

Killing Germs Doesn't Work — Let's Try Feeding Them

Dr. Lon Jones, DO

Published: May 9, 2015

Bacteria have a sweet tooth; feeding them the right sugars makes for friendlier adaptation, reduces the need for antibiotics, and can help solve our problem of antibiotic resistant microbes.

A.H. ‘Lon’ Jones DO Common Sense Medicine Living things adapt; it’s part of the definition of life. They adapt to changes in their environments; and they adapt both offensively, with new ways to get a meal, and defensively, with new ways to prevent their being a meal. Both are pertinent to the practice of medicine.

Paul Ewald, in his book *The Evolution of Infectious Disease*, looks at how bacteria adapt. He looks at some of the chronic diseases that affect humanity and how they have changed. Cholera, for example, changes when the water supply is cleaned up to a less virulent type. With this and other examples he concludes that if we focus on killing the infecting agent we push them into developing defensively with resistance, but if we constrain them in ways that do not threaten them they are more likely to adapt offensively in ways that enhance their survival by finding a new niche that may also be more friendly.

When a bacterium senses a threat it releases a chemical signal and when many bacteria raise their voices in this way it results in the ■quorum sensing■ that triggers the increase in mutation that leads to the development of resistance. Ewald argues that reducing the threat, by a more restrained use of antibiotics, is a way to cope with this problem; it lowers the collective voice and hence the resistance.

Ewald focused on ways to intercept the spread of infection such as clean drinking water, hand washing and basic hygiene, bed nets, condoms, gowns, gloves and masks when dealing with infective situations, etc. Another avenue that applies this same selection pressure is interfering with bacterial or viral adherence. Interfering with adherence is not a threat; it affects individual bacteria and does not trigger quorum sensing. It just says ‘not here’, and the bacterium is more easily washed away.

In their book, *Bacterial Adhesion to Animal Cells and Tissues*, Ofek, Doyle and Hasty show that most bacteria adhere by way of bacterial lectins binding to sugar complexes on our cell surfaces. Nathan Sharon, the person who showed us that lectins have a sweet tooth, was one of the pioneers of this concept as applied to infectious disease.

Working with the mannose lectin on strains of *E. coli* he realized the possibility of competing at these binding sites; free mannose would fill the lectins and reduce both adhesion to the cell and infection. He demonstrated that oral mannose administered regularly switched out the intestinal coliforms with mannose lectins, which are the dominant cause of urinary infections, to those without the mannose lectin. Women with chronic urinary infections, most of which originate from bacteria in their own GI tracts, would be well served by such treatment. Cranberry juice, with a high amount of fructose, works in the same way but fructose is less efficacious than mannose.

Another related sugar-like molecule with similar effects is xylitol. Xylitol is a five carbon sugar alcohol used commonly as a sugar substitute. It is especially useful for diabetics and has been shown in a murine model to normalize many of its abnormalities.

Xylitol has also been shown to inhibit the adherence of many pathogens, most specifically those in the nose, wounds, skin, and gut. While it has not been demonstrated, the most likely reason for this broad effect on a variety of bacteria is the open and flexible nature of the xylitol molecule which is able to fold and fit itself into many of the lectins looking for a particular sugar molecule.

An example of the possible win-win that results from this kind of treatment is found with the effect of xylitol on the bacteria that cause most tooth decay. Caries is the most common infectious disease in the human. A cavity is started when *Strep. mutans*, living in the dental biofilm (plaque), make acids from dietary sugars that then eat through the enamel surfaces of the teeth. The well documented effect of xylitol on these bacteria is to both reduce their number and pressure them to adapt, but when they do adapt—by learning not to eat the xylitol—they also stop making the acid. Reductions in tooth decay come from either path.

These examples show what is possible when we guide bacterial adaptation away from defense. Equally effective is attending to our defenses.

Xylitol has another benefit when nebulized and inhaled. Joe Zabner and his group at Iowa have been studying this use for children with cystic fibrosis.(1) They find that its osmotic effects pull water into the airway surface fluid that enhances the protein based defensins that are handicapped by the high concentrations of sodium present in these children. It is unfortunate that their use is limited to iso-osmolar concentrations that have little effect in a normal population, Considering the escalation of upper respiratory problems over the past five decades something to help nasal defenses do their job better would be a good thing. My own experience with such a spray began after I read of Uhari's study reducing otitis with xylitol sweetened chewing gum.(2) My grand daughter with recurrent otitis was too young to chew gum. Uhari said the xylitol worked on the bacteria and since the reservoir of bacteria that cause otitis is the nasopharynx it made sense to put it there.

Our use rapidly expanded to all nasal related problems, both infectious (where the anti-adherence benefit is paramount) and allergic where the osmotic benefit works to optimize our own nasal cleaning. This cleaning is based on mucociliary function that is highly dependent on the water in the airway surface fluid, which supplies a fluid space for ciliary beating as well as water for the concentrated mucus to absorb to become optimally viscous and sticky. Arundel shows that ambient humidity over 40% reduces upper respiratory problems, likely because it puts less demands on the airway surface fluid.

The increases we have seen in upper respiratory illness began in the mid 1960s and, while correlation is not causation, are likely due to two changes that directly affect the airway surface fluid. Central heating and cooling, increasingly common in new home construction since the 60s, dries the air we breathe, and so does the misguided use of medications commonly used to reign in the histamine response, or runny nose, that Svensson points out is the back up defense.

These drugs were made OTC in the 60s and were heavily advertised on television.

The FDA's recommendation to remove them from the pediatric formulary in 2007 was ostensibly based on caregiver misuse. When I suggested to them that the drugs also compromised an important defense they called it an “interesting idea.” Defenses like rhinorrhea have evolved because they help us clear pollutants from the upper airway. Diarrhea is a similar defense for the GI tract. Hobbling these defenses is not wise, but is common practice based on the mistaken idea that they represent imbalances that signify illness rather than an altered homeostasis to cope with a problem. The rest of the world has found help optimizing GI defenses with oral rehydration solutions.

Like the use of xylitol to optimize nasal defenses oral rehydration is a simple mixture of salt, sugar, and water in the right proportions; one molecule of glucose, two molecules of sodium and the sodium-glucose transport system in the upper GI tract is activated that pumps a disproportionate 210 molecules of water into the body. Drinking this solution optimizes GI defenses by simply keeping the tank full. The editors of Lancet point out that oral rehydration saved more lives in ten years than penicillin did in forty.

That is what helping defenses is capable of doing for our healthcare, and nasal problems are arguably more common and expensive than GI.

Unfortunately these methods use commonly available materials (glucose (corn syrup is closest), salt and xylitol) that are available at your grocery or health food store—they bypass our profit driven healthcare system. That means that there is little possibility of profit from their use, not much money to study them, and certainly not enough to jump through FDA hoops to allow for making appropriate claims. Oral rehydration packets are promoted by the World Health Organization and available around the world, but the idea is almost unknown in the U.S. There is little choice, from our system's point of view, between the profit that comes from actively treating a person with an IV, with a profit over \$100.00, or having them drinking something costing a quarter.

1. Zabner's reports are abstracted at pubmed: PMID: 11027360, 15194156, 15377394, 15510034, 16483382, 16781897, and 22564094.

2. The development of Xlear® nasal wash—xylitol in a saline nasal spray—for our grand daughter was what brought me to see this use of xylitol. My initial report in The Clinical Practice of Alternative Medicine was not indexed, but is available with permission here.