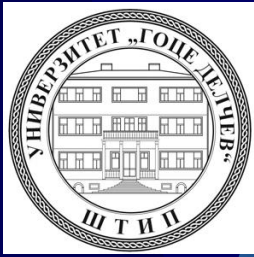


XII KONGRES MIKROBIOLOGA SRBIJE
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POTENTIAL IMPACT OF PROBIOTICS ON HUMAN HEALTH AND DISEASES

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MICROBIOM (Microbiota):

Human microbiota is a complicated microbial ecosystem composed of about thousand different types of 10-100 trillion symbiotic microbial cells (bacteria, yeasts and viruses).

The majority are bacteria mostly lives in colon.

Human organism has about 10^{13} cells (aprox. 100 kg.)

Adults have 10^{14} cells of m.o. (bacteria, viruses) (10 X more then human cells)

> 5 million genes (150 X more then human genes)

> weight 1-2 kg,

> „**Forgotten organ**“

HMP (Human Microbiome Project, 2007 NIH, USA)

MetaHIT (Metagenomics Project of the Human Intestinal Tract ,
EU Commission & China)

- ❖ HMP researchers now calculate that more than **10,000 microbial species** occupy the human ecosystem.
- ❖ Moreover, researchers calculate that they have identified between **81 and 99 percent** of all microorganismal genera in healthy adults.

- ❖ HMP researchers also reported the **human genome** carries some 22,000 protein-coding genes,
- ❖ human **microbiome** contributes some 8 million unique protein-coding genes or 360 times more bacterial genes than human genes.
- ❖ Genes carried by bacteria in the gastro-intestinal tract, for example, allow humans to **digest foods** and absorb nutrients that otherwise would be unavailable.
- ❖ Moreover, the microbes produce beneficial compounds, like vitamins and anti-inflammatories that our genome cannot produce.”

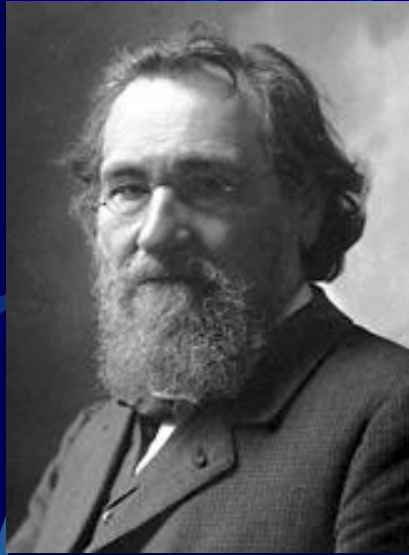
- ❖ Our digestive tracts are critical to our health is because **80 % of entire immune system** is located in digestive tract!
- ❖ **Digestive systems** are the second largest part of our neurological system. It's called the **enteric nervous system** and is located in the gut (**called our second brain!**).
- ❖ Many people with **health issues**, such as thyroid imbalances, **chronic fatigue**, joint pain, psoriasis, **autism** and many other conditions don't realize that these illnesses originate in the gut.

- ❖ The components of the human microbiome clearly change over time.
- ❖ When a patient is sick or takes antibiotics, the species that makeup of the microbiome may shift substantially as one bacterial species or another is affected.
- ❖ Eventually, however, the microbiome returns to a state of equilibrium, even if the previous composition of bacterial types does not.
- ❖ **60 million to 70 million Americans are affected by digestive diseases.** (cost the U.S. over \$100 billion per year)

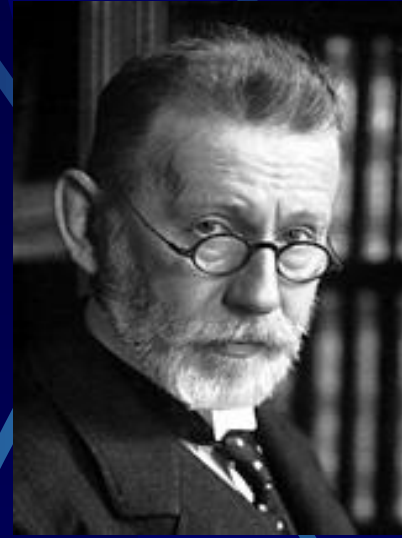
History Of Probiotics

- ❖ Thousands of years ago, a Roman naturalist named Pliny the Elder recommended **drinking fermented milk to treat intestinal problems**. Fermented foods are also mentioned in the **Bible** and the sacred books of **Hinduism**.
- ❖ In 1899, Henry Tissler, a research scientist at the Pasteur Institute in Paris, France, reported detecting a Y-shaped bacteria in the intestines of breast-fed infants. He called the organisms **“bifidobacteria”** (singular – bifidobacterium.)

- ❖ The quest to find a **fountain of youth** was a popular occupation for scientists and physicians of that era. Eli Metchnikoff, a Russian scientist at the Pasteur Institute in Paris, was studying lactic acid bacteria.
- ❖ Metchnikoff had observed that rural dwellers in Bulgaria lived to very old ages, despite extreme poverty and harsh climate. He noted that they **drank fermented milk products**, surmised that the lactic acid bacteria associated with fermented milk products had **anti-aging** health benefits.



Ilya Ilyich Mechnikov



Paul Ehrlich

The **Nobel Prize** in Physiology or Medicine **1908** was awarded jointly to Ilya Ilyich Mechnikov and Paul Ehrlich "*in recognition of their work on **immunity***"

Probiotics Today

- ❖ The word probiotics comes from the **Latin pro (“for”) and the Greek bios (“life”)**.

The **WHO** and the Food and Agriculture Organization of the United Nations developed in 2001 a widely used **definition**:

- **Probiotics are “live microorganisms, which, when administered in adequate amounts, confer a health benefit on the host.”**
- **These microorganisms can be bacterial, viral, or yeast.**
- **They’re also called “friendly” or “good” bacteria.**

Probiotics actions:

Affects pathogens growths by competition, inhibition and adhesion to gut epithelium:

- ❖ **Compete** against pathogens for the same essential nutrients,
- ❖ **Bind** to adhesion sites, preventing pathogen colonization
- ❖ Signaling of immune cells by probiotics may result in the **secretion** of cytokines, targeting the pathogen for destruction
- ❖ **Attack** pathogenic organisms by releasing bacteriocins, killing them directly

"Although some probiotics have shown promise in research studies, strong **scientific evidence** to support specific uses of probiotics for most health conditions **is lacking.**"

> According to the National Center for Complementary and Integrative Health.

- ❖ **European Food Safety Authority (EFSA) rejects the WHO's definition because it contains a health claim which is not measurable.**
- ❖ **The EFSA states that, “the scientific evidence remains insufficient to prove a cause and effect relationship between consumption of probiotic products and any health benefit”.**

Press release

14-Mar-2017, Amsterdam

First Probiotic with EU Health Claim

The first probiotic with a European health claim is now a fact, according to Dutch probiotic researcher and manufacturer Winclove Probiotics. Winclove's upgraded *Propionibacterium freudenreichii* W200 contains adequate amounts of vitamin B12 to make an EFSA approved health claim.

Marco van Es, Director Business Development at Winclove: *"Stringent probiotic regulations drive the market to innovation. We have succeeded in optimizing the fermentation process of Propionibacterium freudenreichii W200 in such a way that it now produces substantial amounts of vitamin B12. It is the first probiotic in Europe that allows EFSA approved health claims. W200 opens up new opportunities for dietary supplement marketers to promote the health benefits of probiotics to health care professionals and consumers"*.

Research into the potential health effects includes:

- ✓ immune function
- ✓ cancer
- ✓ antibiotic-associated diarrhea
- ✓ travellers' diarrhea
- ✓ pediatric diarrhea
- ✓ inflammatory bowel disease
- ✓ irritable bowel syndrome
- ✓ eczema
- ✓ bacterial vaginosis
- ✓ possible improvement of LDL/HDL ratio
- ✓ *Helicobacter pylori*
- ✓ *Lactose intolerance*
- ✓ *Lower risk of necrotizing enterocolitis and mortality in premature infants*

- Probiotics have important role in treatment and prevention of diarrheal diseases caused by: *Clostridium difficile*, Enterotoxigenic *Escherichia coli* (ETEC), *Helicobacter pylori*, Rotavirus, patients with AIDS, chemotherapy, radiotherapy, Inflammatory bowel disease (IBD) as Ulcerative colitis and Crohn's disease and lactose intolerance.
- Some probiotics may decrease level of cholesterol; improve gut function and decrease the risk of colorectal cancer.
- Some studies reported beneficial influence of probiotics on inflammations; depression and anxiety; high blood pressure; skin diseases (acne, rosacea and eczema); rebalance of vaginal flora in bacterial vaginosis; restore oral and throat microflora with probiotic lozenges.

Probiotics **benefits**:

- Stronger immune system
- Improved digestion
- Increased energy from production of vitamin B12
- Better breath because probiotics destroy candida
- Healthier skin, since probiotics naturally treat eczema and psoriasis
- Reduced cold and flu
- Healing from leaky gut syndrome and inflammatory bowel disease
- Weight loss

Probiotic killers that can prevent your body from getting all the tremendous probiotics benefits it needs:

- **Prescription antibiotics**
- **Sugar**
- **Tap water**
- **GMO foods**
- **Grains**
- **Emotional stress**
- **Chemicals and medications**

Commercial probiotics

- European Commission placed a ban on putting the word "probiotic" on the packaging of products because such labeling misleads consumers to believe a health benefit is provided by the product when no scientific proof exists to demonstrate that health effect.
- In the United States, the FDA and Federal Trade Commission have issued warning letters and imposed punishment on various manufacturers of probiotic products whose labels claim to treat a disease or condition.

Safety and Side Effects of Probiotics

- In people who are generally healthy, probiotics have a good safety record. Side effects, if they occur at all, usually consist only of mild digestive symptoms such as gas.
- There have been reports linking probiotics to severe side effects, such as dangerous infections, in people include critically ill patients, those who have had surgery, very sick infants, and people with weakened immune systems
- Most of knowledge about safety comes from studies of *Lactobacillus* and *Bifidobacterium*; less is known about other probiotics.

Possible side effects of probiotics use

- Acne
- Anxiety
- Constipation
- Bloating
- Cramps
- Diarrhea
- Dizziness
- Flu like symptoms
- Flatulence
- Gastrointestinal infections

Future Uses For Probiotics

- ❖ Probiotics are already widely used to prevent the **side effects of antibiotics**
- ❖ The study was double-blind individuals diagnosed with **severe fatigue**. The results were promising.
- ❖ The term “psychobiotics” has been coined for probiotics which show promise for the prevention and/or treatment of psychiatric illnesses, may open new possibilities for the treatment of **depression.**”

„Probiotic strains of *Lactococcus Lactis* subsp. *Lactis* produce neuroactive substances”

Lidia G. Stoyanova et al., Lomonosov Moscow state university, Moscow, Russia
Tested probiotic strains produce neuroactive substances should impact nervous and immune system of the host. (Skopje, October, Food conference, 2017)

Conclusion:

Numerous studies have proved many beneficial activities of probiotics use on human health protection and treatment of various diseases.

Some experts opinion and suggestions are following:

- ❖ *Probiotics **promote a healthy digestive and immune system***
- ❖ *Probiotics **can help keep healthy people healthy***
- ❖ ***Prescribe probiotics when prescribing antibiotics.***

❖ *“Compelling new studies are showing how*
— Dr. Mary Ellen Sanders, Probiotics Specialist

❖ *“With the level of evidence that probiotics work and the large safety margins for them, we see no good reason not to*
***prescribe probiotics when prescribing antibiotics.*”**

— Dr. Benjamin Kliger, Associate Professor of Clinical Family and Social Medicine, Albert Einstein College of Medicine