Microorganisms such as Lactobacillus species, for example, are preserved by freeze-drying and storage of lactic cultures. Cultured Dairy Prod. J., 11:8-12.

There exist numerous food supplements on the market which do not meet the standards claimed on their labels. The consumer has every right to demand that the product one purchases actually meets the standards. It is a responsibility of the health professional, and of the health food-store as well, to make sure that the manufacturer and/or the supplier provides documented proof, preferably published in a peer-reviewed scientific journal or publication, that the claims made for the product were indeed substantiated by tests or research done with that product.

As indicated above, all the different acidophilus products are not alike in that they do not have similar properties. Similarly, a known strain of Lactobacillus, even the DDS-1 strain of L. acidophilus manufactured by different methods, will not have similar properties and stability.

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**L. acidophilus** Aids in the production and/or augmentation of immune bodies and their functions (22,23,24,25).

It is probable that the observed variations in the anticarcinogenic, hypocholesterolytic and antibiotic effects of lacticobacilli may be related to the extent of the production and/or activation of immune factors in the animal. In general, lacticobacilli lack any antifungal activity. However, the observed beneficial effect of certain lacticobacilli on candidiasis under certain conditions may be, in part at least, related to the immunological augmentation or activation in the host.

**CHRONOLOGY OF THREE GENERATIONS OF PROBIOTICS**

There were possibly four or five probiotic microbial supplements on the national market prior to the 1980's. Of these early products I can recall only Lactinex and Setebaid. Although Setebaid was fairly expensive, it had no live organisms, and I don't think it is on the market any more. Then by the early 1980's several newer L. acidophilus products appeared on the market in the form of liquid, powder, capsules and tablets. As far as it could be ascertained, American Cultures and Enzyme Systems (later renamed as Nebraska Cultures) was perhaps the first to come out with a true "Non-Dairy" acidophilus (containing no milk components such as lactose, casein, or any other milk protein). By mid 1980 numerous other acidophilus products and multi-microbial supplements were developed - like acidophilus with bifidus, faecium, bulgaricus, shahani or other than those used in the research of Shahani may have different characteristics and properties.

Consequently, all L. acidophilus products on the market are not alike. Some cannot even survive human stomach fluids. Many products contain extremely low levels of existing and stable L. acidophilus cells. Some manufacturers give numbers of live cells at the time of formulation, packaging, or bottling, but after manufacturing and storage, the number of live cells can drop to almost zero.

As part of our ongoing research program on probiotics at the University of Nebraska, more than 155 acidophilus strains grown in four different media. Adapted from Bhatia (26).

**FALLACIES ABOUT ACIDOPHILUS PRODUCTS**

The literature is replete with studies concerning the beneficial role of lacticobacilli in general and L. acidophilus in particular. Nevertheless, there exist numerous reports indicating divergent, and sometimes, conflicting observations. It has been established that such conflicting results may vary widely due to the different strains used, different methods of manufacture or propagation employed, and of course, due to the different techniques used by different scientists. As indicated earlier and shown in Figures 1, 3, even the same strain grown under different conditions may have different properties (26). Similarly, the DDS-1 strain of L. acidophilus manufactured by methods other than those used in the research of Shahani may have different characteristics and properties.

Consequently, all L. acidophilus products on the market are not alike. Some cannot even survive human stomach fluids. Many products contain extremely low levels of existing and stable L. acidophilus cells. Some manufacturers give numbers of live cells at the time of formulation, packaging, or bottling, but after manufacturing and storage, the number of live cells can drop to almost zero.

As part of our ongoing research program on probiotics at the University of Nebraska, more than 155 acidophilus products collected from U.S.A. and abroad were examined and enumerated (Table 1). Almost 70% of the samples did not measure up to numerical claims, and in fact, nearly 30% of the samples did not have even 10% of the claimed number of live microorganisms. For example, if the product was supposed to have 5 billion/gm, it might not have even 500 million/gm. More than 40 to 50% of the product had more than one species of acidophilus. Several products even had microorganisms belonging to a genus other than Lactobacillus. For example, in addition to L. acidophilus they had Streptococcus lactis. Several of the samples even had undesirable or pathogenic organisms present. These were not only our observations; at least two or three papers in scientific journals authored by very renowned microbiologists reported essentially the results (27,28). Also, almost all acidophilus products carry promotional material with similar claims without any literature identifying the research work and the product was published, or whether it was published in any peer-reviewed reputable journal.

Followiing any antibiotic therapy or use, the number of beneficial or desirable gastrointestinal microflora (such as acidophilus or bifidobacteria) goes down and ratio of the undesirable to desirable bacteria goes up. This is because the desirable bacteria like acidophilus and bifidobacteria, being Gram +ve, are more severely killed by most of the commonly used antibiotics. It is at this time that supplements of desirable bacteria are most needed. If, instead of taking supplementary bacteria that have been proven to be desirable, one takes supplements of bacteria of unproven benefit, one may be actually helping the undesirable organisms to continue their predominance.

**MANUFACTURE OF FREEZE DRIED L. ACIDOPHILUS**

The DDS-1 strain of L. acidophilus is manufactured by an exclusive, unique process involving growth in a well-defined and highly nourishing medium for this special strain. In the manufacturing process the microorganisms are concentrated first by removing unspent liquid medium by sedimentation, ultrafiltration, osmosis, and/or centrifugation. To the intact cell concentrate is then added a definite cryoprotectant before freezing to prevent "freeze damage" to the bacteria (29).

Figure 1. Variation in the viable cell count (log cfu/ml) of three L. acidophilus strains grown in four different media. Adapted from Bhatia (26).

**STABILITY**

The DDS-1 strain of L. acidophilus is highly stable even under adverse conditions...