

L. Acidophilus and the Ecology of the Human Gut

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INTRODUCTION

In 1908 Metchnikoff proposed that *lac-tobacillus acidophilus* (LA) played an important role in the prolongation of human life through its role in improving the intestinal environment.

Metchnikoff's suggestion provoked considerable work on the clinical utility of LA (reviewed in Kopeloff, 1926 and in Rettger et al., 1935. Unfortunately LA products had an acid and cooked taste and were not palatable; after a hiatus in the use of these products during World War II, general interest in LA was not renewed until the 1960's.

Supplementation with LA may be an important tool for orthomolecular medicine. LA serve directly as antidepressants and mild euphorants since their cell walls contain phenethylalanine (PEA). LA reduce the detoxification burden on the liver through inhibition of gram negative organisms. Fewer gram negative pathogens mean a smaller total burden of endotoxin which is found in the cell walls of these pathogens. LA facilitate the adsorption of food and reduce absorp-

tion of allergenic proteins; LA manufacture B vitamins and vitamin K; and LA size and tone the colon by increasing the size and improving the composition of feces and where the diet is adequately supplied with unrefined carbohydrates and fiber the stools are as much as 85 percent bacteria almost all of which are LA. When the ecology of the gut supports a flourishing growth of LA the production of toxins in the colon is almost completely eliminated. Several recent reviews survey these findings, notably Sandine et al. (1972), Drasar and Hill (1974), and Speck (1978).

DISCUSSION Intestinal

Ecology

A favorable intestinal ecology is facilitated by treatment with LA (Beck and Necheles, 1961); infants gain weight after LA feedings (Robinson and Thompson, 1972); *E. coli* and other pathogens decrease and fecal LA increase after feeding LA (Mutai et al., 1978), and nonfermented LA milk (Gilliland et al., 1971).

Prophylaxis

The major pathway for the lesion of alcoholic sclerosis of the liver may be through

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an increase in gram negative pathogens. Since endotoxin is found in the cell walls of these pathogens the liver's capacity to detoxify endotoxin may be overcome. Alcohol kills gram positive organisms, including LA, but gram negative pathogens thrive in the alcohol intoxicated gut. LA are antagonistic to *S. aureus*, *Salmonella typhimurium*, *E. coli* and *Clostridium perfringens* and other pathogens (Gilliland and Speck, 1977); on the other hand, phenethylalanine (PEA), an autogenous antidepressant, is found in the cell walls of gram positive organisms.

LA manufacture B vitamins and vitamin K; increase the bulk and improve the composition of feces; aid digestion, completely breaking down lactose; the frequency of eosinophilic leukocytes and immunoglobulin A are a function of LA; IgA and LA are often deficient or absent in the gut of schizophrenics (Brown, 1977); and gastrointestinal symptoms associated with many diseases are relieved by aggressive treatment with LA (Rettger et al., 1935). Antibiotic treatment is followed by an increase in pathogenic bacteria and a decrease in facilitative bacteria (Dubose et al., 1963). Salmonellosis increased after World War II, and LA decreased (Speck, 1978). Stress is followed by a reduction in LA; meat, alkaline foods, alcohol, sugar and other foods reduce LA (Brown, 1977).

Ordinary Yogurt Is Not Adequate

L. bulgaricus, *S. thermophilus*, and *S. lactis* rapidly replace LA in yogurt. LA are not stable in yogurt with other organisms (Gilliland and Speck, 1977). While yogurt made with *L. bulgaricus* and other benign organisms may be beneficial to humans, e.g. reducing cholesterol (Hepner et al., 1979), these non-LA yogurts do not increase the ongoing viability of intestinal flora and may even reduce LA (Gilliland and Speck, 1977a, 1977b).

Monitoring Treatment Is Easy

Breastfed infants rapidly establish *L. bifidus* (LB) throughout their originally sterile intestines (Tissier, 1900; Mata and Urutai, 1971); LA and LB can be made to grow in the intestine to the exclusion of (95 percent) almost

all other organisms (Weiss and Rettger, 1934) and the establishment of thriving LA is readily observable in the stool (Rettger et al., 1935).

Palatable Acidophilus Milk

A commercial LA product was developed at North Carolina State University in 1975. This product, added to lowfat milk is indistinguishable in taste from ordinary lowfat milk (Speck, 1975); it implants in the human gut; suppresses gram negative organisms (*E. coli* and others) (Gilliland and Speck, 1977b); and appears to have beneficial effects in human GI illnesses, especially those characterized by diarrhea (Speck, 1975, 1978).

Commercial Strains of LA Adapt to Human Gut

Rettger et al., (1935) and other early workers demonstrated that successful implantation of LA in the human gut was followed by symptomatic relief in mucous colitis, irritable colon, idiopathic ulcerative colitis, and various disorders complicated with constipation and biliary symptoms. It was demonstrated that many individuals resist implantation; recent work verifies this finding and indicates that LA does not thrive in media containing *L. bulgaricus* or other facilitative bacteria (Gilliland and Speck, 1977a). The North Carolina State researchers found that commercial products advertising LA content in conjunction with other lactobacilli in fact do not contain appreciable numbers of LA.

LA and *Candida albicans*

LA is a normal inhabitant of the healthy human female vaginal vault and is antagonized by vaginomycosis. *C. albicans* often infests the vagina of depressed women and other psychiatric patients and vaginitis is a routine consequence of pellagra. A common midwife remedy for vaginomycosis is a buttermilk or yogurt douche.

Some Clinical Observations in Psychiatric Patients

We observed a series of psychiatric patients (1969 through 1980); most of these patients suffered idiopathic food sensitivities as well

as their primary illness and they had fewer LA in stools than normal controls. Psychiatric patients typically had less than 5 percent LA in stools.

We gave freeze dried LA preparations as supplements to adolescent psychiatric patients (1969-1974); and LA preparations, LA supplemented milk or yogurt cultured from LA milk to adult and adolescent patients (1975-1980). When LA increased in stools most patients reported reduction of GI symptoms; and the signs and symptoms associated with food allergy were reduced (frequent bruising, allergic shiners, suborbital edema, myalgia, idiopathic fatigue and endogenous depression).

Almost all milk intolerant patients tolerated freeze dried LA well; and many such patients had no difficulty eating LA yogurt. LA milk was tolerated by some milk intolerant patients. Commercial "Sweet Acidophilus" milk proved an adequate source of LA especially when cultured into yogurt. Implantation and symptom reduction were adequately produced when "Sweet Acidophilus" milk was used as the source of LA for yogurt cultures. Implantation of LA was more readily obtained by the use of yogurt cultured from "Sweet Acidophilus" milk than by use of "Sweet Acidophilus" milk without yogurt.

Resistance to LA Implantation

Rettger (1935) reported that some patients require extremely large and persistent supplements of LA. We found this to be true among our patients. We found that dosages as large as 20 standard capsules of LA at meals for 30 days were required to establish LA in the stools of some patients. In several of these resistant patients LA disappeared from stools as soon as supplementation ended. Most patients maintained a self producing colony of LA after they were given three courses of supplementation for a week interspersed with a week rest from supplementation. In the initial period 10 capsules of LA are given with meals for a week. Subsequently patients are advised to take 10 standard capsules of LA before breakfast, at least once a week, to eat some foods with an acid ash at breakfast, and to observe their stools for the characteristic larger size, lighter color, and

tolerable odor associated with LA implantation. All patients are advised to avoid modern foods, to eat much fiber and emphasize unprocessed carbohydrates. A pint of LA yogurt or two quarts of LA milk per day may be adequate substitutes for the freeze dried preparations.

LA and *Candida albicans*

We have observed a series of 16 women treated for vaginomycosis by douching daily with yogurt cultured from LA while daily consuming 10 to 20 capsules of freeze dried LA, a pint of LA yogurt, or a quart of LA milk until LA predominate among the microorganisms in the stools.

In 13 of 16 cases the symptoms of vaginitis responded to LA treatment and the patients enjoyed a concurrent lifting of mood. In three cases observed in 1981 the patients' skin responded with a positive wheal after intradermal injection of 1:1000 *C. albicans* vaccine before LA treatment; but after two weeks of LA supplementation an identical injection produced no positive wheal.

Method of Culturing LA Yogurt

In the eastern states LA milk is available in almost all supermarkets under various brand names. This milk is taken and placed directly in one of the containers in a standard yogurt maker (Salton Yogurt Maker, sold by Sears and other stores). The LA milk should not be processed in any way, it is merely poured from the milk box into the yogurt maker glass jar. After 10 to 20 hours of incubation either a firm yogurt is formed, or a separated white curd with clear whey. The white curd or yogurt is then used as a starter.

Experience indicates that regular, non-LA milk, is best used in the second stage. This milk is brought to a simmer without permitting it to boil. The milk is then allowed to cool to the range indicated on the thermometer supplied with the yogurt incubator. All the jars are then filled and the incubator left on for 10 hours. The resulting palatable yogurt is rich in LA.

Some patients have difficulty following these simple instructions. Our solution to this has been to supply them with yogurt starter, and to hold classes for them at our offices.

Since most of our patients are encouraged to rotate foods, to use exotic foods, to prepare foods in ways novel to them and substantially to change their food preparation habits, this added instruction is not a burden to them or to us.

SUMMARY

Observation of a long series of psychiatric patients disclosed a deficiency of *lac-tobacillus acidophilus* (LA) in their stools associated with GI symptoms and other evidence of idiosyncratic responses to food. These patients were also deficient in immunoglobulin A and had high levels of eosinophilic leukocytes.

Supplementation with high levels of LA in the form of freeze dried LA in capsules, LA cultured milk yogurt, or LA implanted milk ("Sweet Acidophilus") resulted in grossly observable changes in stools, increase in stool LA, and reduction of symptoms associated with food.

Infestations of *Candida albicans* responded, in 13 of 16 women, to LA douches and LA dietary supplementation. Associated symptoms were relieved as the vaginitis responded to this treatment.

Rettger's early observation that extremely large supplements are required to establish LA was confirmed in these observations. Not less than 10 standard capsules of freeze dried LA per meal for five days appear to be the minimum effective dose for initiating implantation of LA.

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