Probiotics have many functions in the human body. As healthy bacteria that populate the gut, they help establish a healthy gastrointestinal system, promote immunity, are essential for maintaining a balance of intestinal flora, support colon health, and improve the absorption of nutrients from foods. Some of the good flora groups such as lactobacilli and bifidobacteria produce natural inhibitors of undesirable bacteria such as bacteriocins, peroxides, and organic acids. However, not all probiotics have all of the essential characteristics that allow them to temporarily or permanently colonize the gut environment, and are not all equal in their ability to maintain good health and immune function.

**DDS-1: A unique strain**

One strain of probiotic bacteria that has proven to have a much better ability to colonize the gut for sustained periods with regular use and provide more essential health benefits was discovered by Dr. Khem Shahani, a professor of food science at the University of Nebraska for over 40 years. This strain of *Lactobacillus acidophilus*, known as DDS-1, can survive stomach acidity, resists bile salts, and grows well in an intestinal environment. It also has multiple researched health benefits.

**Producers vitamins B6, B-12, and folic acid; maintains cholesterol**

DDS-1 produces a substance that balances gut bacteria, thereby supporting a healthy gastro-intestinal tract. In addition, DDS-1 helps maintain cholesterol levels already within a healthy range, produces lactase to help reduce lactose intolerance, and manufactures the B vitamins B12, folic acid, and B6 while colonizing the intestinal tract in high numbers when taken as a daily supplement.

**Lactose intolerance**

DDS-1 produces more lactic acid than comparable strains of *L. acidophilus*. It also produces more beta-galactosidase, the enzyme that breaks down lactose into the simple sugar galactose, which can be absorbed and metabolized for energy just like glucose. Since people with lactose intolerance lack sufficient levels of this enzyme, DDS-1 can be a helpful way to augment lactase deficiency in those with lactose intolerance (Murthy, 2000).

**Gut health and diarrhea**

Changes in bowel microbial balance may occur as a result of diet, certain treatments, and poor bowel health. Though the resident intestinal microflora acquired at birth is usually somewhat permanent in creating a defense against undesirable bacteria, when homeostasis is disrupted, gastro-intestinal health may be negatively affected. Ingesting probiotics such as DDS-1, which are representative of a healthy intestinal tract, will introduce desirable bacteria into the gut that can be sustained with regular use. Compared with other strains of beneficial bacteria, DDS-1 was better able to bind to the intestinal lining, thereby creating a shield against undesirable bacteria and promoting normal stool consistency. It was also better able to survive the harsh acidic environment of the stomach and the high alkalinity and presence of bile acids of the small intestine compared with *B. bifidum* and other acidophilus strains (Murthy, 2000).

**Cellular health**

*Lactobacillus acidophilus* strain DDS-1 has been found to protect cells against the harmful effects of chemicals in laboratory animals. The mechanisms of its protective activity were shown in a mouse study to be related to its ability to stimulate the production of immune messengers or cytokines, including interleukin-1 alpha (IL-1 alpha) and tumor necrosis factor-alpha (TNF-alpha). When live or heat-killed cells of four strains of *L. acidophilus* or *Bifidobacterium bifidum* were tested, DDS-1 induced the production of higher levels of IL-1 alpha and TNF-alpha than other lactobacilli and bifidobacteria. The stimulation of the cytokines was not due to the lipopolysaccharide components of *E. coli* since the concentrations were the same as or 100-fold greater than that of the DDS-1 and induced only negligible amounts of IL-1 alpha and TNF-alpha. This is proof of the ability of DDS-1 to stimulate the production of immunologic factors (Rangavajhyala, 1997).

**Colon health**

DDS-1 can help prevent the transformation of the bile acid chenodeoxycholic acid into the secondary bile acids deoxycholic acid and lithocholic acid, which can negatively affect colon health, as shown in a study of human fecal matter and bile acids incubated in the colon.
with DDS-1. The bile acids incubated only with DDS-1 showed a 32% conversion rate as compared with the control, which showed a 49% conversion rate, yielding a roughly 34% reduction. In addition, DDS-1 helped balance gut bacteria. (Lee, 1995).

**Good survival in the gut**

Bacteria of the genus *Lactobacillus* are the most widely used probiotics due to their well-known health benefits. Since most are known to die off rather quickly, it is vital to determine which strains are most viable for providing long-lasting colonization of the gastrointestinal tract. With an area of 200–300 square meters, the surface of the human gastrointestinal tract is populated by up to 10^{14} bacteria derived from some 400 species and subspecies (Hao, 2004). These bacteria can be grouped into two types: autochthonous flora that forms more permanent colonies, and allochthonous flora that is transient and dies off in just hours to a few days. A study found that the allochthonous DDS-1 was able to survive just as long (8 days before dying off) as a strain of *L. reuteri* that is considered to be autochthonous (Frese, 2012). With the many benefits of DDS-1, including its ability to generate more lactic acid and lactase enzyme for lactose digestion, this represents a better option than other probiotics with comparable survival times.

**References**