

# Sour Milk and All-Natural Science

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**T**hough it's easily forgotten, a second strand of thinking accompanied the fin de siècle exploits of the microbe hunters. While they were incriminating one bacterium after another as agents of disease, other investigators were developing the notion that certain organisms might be used more positively, to promote health and well-being.

The concept took root firmly in the first decade of this century and two historic reminders of that era sit on my bookshelves. The prolix title of one—George Herschell's *Soured Milk and Pure Cultures of Lactic Acid Bacilli in the Treatment of Disease*—is self-explanatory. Published in 1909, it was followed two years later by *The Bacillus of Long Life*, in which Loudon M. Douglas popularized the theory of Russian bacteriologist Elie Metchnikoff that we may extend our life-span by consuming large quantities of sour milk or yogurt. All three authorities believed that lactobacilli from these products proliferated in the ingestor's intestines, suppressing harmful bacteria and thus ensuring health and longevity.

Now epitomized by "bio-yogurts" on the supermarket shelf, the idea has survived largely in the domain of alternative medicine. Mainstream science has always been much more wary. Although some evidence indicates that products of this sort can be effective in treating vaginal infections, their use against conditions such as *Salmonella* food poisoning seems to be invalidated by the destruction of lactobacilli by the gastric juices, long before they can colonize the lower intestinal tract.

In any case, this is low technology. Do we really need such tactics when antibiotics are available in rich profusion to combat infections? Answer: we do indeed. Despite the historic achievements of antibacterial warfare in the past, the picture is now grim. As Harold Neu pointed out recently in *Science*, (257: 1064, 1992), the inexorable spread of drug resistance has spawned a medical crisis. Many members of the family *Enterobacteriaceae* and the genus *Pseudomonas*, which cause intestinal and urinary infections, have become invulnerable to virtually all of the older magic bullets. As with biological pest control, a more natural approach may circumvent those obstacles and perhaps lead to their demolition altogether.

By happy coincidence, the past few months have seen the appearance of several papers containing concrete evidence that innocuous organisms can combat major intestinal infections in humans and other animals. One group of reports has focused on the inoculation of a protective intestinal flora into livestock as a means of safeguarding them against coloni-

zation with *Salmonella* and other pathogens. Thus researchers at the Food Directorate, Health and Welfare Canada, Ottawa, have found that a cocktail of organisms isolated from the feces of healthy adult hens, given by mouth to newly hatched chicks, protects them from invasion by an enteropathogenic strain of *Escherichia coli* that has been associated with numerous outbreaks of hemorrhagic colitis in humans (*Letters in Applied Microbiology*, 14: 191, 1992). There are clearly the makings here of a routine method of controlling this and other serious human diseases.

Even more exciting is a paper that has just been published by a team including Sylvia M. Gonzalez at the Centro de Referencia para Lactobacillos in Chacabuco, Argentina. Like the report from Ottawa, it originates in the belief that whereas the neonatal intestinal tract is free of germs, the complex flora subsequently acquired from the mother and other sources plays an important role in later defense against marauding pathogens. In this case, however, the aim is to evolve a strategy for prophylaxis against human diseases. Defined strains are thus being used.

Gonzalez and co-workers worked with two strains, one of *Lactobacillus casei* and the other of *L. acidophilus*, which they obtained from human feces. They isolated the organisms in pure culture, inoculated them separately into 10 percent solutions of skimmed milk powder, and mixed the two fermented milks together after 8 hours of incubation. The group chose as the target pathogen a strain of *Shigella sonnei*, because the dysentery caused by this organism is particularly common in their region of Argentina.

They found that milk fermented with *L. casei* and *L. acidophilus* was dramatically effective in inhibiting *S. sonnei* infection. Every one of the mice dosed orally with the pathogen after feeding for eight days on the milk survived the infection. The corresponding survival rate in control mice was 60 percent.

As described in the *Journal of Applied Bacteriology* (73: 407, 1992), pretreatment with milk also markedly inhibited colonization of the liver and spleen with *S. sonnei*. The organism disappeared from these organs by the tenth day, but remained at a high level in the untreated mice. And there were raised levels of antibodies against the pathogen in both the serum and intestinal fluid, suggesting that the fermented milk also increases the systemic immune response.

Impressive results. And anyone doubtful about their relevance to human disease should know that the Argentinean group also has preliminary evidence that the fermented milk can be used to treat and prevent infantile diarrhea. Loudon Douglas may have been off-beam, but my money's still on George Herschell.