# Microbiology Focus

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Fluka Analytical

## Probiotics

*Lactobacillus bulgaricus added to dairy products in a milk protein matrix.*

Probiotics.....p2

Genus *Yersinia*.....p5

Marine Isolates for bioleaching.....p7

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# Probiotics

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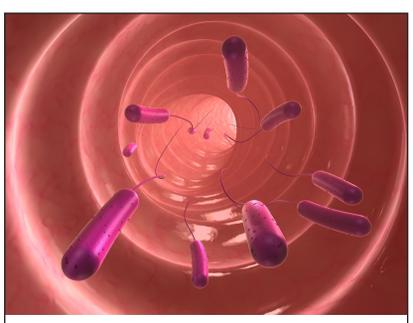
## Probiotics take on a key role in the functional food industry

The name "Probiotics" is derived from Latin (pro) and Greek (biotic) roots meaning "for life". Probiotics are defined as live bacteria with beneficial effects to the health of the host organism. Today, primarily lactic acid bacteria (LAB) and bifidobacteria are used as probiotics, however certain yeasts and bacilli are also known to have positive effects. In most cases, probiotics are produced directly by fermentation in foods such as yogurt, or are supplied through dietary supplements. Although the term "Prebiotics" is also used often in such cases, the two terms should not be confused, since "prebiotics" actually refers to non-digestible compounds that stimulate the growth and/or activity of probiotics in the gut. Prebiotics are frequently used in functional food, and typically consist of oligosaccharides. Prebiotics can be found in milk (galactooligosaccharides, or GOS) and plants with dietary fibers, however they are often produced by fermentation.



## Did you know…

### that bacteria accounts for about 7% of human body weight?

An adult person carries about 2.5 - 7.5 kg of living bacteria in the intestinal tract. There are about ten times as many bacterial cells as there are tissue cells in the entire body.

At the beginning of the 20th century, probiotics were thought to have a beneficial affect to the host by improving the intestinal microbial balance. At that time, it was observed that lactic-acid bacteria inhibit the growth of proteolytic bacteria due to low pH. Through his studies and observations, the Russian biologist Metchnikoff noted that people from cultures which consumed large amounts of fermented milk, for example those in Bulgaria and the Russian steppes, generally had a higher life-span. Therefore, he proposed that lactic-acid bacteria decrease the intestinal pH as a result of fermentation, thereby suppressing the growth of proteolytic bacteria. Metchnikoff propagated the consumption of sour milk fermented with the *Lactobacillus bulgaricus* [5] as a means of promoting intestinal balance and overall health.

Today, diverse studies report the benefits of probiotics, such as inhibitory effects on pathogens, aid in the management or prevention of chronic intestinal inflammatory diseases or of atopic diseases, and support to the immune system. Potential beneficial applications abound, and the research around this topic continues to expand.

Recently, scientists in Finland have discovered that cheese can help preserve and enhance the immune system of the elderly by acting as a carrier for probiotic bacteria. The research showed that daily consumption of probiotic cheese helps to bolster immunity in elderly people. Cheese was confirmed to be an effective carrier for probiotics [1].

## Bifidobacteria

*Bifidobacterium* is one of the most important probiotic bacteria used in the dairy industry. They are Gram-positive, non-motile, rod-shaped, and often branched anaerobic bacteria. They were first isolated from a breast-fed infant by Henry Tissier from the Pasteur Institute. At that time, Tissier named the organism *Bacillus bifidus communis* [6]. Bifidobacteria have a positive affect on the immune system and help to control intestinal pH . In additional, bifidobacteria produce bacteriocins and bacteriocin-like inhibitory compounds which inhibit the growth of other bacteria.

Bifidobacteria posesses many glycosylases able to degrade various plant- or milk-derived oligosaccharides. Several such enzymes were identified on the Bifidobacterium genome. Also diverse glycosyl hydrolase, ABC transporter and the fos gene cluster that is involved in the processing of health-promoting fructooligosaccharides (prepiotics), called bifidogenic factors, can be found on the genome [10]. Obviously Bifidobacteria are able to utilize a broad range of substrates as energy sources, such as plant polymers, glycoproteins and glycoconjugates, as well as having specialized proteins for the catabolism of oligosaccharides.

Bifidobacteria also have a unique hexose metabolism called the bifid shunt. The key enzyme, fructose-6-phosphate phosphoketolase is not found in any other Gram-positive intestinal bacteria and therefore provides an ideal target for a diagnostic test.

It was found that live *B. lactis* bacteria can directly counteract the harmful effects of coeliac-toxic gliadin and this may prove to be a future potential treatment of coeliac disease [9].

In adult intestines, only 3-6% of the fecal flora is composed of Bifidobacteria, while in breast-fed infants Bifidobacteria can constitute up to 90%. With increasing age, the number of Bifidobacteria decreases. It was observed that babies and adults with lower numbers of Bifidobacteria have a higher risk for diarrhea and allergies. For this reason, Bifidobacteria are added as a probiotic supplement to infant formulas, drinks, yogurts and a range of other products.

Because of the wide use of bifidus, Fluka has developed a Bifidobacteria Selective Media (BSM), available as an agar or a broth, as a standard for quality control. This medium allows for easy and fast quality control of yogurt made with bifidus and can be used to control the count of bifidus bacteria.