

Probiotics

Terminologies and Definitions

Biotics: A term that is functionally equivalent to “bacteria”

Probiotics: Viable microorganisms, given in sufficient amounts (10^8 - 10^{10} daily) that reach the intestine in active form and exert a positive health effect.

Prebiotics: A food source especially for the existing microbiome and for probiotics

Synbiotics: A therapeutic mixture of pre- and probiotics

Antibiotics: Chemical molecules especially made by bacteria and fungi, that kills or arrest the growth of other bacteria

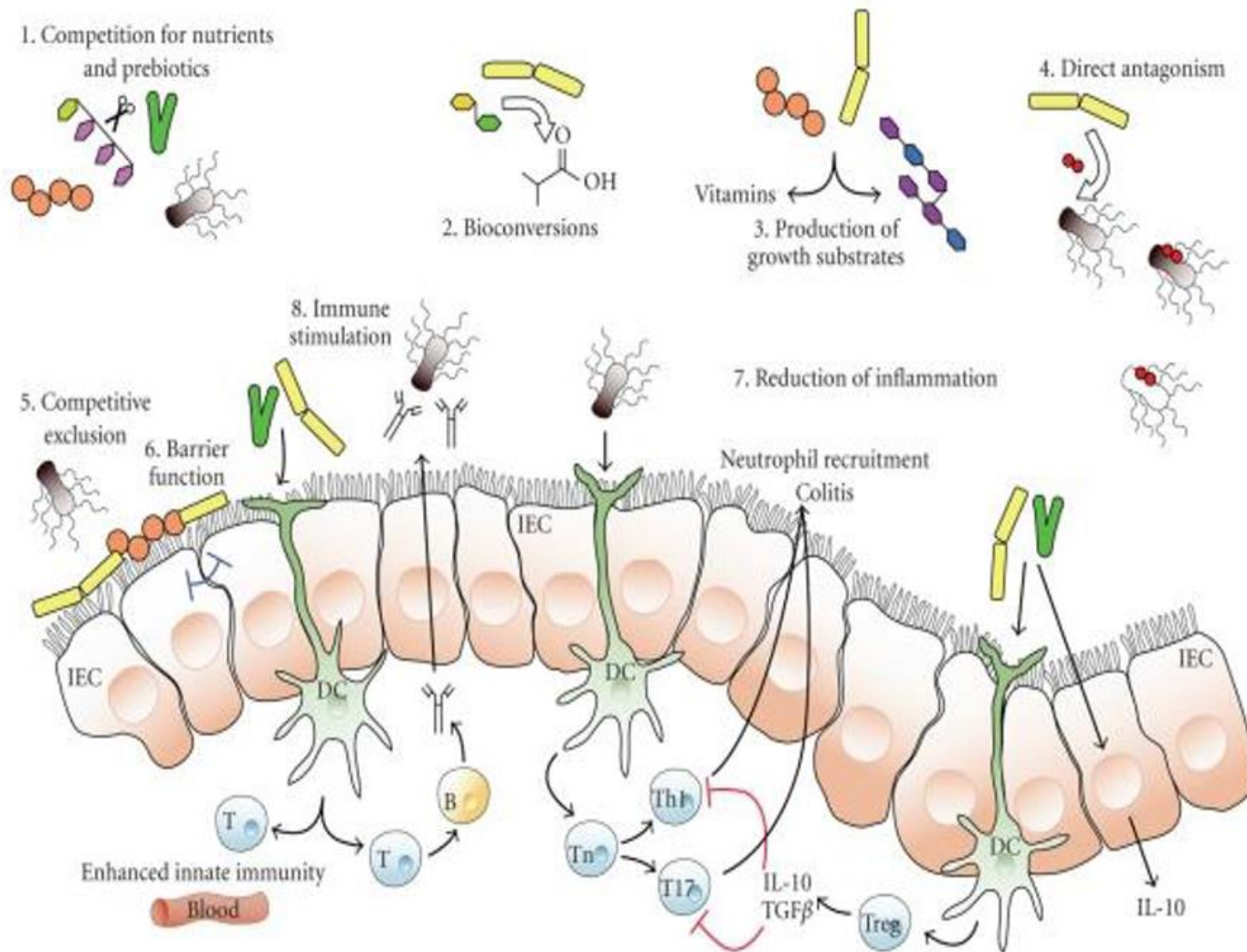
Current definition of Probiotics

“live microorganisms which when administered in adequate amounts confer a health benefit to the host” - WHO and FAO

The definition is inclusive of a broad range of microbes and applications, whilst capturing the essence of probiotics (microbial, viable and beneficial to health).

WHO- World Health Organization

FAO- Food and Agricultural Organization



Schematic diagram illustrating potential or known mechanisms whereby probiotic bacteria might impact on the microbiota. These mechanisms include (1) competition for dietary ingredients as growth substrates, (2) bioconversion of, for example, sugars into fermentation products with inhibitory properties, (3) production of growth substrates, for example, EPS or vitamins, for other bacteria, (4) direct antagonism by bacteriocins, (5) competitive exclusion for binding sites, (6) improved barrier function, (7) reduction of inflammation, thus altering intestinal properties for colonization and persistence within, and (8) stimulation of innate immune response (by unknown mechanisms). IEC : intra epithelial cells, DC: dendritic cells, T:T-cells.

Benefits of Probiotics

- The following bacterial species, when delivered in food at a level of 1×10^9 colony forming units (CFU) per serving, as probiotics for which non strain-specific claims might be made:

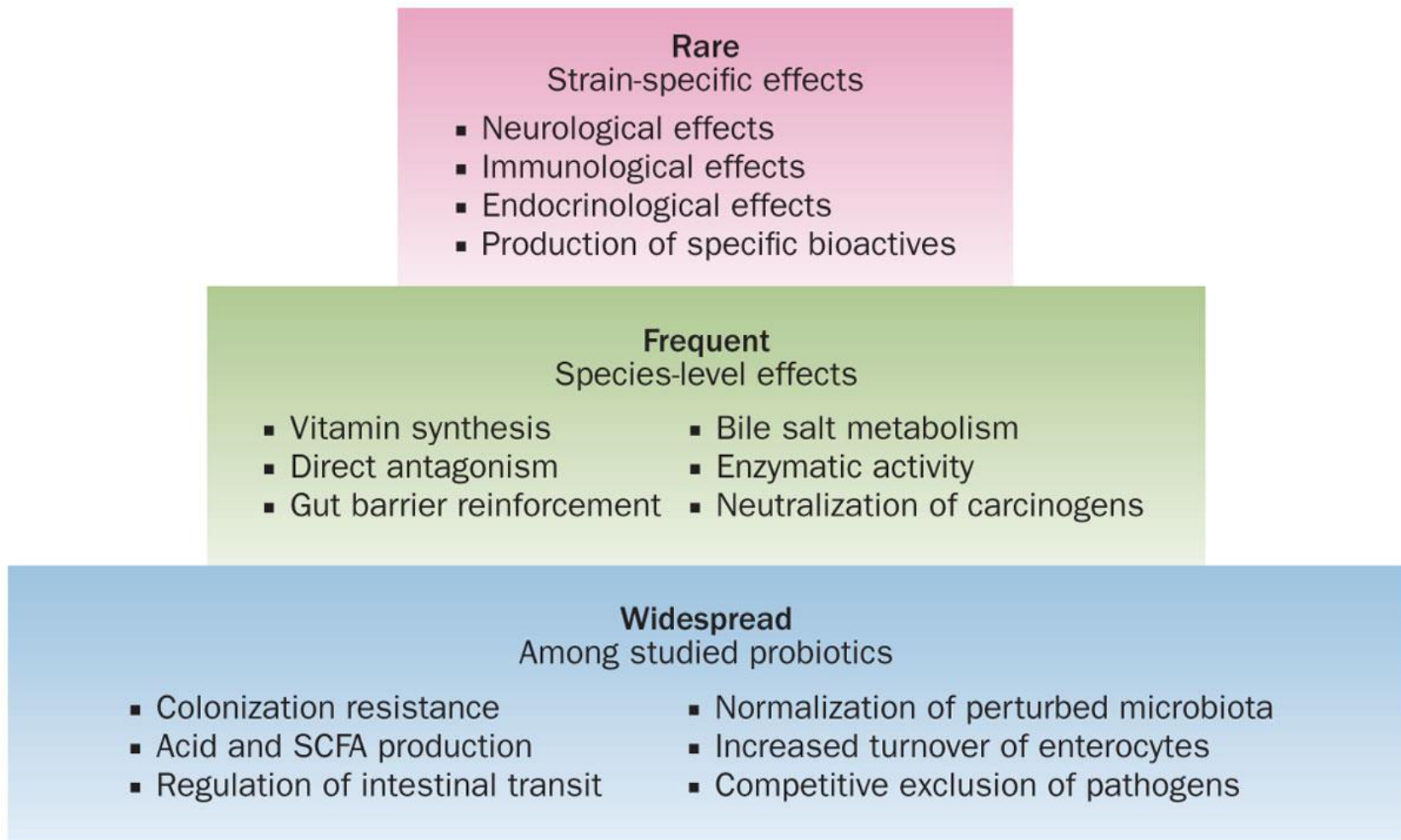
Bifidobacterium (*adolescentis*, *animalis*, *bifidum*, *breve* and *longum*) and

Lactobacillus (*acidophilus*, *casei*, *fermentum*, *gasseri*, *johnsonii*, *paracasei*, *plantarum*, *ramnosus* and *salivarius*)

Benefits of Probiotics

- For example, Italy has had a tradition of using beneficial bacteria, administered as food supplements or food ingredients, to help manage the intestinal microbiota.
- Use of the term probiotic for food and food supplements under certain conditions, including a minimum number of viable cells (1×10^9 CFU) administered per day, a full genetic characterization of the probiotic strain and a demonstratable history of safe use in the Italian market.

Possible distribution mechanism of probiotics



Mechanisms

- Some mechanisms are widespread among a diversity of strains whereas others are less so.
- Widespread mechanisms can be associated with effects that are observed across taxonomic groups, such as inhibition of potential pathogens or the production of useful metabolites or enzymes.
- Effects at the intestinal or extraintestinal level, including immune effects, are more likely to be strain-specific.

Mechanisms

- ❑ A probiotic might exert several health-promoting effects
- ❑ In a study encompassing 74 studies, 84 trials and 10,351 patients, it has been found that probiotics are beneficial in the treatment and prevention of gastrointestinal diseases.
- ❑ For example, fermented dairy products have been associated with reduced risk of type 2 diabetes or improved markers of glucose homeostasis, less weight gain over time in a prospective study of 120,000 adults and reduced risk of overall mortality

Lactobacillus

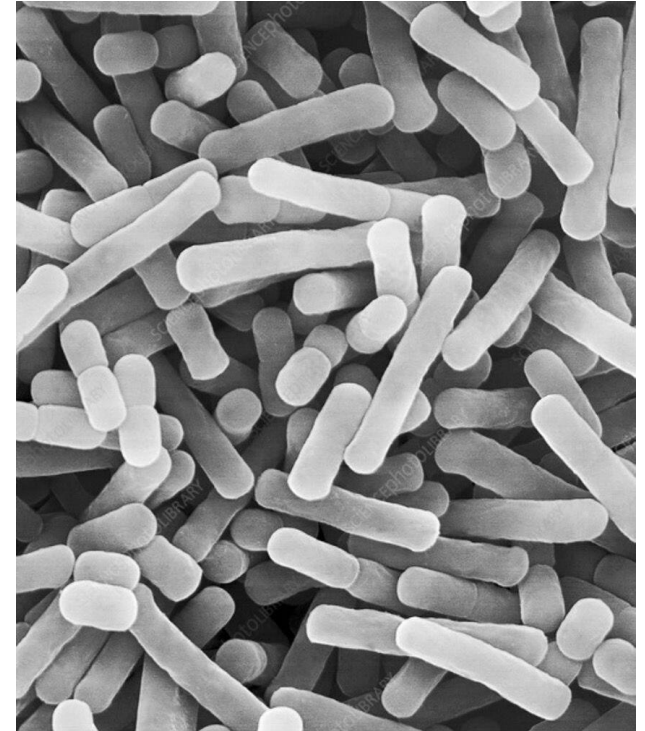
- *Lactobacillus* refers to a group of lactic acid–producing Gram-positive rods that are obligate and facultative anaerobes in the human gastrointestinal and genitourinary tracts
- The name lactobacillus refers to the bacterium's ability to produce lactic acid, not to the ability to digest lactose
- Lactobacilli are used therapeutically as probiotics, the opposite of antibiotics.

Lactobacillus

They are considered "friendly" bacteria and are taken for the purpose of recolonizing areas of the body to provide nutritional benefits including inducing growth factors and increasing the bioavailability of minerals

Lactobacilli also stabilize the mucosal barrier and decrease intestinal permeability

Altering the normal flora allows for potential colonization by pathogenic organisms, which can result in side effects, such as diarrhea, cramping, and less commonly pseudomembranous colitis (PMC), caused by *C. difficile*.



- The theory is that taking *lactobacillus* probiotics during antibiotic treatment can prevent or minimize normal flora depletion and pathogenic bacteria colonization
- There is some preliminary evidence that lactobacilli and other probiotics might help protect against cancer.
- In animal models, *lactobacillus* has been shown to bind dietary carcinogens and decrease development of tumors in the colon after carcinogen challenge

- An observational study of >6,500 individuals found that yogurt consumers had reduced levels of circulating triglycerides and glucose, as well as reduced systolic blood pressure and insulin resistance, compared with non-consumers.
- Consumption of foods containing live microbes might therefore be a beneficial dietary recommendation.