

# Relationship between intestinal microbiota and brain functions: potential of probiotics in the therapy of neuropsychiatric disorders

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MINISTRY OF EDUCATION,  
YOUTH AND SPORTS



# Relationship between intestinal microbiota and brain function

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## National Institute of Mental Health Prague

**NIMH Prague** was established in 2015 thanks to the support by the EU Operational Programme Research and Development for Innovation.) is scientific activity focused on research in the field of applied neurosciences and mental health

### **Our mission:**

to establish of a new modern center oriented on research and clinical care:

- “ Neurobiology of mental diseases, chronobiology, cognition ...
- “ Research and development of novel diagnostic and therapeutic methods
- “ Our approach is based upon interconnection of methods of molecular biology, animal modelling, electrophysiology, neuroimaging and clinical research and testing.
- “ Cooperation with international organizations (such as the WHO, UNESCO, the World Federation of Mental Health) and national reference institution for the field of mental health
- “ NIMH is also a training base for medical students of Charles University and for other master's and postgradual programmes (psychology, neurosciences, biology, sociology, epidemiology etc.)

## **Relationship between intestinal microbiota and brain function**

- “ I would like to turn your attention to a new and promising topic
- “ which links up to now little co-operating scientific areas of microbiology and biotechnology on the one hand and mental health on the other hand

## Current therapy challenges in psychopharmacology

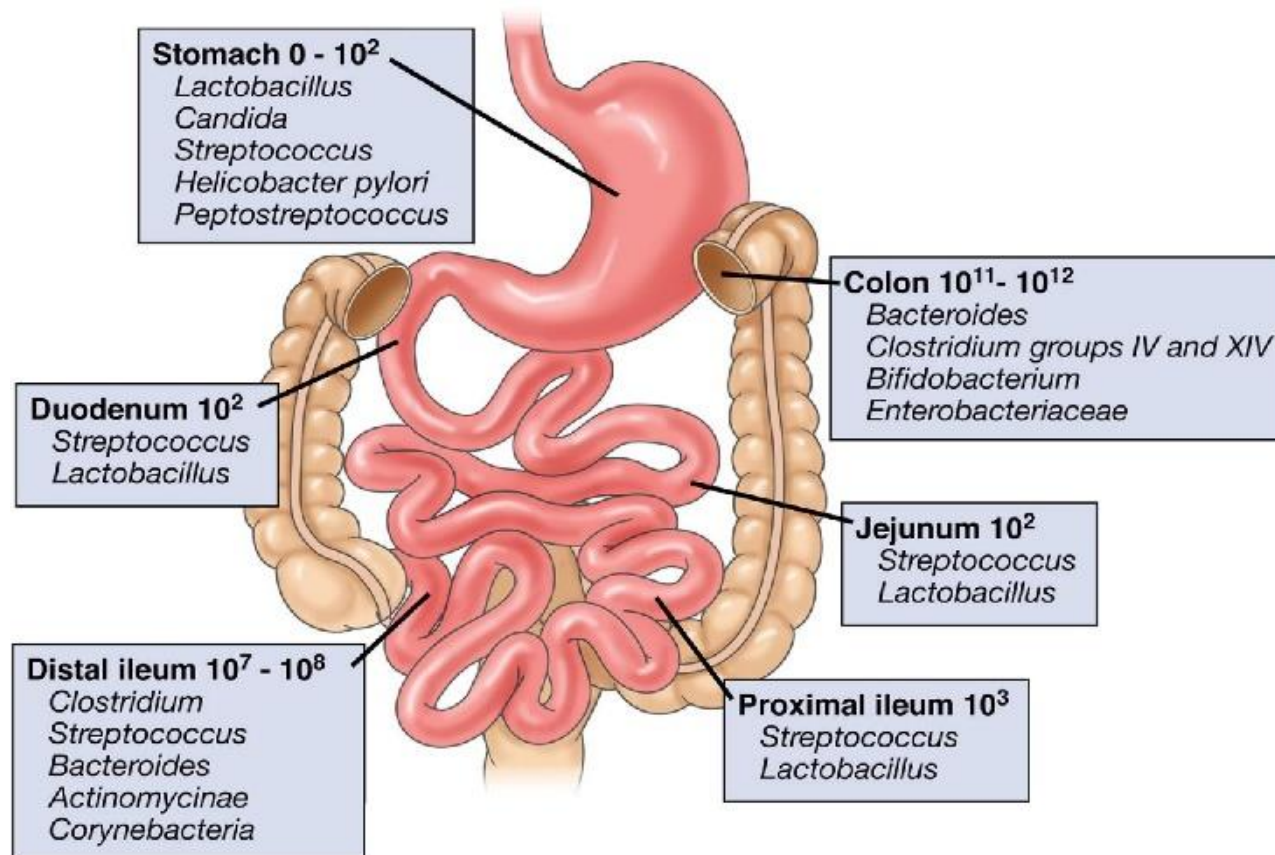
- “ Current psychopharmacology has a rising problem to bring a new drugs to the market/clinical practice
- “ High percentage of patients does not respond adequately to treatment.
  - “ novel CNS drugs should show higher efficacy or less side effects
  - “ it leads to study of new mechanisms of action and innovative therapeutic strategies
- “ Modulation of microbiota activity may be a promising adjuvant therapy

## Relationship between intestinal microbiota and mental health

- “ Approximately 75 percent of patients with irritable bowel syndrome (IBS) suffer from psychiatric comorbidities
- “ Conversely, the prevalence of IBS in the population of psychiatric patients is higher than that of the general population

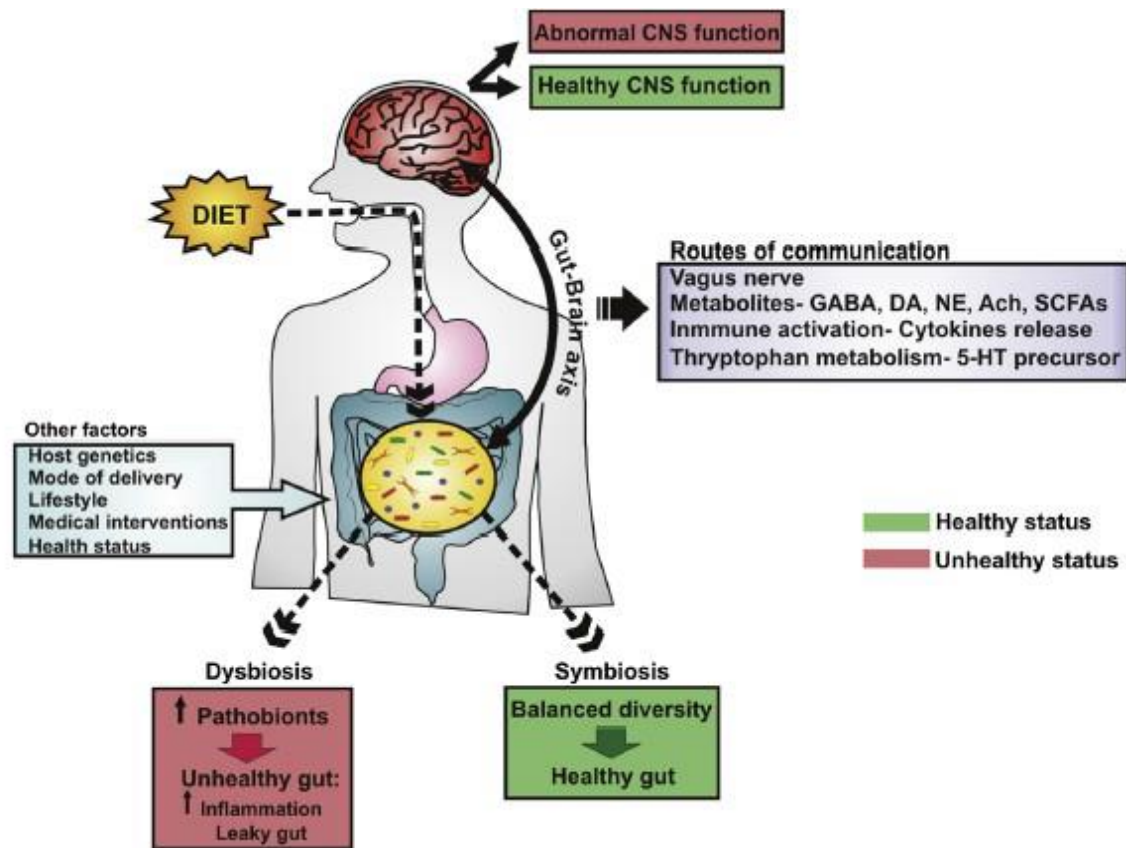
*IBS is manifested by a chronic gastrointestinal discomfort. In fact, all the dysbiotic problems that have failed to find cause. Role plays immune system activation by chronic psychological stress, dietary habits ...*

# Relationship between intestinal microbiota and brain function



The intestine is populated with a large number of microorganisms that play a physiological role in digestion and are a source of physiologically active substances

# Relationship between intestinal microbiota and brain function

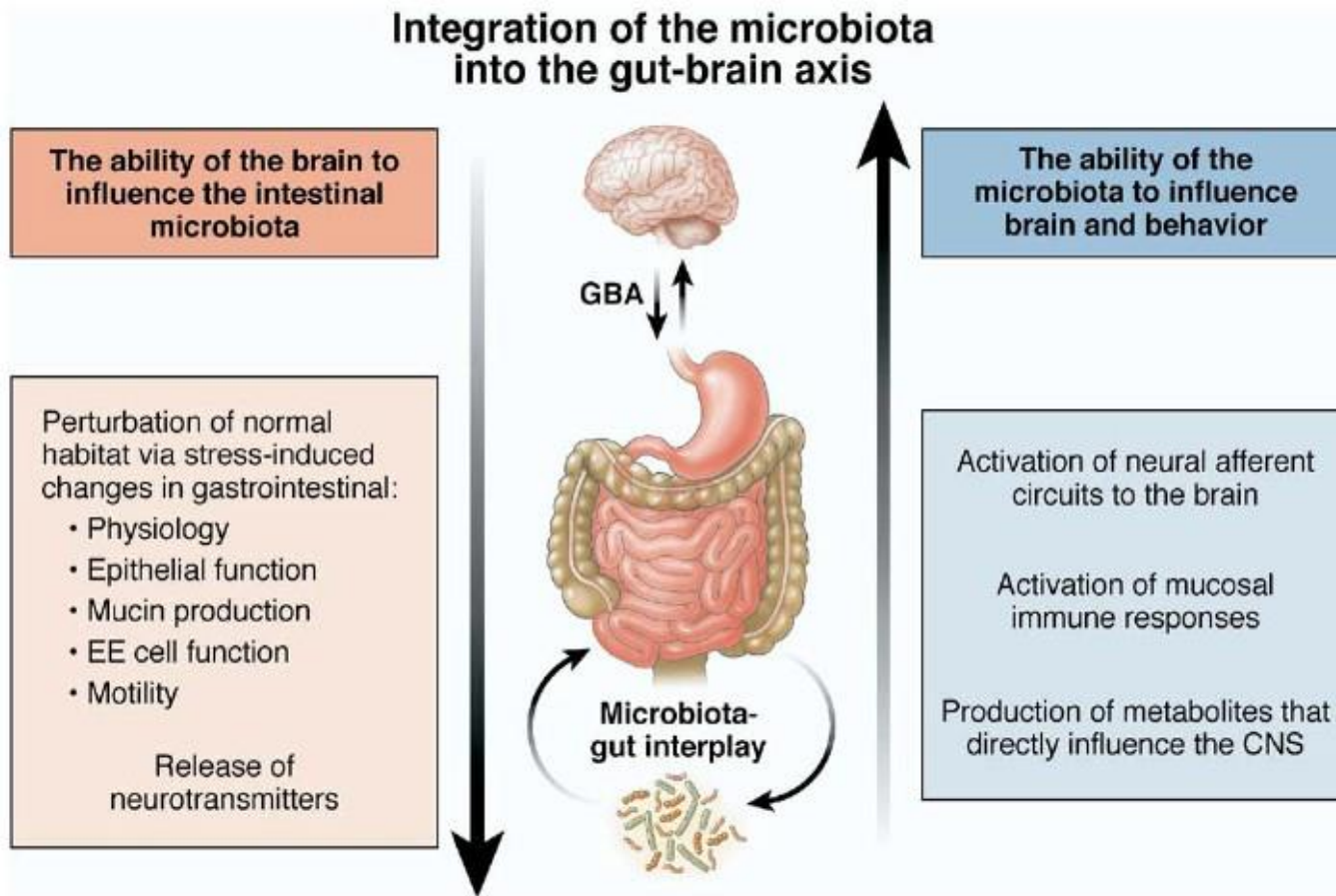


Some of these substances also affect the nervous system.

The autonomic intestinal system is highly complex and is connected via the *nervus vagus* to the central nervous system

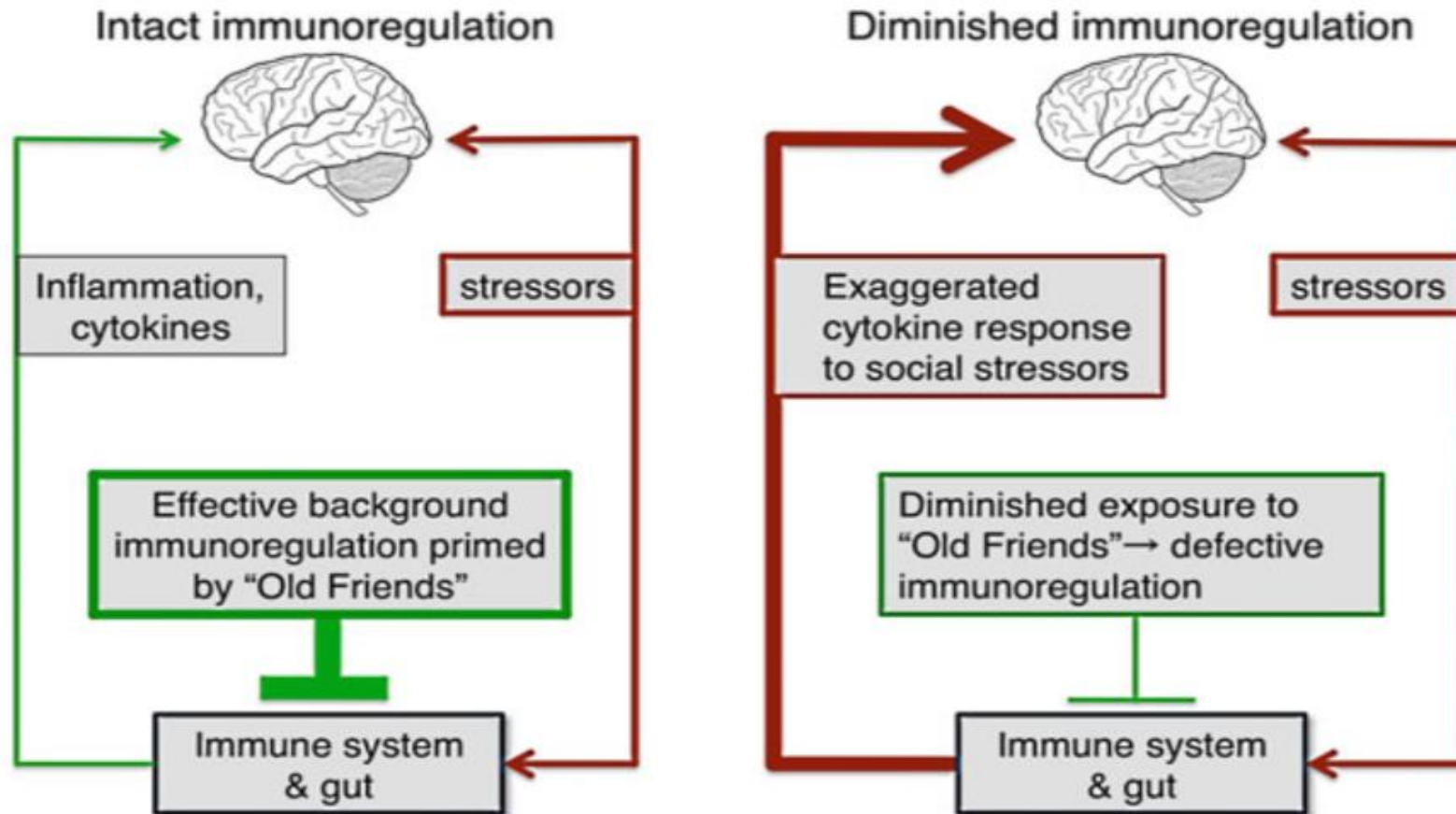


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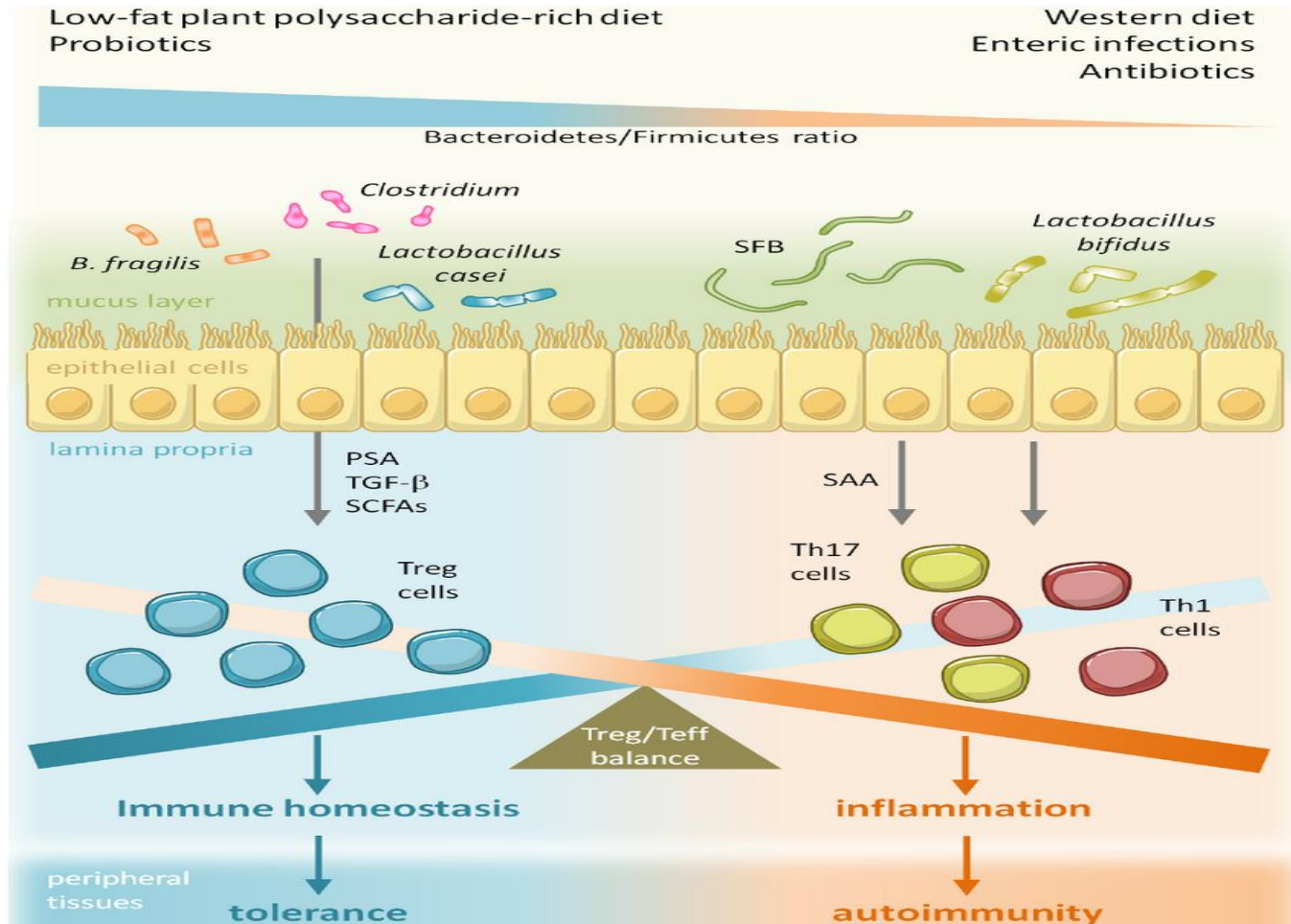
Nerve tissue and intestinal microbiota interact with immune, metabolic factors.

## Relationship between intestinal microbiota and brain function



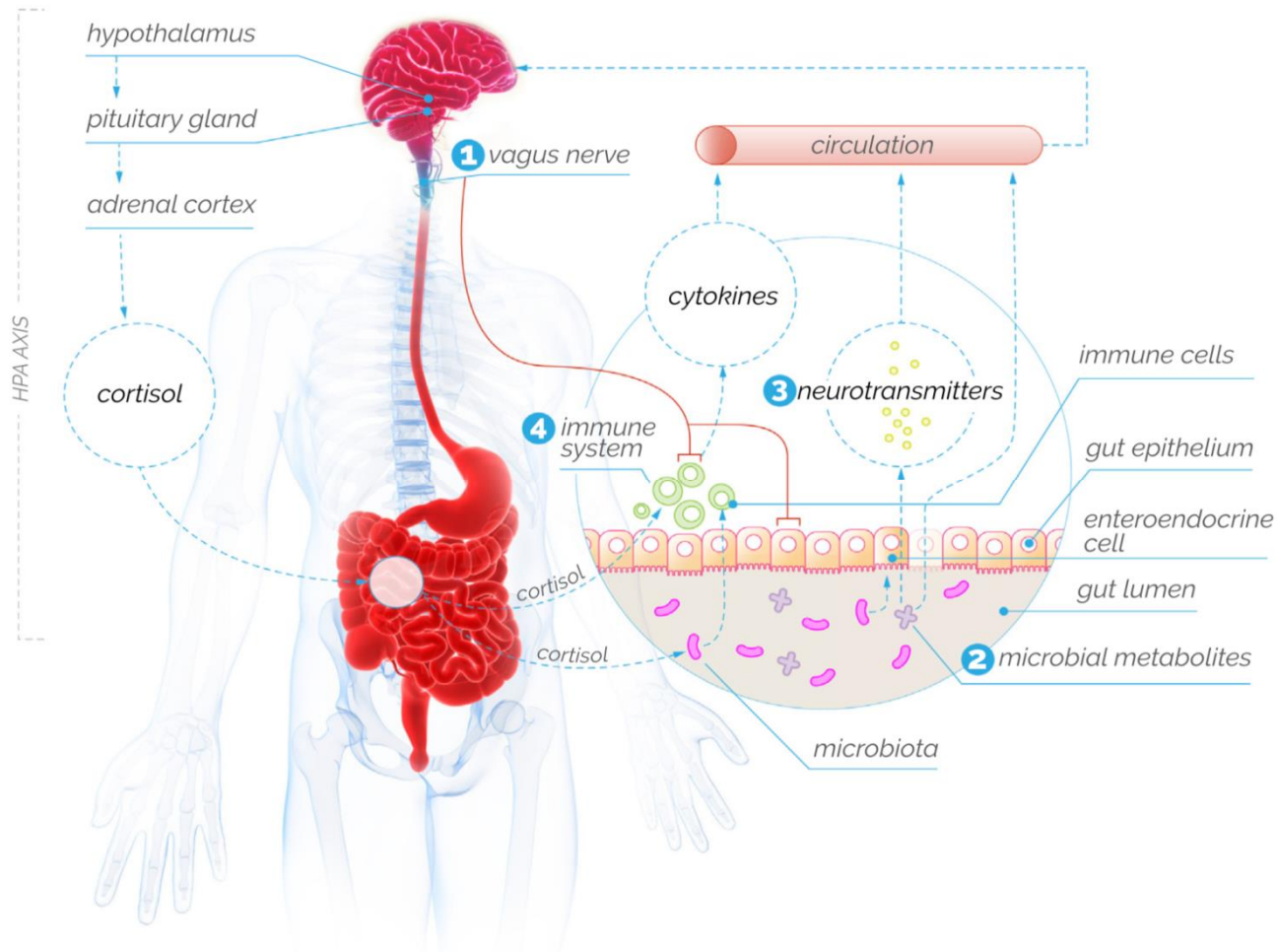
Fine balanced relationships can be disturbed by external factors such as stress, inflammatory processes, inappropriate diet ...

# Relationship between intestinal microbiota and brain function



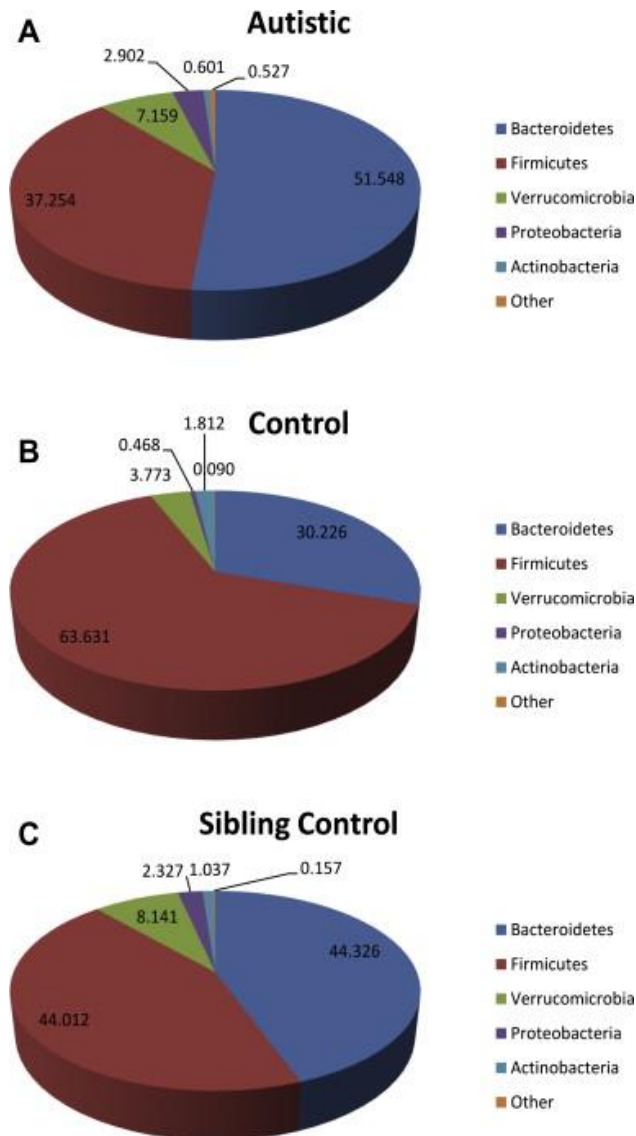
We can see microorganisms as an ecosystem that is in the balance. However, this balance may be disturbed by many factors.

# Relationship between intestinal microbiota and brain function



These factors can lead to a change in the species composition of the microbiota. By increasing the proportion of pro-inflammatory species that further exacerbate the situation. This can lead to intestinal epithelial disruption and to more leakage of metabolic and immune effects

# Relationship between intestinal microbiota and brain function



Composition of the microbiome of children with autism, healthy siblings and unrelated healthy controls. The microbiome of siblings lies on the border between autistic and common populations.

## Potential of probiotics in the therapy of neuropsychiatric disorders

- “ The described biological process can participate in the development of a number of symptoms of disorders of the central nervous system or in the worsening of the course of mental illness
- “ At the same time it offers the possibility of therapeutic influence
- “ There is evidence of microbiota changes and its participation in disruption of neuroimmune parameters in a number of neuropsychiatric diseases and aging

## Potential of probiotics in the therapy of neuropsychiatric disorders

- “ The idea of influencing brain activity during mental illness and aging is an interesting opportunity for cross-sectoral cooperation.
- “ This approach requires the cooperation of two relatively remote areas of science. Psychiatry and neurobiology on the one hand. And microbiology and biotechnology on the other hand.
- “ Similarly, there is an opportunity to transfer technology between both fields and subsequently into the clinical practice.



# Potential of probiotics in the therapy of neuropsychiatric disorders

## “ Psychobiotics:

Probiotics, which, when administered in sufficient quantity, have health benefit for patients suffering from mental illness

These microorganisms:

- ✓ are able to produce neuroactive agents that affect CNS activity
- ✓ suppress the activity of microorganisms negatively affecting CNS activity
- ✓ affect the metabolism of psychopharmaceuticals
- ✓ modulate the side effects of psychopharmaceuticals (weight increase, overeating, loss of appetite, metabolic syndrome ...)



# Potential of probiotics in the therapy of neuropsychiatric disorders

## “ Our projects:

- ✓ Gut microbiota: implication for metabolic syndrome in schizophrenia
- ✓ Long-term outcomes of perinatal risk factors and microbiota on neuropsychological development
- ✓ Influence of psychobiotics on cognitive functions in aging

## Conclusion

- “ Promising field for intersectoral cooperation for the development of specific probiotics strains called Psychobiotics
- “ Thus, potentially new classes of psychotropic medicaments that can bring innovative approaches to adjuvant/supportive therapies of neuropsychiatric illness .
- “ This is an interesting and new area of applications for biotechnology

Thanks for attention



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