



L. ACIDOPHILUS DDS-1 RESOURCE DOCUMENT

HISTORY OF *L. ACIDOPHILUS*

For centuries lactic acid bacteria have been used in the preservation of food for human consumption. In 1906, Nobel laureate Dr. Illya Metchnikoff attributed the long life span of the Balkan people to the ingestion of large quantities of fermented foods—foods rich in lactobacilli and other lactic acid-producing organisms which inhibit pathogens and detoxify one's system.

In the late 1950s, Dr. Khem Shahani began studying *L. acidophilus*, *B. bifidum*, and other lactic acid producing cultures to determine their dietary effect on humans. This well-documented scientific research has proven that certain types of lactobacilli and bifidobacteria are essential for achieving optimal health.

Dr. Shahani and his group observed that a particular strain of *L. acidophilus*, which they called DDS-1, when grown and produced under specific conditions had properties of great significance for digestion and nutrition and for other physiological health and disease.

Health-promoting or prophylactic properties of lactic acid-producing bacteria were found to be dependent on the inherent properties of each strain rather than on the common characteristics of each bacterial species. Dr. Shahani's research group documented that there are considerable differences among various strains of *L. acidophilus* as well as differences among identical strains that are grown under different circumstances. It is probable that the observed variations in the anticarcinogenic, hypocholesterolytic and antibiotic effects of lactobacilli may be related to the extent of the production and/or activation of immune factors in the system. In general, lactobacilli lack any antifungal activity. However, the observed beneficial effect of certain lactobacilli on candidiasis under certain conditions may be, in part at least, related to the immunological augmentation or activation in the host.

NUTRITIONAL, PROPHYLACTIC AND ANTIBIOTIC PROPERTIES OF *L. ACIDOPHILUS* DDS-1

- Produces enzymes such as proteases, which help digest proteins, and lipases, to digest fat (2, 3).
- Produces B-vitamins which are biocatalysts in food digestion, particularly folic acid and B-12 (4, 5).
- Produces the natural antibiotic-like substance acidophilin, which was patented by Dr. Shahani (7, 8, 9).
- Inhibits the growth of 23 toxin-producing microorganisms (9, 10).
- Has anticarcinogenic and antitumor properties (11, 12).



- Produces the enzyme lactase which helps in the alleviation of lactose intolerance, thereby reducing bad breath, bloating, gas formation and stomach cramps (13, 14).
- Inhibits gastrointestinal- and uro-pathogens, which reduces the occurrence of diarrhea and urinary & vaginal infection (15, 16, 17).
- Enhances calcium metabolism, which can prevent osteoporosis (18, 19).
- Reduces serum cholesterol levels (10, 18).
- Helps alleviate dermatitis and other skin disorders by modifying and improving gastrointestinal microbial balance (21).
- Aids in the production and augmentation of immune bodies and their functions (22, 23, 24, 25).

ANTICARCINOGENIC AND IMMUNOMODULATING ROLE OF *L. ACIDOPHILUS* DDS-1

Further, in a recent study, *L. acidophilus* DDS-1 was demonstrated to prevent tumor formation in rats challenged with a chemical carcinogen. The mechanism of cancer prevention/prophylaxis may involve (a) inhibiting the growth of putrefactive bacteria and in turn reducing the production of N-nitrosocompounds; (b) direct reduction of secondary nitrites and bile salts, etc, since our earlier studies indicated that DDS-1 lowered the rate of conversion of primary bile salts into its secondary derivatives and; (c) stimulation of intraperitoneal macrophages and their enzymes may play a role in the antitumor effect of DDS-1. Our other studies with DDS-1 confirmed the immunostimulatory role of this bacterium in stimulating macrophages and inducing the cytokines Interleukin-1-alpha and tumor necrosis factor-alpha, which are known to exert cytostatic and cytotoxic effects on tumor cells.

ADDITIONAL CRITERIA OF FACTUALLY BENEFICIAL *ACIDOPHILUS*

To assure that *L. acidophilus* possesses these nutritional and therapeutic properties, it must implant and multiply rapidly in the gut to avoid its being expunged entirely. Hence, for gut inhabitation, *L. acidophilus* must not only be able to tolerate and pass through the high stomach activity (low pH), but also be able to grow and proliferate at physiological levels of bile salts and adhere to the intestinal epithelial cells.

L. acidophilus strains are known to differ tremendously in their ability to grow in the presence of bile salts. Bile salts, produced by the gall bladder, are essential in helping to emulsify fat before it can be digested in the intestine (16). The DDS-1 strain of *L. acidophilus* has been reported to be highly resistant to several commonly known antibiotics like penicillin, streptomycin, aureomycin, etc. Such antibiotic resistance of *L. acidophilus* DDS-1 is a paramount importance because it can be taken simultaneously or soon after an individual has been on antibiotic therapy. Common antibiotic therapy not only kills the pathogenic bacteria but also kills "friendly bacteria" like lactobacilli and



streptococci and may upset gastrointestinal microbial balance. *L. acidophilus* DDS-1 may thus help in restoring the optimal microbial balance in the gut.

MANUFACTURE OF FREEZE DRIED *L. ACIDOPHILUS* DDS-1

An exclusive, unique process involving growth in a well-defined and highly nourishing medium for this special strain is used for manufacturing *L. acidophilus* DDS-1. In the manufacturing process the microorganisms are concentrated first by removing unspent liquid medium by sedimentation, ultrafiltration, reverse osmosis, and/or centrifugation. As far as is known, the viability of the cells is not damaged at all during sedimentation, ultrafiltration, reverse osmosis or centrifugation. Natural cryoprotectants are then added to the intact cell concentrate before freeze-drying to prevent “freezer damage” to the bacteria (29).

Following freezing, the mass is freeze-dried in a specially designed unit. The final product is then subjected to fine screening and quality control involving at least several tests. When the product passes all the rigorous tests, it is then mixed with a natural stabilizer to prevent the loss of its viability during packaging, shipping, storage, marketing and consumption.

STABILITY

L. acidophilus DDS-1 is highly stable even under adverse conditions of manufacture and storage. Normally, microorganisms such as *L. acidophilus* are affected adversely by heat, humidity (moisture), light and oxygen (air). The unique process of manufacturing DDS-1, coupled with the addition of a suitable cryoprotectant and specially designed natural stabilizer, significantly help protect the microorganisms against heat, humidity, light and oxygen (from air).



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