



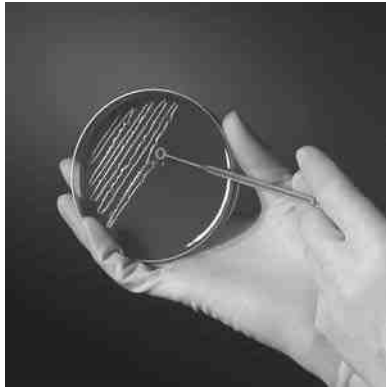
Fact or Fiction?

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Friendly Bacteria and the Hygiene Hypothesis

Over 400 distinct species of micro-organisms inhabit the various regions of the human digestive tract, making up nearly four pounds of every individual's total body weight. This vast population of micro-organisms far exceeds the number of tissue cells that make up the human body. It has been estimated that an adult carries 90 trillion microbes, a figure that outnumbers the body's own cells by nearly 10 to one.¹



With all of this we should normally have a balance of about 85% probiotic bacteria (friendly bacteria) and 15% harmful bacteria, but many people are so far off that their intestinal tract contains only 15% probiotic bacteria and 85% harmful bacteria. We need to have a large population of probiotic bacteria to aid with digestion and to keep harmful disease-causing micro-organisms in check. If the percentage of good bacteria is too low, compared to the bad bacteria, our bodies function poorly. Over time we are likely to have many health problems.²

Have you heard about bugs in baby food, or microbes in your milkshakes? As Lindsey Tanner reports, these are not the latest health food scares but rather a growing trend in foods designed to boost health, not make you sick. These products contain probiotics, the "friendly bacteria" similar to those found in the human digestive system.³

Tanner also reports, "There are supplement pills, yogurts, smoothies, snack bars

and cereals, even baby formula and chocolate. Sold by major names like Dannon and Kraft, they're spreading like germs on grocery store shelves and in supermarket dairy cases. In 2007, more than 150 probiotic and prebiotic commercial food products were introduced in the U.S., compared with about 100 in 2006 and just 40 in 2005. Even without all the answers from science, probiotics are a multibillion-dollar global industry. In the United States alone, retail sales of probiotic-containing foods and supplements totaled an estimated \$764 million in 2005 and are projected to reach \$1 billion in 2010, according to the market firm BCC Research."³

Jessica Snyder Sachs adds to the success list of this futuristic approach: "A 'probiotic' nasal spray imbued with beneficial bacteria that helps prevent chronic childhood ear infections; a bioengineered strain of mouth bacteria that prevent rather than cause cavities and a so-called Dirt Vaccine that appears to ease a range of chronic inflammatory disorders and also jolts the immune system into a cancer-fighting mode. Some scientists are even dreaming about 'probiotic' cleaning products - each detergent, cleanser or air spray formulated with its own patented mix of protective and health-enhancing microbes."⁴

University of Michigan researcher, Gary Huffnagle calls probiotics "a new essential food group" in his book, *The Probiotics Revolution*.⁵ Huffnagle does advise consumers to be wary of probiotic-containing products that don't specify how much or what type of bacteria is present. Evidence suggests the bugs need to be alive and ingested in huge amounts, generally between five and ten billion daily, he notes.³

This is all fairly new. On a spring morning in 2003, a middle-aged Dutch farmer had swallowed his first twice-daily handful of ten small capsules, each filled with some ten billion cells of the cheesemaking bacterium *Lactococcus lactis*. That small act entered the Dutchman into the history

books as the first human deliberately colonized with transgenic bacteria. The live bugs he'd swallowed carried and expressed the human gene for the immune calming cytokine interleukin-10. The farmer had been debilitated with Crohn's disease for more than twenty years. When consumed in dairy products, ordinary *L. lactis* disappears from a person's intestinal tract within a day or two. The farmer noted a dramatic reduction in his symptoms. A follow-up trial with ten other patients also proved successful. Further studies are planned in the Netherlands in 2008 with the hope that government regulators will allow this next trial on an outpatient basis.⁵

In perhaps the ultimate illustration of how far things have come, Joel Weinstock, a professor of internal medicine at the University of Iowa, recently ran a preliminary clinical trial in which six patients suffering from Crohn's disease were treated with a dose of live parasitic worms. In five of the six, the disease went into complete remission in the period when the harmless microbes were in the patients' bodies. The sixth patient also showed significant improvement.¹

This is all part of the so-called hygiene hypothesis, first voiced by a British epidemiologist, D. P. Strachan in 1989. The hypothesis is that our immune system needs a certain amount of bacteria on which to flex its muscles. Deprived of it, the white cells that are designed to fight bacteria fail to develop, and the other white cells - those designed to make antibodies to defend the body against microbial dangers as well as to produce allergic reaction - will take over.⁷

One scientist has likened the immune system to the brain. You have to exercise it, that is, expose it to the right antigenic information so that it matures correctly. Excessive hygiene, therefore, may interfere with the normal maturation of the immune system.⁸

Some examples of the hygiene hypothesis were given in a previous column

[*Plating & Surface Finishing*, **90** (11) 24 (2003)]. Here are some additional ones:

- The hygiene hypothesis can be used to explain the Louisiana Purchase. In Haiti, the 1801 uprising of African slaves was successful because yellow fever killed twenty-seven thousand French troops while leaving untouched the African-born slaves, who were relatively immune because of their exposure earlier in life. Napoleon, discouraged by the loss of his Haitian colony, gave up his American ambitions and sold his remaining territory, the Louisiana Purchase.⁹
- Dirt and infection don't just make you less allergy prone, they can fight off some cancers. Dairy farmers are as much as five times less likely to develop lung cancer. Working in a cotton factory protects you against lung, breast, liver and other tumors.¹⁰
- A Canadian study published in November 2007 suggested that fermented milk containing *Lactobacillus acidophilus* and *Lactobacillus casei* could prevent antibiotic-related diarrhea.¹¹
- A 2007 study from Finland published found that an oat drink containing *Bifidobacterium lactis* bacteria helped bowel function in nursing home residents.¹¹
- Scientists in Argentina are investigating whether milk fermented with lactic acid bacteria might reduce amounts of cancer-causing substances in the intestine.¹¹

Wine and microbes

John Postage postulates that few people are unaware that beers, wines, cheeses and so on are prepared by allowing microbes to act on foodstuffs. Even fewer can have failed to recognize that food goes bad through the actions of microbes.¹²

Today, modern wine making techniques are wiping out *Racodium cellare*, a benign mold once seen as the sign of a good Tokay cellar, since it helps keep the cellar air fresh. Stainless steel barrels prevent alcohol from evaporating, cutting off the Tokay mold's food source. It is also under threat from modern standards of hygiene, which aim to create laboratory-like levels of cleanliness in wine cellars. Some vineyards, however, still go out of their way to encourage it. However, it seems to have disappeared from the UK.

"I am very sorry to never to have found *Racodium* in Britain," says Henry Tribe of the University of Cambridge, who has studied the mold. "Even the cellars of St. John's College are too hygienic. Hygiene is reaching stupid proportions."¹³

Space travel

John Postage provides this interesting information about microbes and space travel. "A space ship with a few astronauts taking a year-long trip to Mars would be a physically isolated community and a peculiar thing happens to the commensal microbes of people in such communities. One type of microbe tends to become dominant, from mouth to anus, and if this germ happens to be pathogenic the situation can be dangerous. Likewise, immunity to infection by ordinary microbes tends to be lost. It seems probable that astronauts will have to keep cultures of the varieties of microbes they started out with, and will need to deliberately re-infect themselves at intervals."¹⁴

Next they will probably be telling us then when we go on long car or airplane trips we should carry our own satchel of personal microbes for ingestion after a certain number of hours. Think of all the fits this would create with airport security. **P&SF**

References

1. Garry Hamilton, "Why We Need Germs," *The Ecologist Report*, June 2001; <http://www.mindfully.org/Health/We-Need-Germs.htm>; accessed September 18, 2008.
2. "Probiotic Bacteria and Your Health," <http://www.ghchealth.com/probiotic-bacteria-and-your-health.html>; accessed September 18, 2008.
3. Lindsey Tanner, "The Next Craze: 'Good' Germs in Your Food," *Honolulu Advertiser*, December 10, 2007; p. A3.
4. Jessica Snyder Sachs, *Good Germs, Bad Germs: Health and Survival in a Bacterial World*, Hill and Wang, New York, NY, 2007; p. 12.
5. Gary B. Huffnagle, *The Probiotics Revolution*, Bantam Dell Publishing Group, New York, NY, 2007.
6. Jessica Snyder Sachs, *Good Germs, Bad Germs: Health and Survival in a Bacterial World*, Hill and Wang, New York, NY, 2007; p. 206.
7. Katherine Ashenburg, *The Dirt On Clean: An Unsanitized History*, North Point Press, New York, NY, 2007; p. 290.

8. Thomas R. DeGregori, *The Environment, Our Natural Resources and Modern Technology*, Iowa State Press, Ames, IA, 2002.
9. E. Fuller Torrey & Robert H. Yolken, *Beasts of the Earth: Animals, Humans, And Disease*, Rutgers University Press, Piscataway, NJ, 2005.
10. Jessica Marshall, "Filthy Healthy," *New Scientist*, **197** (2638), 34 (January 12, 2008).
11. Lindsey Tanner, "Products with Good Bacteria Get Popular," *USAToday.com*, December 10, 2007; http://www.usatoday.com/news/health/2007-12-10-2613624271_x.htm.
12. John Postgate, *Microbes and Man*, 4th Edition, Cambridge University Press, Cambridge, UK, 2000; p. 133.
13. "The Word: Wine cellar mould," *New Scientist*, **194** (2607), 57 (June 9, 2007).
14. John Postgate, *Microbes and Man*, 4th Edition, Cambridge University Press, Cambridge, UK, 2000; p. 353.

Test Your Plating I.Q. #447

By Dr. James H. Lindsay

Prefixes and suffixes

1. If **mega-** denotes millionth and **nano-** denotes billionth, what denotes trillionth?
2. In **ferrous** chloride, the iron has a (a. higher; b. lower) valence than the iron in **ferric** chloride.
3. In **nickel sulfate**, the sulfate ion contains (a. more; b. less) oxygen than **nickel sulfite**.
4. Sulfite is SO_3^- , what is S_2O_3^- ?
5. What do the following multiple prefixes denote?
a. Tera
b. Femto
c. Zepto
d. Hecto

Answers on page 47.