

Learning to Care About Caries

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Fighting tooth decay effectively may just be the most impossible task on earth. If it weren't so difficult, we would be out of a job. The problem is that the disease is misunderstood and multifactorial. That bears repeating... *dental caries is misunderstood and multifactorial*. Dental caries is not a disease caused by one simple bacterium named "Mutans," and it's infinitely more complex than a few bacteria sitting around on a piece of enamel. This disease that plagues humankind *is* a symphonic orchestration performed by musicians we can't see that crescendos in a little white spot and terminates in total devastation.

In the beginning there was a piece of enamel made up of carbon, phosphorous, some oxygen and hydrogen. Hopefully they merged to create pure hydroxyfluorinated apatite. But no matter how pure that crystalline structure appears to be, there are hundreds, if not thousands, okay really billions of impurities within that enamel. Some sodium, chloride, magnesium, and lead has contaminated the crystal structure and set up weaknesses, or atomic gaps. And it is within these atomic gaps that tooth decay begins.

By some chance this random piece of mineral became attached to a living organism via dentin, which was attached to pulp tissue, which ultimately was attached in an increasingly complex network of proteins forming a person.

This little piece of contaminated (some may say decorated) hydroxyfluorinated apatite sits within a mouth, and is bathed by mineral rich saliva. Saliva is a veritable buffet for the tooth, containing a smorgasbord of protein and ions. The mineral rich liquid is constantly soothing, remodeling, and repairing this piece of apatite and as it does so, proteins become deposited on the tooth. The proteins act like highly specific glue, and based on their molecular structure can adhere certain substances together, in this case bacteria and enamel.

Thus it is only a matter of time before one bacterium which happens to be "floating" through a world infinitely larger than itself finds the one protein that will hold it. In a perfect world, the protein would be one that attracts and can only bind to non-cariogenic bacteria....but that's highly unlikely.

A few trillion crystals, each with a protein that will bind hydroxyfluorinated apatite with a certain type of bacteria, and one brilliant fractal garden is created. Imagine a piece of granite growing a brilliant array of lichen and moss, and you have on only a basic scale what a terrific feat of nature this membranous creature is. What's even more amazing is that "stuff" can penetrate down into it and completely alter the entire semi-solid mass.

In reality the initial layer of bacteria is merely "parental mass." Within each bacterium there exists the desire to thrive and produce offspring. But these bacteria don't need other bacteria to procreate, because they can simply divide, and within four hours it has produced more than four thousand offspring. In actuality, the scale of this growth explosion is four thousand offspring of trillions of bacteria and that results in almost one quintillion bacteria.

Trillions upon quintillions of bacteria! No two exactly alike because of mild molecular flaws, and they grow like a watermelon plant in the summer sun. They attract other bacteria and some "gene sharing" occurs creating even more diverse and more complex fractals. As they grow into a monolithic mutualistic macro organism, or biofilm, the bacteria seem to understand that channels must be created in order to acquire nutrients, rid themselves of waste, and at the same time provide a fuel source to other organisms growing in their midst.

Within each bacterium's waste, hormones are present. These incredibly potent chemical signals pulse through this complex macrocosm sending information regarding the outside environment, and how best to mature. In other words, the bacteria are protecting their parents and inadvertently helping the offspring of the neighbors as well.

This bacterial matrix is really behaving like a microscopic parasite, and converts a substance our bodies produce, into its own home. Fortunately for us, we are in control of the environment. The bacteria don't have a chance...or maybe they do. Maybe they have more control over the environment than we do. That poses a real problem when you consider patients and dentists are joining forces to fight an invading species that outnumbers them trillions to one.

These invaders are so small they cannot be crushed by force. No amount of mechanical debridement is going to completely disrupt this creature or alter it in any appreciable way. Fortunately there is a movement within the dental community to think through the complex nature of dental caries. We realize that mechanistic brushing away of the outer biofilm layers has no effect on the parental organisms.

Understanding that dental caries is complex down to the molecular level is the first step in treating the disease. The next step is coming to the realization that "grooming" this biofilmatic creature with a brush doesn't work. You may make mild inroads, but the jungle keeps fighting back, and it's fighting for its life.

Realize that your patient's biofilm is not the disease. The biofilm is an organism that doesn't directly harm the host. In fact, it's in the biofilm's best interest to *not* harm the host. The process dentists want to stop is decay; the process dentists should stop is the biofilm's metabolism. End the metabolism, and waste products are non-existent. Better yet, alter the metabolism and create

waste products that achieve your goal: the mutation of the biofilm into one that is non-cariogenic.

The elusive goal of dentists everywhere is to achieve “mutualistic symbiosis.” Fluoride has worked mildly at best, and the latest public health data shows the disease is on the rebound. Dental caries is affecting more children than ever before, especially the young ones. The amount of money spent on dental care in the United States is a testament to the sheer magnitude of this epidemic.

While it's true that only a handful of people die due to tooth decay, it does happen. Dentistry is an odd profession in that our patients see us time and time again, yet we fail them at every visit. We have accepted that dental caries will never go away, we can't do anything about it, and the best chance we have at making a dent in this pandemic is to brush better, eat less sweets, and slather fluoride on every tooth surface we see. The health statistics in our world reveal dentistry is failing miserably toward its goal to rid the planet of pain and suffering caused by dental disease. When did tooth decay become permissible? Why do dentists repeatedly say to patients, “It's just a small cavity, we can watch it...?”

Dentists should be saying, “Listen, I've got some really bad news. You have a white spot lesion. This is only the first sign that something is wrong in your mouth. I'm sorry I let it get to this point. The bacteria have penetrated into the crystalline structure of your teeth and if it's happening in this one spot then it's happening everywhere in your mouth, we just can't see it yet. You've already lost the battle on this tooth. Eventually it will probably have to be pulled, but we might have caught it in time. If you want to take this seriously, I'll treat you with everything I can think of and we may be able to save your mouth.”

The sad truth is that no dentist says that. It's almost comical to think a dentist would actually do that. It's also interesting to imagine a time when our great great great great great great great great grandchildren will read about us in books and not even be able to fathom what it was like to live in an age when your teeth would literally rot out of your body.

So the question becomes: How do we really treat dental caries? Are you up to the challenge, and is it something you're willing to devote your life to? Are you passionate about the health of your patients and honored that they trust you? If you answered, “Yes...,” then start here:

Slow down your day just enough to really talk with your patients and explain how to better prevent tooth decay. Encourage your staff to do the same. It can start with a simple phrase such as, “The doctor just came back from a course on tooth decay, and she said that dentists are finally figuring out how to stop decay...it was really fascinating.”

Educate yourself about the power of xylitol in fighting cariogenic bacteria. Search the internet for literature on caries and xylitol. If you find a wild claim, investigate it rather than dismiss it as false. The claims about CPP-ACP are continuously being re-validated throughout the world. It's difficult to dismiss more than thirty randomized clinical trials showing CPP-ACP is effective.

Continue to question what you are doing. If fluoride varnish and sealants were really working so well, why are our afternoons filled with placing class I restorations on teenagers? If you're always going to blame the patient, you will save yourself many headaches by telling them to find another dentist. Dentists have already been sued for malpractice and lost because they blamed recurrent decay on the patient's lack of plaque control.

When things aren't working, try something else. Don't be afraid to experiment on your family and staff. Your whole office can learn a lot from culturing bacteria, testing saliva, or even monitoring the biofilm ATP of each other. You know how to conduct research projects in order to determine if chlorhexidine mouthwash really works. Regain your lost curiosity and start looking for questions you didn't know you hadn't asked, and then look for the answers.

Consider seeking out CE courses on prevention. Organizations such as the World Congress of Minimally Invasive Dentistry are excellent places to network with dentists who have been down this road and can help you be successful. There is a lot more to effective prevention than stronger fluoride and more of it.

Ask dental manufacturers what new products they have for prevention. You'll find out fairly quickly which companies are serious about helping you make money through prevention and which ones only know how to sell restorative materials. I know the best part of my day isn't when I retake an impression multiple times, it's when I get to talk to my patients. I doubt you disagree.

For more information, I recommend the following excellent article:
J. Ruby, J. Barbeau. The buccale puzzle: The symbiotic nature of endogenous infections of the oral cavity. Can J Infect Dis 2002;13(1):34-41

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