Prebiotic, Probiotic, Postbiotic

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1404.3.8



Gut Ecosystem

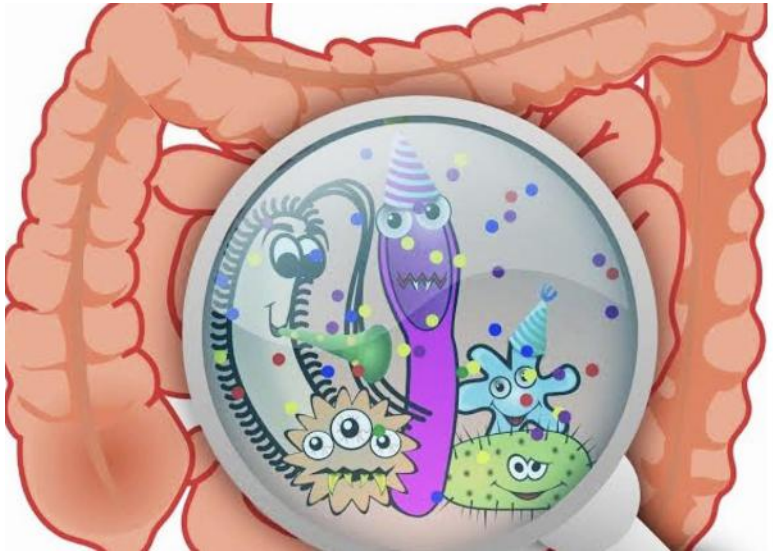
- Gut Ecosystem or gut microbiota thousands of species of microbes, in 28 Foot long

- Gut Ecosystem **Effect on;**

  -short and long term health,

  -balance or imbalance of mucous membranes,

  -and modulation of the gut microbiota



GUT MICROBIOTA

- **In human GI tract, a diverse and intricate collection of microorganisms that is called;**

  "hidden metabolic organ"

- **It is comprising;**

  -a dynamic ecosystem that plays a role in human well-being and disease

  -help in the digestion and metabolism of food components,

  -it easier for nutrients to be absorbed

  -vital role in the development and maturation of the immune system

  -preserving the integrity of the intestinal barrier and regulating inflammation

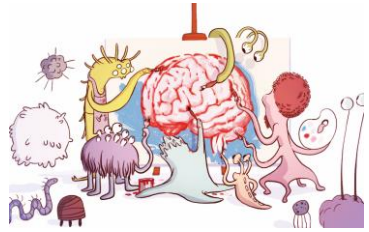
  -fermenting food,

  -synthesizing vitamins,

  -protecting against pathogens,

  -and stimulating immune responses,

  -produces SCFAs, which serve as an energy source for the cells lining the colon



In Healthy Humans

-the separation of bacteria from the mucosa is equal in the proximal and distal colon

-and bacteria are never found in crypts

-mucus layer is continuously renewed

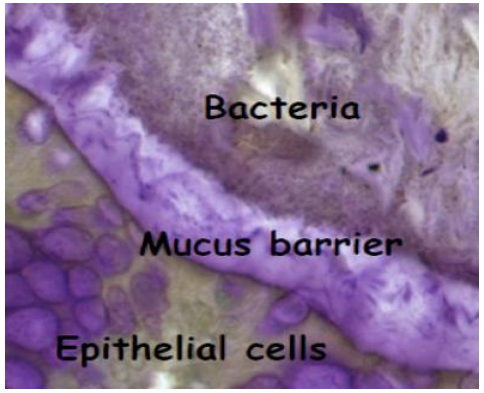
-specific groups of gut bacteria may have protective effects disease (such as; IBD,….)

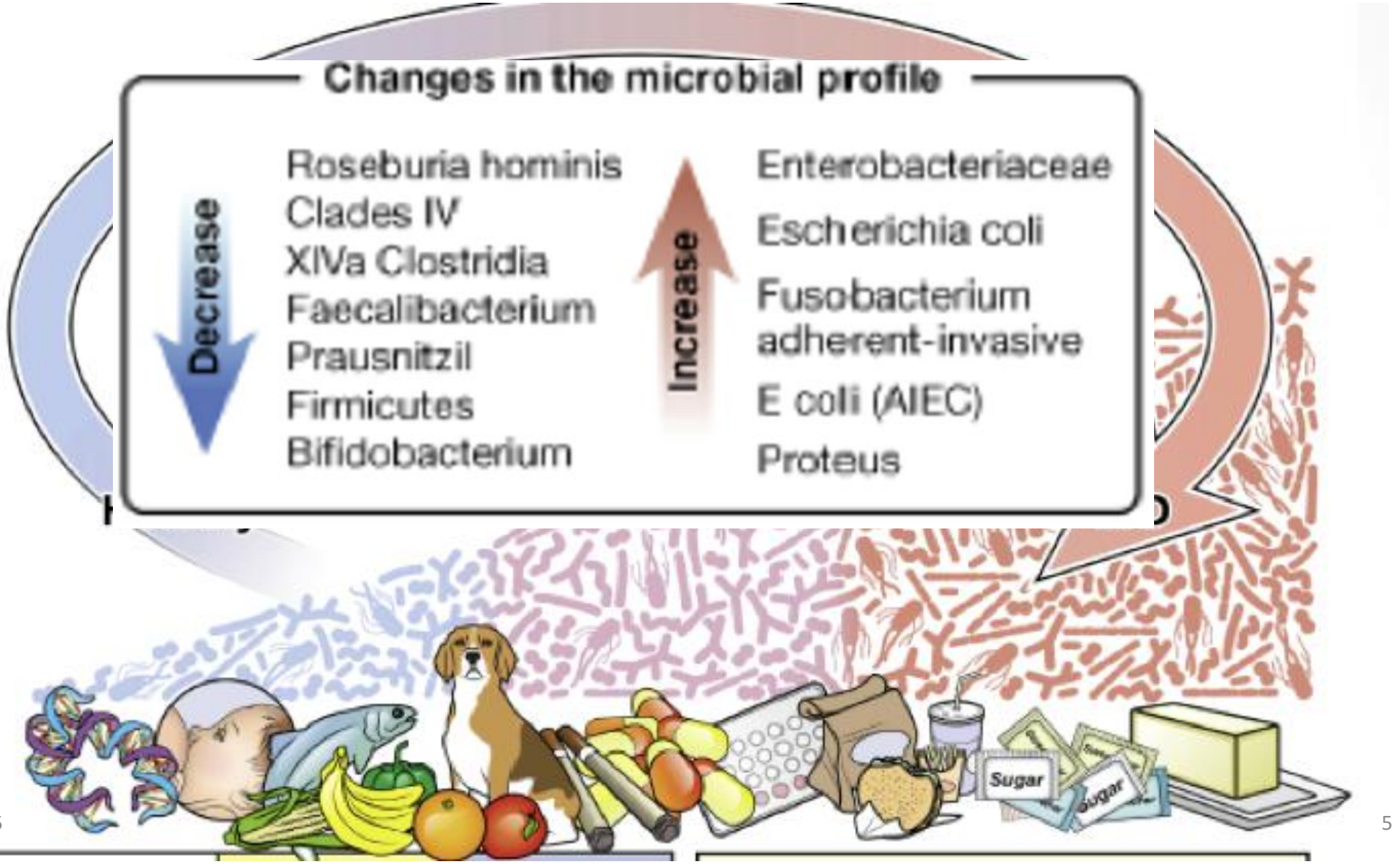
- The mechanism of the commensal microbiota may protect the host, that including:

-commensals bacteria occupy niches within the host

-and prevent colonization by pathogens

-and help to compete effect with pathogenic bacteria




Changes in the microbial profile
Decrease
Roseburia hominis
Clades IV
XIVa Clostridia
Faecalibacterium
Prausnitzil
Firmicutes
Bifidobacterium
Increase
Enterobacteriaceae
Escherichia coli
Fusobacterium
adherent-invasive
E coli (AIEC)
Proteus
Sugar
Sugar

- **Bifidobacterium, Lactobacillus, and Faecalibacterium genera;**

  -may protect the host from mucosal inflammation by several mechanisms, such as:

  1-Down regulation of inflammatory cytokines

  2-Stimulation of IL10

  3-Others anti-inflammatory cytokine

- **Low levels of Firmicute Prausnitzii in mucosa are associated with;**

  -higher risk of recurrent CD after surgery

Gastroenterology 2014;146:1489–1499

- The gut microbiota is composed of four dominant phyla;
  - -Firmicutes, Bacteroidetes, Proteobacteria
  - -and Actinobacteria

- Alterations in bacterial groups phyla, along with the use of high fat diet and low fiber diet;
  - -may associate with; obesity, insulin resistance, T2D and MAFLD



Dysbiosis

Characterized by, an imbalance or disruption in the gut microbiota

- **The disturbances in the composition of the gut microbiota, triggered by factors like;**

  -stress (anxiety, depression) , antibiotics, inadequate diet,…….

- **Dysbiosis may seen in some of following condition:**

  -IBD, IBS, and celiac disease,

  -extraintestinal disorders such as obesity, diabetes, allergies, asthma, CAD, metabolic syndrome,

  -chronic liver diseases, CKD, Parkinson’s disease, Alzheimer’s disease

The Probiotic History



•**Ellie Metchnikoff**, the first scientist who proposed the therapeutic use of lactic acid bacteria.



•Lactic acid bacteria were first discovered by **Pasteur** in 1857



•Their isolation from rancid milk was reported in 1878 by **Lister**.



- In 1889 **Tissier** discovered Bifidobacterium spp.



•The first stable cultures of *Lactobacillus casei* strain Shirota were made in 1930 by **Dr. Minoru** Shirota

Definitions of Perbiotics, Probiotics, Synbiotics and postbiotics

- ***Prebiotic,*** **selectively utilized by host microorganisms conferring a health benefit**
- ***Probiotics,*** **are "live microorganisms that, when administered in adequate amounts, confer a health benefit on the host"**
- ***Synbiotic*****, initially as a combination of both probiotics and prebiotics**
- ***Postbiotics;*** **are composed of microbial components and metabolites to confer a health benefit**

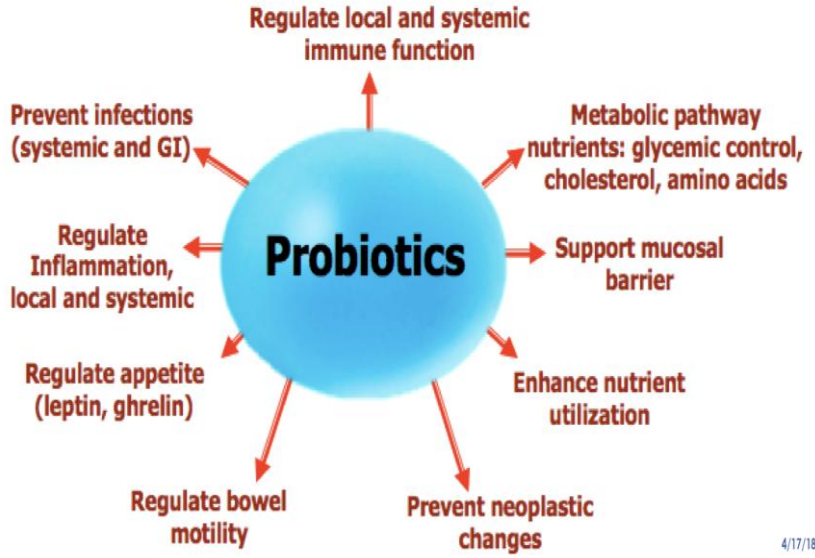
  -These metabolites such as SCFAs and secondary bile acids

  -SCFAs; have anti-inflammatory benefits and improve barrier function

Clinical Gastroenterology and Hepatology 2025;23:406–418

Characteristics of Effective Probiotics

- Able to survive the passage through the digestive system
- Able to attach to the intestinal epithelia and colonize
- Able to utilize the nutrients in a normal diet
- Non pathogenic and non toxic
- Capable to have a beneficial effect on the host
- Anti-inflammatory, Antimutagenic, Immuno-Stimulatory

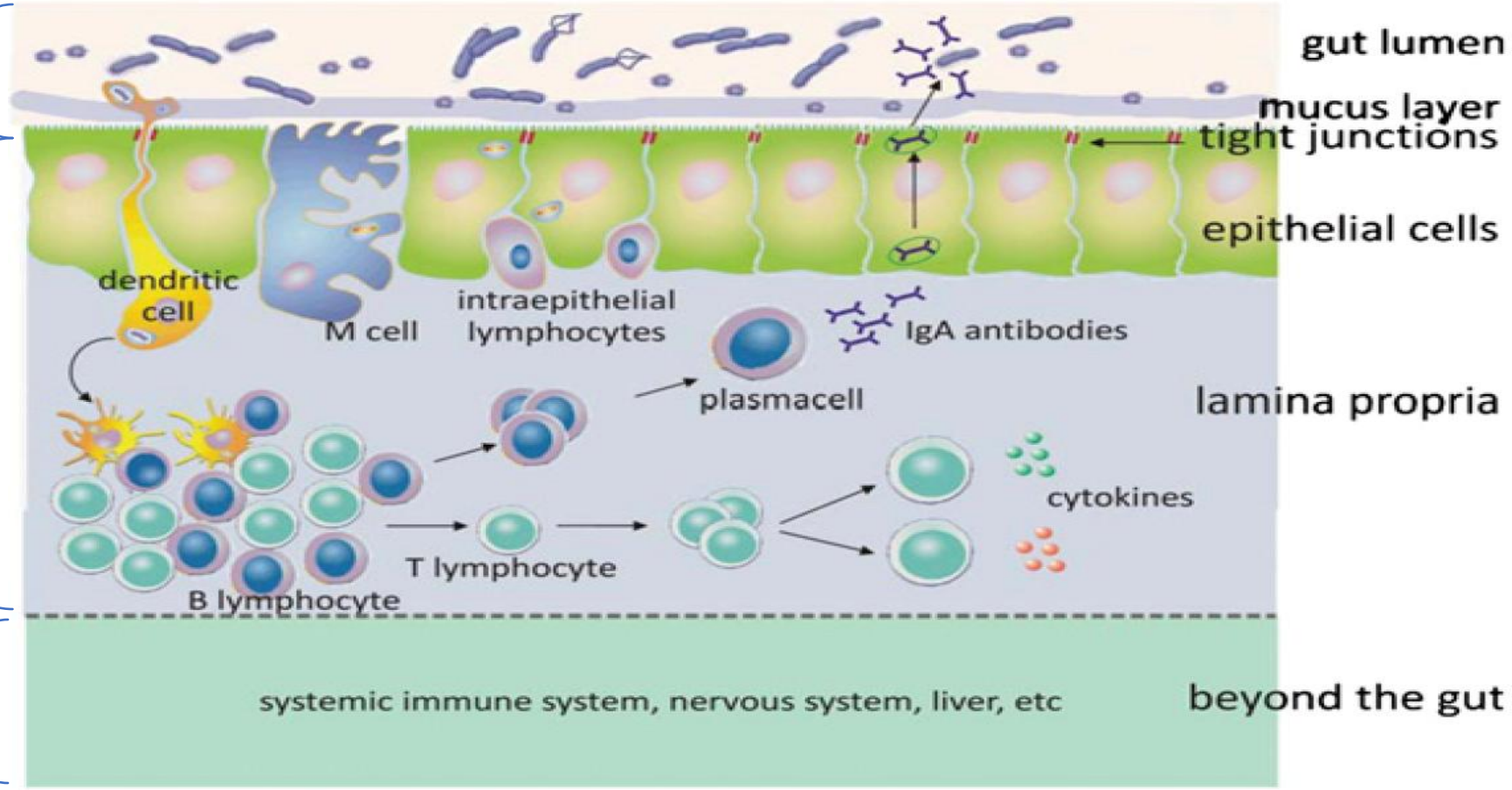


Levels of Probiotic Activity in the Gut

Interfere with growth or survival of bacteria in gut lumen

Improve mucosal barrier function and mucosal immune system

Affect systemic immune system

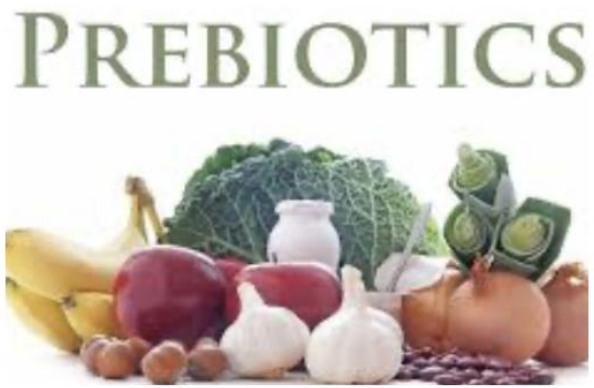


Adapted from Rijkers GT, et al. *J Nutr*. 2010;140:671S-676S

PREBIOTICS

To promote good bacteria growth

- Dietary fiber found in fruits, veggies, whole grains
- Converted into metabolites by gut microbiome
- Support a balanced microbiome*
- Support symbiotic relationship between microbiome and human body



*The statements herein have not been evaluated by the Food & Drug Administration.
This product is not intended to diagnose, treat, cure or prevent any disease.

PROBIOTICS

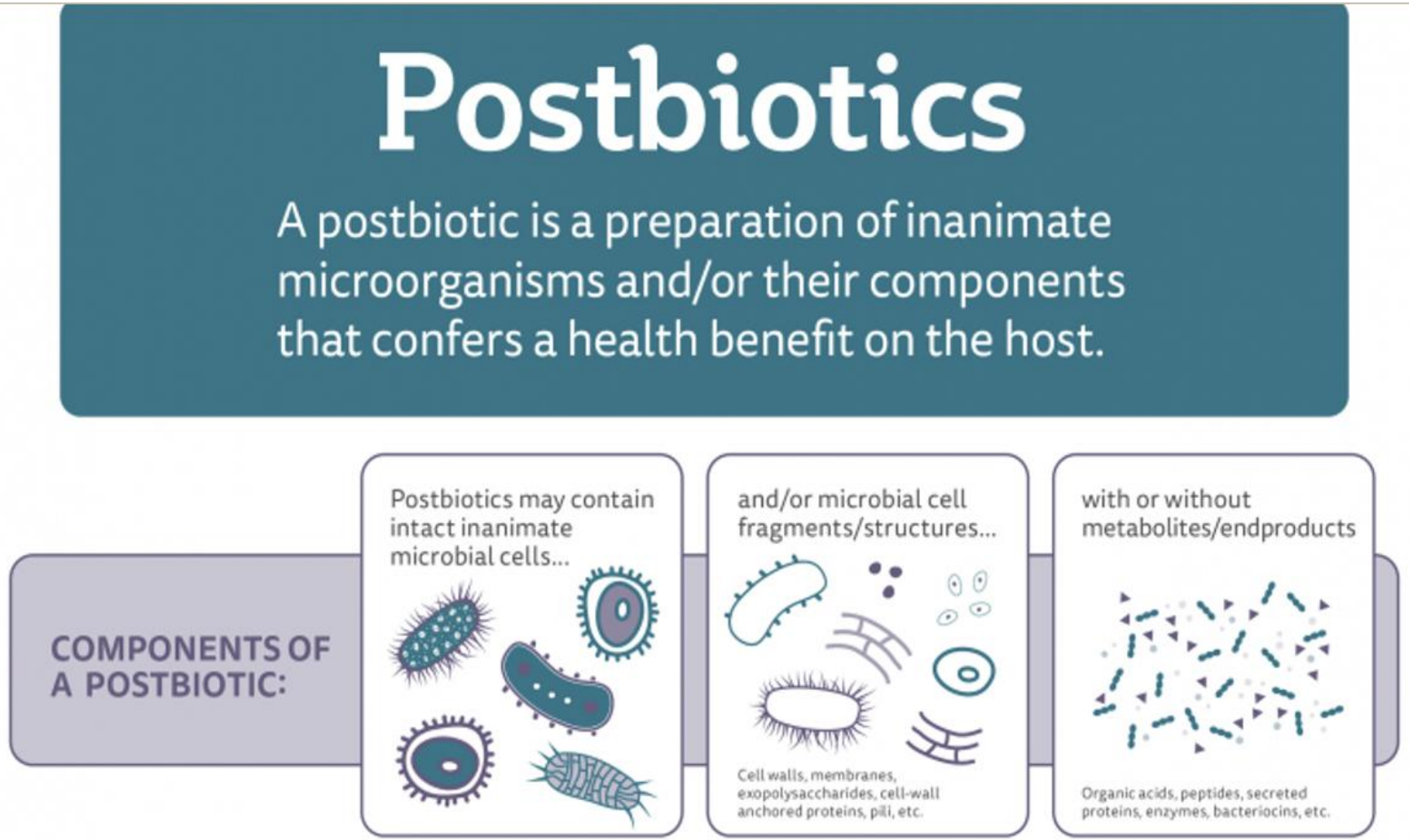
Good bacteria found naturally in gut

- Help balance gut flora*
    - Support immune function, digestive health, overall wellness*
- Found in fermented foods like yogurt, kefir, kombucha, kimchi, and supplements



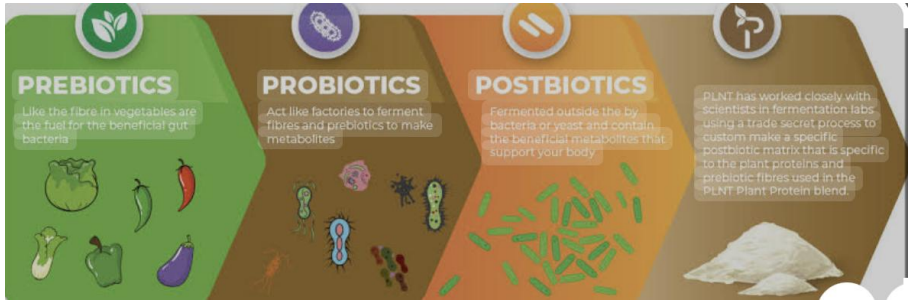
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Postbiotics; What Are They and How Are They Different from Other –Biotics?



- Prebiotics and probiotics consumption in digestive system finally converted into postbiotics
- Postbiotics are actually product of fermentation done by probiotics
- Probiotics used;
  - -some of fibers molecules for growth
  - -and wast products called postbiotics,
  - -and has important role in gut health

- Beneficial effect of postbiotics;
  - -help to optimize the benefits in gut health, (SCFAs, functional proteins, peptides, vitamins)
  - -help to gut microbiome balance
  - -help to immune systemm and nervous system
  - -reduction of pathogens
  - -and reduction of oxidative stress levels



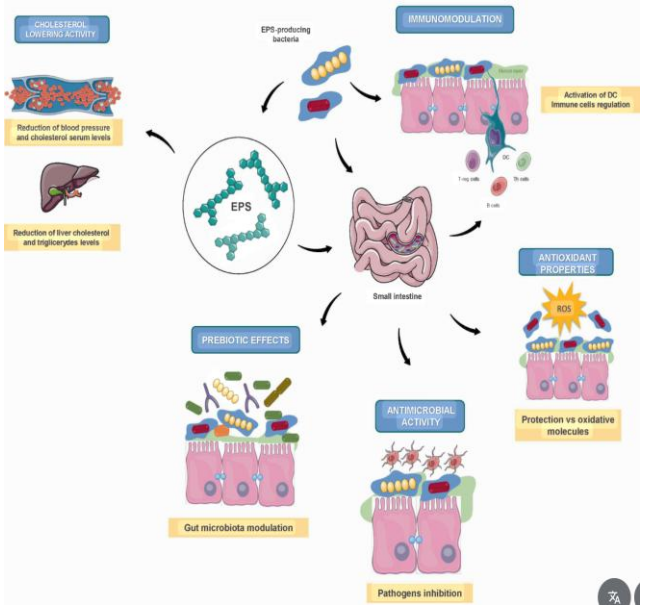
What is a Heat Treated Postbiotic?

- A product derived from inactivated or dead microorganisms (Postbiotics)

- Heat treated probiotic cells, are able to;
  -confer beneficial effects, mainly immunomodulatory effects,
  -protection against entero-pathogens,
  -and maintenance of intestinal barrier integrity

- Heat-killed; ***Lactobacillus acidophilus***;
  -reduced bowel movements in patients with chronic diarrhea,
  -even in comparison with the live ***L. acidophilus*** *treated* group

- Inactivated ***Lactobacilli***; have been capable of reducing;
  -pain score, bloating,
  -and stool frequency in IBS patients



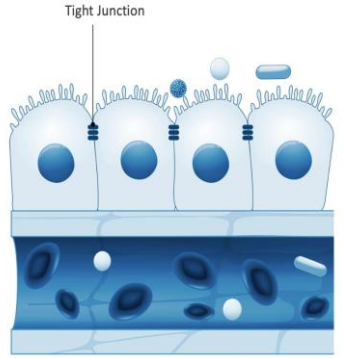
Are Postbiotics good for Constipation?

- Postbiotics and EPS (Exopolysaccharides) significantly improve constipation
- EPSs are large, extracellular polysaccharides produced by microorganisms like bacteria
- EPSs can act as a protective barrier function

- Postbiotics from ***L. gasseri*** through traditional fermented milk, also;
  - -improved stool consistency in healthy individuals with tendency for constipation,
  - -and increase in SCFA production

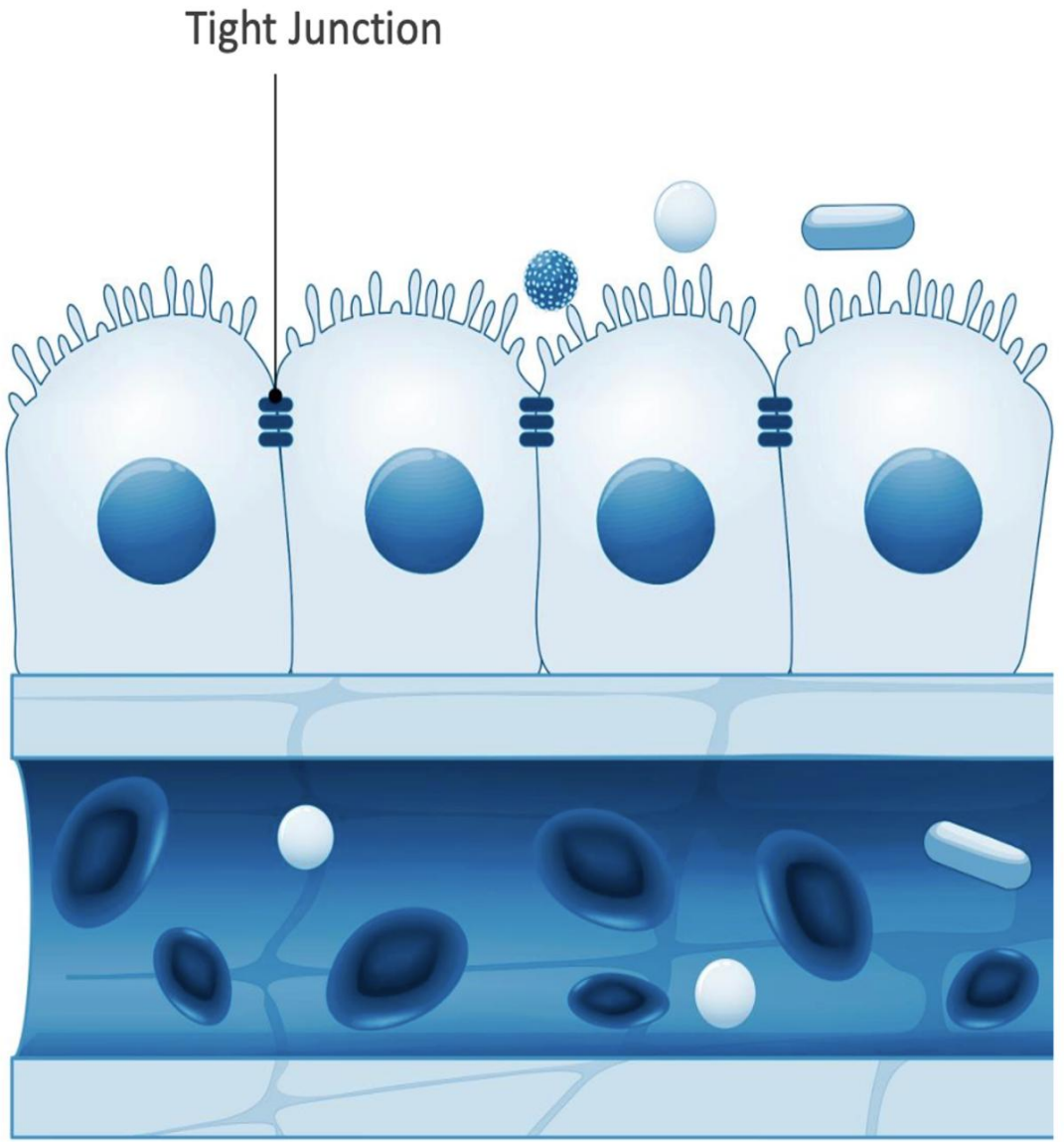
- ***SCFA*** are known to stimulate colonic sodium and fluid absorption, and showing;
  - -positive benefits on helping colonocytes grow and repair,
  - -enhancing gut barrier function,
  - -and mucosal immunity

***Med Comm.* 2023; 4: 420**



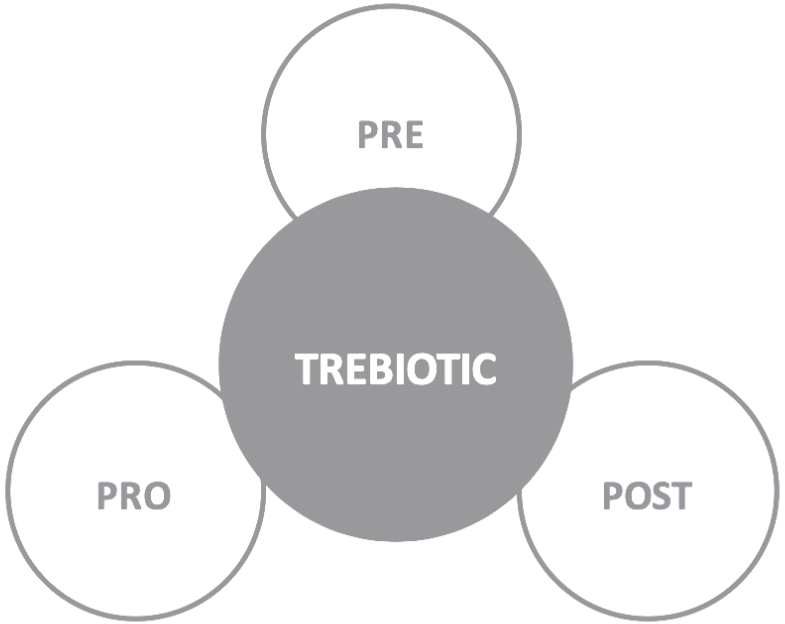
Short-chain fatty acid

- Results from probiotic activity (fermentation process)
- Essential to a healthy gut
    - Supports tight junctions,* helping to
        - Support gut barrier function*
        - Optimize micronutrient absorption*
        - Support selective permeability of gut lining*
        - Support immune function & overall wellness*
        - Consumed butyrate may be absorbed by stomach, negating benefits
        - Important to nourish natural production in gut



MODERE AXIS™ TREBIOTIC

The first 3-in-1 of its kind





MODERE AXIS™ TREBIOTIC

3-in-1 support for:

- Gastrointestinal health*
- Gut barrier integrity*
- Micronutrient synthesis*
- Microbiome diversity*
- Immune function*
- Brain & cognitive health*
- Overall wellbeing & energy*
- Regularity, occasional bloating & occasional constipation*



In your GI practice, in which of following disorders do you use probiotics?

1-IBS

2-CD

3-UC

4-C. Diff Infection

5- Acute Infectious Gastroenteritis (children)

6- Pouchitis; experience recurrent episodes

7- Pouchitis; experience infrequent episodes

Probiotic vs. Placebo in Irritable Bowel Syndrome: A Randomized Controlled Trial

Behnaz Amirimani[1], Sepideh Nikfam[1], Maryam Albaji[1], Sara Vahedi[1], Siavosh Nasseri-Moghaddam[1], Maryam Sharafkhah[1] , Reza Ansari[1], Homyoon Vahedi[1*]

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ABSTRACT

BACKGROUND

This study assesses the potential effect of *Lactobacillus reuteri* as a single strain probiotic preparation (Biogaia®) on irritable bowel syndrome (IBS).

METHODS

Patients diagnosed with IBS who fulfilled Rome III criteria and consented to participate in this study were randomized to receive either the probiotic or an identical placebo once daily for four weeks. Patients used a questionnaire to record any symptoms and adverse reactions over a one-week run-in period and during the final two weeks of intervention. For each group, we calculated the differences between mean scores of the variables and compared the results between groups.

RESULTS

Frequency of defecation increased in the Biogaia® group and decreased in the placebo group meaningfully. But There were no significant difference in the two groups in other terms of bloating, sense of urgency for defecation, abdominal pain, stool shape, quality of defecation, sense of incomplete evacuation, and treatment satisfaction.

CONCLUSION

The frequency of defecation increased in the Biogaia® group and decreased in the placebo group, however this study did not classify patients according to diarrhea or constipated subgroups, the efficacy of this drug is not clear. Hence *Lactobacillus reuteri* was not better than placebo in controlling IBS symptoms in this study. However, considering the significant placebo effect in IBS patients, it may be necessary to conduct studies with larger numbers of participants to better assess the possible beneficial effects of Biogaia.

KEYWORDS

Irritable Bowel Syndrome; Probiotic; *Lactobacillus Reuteri*

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انجمن حمایت از بیماران مبتلا به بیماریهای التهابی روده ایران

Original Article

Therapeutic Effects, Tolerability and Safety of a Multi-strain Probiotic in Iranian Adults with Irritable Bowel Syndrome and Bloating

Elham Jafari MD MPH[1], Homayoon Vahedi MD•[12], Shahin Merat MD[12], Shabnam Momtahen MD[1], Aina Riahi MD[1]

Abstract

Background: Irritable bowel syndrome (IBS) is a common disorder in Iran with challenging treatment. Although trials have suggested that probiotics alleviate the complaints of patients with minimal side effects, they have not been investigated in Iranian adults.

Methods: B In a randomized double-blind study, 108 eligible IBS patients (Rome III Criteria) aged 20 – 70 years who referred consecutively to a clinical center in Tehran with abdominal bloating from 2010 to 2012 received a combination probiotics or placebo twice daily for 4 weeks. The objective was to evaluate the efficacy and safety of a multi-strain probiotics combination. One week prior to and throughout the treatment, the participants recorded their abdominal symptoms on a daily basis, using visual analogue scale and reported satisfactory relief of general symptoms at the end of each week. Adverse events were evaluated by self-reporting and physical examination. Continuous variables were analyzed by independent t test and chi-square was used for binomials.

Results: The baseline characteristics were balanced (60% female, mean age 36.7 ± 11.5). A total of 97 (51 intervention, 46 control) completed the treatment. Intention to treat analysis was done on 108 allocated subjects. 85% of the probiotic group reported satisfactory relief of general symptoms compared with 47% in the control group ($P < 0.01$). A reduction in abdominal bloating and pain with probiotic was superior to placebo [-13.0 vs. -3.7 ($P < 0.01$), -8.2 vs. -2.1 ($P = 0.02$), respectively]. No severe adverse drug reaction was seen in either group.

Conclusions: A 4-week period of treatment with the combination probiotics twice daily was safe, well tolerated, and effective in our patients. Further investigation is recommended for other subgroups of IBS.

Trial Registration: IRCT.ir IRCT2012071010230N1

Keywords: IBS,Bloating,Probiotic,Adults,Iran

Cite this article as: Jafari E, Vahedi H, Merat S, Momtahen S, Riahi A. therapeutic effects, tolerability and safety of a multi-strain probiotic in Iranian adults with irritable bowel syndrome and bloating. *Arch Iran Med*. 2014; *17(7):* 466 – 470.

AGA Clinical Practice Guidelines on the Role of Probiotics in the Management of GI Disorders

- In patients with ***CDI***;

  we recommend the use of probiotics only in the context of a clinical trial

- In adults and children with ***CD***;

  we recommend the use of probiotics only in the context of a clinical trial

- In adults and children with ***UC***;

  we recommend the use of probiotics only in the context of a clinical trial

- In symptomatic children and adults with ***IBS***;

  we recommend the use of probiotics only in the context of a clinical trial

- In children with ***Acute Infectious Gastroenteritis***;

  we suggest against the use of probiotics

Gastroenterology 2020;159:697–705

British Society of Gastroenterology guidelines on the management of IBS

Recommendations

- ***Probiotics***, as a group, may be an effective treatment for ***global symptoms and abdominal pain in IBS***

- But it is not possible to recommend a specific species or strain

- It is reasonable to advise patients wishing to try probiotics to take them for up to 12 weeks, and to discontinue them if there is no improvement in symptoms

  (recommendation: weak, quality of evidence: very low)

Vasant DH, *et al*. *Gut* 2021;0:1–27

AGA

- Management of Pouchitis and inflammatory pouch disorders
- In adult outpatients with ***Pouchitis***

- What is the effectiveness of ***Probiotics*** for the treatment of ***Pouchitis***?

Recommendation

- In patients with UC who have undergone ***IPAA*** and experience infrequent episodes of ***Pouchitis***

- ***The AGA makes no recommendation in favor of, or against, the use of Probiotics for the treatment of Pouchitis***

(No recommendation, knowledge gap)

Gastroenterology 2024;166:59–85

- In adult outpatients with ***Pouchitis***
- What is the effectiveness of probiotics for the prevention of ***Recurrent Pouchitis***?

Recommendation

- In patients with UC who have undergone IPAA and experience recurrent episodes of ***Pouchitis*** that respond to antibiotics

- ***The AGA suggests using Probiotics for preventing Recurrent Pouchitis***

(Conditional recommendation, low certainty of evidence)

Gastroenterology 2024;166:59–85

- The evidence for use of probiotics for preventing recurrence of pouchitis is limited;

  -the De Simone formulation and to patients who are antibiotic responsive

What is the De Simone Formulation?

- The De Simone Formulation is a specific multispecies probiotic combination that consists of a mixture of 8 strains of bacteria:

  -Streptococcus thermophilus,

  -Bifidobacterium breve, Bifidobacterium longum, Bifidobacterium infantis,

  -Lactobacillus paracasei

Gastroenterology 2024;166:59–85