



Probiotics, Micro-organisms with Great Potentials For Human Health and Wellbeing

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Probiotic organisms: are live **MICROORGANISMS** proposed to be beneficial to the host organism

Probiotic organisms: are live **MICROORGANISMS** proposed to be beneficial to the host organism **if used in proper food system**

Prebiotics: are **foods that support probiotics**

Original Initiatives On Health Benefits

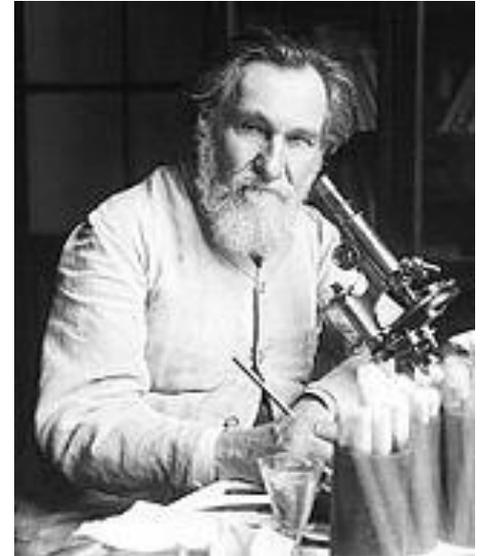
Probiotics in the form of *Streptococcus thermophilus* and *Lactobacillus bulgaricus* in fermented milk have been ingested by humans for thousands of years for their health benefits. For example, “**Persian tradition has it that Abraham owed his fertility and longevity to the regular ingestion of yogurt**”. In the early 20th century, the Russian immunologist Elie Metchnikoff proposed that lactic acid bacilli may have beneficial health effects and attributed his own longevity to regular probiotic ingestion (**Robert J Boyle, et al. 2006, American Society of Clinical Nutrition**)

Systematically Documented Initiatives

The original observation of the positive role played by certain bacteria was first introduced by Russian scientist,

NOBEL LAUREATE ELIE METCHNIKOFF

who in the beginning of the 20th century suggested that it would be possible to modify the **GUT FLORA** and to replace harmful microbes with useful microbes :



Detoxification using **FERMENTED MILK**

KOLLATH, Terminology of **“PROBOTICS”**

ROY Fuller, The first definition for Probiotics:

-Live micro organism, Supplement, Intestinal Microbial Balance

Eligibility Criteria of Ideal Probiotics

- “Live Friendly microorganisms”
- Non-pathogen
- Viable at the level of the intestine
- Adhere strongly to the intestinal epithelium and be able to stay there for enough amount of time both in vitro and in vivo studies
- Resistant to gastric acid digestion and to bile salts to reach the intestinal intact and immune system modulatory effect
- Most probiotics are strains of *Bifidobacterium* or *Lactobacillus* species.
- Species from other bacterial genera such as *Streptococcus*, *Bacillus*, and *Enterococcus* have also been used as Probiotics, but there are concerns surrounding the safety because of many pathogenic species in these groups, particularly *Enterococcus*

Examples of Commonly Used Probiotics

-*Lactobacillus acidophilus*:

-*Lactobacillus bulgaricus*:

-*Lactobacillus plantarum*:

-*Lactobacillus brevis*:

-*Lactobacillus caucasicus*:

-*Lactobacillus fermentii*:

--Prevention of infectious diseases and favorably altering the intestinal microflora balance in small intestine ,

-Reduce severity of childhood intestinal diseases, including diarrhea. This bacteria is found commonly in yogurt, and considered safe.

- prevalent in nearly all plant life, was identified in the human body with high safety

-Antibiotics like effects. Good mucosal colonization, adhesion to human epithelial cells, hydrogen peroxide production and antimicrobial activity

-Traditionally, microflora in **kefir** include *Lactobacillus caucasicus*.

- known to play a role in **vitamin B12** metabolism

To Be Continued:

Examples of Commonly Used Probiotics

-*Lactobacillus helveticus*

- In pasteurized fermented or sour milk, fermentation of antihypertension compounds, affects angiotensin-I converting enzyme inhibitory peptides.

-*Lactobacillus Leichmannii* :

-Microbiological flora of sour dough. secrete an antibiotic cycloheximide, "sterilizes" the dough since it kills many (but not all) pathogenic organisms.

-*Lactobacillus lactis*:

-Inhibitory to spoilage bacteria in foods at refrigeration temperatures. production of hydrogen peroxide. inhibitory action on *E. coli* O157:H7 at refrigeration temperatures

-*Lactobacillus-casei*:

-Beneficial effects on cholesterol

-*Bifidobacterium bifidum*:

- Excellent immune system-strengthening properties, especially for children.

-*Bifidobacterium longum*:

- Probiotic bacteria which offer many health benefits (supplement).

Format and Usage of Probiotics

Dairy : Fermented milk, Kefir, Yougurt, Cheese

Non-Dairy : Juices, Soya drinks , Miso, Sauerkraut, Tempeh...



Miso



Sauerkraut



Tempeh

Supplement Format: Capsule, Tablet and Sachet

Gastro-Intestinal (GI) Tract



- GI is the gate of entrance of nutrients and food to the body.
- Every internal and external factor can affect the immune system respond to the Gut
- **Good to harmful bacteria can exert a major role in our health through our GI system, both in a positive and negative manner**
- **Imbalance** in gut flora is referred to as *dysbiosis*. Which is a condition that occurs when the **population** of organisms residing within the gastrointestinal tract becomes **unbalanced**, often resulting in **acute or chronic sickness**.
- Consumption of **chlorinated water** and excess intake of **refined sugars found in candy, baked goods and soft drinks** cause imbalance of beneficial to pathogenic gut bacteria.

“Bad Gut” Medical Cost

Digestive diseases, result in, **dysbiosis**, cost nearly \$107 billion in direct health care expenditures. Digestive diseases result in nearly 200 million sick days, 50 million visits to physicians, 16.9 million days lost from school, 10 million hospitalizations, and nearly 200,000 deaths per year.

The most costly digestive diseases are gastrointestinal disorders such as

- **diarrheal infections** (\$4.7 billion);
- **gallbladder disease** (\$4.5 billion);
- **colorectal cancer** (\$4.5 billion);
- **liver disease** (\$3.2 billion);
- **Peptic ulcer disease** (\$2.5 billion).

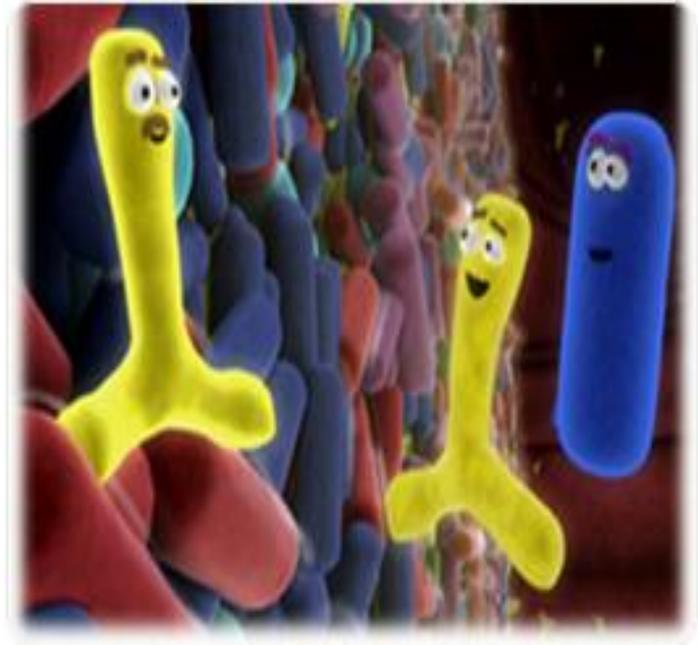
Cancers of the digestive tract, 117,000 deaths yearly. Non-cancerous digestive diseases cause 74,000 deaths a year.

Probiotics Decontaminate & Detoxify The Gut

-Inhibition of intestinal bacterial enzymes involved in the synthesis of colonic carcinogens by:

- competition for limited nutrients,
- inhibition of epithelial and mucosal adherence,
- inhibition of epithelial invasion and production of antimicrobial substances.

- **Heavy metals**; lead, cadmium, mercury, arsenic, chromium
- Degradation of **pesticides** and sequestering toxic chemicals. (M. Monachese, J.P. Burton, and G. Reid, 2012)



Prebiotics, The Key

Prebiotics are foods that support probiotics, thus further protection from viruses, dangerous toxins and cancer causing cells. They are fibers and complex carbohydrates.

Dietary Carbohydrates:

- Inulin, Fructo-oligosaccharides (FOS), specific colonic fermentation with bifidobacteria, in lower gut, both laboratory and human trials. (6 g/day) (non-digestible oligosaccharides),
 - **Bifidobacteria has b-fructofuranosidase enzyme** to break down of fructo-oligosaccharides
 - Galacto-oligosaccharides (GOS) are another another type of Prebiotics with recommended amount of 5 grams/day

Whole Foods As Prebiotics

- Barley, wheat, other whole grains
- Fruits, banana,
- Vegetables, Garlic, Onion
- Nuts
- Seeds
- Herbs, dandelion
- Spices
- Dark chocolate
- Chicory root powder (Inulin)

Synbiotics

Prebiotics + Probiotics = Synbiotics.

- **Synbiotics** help to reduce the risk of colon cancer.
- Synbiotics help in the healing time for serious injury.
- Reduce risk of blood infections and pneumonia
- Provides phytochemical through prebiotics for healthy gene messages.
- The physical relationships between us and our food with trillions of our bacterial friends remains variable (5-6g/day/1-2b)



Effects of Probiotics on Human Health

- Bifidogenic is the term 'bifidogenic' describes substances with stimulate the growth of probiotics, in particular Bifidobacteria. Prebiotics should therefore be Bifidogenic in order to fulfil their role. The action of prebiotics on Probiotics in the gut is often referred to as the 'bifidogenic effect' or sometimes as the 'bifidus effect' which generally happens in lower Gut.

- LB acidophilus and Caseai work in the first part of intestine in more acidic pH and faster growth

Each group cause different molecular availabilities and result in different health benefits



Seaton, Tanya. "Probiotics conference held," Nutraceuticals World, 3/1/2005.

To be Continued

Effects of Probiotics on Human Health

- Prevention of bad bacteria (Pathogens) and infection in:
 - conditions like infections , diarrhea, irritable bowel syndrome, inflammatory bowel disease, infections with Helicobacter Pylori, tooth decay, periodontal disease, urogenital infections, stomach and respiratory infections and skin infections.
- Prevention secondary infections after antibiotic therapy.
- Treatment and prevention of acute diarrhea in Children and travelers
- Helps individuals with compromised intestinal barrier and as the results modulating immune reactivity
- Prevention and delay of type 2 Diabetes
- Modulation of IBS syndrome through normalization of the anti-inflammatory to proinflammatory cytokine ratio (interleukin-10/interleukin-1 β), suggesting an immune-modulating role for *B. infantis*

To be continued...

Effects of Probiotics on Human Health

- Treatment of Helicobacter pyloric infections and peptic ulcers in adults, in combination with standard medical treatment
- Treatment of chronic intestinal inflammatory disease, prevention and treatment of pathogen induced diarrhea and atopic disease.
- Reducing lactose intolerance symptoms
- Anticarcinogenic effects by prevention of enzyme Beta-glucuronidase which can generate carcinogen in digestive tract.
- Lowering serum cholesterol levels, by breaking down bile in the gut, inhibiting its re-absorption and preventing cardiac diseases.
- Acetyl Choline Esterase (ACE) inhibition and very low molecular weight proteins. (two mechanisms for blood pressure reduction)

Molecular Mechanisms Based on co-consumption With Nutrients

- **Disclosure of Biological Envelop**
 - Release of valuable Bioactive compounds and increase their availability and absorption for the body
 - Increased in the ratio of Glutathione reduced/ Glutathione oxidized (GSH/GS-SG) (in house data)
 - Release of metals, trace elements and minerals. As the result their better availability
- **Better Availability of minerals:**
 - Reduction of cationic charge in the case of Fe (III) to Fe (II)
 - Better Ca^{2+} Availability and absorption in Acidic of pH (Ca^{2+}) in our in house data.



Safety and Side effects of Probiotics

- In normal healthy persons recommended doses, does not cause any significant side effects.
- Doses of probiotics can be increased gradually the physician recommends
- In certain disease and should not be used as a replacement option for prescribed medications.
- It is always better to consult a qualified physician before using it as food supplement.
- Not to be used for people having an underlying disease or a compromised immune system. It can cause potential health problems loping infections for them
- Symptoms such as bloody stools, skin rashes and fever are the indications of intestinal infections.
- In some cases, the probiotics may interact with immunosuppressive drugs leading to life threatening conditions.
- Interaction with drugs:

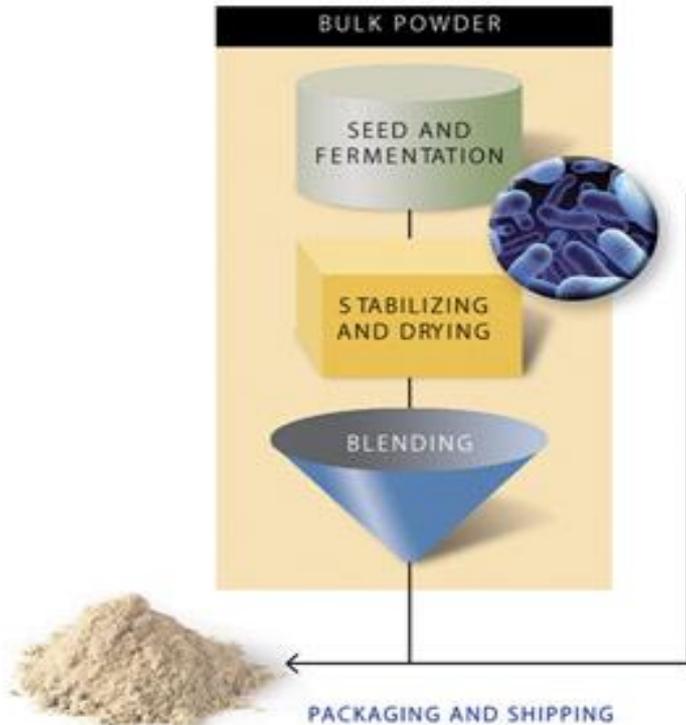
Drug Interactions With Probiotics

Certain medicines interact with probiotics may increase the need for probiotics. *The following list only includes the generic or class name of a medicine.*

| | | |
|----------------------------|-----------------------|---|
| Aminoglycoside | Dicloxacillin | |
| Antibiotics | Doxycycline | Penicillins |
| Amoxicillin | Erythromycin | Quinolones |
| Ampicillin | Gentamicin | Sulfamethoxazole |
| Antibiotics | Levofloxacin | Sulfasalazine |
| Azithromycin | Loracarbef | Sulfonamides |
| Cephalosporins | Neomycin | Tetracycline |
| Chlorhexidine | Macrolides | Tetracyclines |
| Ciprofloxacin | Metronidazole | Tobramycin |
| Clarithromycin | Minocycline | Trimethoprim |
| Clindamycin Oral | Nitrofurantoin | Trimethoprim/ Sulfamethoxazole |
| Clindamycin Topical | Ofloxacin | |
| Dapsone | Penicillin V | |

Manufacturing

- There are rules and regulations for the manufacturing the Probiotics



The manufacturing process for making microorganisms for use in Probiotics play an important role in the viability of the culture.

- The medium,
- The temperature , pH and ...
- Identity of the microorganisms.
- Lack of contamination with other harmful bacteria
- Consistency in manufacturing process and packaging.

The viable cells are guaranteed as CFU (colony forming units) per gram at the time of probiotic packaging. If the packaging does not list viable cells, or does not list the amount in CFU form, it is not valid. All the rules of Natural Health Products under GMP must be respected.

Conclusion & Suggestions

Probiotics must be used in food system with nutrients and prebiotics in the format of dairy and non-dairy Probiotic foods. As there will be a dual benefit for the body in terms of providing more available active compounds and allowing the chance of real propagation of the beneficial bacteria internally

- The advantage of the above is the prevention of extreme supplementation with Bacterial tablet and capsules which carry billions of questionable and unsafe bacteria for a treatment that body already has it.
- Encouragement of the industry for innovative ways of formulations of new Functional foods for human and animal consumption.
- Encouragement and education in health and agricultural sector for using Probiotics for better nutrition, cleaning the animal farms and agricultural lands by formulating Probiotic feed for animals and natural fertilizers for better environment and feed and maximizing the goodness of our little friends (Probiotics) in food chain.

