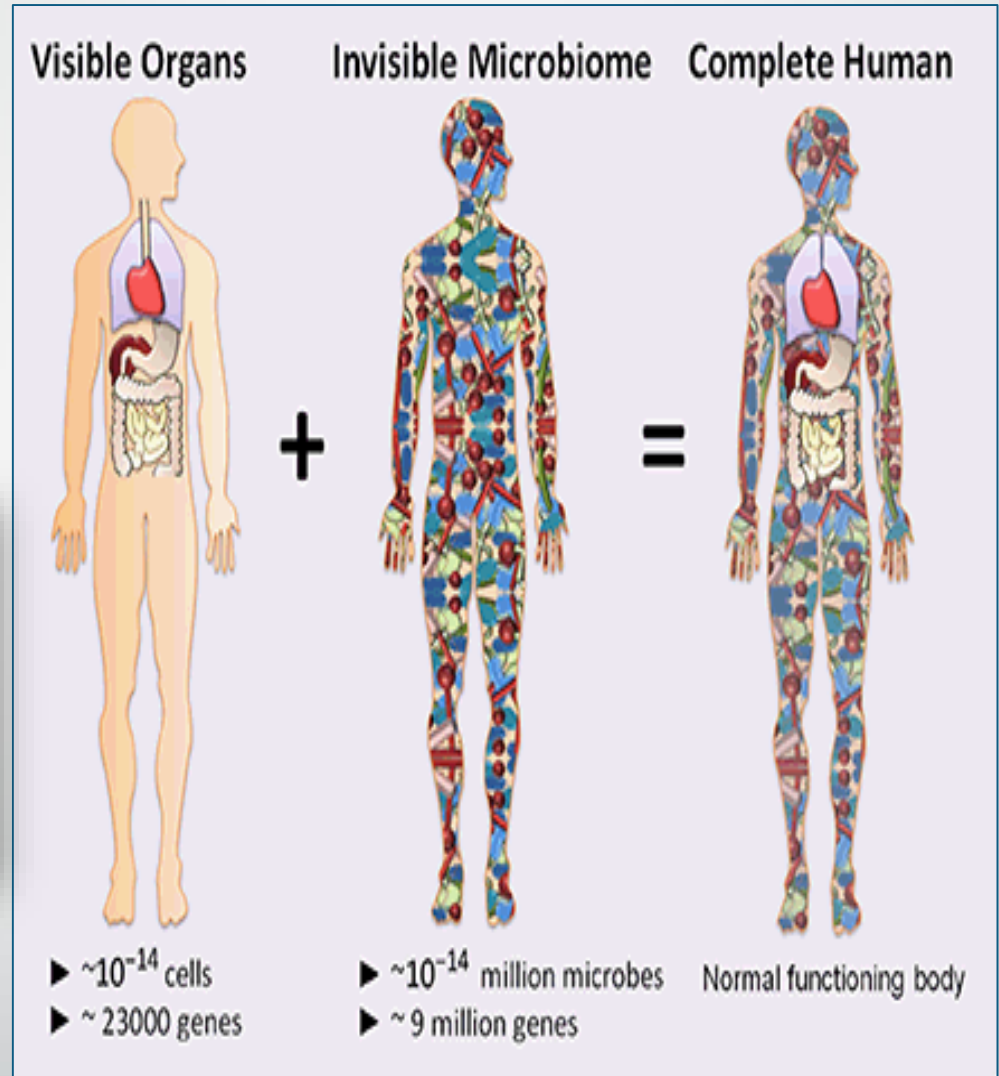


What are
we?

Holobiont
or
Human ?

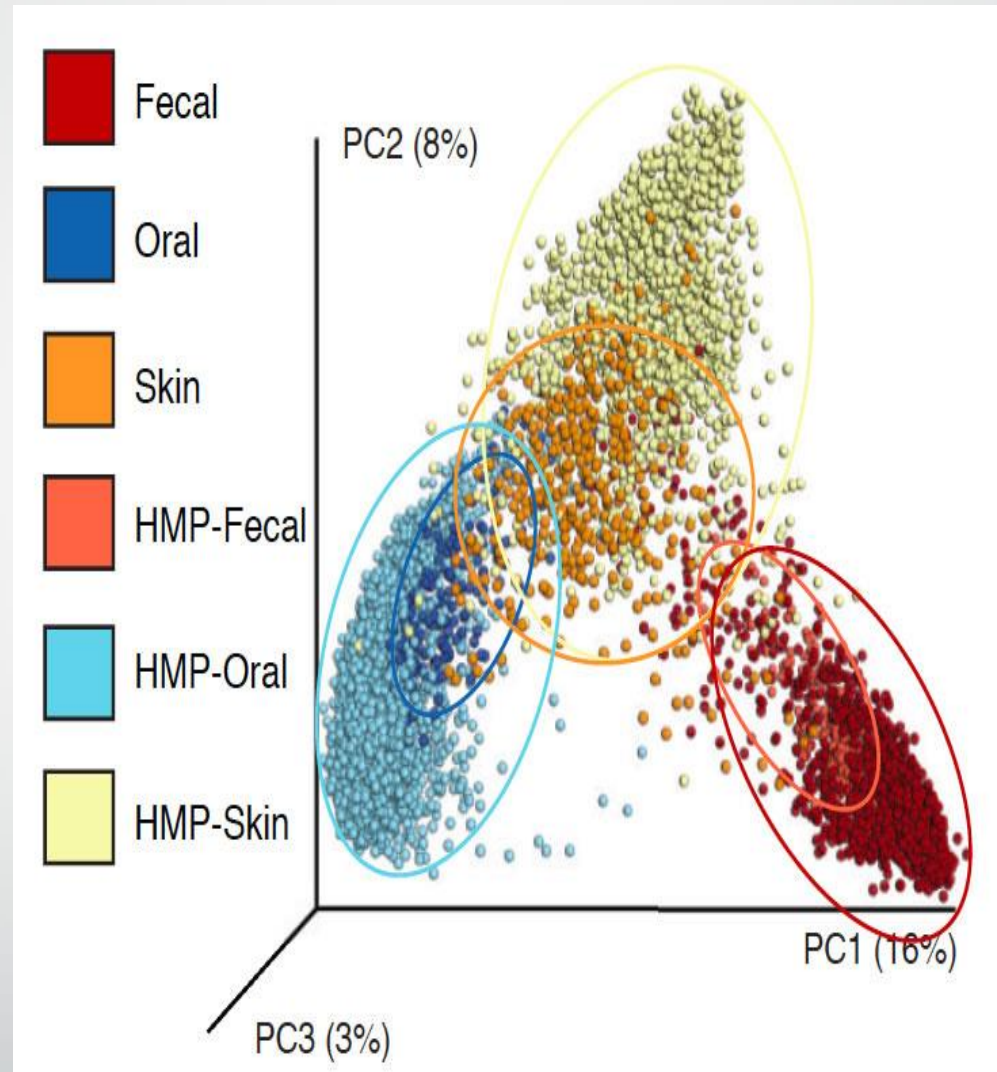


In fact ...



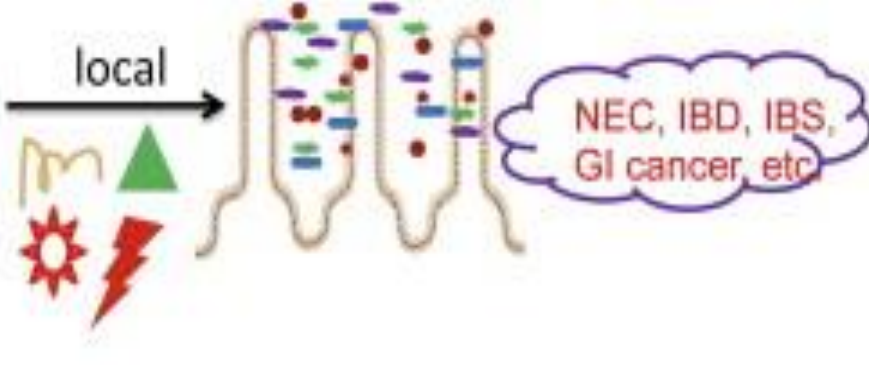
The Human Microbiomes

Each part of the human body is home to a different community of microbes



Gut microbiota
(Dysbiosis)

local



NEC, IBD, IBS,
GI cancer, etc.

distant

Metabolites



Inflammatory
cytokines



PAMPS



Heart
diseases



Liver
Infection
cancer



Brain
Parkinson's disease
Alzheimer's disease



Prostate
Cancer



Kidney
Infection



Lung
Allergy (Asthma)
Infection (TB)



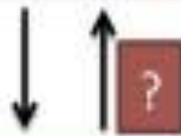
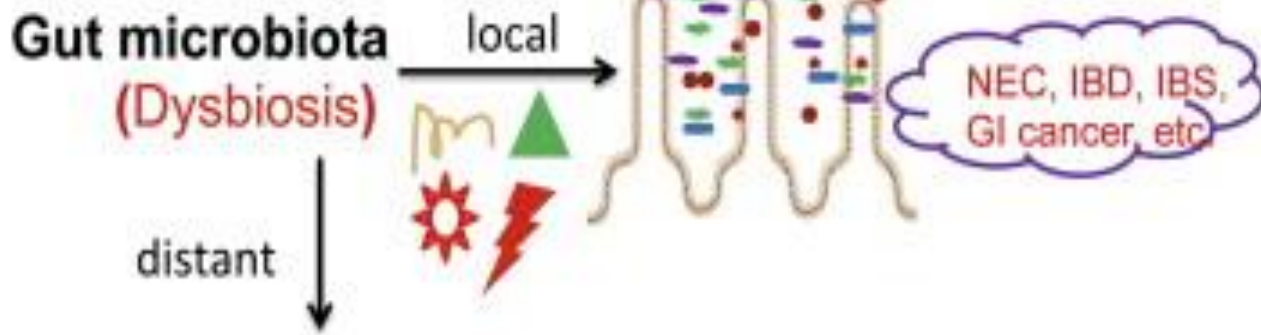
Islet
Obesity
Diabetes

Metabolites: secondary bile acids, SFAC, vitamin, etc

PAMPS: LPS, flagelin, peptidglycan, etc

Proinflammatory cytokines: IL-6, TNF- α , etc.

? : mutual interactions

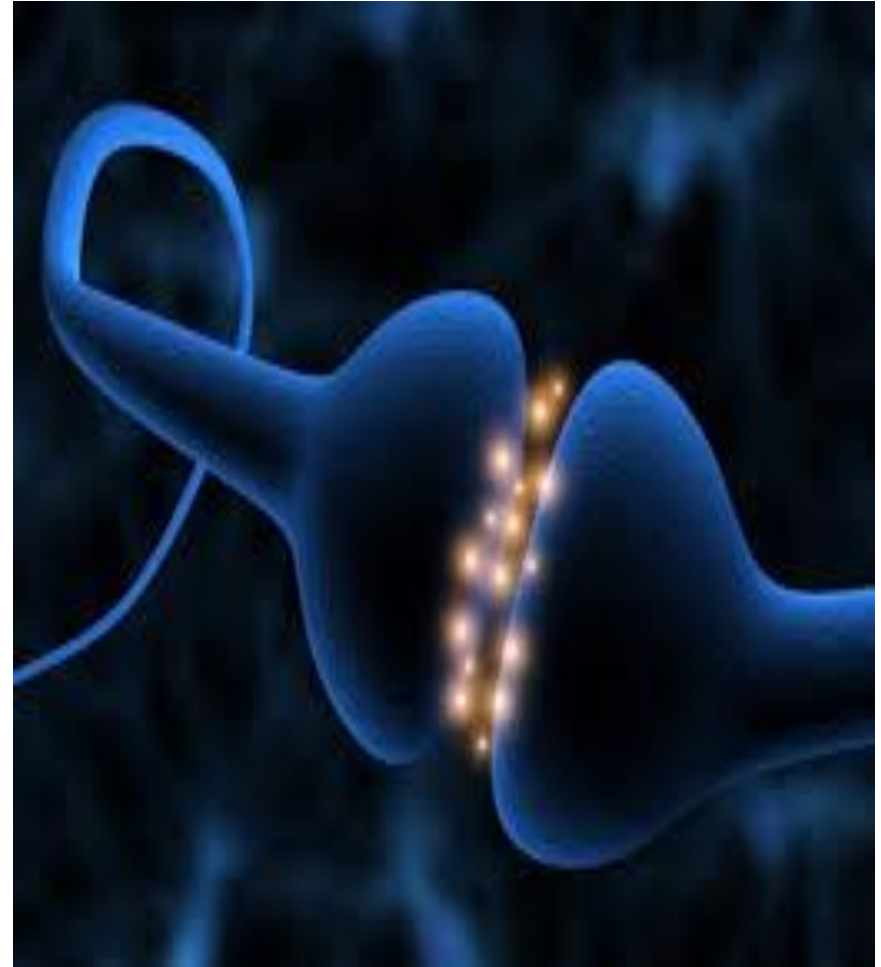
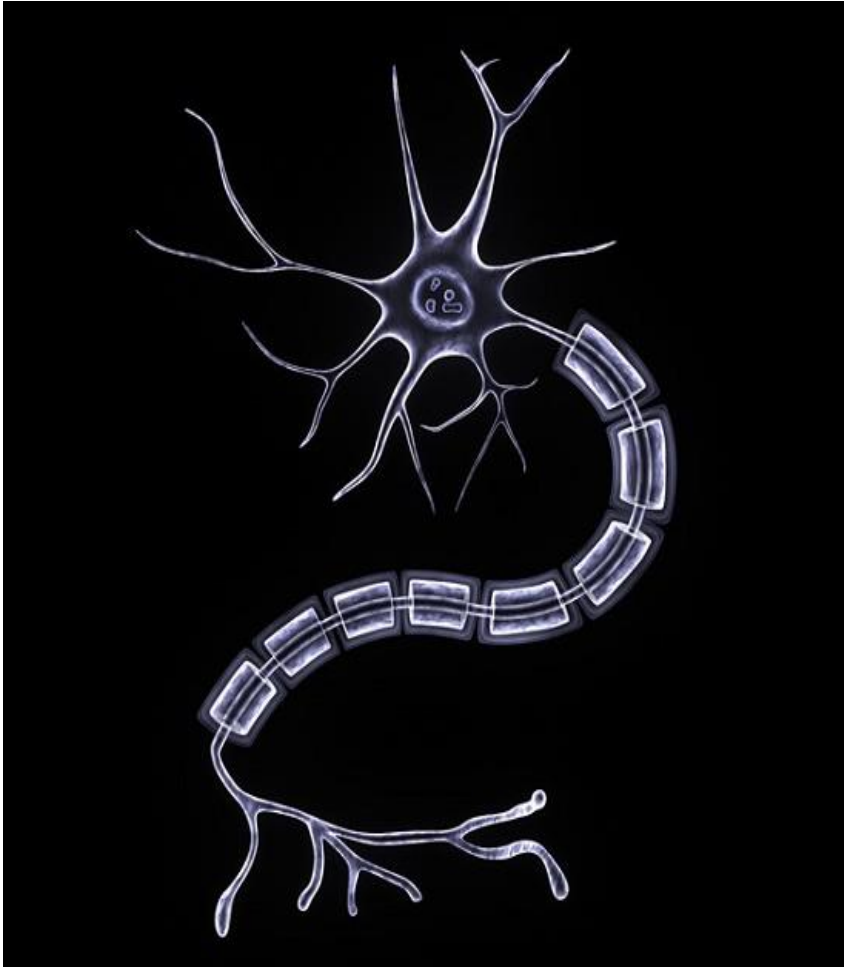


Metabolites: secondary bile acids, SFAC, vitamin, etc
PAMPS: LPS, flagelin, peptidglycan, etc
Proinflammatory cytokines: IL-6, TNF- α , etc.
?: mutual interactions

Brain and Gut Connections and the Human Microbiome

A short overview

A Brain in the Gut



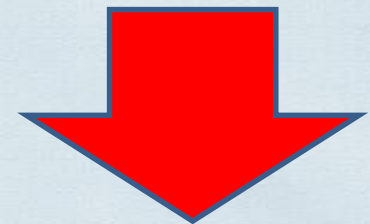
Janice Singles, Psy.D., Distinguished Psychologist

Mind-Gut Connections



WHAT IS REALLY THE DIGESTIVE SYSTEM ?

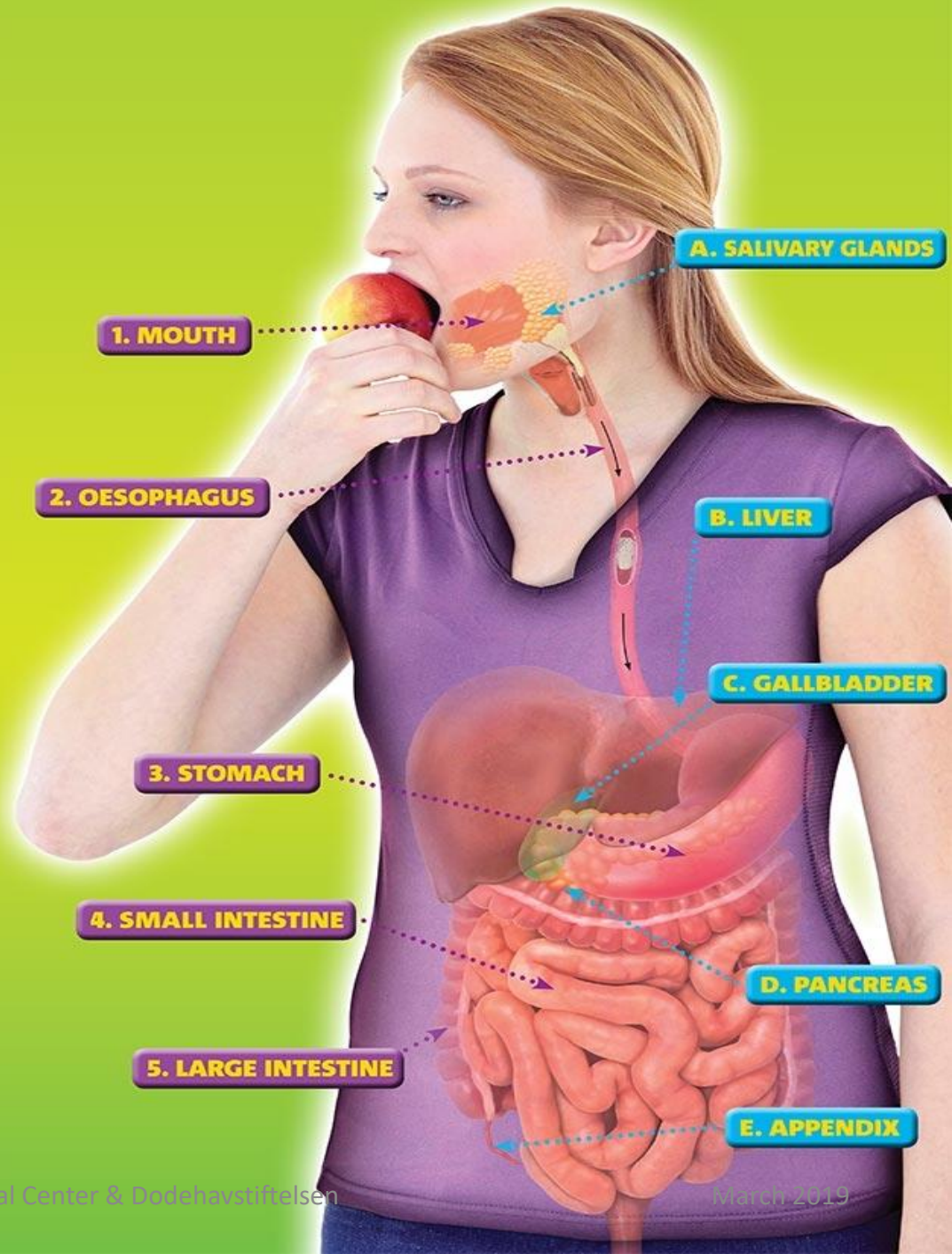
The digestive canal represents a tube passing through the entire organism and communicating with the external world, i.e. as it were the external surface of the body, but turned inwards and thus hidden in the organism.



Ivan Pavlov

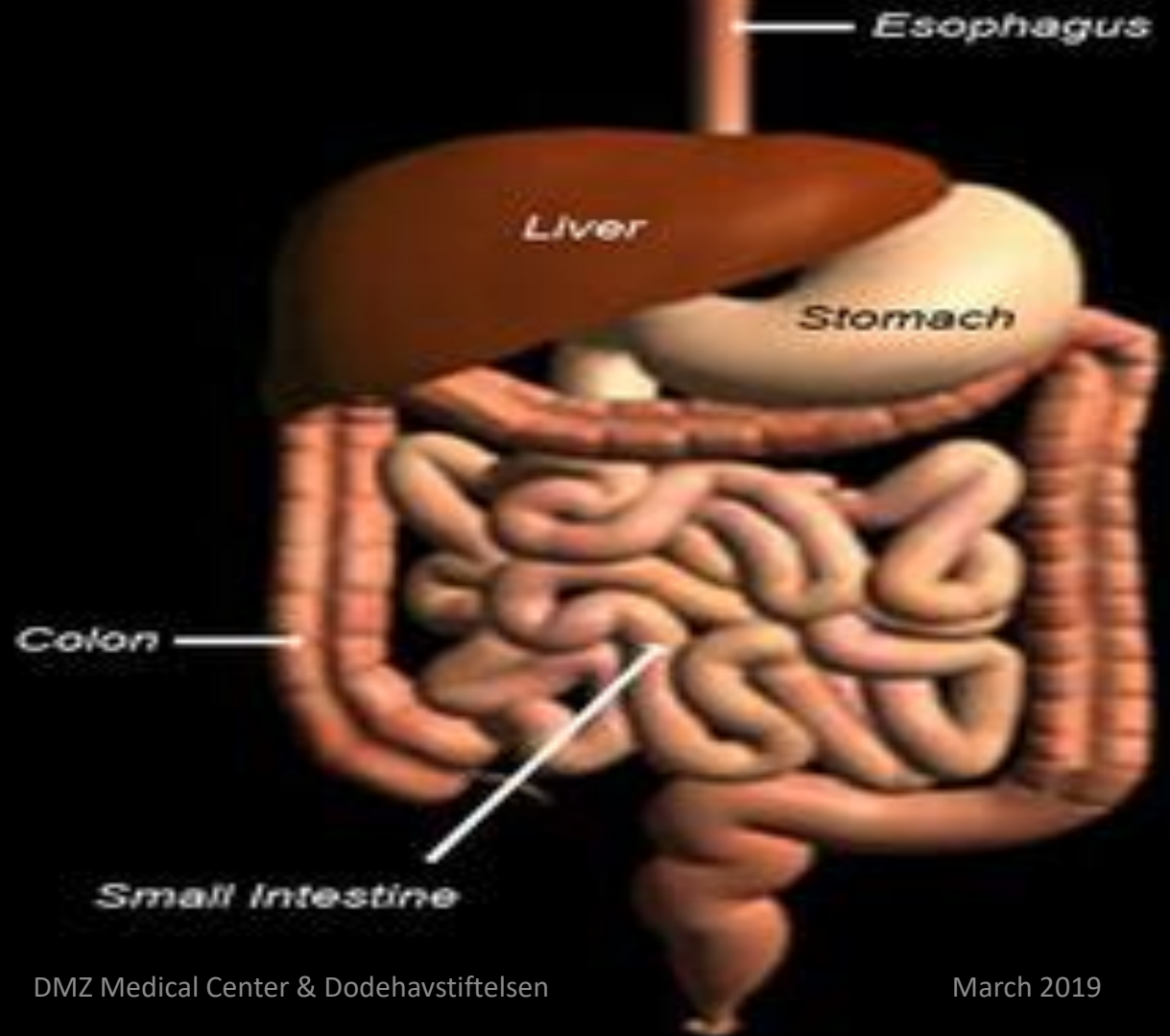
Russian Psychologist

**70% OF
OUR
IMMUNE
SYSTEM
IS FOUND
THERE**



Can
operate
independently
of the brain
and the
spinal cord

The Digestive System

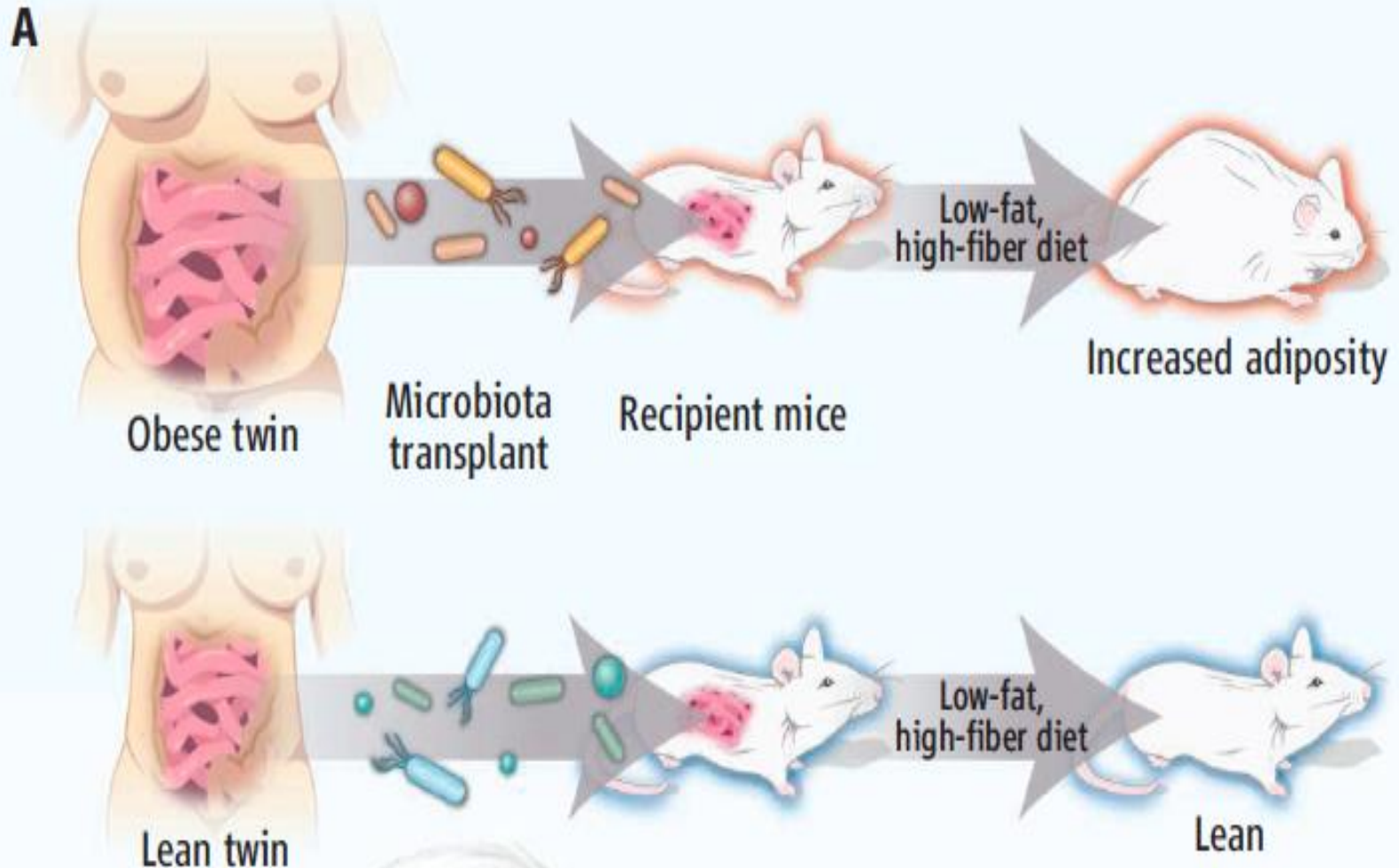






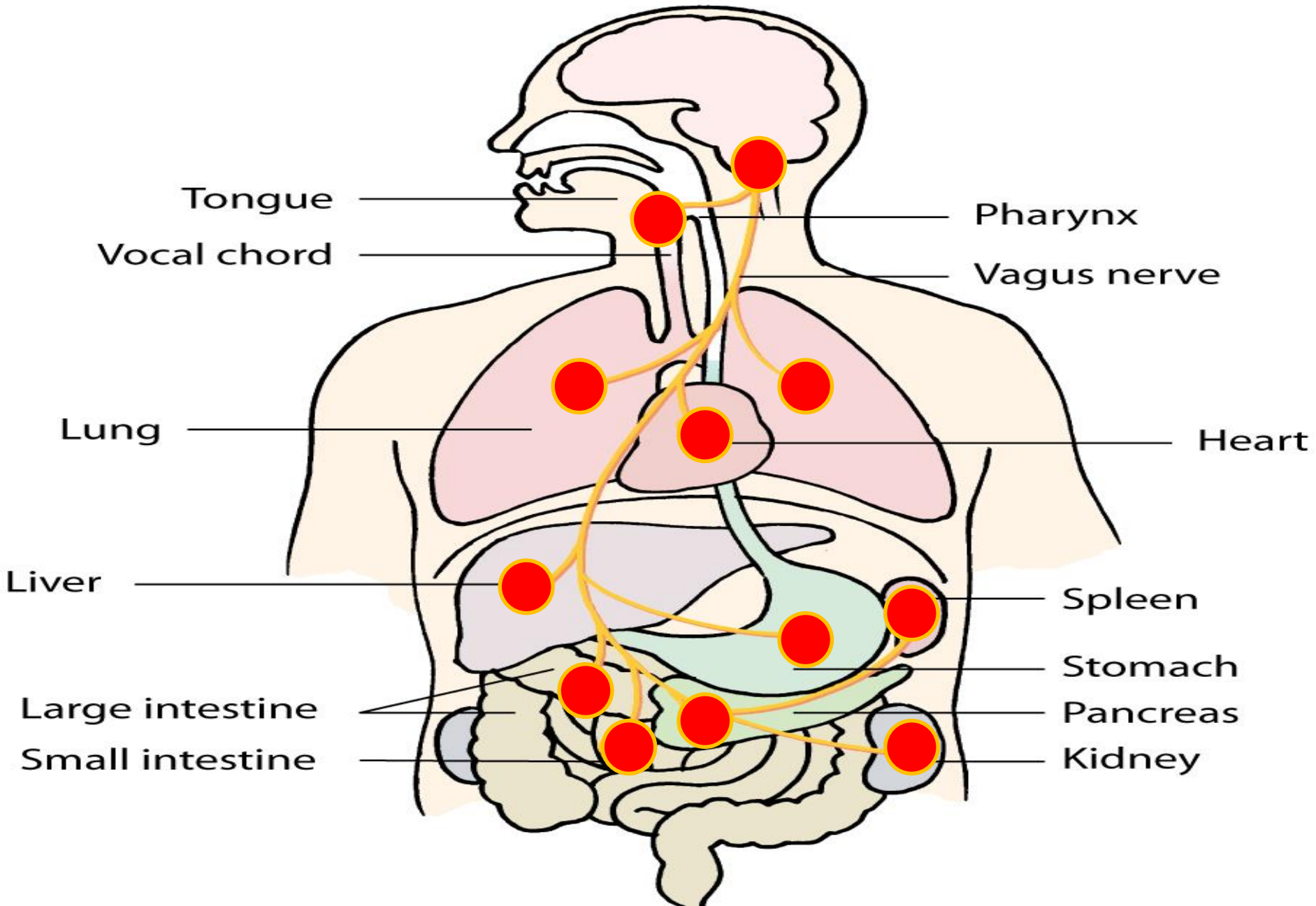
© Earthside Birth

Ridaura, V.K., et al., *Gut microbiota from twins discordant for obesity modulate metabolism in mice.* Science, 2013.



How Does the Brain and Gut Connect?







**FROM
THE
BRAIN
TO THE
GUT**



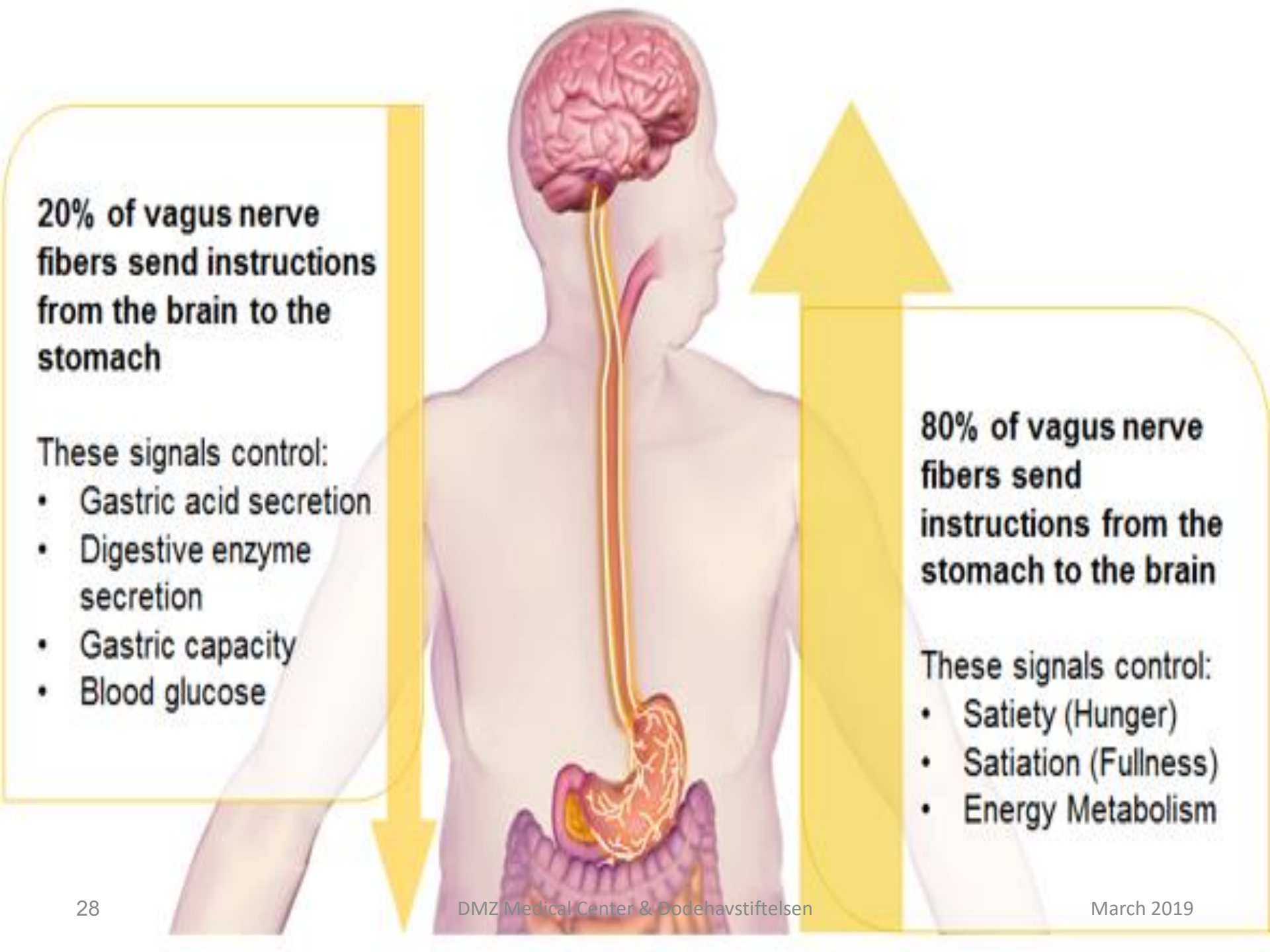
**FROM
THE
GUT
TO THE
BRAIN**

20% of vagus nerve fibers send instructions from the brain to the stomach

These signals control:

- Gastric acid secretion
- Digestive enzyme secretion
- Gastric capacity
- Blood glucose

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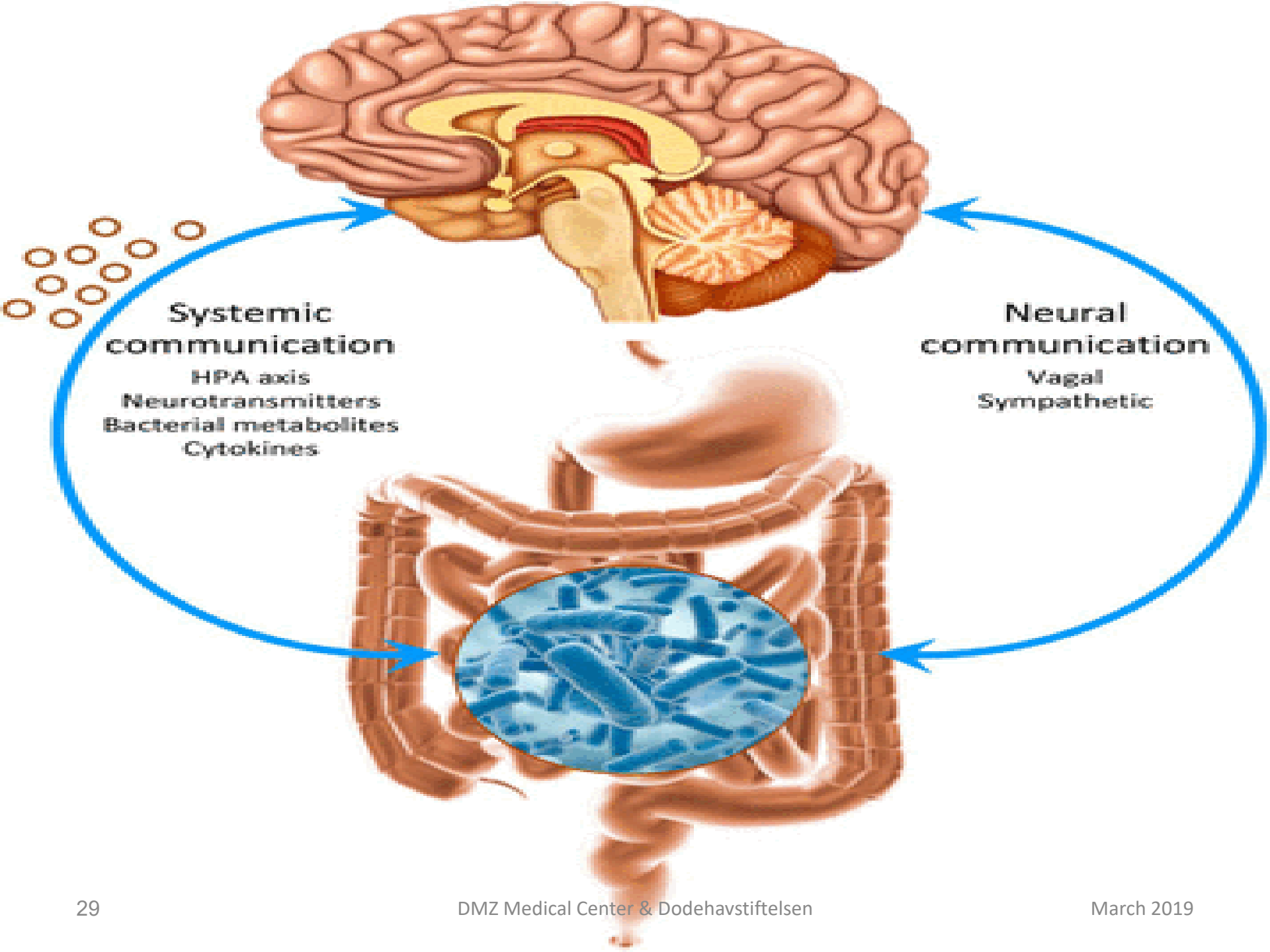
These signals control:

- Gastric acid secretion
- Digestive enzyme secretion
- Gastric capacity
- Blood glucose

80% of vagus nerve fibers send instructions from the stomach to the brain

These signals control:

- Satiety (Hunger)
- Satiating (Fullness)
- Energy Metabolism



STILL WE HAVE A LOT TO LEARN

AND WE TRY HERE AT THE DEAD SEA



