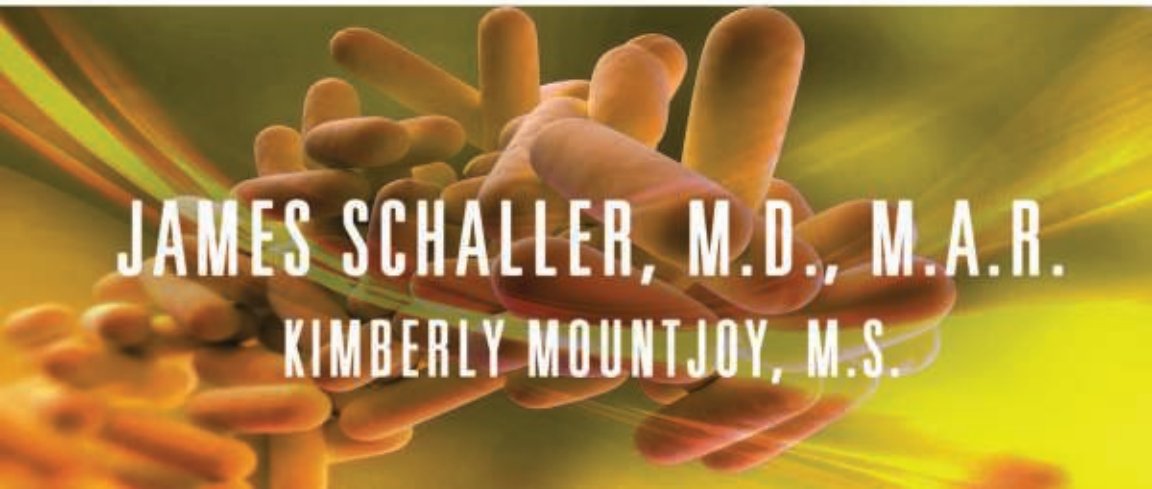
COMBATING BIOFILMS

WHY YOUR ANTIBIOTICS AND ANTIFUNGALS FAIL

Solutions for Lyme Disease, Chronic Sinusitis, Pneumonia, Yeast Infections, Wounds, Ear Infections, Gum Disease, Intestinal Disease, Bad Breath, Cystic Fibrosis and Implants

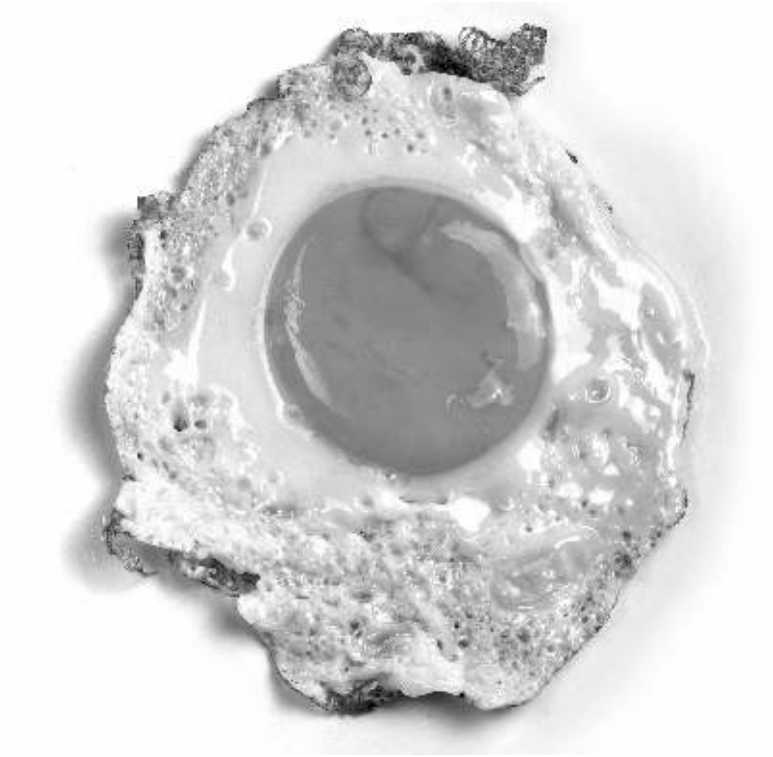
A MAJOR MISSING PIECE IN THE CHRONIC DISEASE PUZZLE



JAMES SCHALLER, M.D., M.A.R.
KIMBERLY MOUNTJOY, M.S.

What is a Biofilm?

The simple, scientific biofilm definition: any group of microorganisms in which cells stick to each other on a surface. They are typically inside a layer they create called “slime.”



Compare a biofilm to a fried egg. The yellow yolk in the center of the fried egg is the bacterial or fungal infection.

The larger white part that surrounds the yolk can be called the “biofilm.” It protects the inner infection, or yolk, from both antibiotics and the human immune system.

The outer edge of the egg shows some very small fried edges. They are easy to miss due to the size of the egg. We are going to pretend they are antibiotics, or infection-killing chemicals. They are useless due to the fact that they never get past the outer white edge of the egg. The egg white is like a wall to them.

Who Has Biofilm Infections?

When you learn about the massive diversity of locations and situations in which biofilms are common and consider that that are often the routine state of bacteria and fungal organisms, you start to realize anyone may have a biofilm infection or infections.

What Are We Looking For in This Book?

The following material will show many ways to break through the "egg white," or biofilm. Once that happens, it is usually much easier to destroy the infection represented by the egg yolk or yellow center.

Biofilms Are a Leading Cause of Suffering and Death

Biofilm Body Locations and Situations

- An infection lasting over 2 weeks
- The leading cause of death in children under 6 years of age
- Dental plaque—the human mouth harbors about 25,000 species of bacteria, about 1,000 of which reside in the dental plaque biofilm.
- Yeast infections
- Postsurgical infections
- Cancer
- Bad breath
- Gum disease or periodontitis*
- Tooth decay
- Lung infections
- Urinary system infections
- Oral bacteria—can harm heart arteries and cause death and increase intestinal cancers
- Chronic ear infections
- Sinus infections**
- Chronic tonsillitis
- Wounds
- Tooth brush heads — including sonic moving head styles

- Catheters to allow urine removal
- Artificial knees, hips, and other replacements
- Heart valve infections
- Lesions or sores
- Lyme disease
- IV catheters of any type
- Urinary catheters
- Contact lenses
- Implanted devices—any implanted or inserted device can send bacteria to the brain, liver or kidneys.
- Chronic prostate infections
- Legionnaire's disease and many other biotoxin bacteria that **explode in any indoor water**
- Mold illnesses—which can arise from mold build up in any standing indoor water, i.e., flooding, roof, basement or window leaks, humidifiers, unused Waterpik™ or other tooth cleaning devices, condensation in AC ducts, etc.
- Cystic fibrosis—excess mucus production in the airways allows bacteria like Pseudomonas aeruginosa to beat bacteria killers behind a biofilm coat.
- Lost body parts
- Skin, hair or nail infections
- Arthritis
- Endocarditis
- Bone infections
- Acne

Many other things could be added to the list, including profoundly serious issues of biofilm contamination in water and dozens of other health-related and manufacturing practices.

*Doctor David Kennedy, a retired dentist, lamented that most adult Americans have gum disease—another bacterial biofilm condition involving chronic infection. So just how widespread is this stealthy healthcare epidemic?

**At Ondine Biopharma, an interview [with Richard Longland] revealed that 38,000,000 people in this country have (or had) a chronic sinus problem.

***Ricardo Murga; Terri S. Forster. Role of biofilms in the survival of Legionella pneumophila in a model potable-water system. Microbiology (2001), 147, 3121–3126.

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Why Your Antibiotics and Antifungals Fail

Solutions for Lyme Disease, Chronic Sinusitis, Pneumonia, Yeast Infections, Wounds, Ear Infections, Gum Disease, Intestinal Disease, Bad Breath, Cystic Fibrosis and Implants

A Major Missing Piece in the Chronic Disease Puzzle

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and anonymous patients from all over the world

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1. Biofilms 2. Treatments 3. Antibiotics 4. Antibiotic Resistance
5. Lyme disease 6. MRSA

Manufactured in the United States of America

To Lieutenant Brent Miles

A man who has inspired me to believe some great people still serve in the criminal justice system.

A husband who supported and loved his wife for the ten years she valiantly fought breast cancer. She will be missed.

A father who loves his children.

A man's man, a gentle giant, and a superior leader.

I am honored to call you a brother.

JS

Making Current Biofilm Life-Saving Answers Clear and Rock Solid

Right now you could read two years worth of biofilm-defeating options in papers, blogs and books. This would take you 1,000-1,500 hours. And you would have a number of options to propose. Here are some examples of options you would find in those papers, blogs and books:

Avoid magnesium	EDTA	Royal Jelly
Avoid sugars and grains	DMSO	Thyme
NAC	Vancomycin	Lemon-grass
Norspermidine	Gentamicin	Serrapeptidase
Cis 2- Decenoic Acid	Banderol	2-Aminobenzimidazole
Lumbrokinase	Avoid fats	Echinocandins

How Do You Find Reasonable Marketing and Confidence in a Biofilm Agent as a Solution?

Tom and Lisa blog that product "x" and prescription "d" are exceptional treatments to undermine biofilm infections in Chronic Fatigue (CFS) and Fibromyalgia (FM). People are excited since their regular doctor has no major solution and no interest in biofilm infections.

The trouble is that "x" or "d" might have a use in undermining a biofilm or helping overcome an illness. But be careful to make fast links. Treatment "a" may only work in the biofilm of ten infections, and we only have proof it works in three infections.

Our goal is to show you what good research shows so that you and your physician can start with facts and will be able to understand the reason behind any possible biofilm trial.

For example, your infection might be like Lyme in its use of iron. Saito and many others report that unlike all other known organisms, Borrelia, the cause of Lyme disease, can exist without iron, a metal that all other life needs. Instead, Borrelia uses manganese.

What if your biofilm-based illness in the future is found to have the same ability to live well without iron? It might mean that a biofilm agent that undermines Lyme disease's biofilm might work for yours. Bacterial and fungal infection biofilms tend to share a **similar vulnerability** to a biofilm disruptor. Knowing how your infection works may help to determine what biofilm agent will work.

http://phys.org/news/2013-03-scientists-reveal-quirky-feature-lyme.html#jCp. Accessed March 26, 2014.

Contents

A Medical Revolution

The theory of biofilm infection is a profound revolution in the study of infections which can be painful, disabling and in fact, are a top killer depending on one's age.

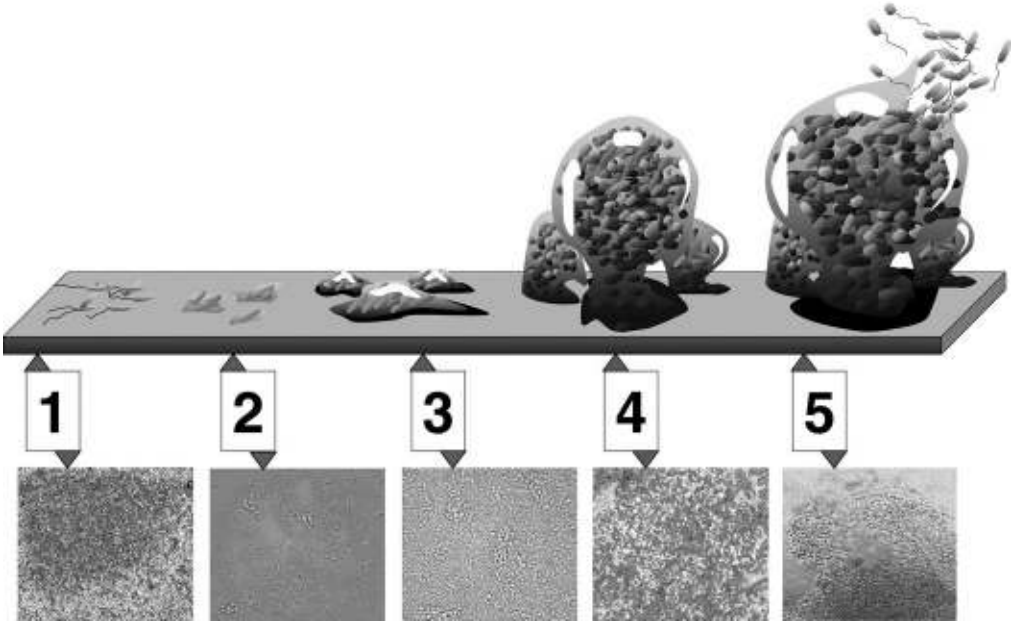
Infections are starting to return us to the days when people died of simple infections. The new biofilm infection world could kill more people than WWI and WWII combined if things do not quickly change in both developed and undeveloped nations. Due to a slow understanding of the importance of biofilms and therefore, a slow adoption by physicians of new biofilm solutions, even cutting edge doctors might only take biofilms seriously when it has been proven that more people are becoming disabled and die due to them. Currently, most miss biofilms as the cause of suffering and death. So, biofilms without solutions are as serious as polio in the 19th century without a vaccine, and in terms of numbers of victims, **they are far more devastating than HIV/AIDS.**

Most bacteria live in communities that typically have unique protective biofilms. 1% of bacteria infecting humans or impacting human life are floating alone and when they are found in blood, they would not be found together with any biofilm slime.

The National Institutes of Health estimates that **more than 80%** of microbial infections in the human body are caused by biofilm, many of them creating chronic and reoccurring problems. Or, is Glowacki right and 99% of bacteria live in a biofilm? Whether you use NIH's 80% or Glowacki's 99% as the estimate, biofilms are a serious consideration in infections.

Głowacki R, Strek P, Zagórska-Swiezy K, Składzień J, Oleś K, Hydzik-Sobocińska K,Miodoński A. [Biofilm from patients with chronic rhinosinusitis. Morphological SEM studies].[Article in Polish]. Otolaryngol Pol. 2008;62(3):305-10.

The Five Stages of Biofilms



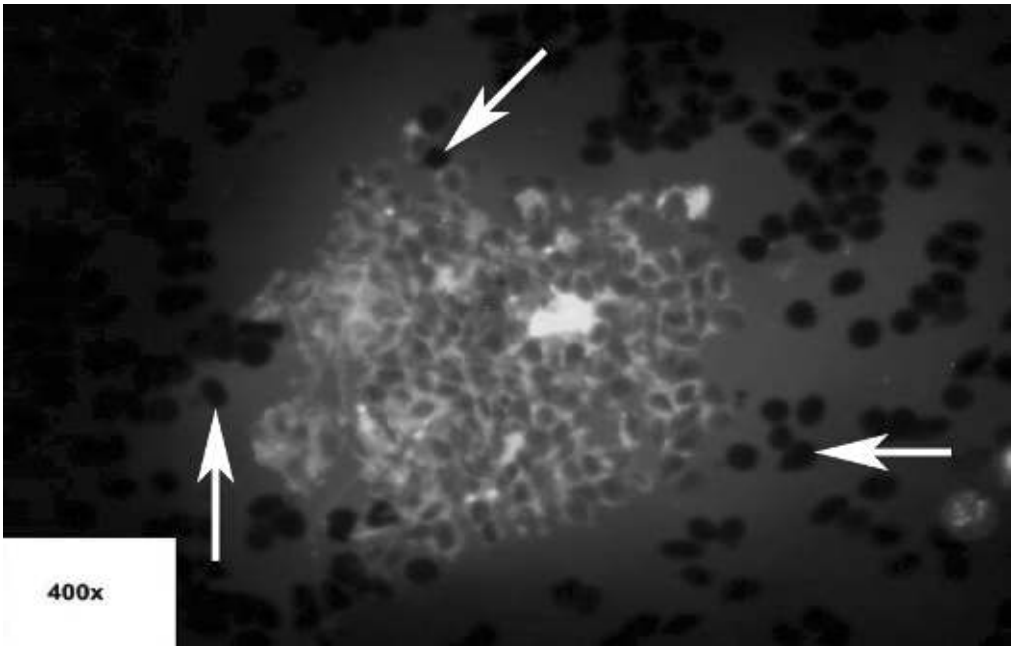
5 stages of biofilm development

- Stage 1: initial attachment of individual bacteria
- Stage 2: irreversible attachment
- Stage 3: maturation I
- Stage 4: maturation II
- Stage 5: dispersion

Each stage of development in the diagram is paired with a photo.

Monroe D. Looking for Chinks in the Armor of Bacterial Biofilms. PLoS Biol. 2007 Nov;5(11):e307.

Introductory Biofilm Images

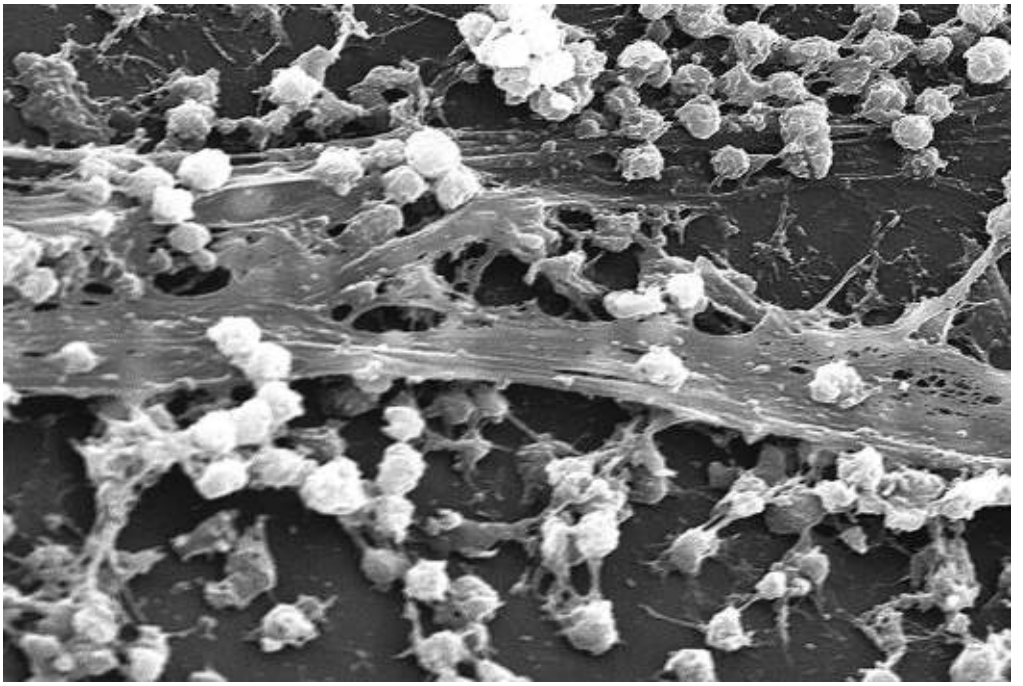


A new genetically unique biofilm-producing single-celled parasite named **FL1953** or **Protomyxzoa rheumatica.** (This special smear is the best way to detect these single-celled parasites in human bodies, since DNA or PCR testing is not always positive).

The hundred dark ovals on the outside of this image shown above are 8 micron sized red blood cells (RBCs). The center mass is a biofilm ball with many red blood cells in the mass of the biofilm.

This biofilm shown above is commonly found in those with tick-borne infections such as the very common Bartonella, the Lyme disease Borrelia bacterium, and deadly Babesia. While some tick-borne diseases may be worse than others or more common than others, all are potentially deadly unless eradicated. This parasite shown above is a single-celled infection related to Babesia and malaria, and when it is stripped of its biofilm, it looks like immature malaria. **According to the Centers for Disease Control, this is a unique protozoan. It is neither Babesia nor malaria. This infection is called FL1953** or **Protomyxzoa rheumatica.** It makes huge amounts of biofilm and the huge center mass in this picture contains hundreds of red blood cells.

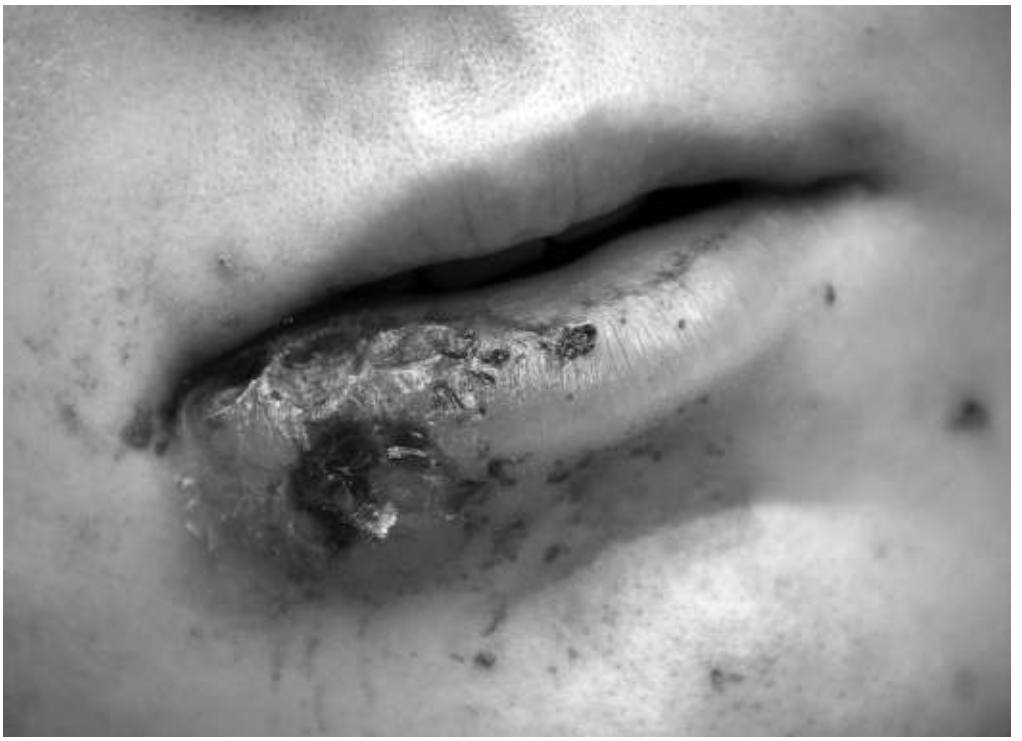
A Common Bacterium Found on All Human Skin



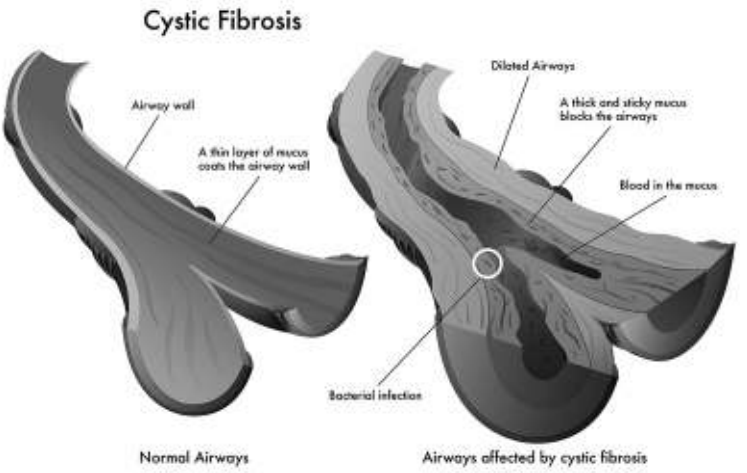
Staphylococcus aureus showing a biofilm found on the surface of a catheter. The webbing of the biofilm is easily observed. This is a profoundly common bacterium found on the surface of human skin.

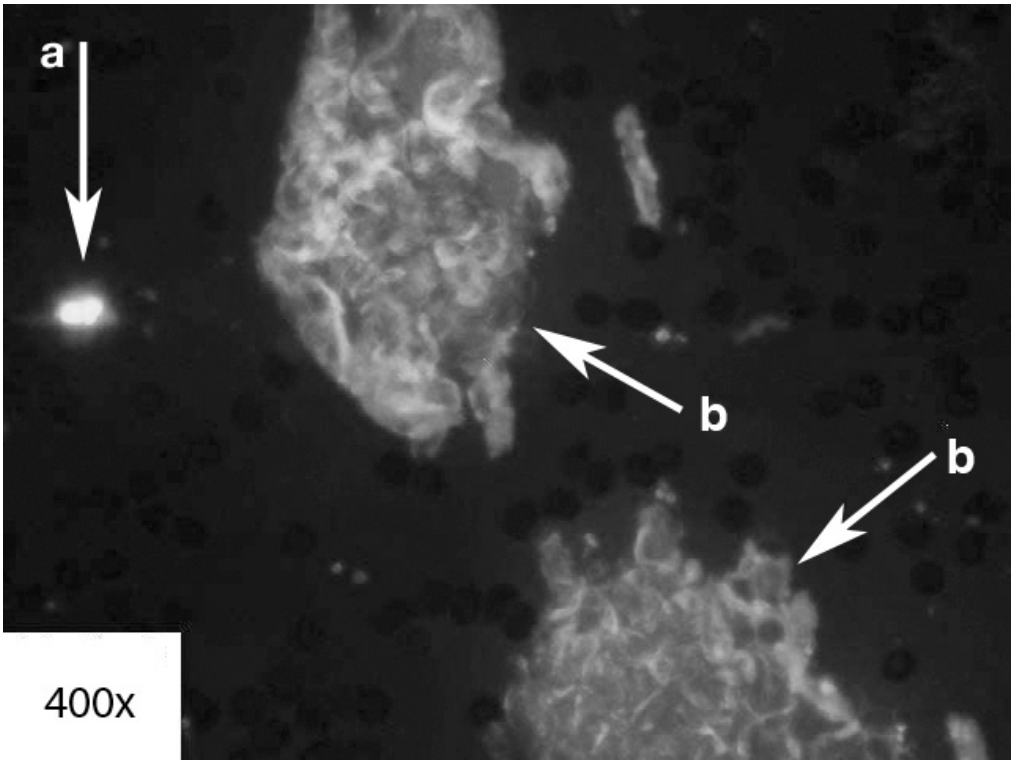
(Source: CDC. RM Donlan and J Carr, 2005).

"Staph" Infections Have Become Resistant to Most Antibiotics

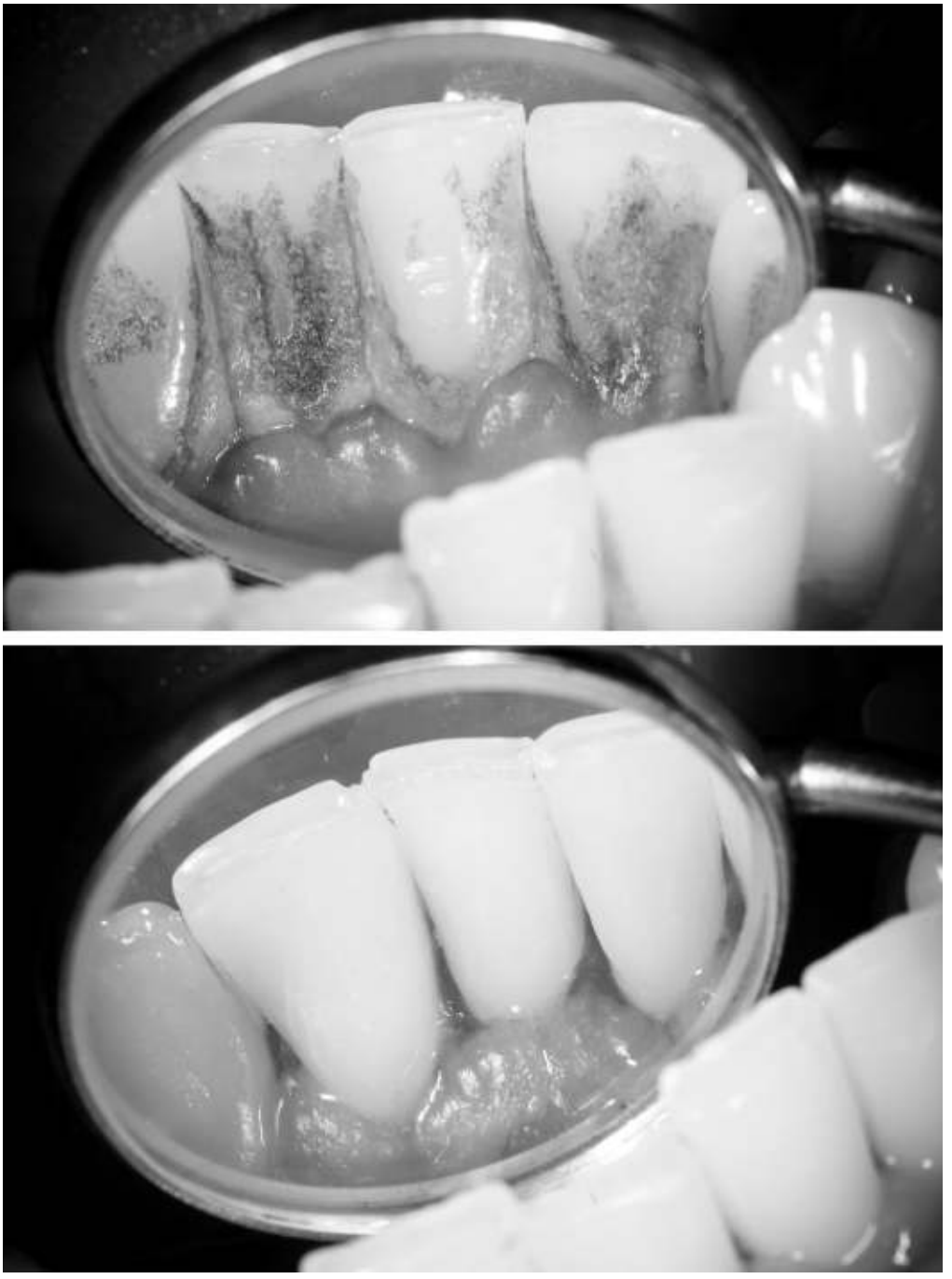


What do we offer this child when all patented synthetic antibiotics no longer work for this child's visible infection? Perhaps the new and helpful information gained from reading a book like this one, which assumes routine, tough and resistant infections like MRSA and those in cystic fibrosis, will provide a solid start.

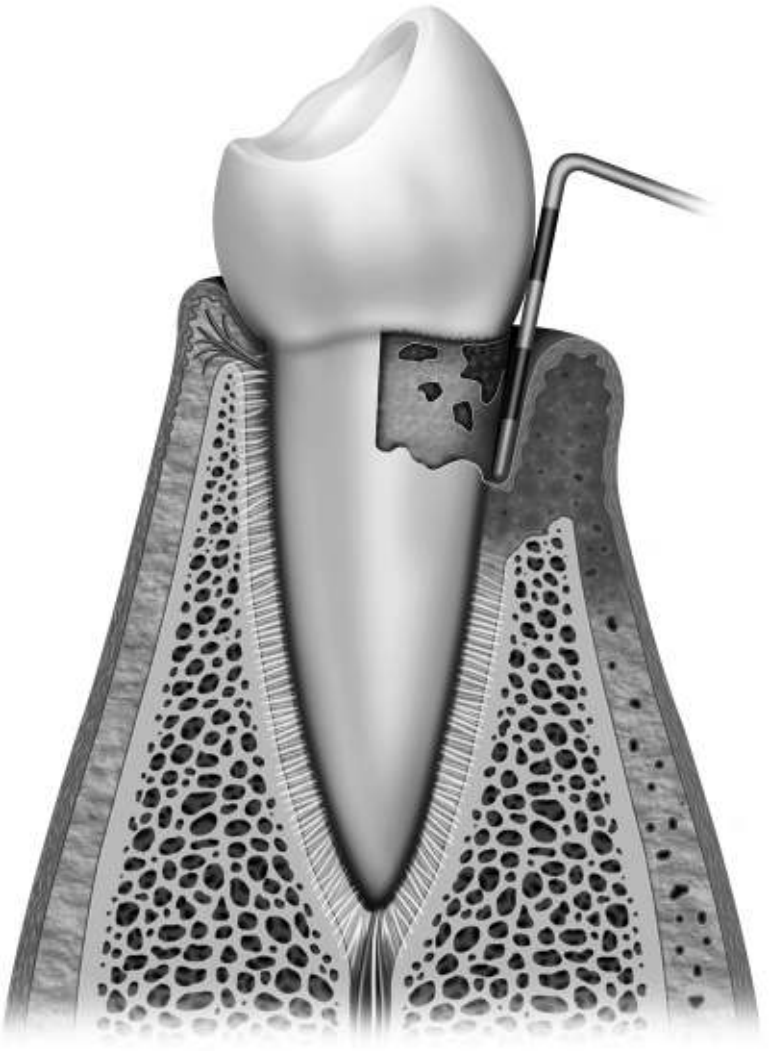




A white blood cell, (a) shown above, is seen as white. White blood cells fight infections and are larger than the smaller red blood cells. Seen in the background, red blood cells are seen as black and are either round or oval in shape. Two large complex white biofilm community structures are observed. Advanced complex stain technology was employed. Red blood cells contain the ring-shaped single-celled parasite, **FL1953,** that makes this biofilm. These rings are not genetically related to Babesia rings or young malaria rings. The ring form is not shown in this slide. This is a newly discovered organism, genetically different than other single-celled parasites, living in red blood vessels (Fry Laboratory 2013).

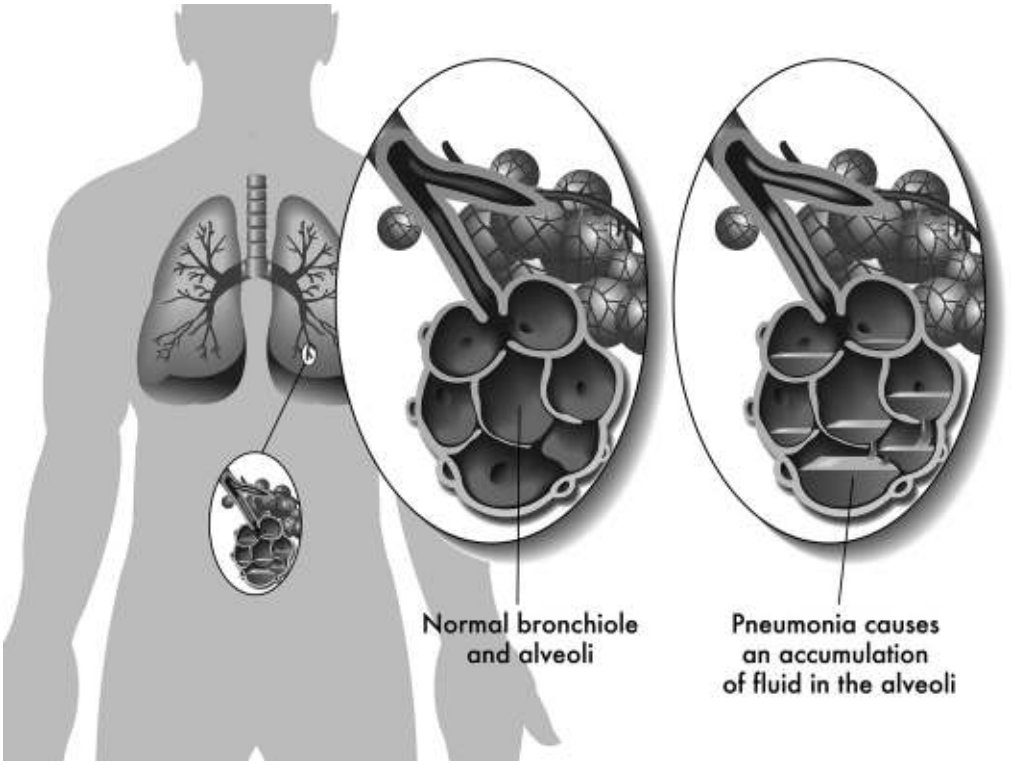


Dental plaque can be associated with biofilm makers. Dental hygiene such as teeth cleaning is healthy because it kills bad bacteria and allows "good" bacteria to survive.



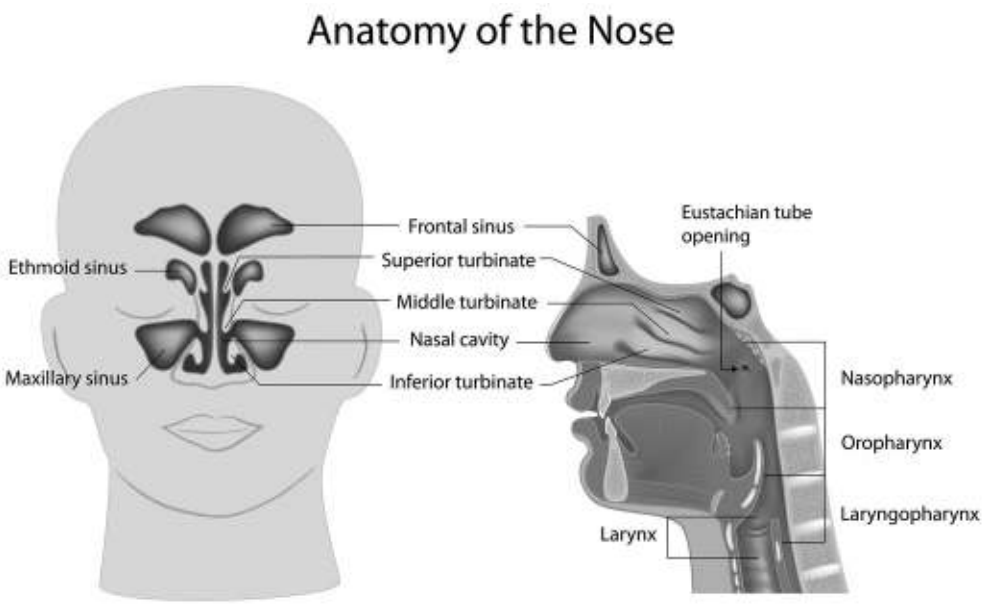
Increased gum disease can increase the risk of a heart attack. Dangerous plaque is due to the species of bacteria present and not the severity of the plaque.

A reviewer, “Michael,” read this book and recalled that Listerine did little without addition of essential oils. In order to treat his halitosis (bad breath), he paired eugenol from cloves (Clovanol) and cinnamon (Cinnamol) from North American Herb and Spice Company with Listerine. He used a mixture of 90% Listerine and 10% essential oils: Clovanol at bed time and Cinnamol in the morning. After 7 days of using this mouthwash, the biofilm cells that were responsible for his bad breath were destroyed.



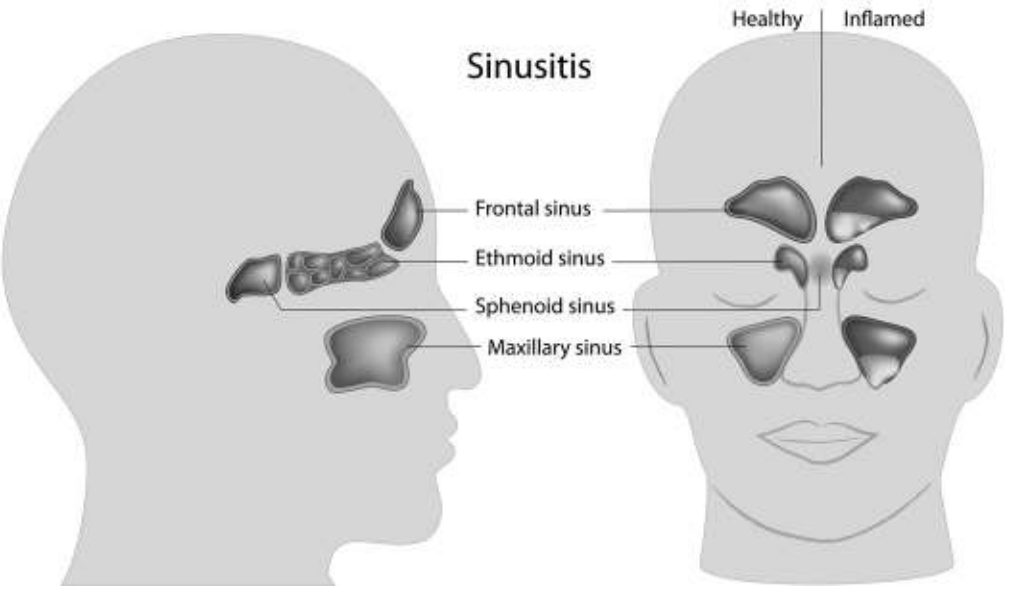
A lung infection routinely creates a biofilm which causes antibiotic penetration to be hindered.

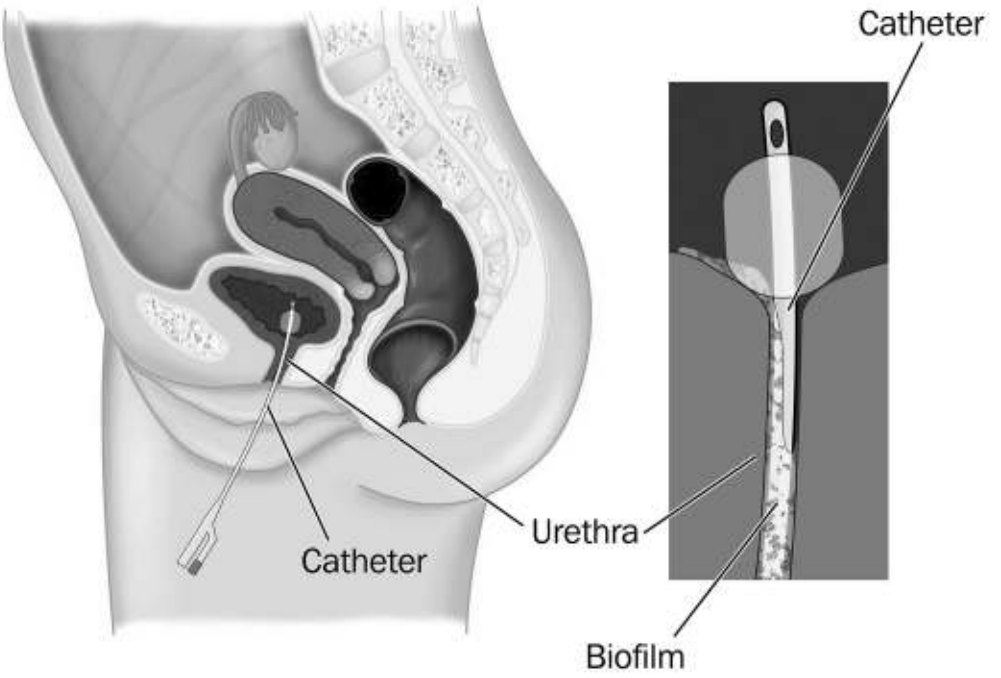
We believe you can undermine biofilm lung infections by agents that are inhaled or carried by blood to the area of the infection.



Sinusitis is inflammation of the sinuses. It occurs as the result of an infection from a virus, bacteria or fungus.

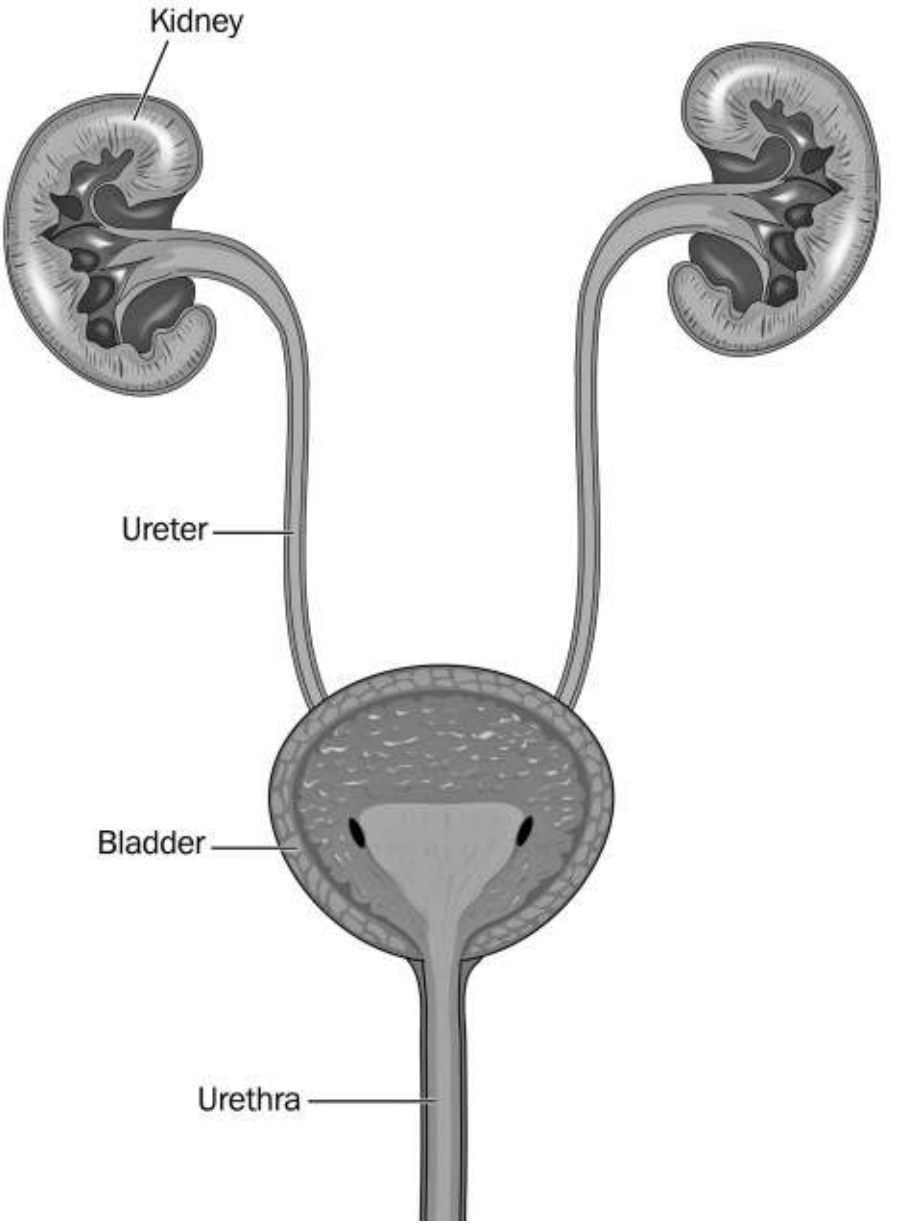
38 million people in the USA have sinus infections each year. These infections are often profoundly painful, to the point that a person suffering from one can have diminished function at work and in his or her personal life. These infections, often thought to be minor ailments, can even cause death.





Any foreign body can develop a biofilm. Compare a biofilm in the body to a boat with huge growths on the hull. They are biofilm agents, cause huge drag, slowing the boat and consuming energy just as biofilms do in the body.

The image above shows a catheter to remove urine. If biofilm infections grow on metal, plastic or ceramic, they can grow on virtually anything. This means biofilms can grow on silver coated objects placed in the body to defeat biofilms. Bacteria can live in silver mines.



Urinary tract infections (UTIs) are among the most common bacterial infections, accounting for a significant part of the workload in clinical microbiology laboratories. Intestinal or enteric bacteria (in particular, Escherichia coli) remain the most frequent cause of UTIs, although the distribution of pathogens that cause UTIs is changing. More important is the increase in resistance to some antimicrobial agents, especially the resistance to trimethoprim-sulfamethoxazole or Bactrim as seen in E. coli.

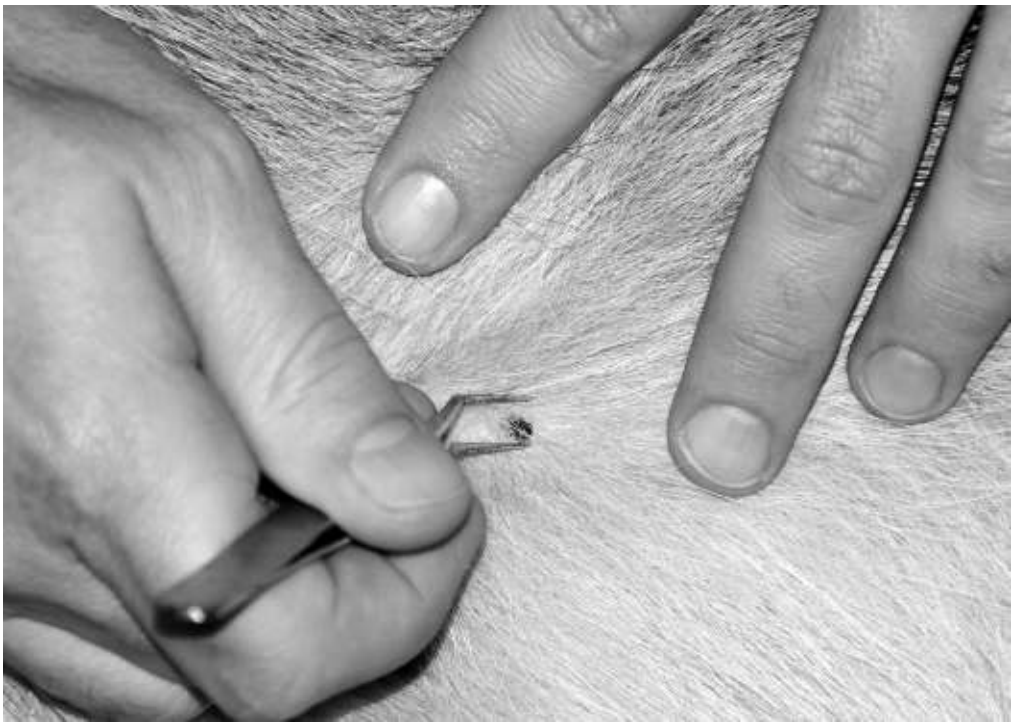
One problem in both the bladder and vagina is the presence of the wrong sort of bacteria. Vaginal probiotics seem to have helped many women suffering from this problem, and Natren Gy-Na-Tren is one respected option for them. Too many patients, however, suffer needlessly due to never being taught that spermicides kill the required good vaginal bacteria and that lack of flora results in yeast infections.

http://cid.oxfordjournals.org/content/38/8/1150.long. Accessed March 8, 2014.

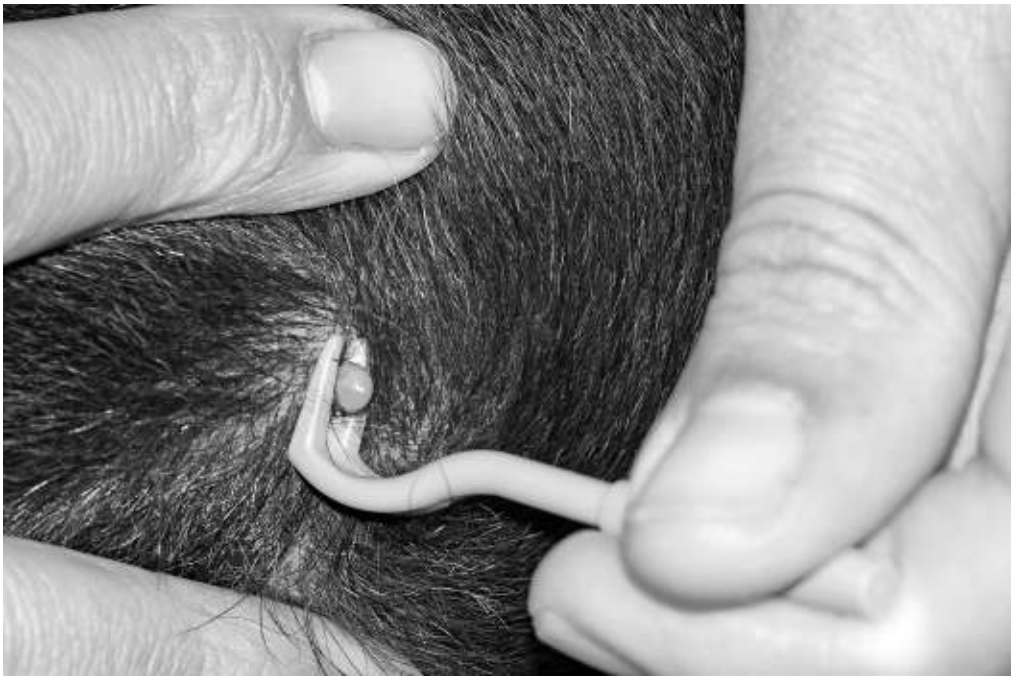
As we are looking at different organs and causes of biofilms, we should not leave out a vector of biofilm infections carried by over 200 living things in at least three continents—the Ixodes tick. It carries at least two serious biofilm makers: **FL1953** and the highly complex genetically advanced Lyme bacteria. We are still learning about all the possible infections it carries.

Please note the hair looks like large grass, so this tick is a fraction of this size. When you combine invisibility with a bite that has a pain killer, an anti-histamine, an anti-coagulant and an anti-inflammatory agent, you have a stealth infection carrier. One tick saliva chemical, Sialostatin L, is such a good immune suppressing enzyme that it may inhibit asthma (Horka 2012).

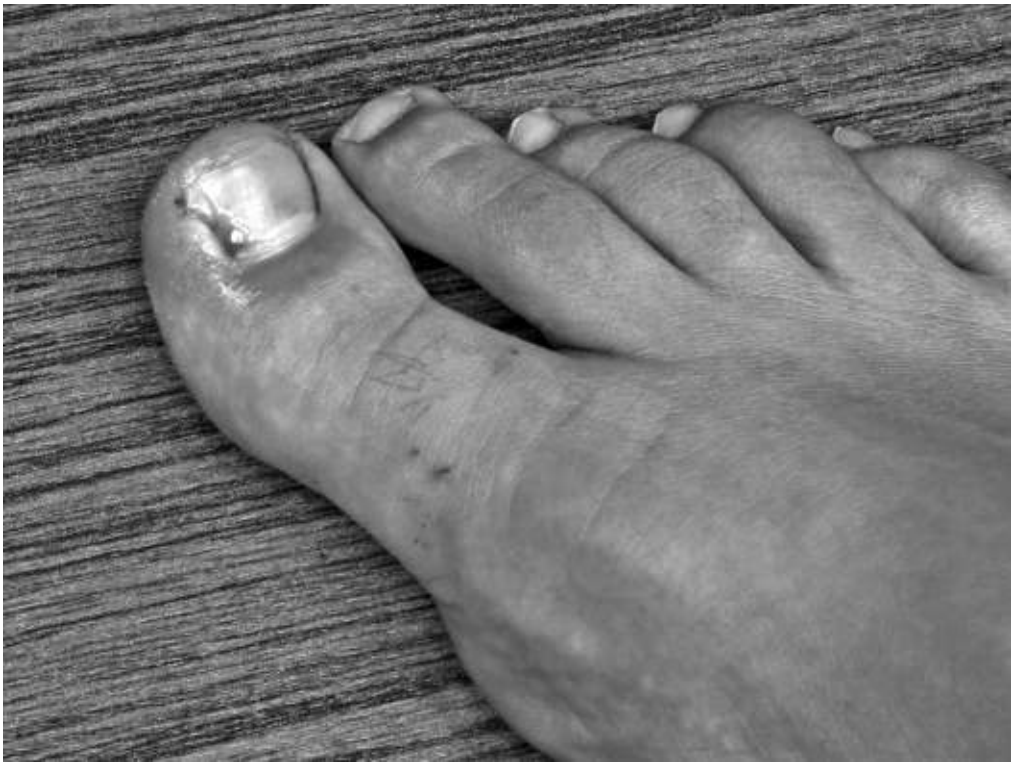
Horka H, Staudt V, Klein M, Taube C, Reuter S, Dehzad N, Andersen JF, Kopecky J, Schild H, Kotsyfakis M, Hoffmann M, Gerlitzki B, Stassen M, Bopp T, Schmitt E. The tick salivary protein sialostatin L inhibits the Th9-derived production of the asthma-promoting cytokine IL-9 and is effective in the prevention of experimental asthma. J Immunol. 2012 Mar 15;188(6):2669-76. doi: 10.4049/jimmunol.1100529. Epub 2012 Feb 10.



Dogs can be man's best friend, but not if you touch their saliva and not if they bring ticks or fleas into your home or car. Assume that every dog and cat that lives outside a city probably has had tick or flea bites.



We strongly suggest not routinely wearing the foreign body known as contact lenses while you sleep. Storage containers can have biofilm bacteria **even in the presence of hydrogen peroxide and chlorine cleaning and storage systems.** Many studies have shown the presence of diverse classes of fungi with biofilms present in the eye infection. A biofilm significantly adds to the power of bacteria and fungi to harm the eye. Some researchers feel biofilm eye infections are more common than we believed in the past, and some of these bacteria can harm the eye.



This toe appears to have fungal and bacterial infections which can have biofilm protection. This infection is not trivial and in a diabetic patient might result in an amputation or death.

A physician is doing an ear exam with a very patient girl. He is going to check for infections in the ear canal, infections against the tiny membrane that moves slightly with sound and to look through this tympanic membrane or "ear drum" to see if fluid or pus exists on the other side. This exam will also help to determine if the tube going from behind the ear drum, called the eustachian tube, is infected. This small tube connects the middle ear to the airway in the back of the nose.

Many parts of the visible ear, the inner ear and the tube between the inner ear and the top of the throat can have biofilms that ignore routine antibiotics. The ear drum is often as far as you can see into an ear. If infections repeatedly live behind this thin membrane, "ear tubes" are considered. Ear tubes can also collect biofilms.

We do not want any infections, and certainly not biofilm infections. Some self-healers feel a number of plant based treatments help ear infections that are not defeated by common antibiotics like amoxicillin or stronger Augmentin, which has a resistance fighter combined with amoxicillin. I caution everyone to read fully about treatment in terms of how it impacts the middle and inner ear, before tossing in an acidic oil that quickly makes contact with the very sensitive outer ear.

Biofilms are Ignored by the Medical Community

When was the last time any professional licensed healer mentioned this word to you? “Biofilm.” The good news is that research all around the world is finding solutions and more are coming, but, often **knowing them requires self-study.**

The causes of low biofilm knowledge in healers include the immense time and expense involved in training physicians and the massive volume of information available. Therefore, the science used by doctors is usually conservative and limited to that being used at the time of their training, which can strongly limit creative solutions in medicine. Many new doctors limit their reading to three journals because their teachers felt these three journals were the best to stay current. Biofilms may not even be mentioned in them yet.

Most physician education is limited to current synthetic medications. Synthetic medications can help destroy some biofilm infections, but it is common for the infection eventually to defeat the synthetic antibiotic biofilm treatment and also to defeat its back-up antibiotic.

Making "Biofilms" Clear

A biofilm is like a dime in the center of a pool of olive oil, and on the outer edge of the oil is pepper representing infection killing cells. They cannot move in to destroy the dime. Biofilm bacteria communities are the usual state of most human infections. We have been taught that infections are isolated bacteria floating around and this is a serious error. It shows how far we need to go in science if the main form of bacteria—biofilm bacteria communities—is a new, but crucial, concept. When I made a list in 2004 of twenty-five options to kill biofilms, there wasn't much interest.

> Today, the inability to destroy biofilms with diverse options is literally a health disaster.

The goal in writing and publishing this book is to make an affordable research-based set of options along with other possible options, to present a pure book of solutions offering the newest possible current and up to date solutions for the hundreds of diseases associated with biofilms. The barrier of a biological film can be utterly impossible to remove or penetrate with the routine options used by physicians, infection specialists, naturopaths, alternative medicine schools, essential oil practitioners, acupuncturists, nurse practitioners or herbalists.

With this book we hope to serve you and your physician/healer by the exploration of options available now. We searched the past five years of publications on PubMed—the massive database for medical science—for "biofilm treatment." The range of options is impressive and not always things you might expect. This book is meant to give you broad options to prevent your suffering, disability and even death.

After years of research and study, I have come to realize that the infectious disease "experts" on biofilm may have long since lost the war, and in fact, many may not ever have been aware of all the battles. Pa-

tients and researchers were learning basic things about infections in 2012 and 2013 which shatter trust in infection specialists. **Most people, and infectious disease doctors themselves believe that an infection physician knows all infections.** Much of their work is related to HIV, Hepatitis B and C, Tuberculosis, strong pneumonia, the antibiotic resistant staph infection MRSA, sepsis [bacteria in the blood], post surgical infections, Flu, Meningitis, Rotavirus, Streptococcus, Clostridium difficile (caused in part by lack of knowledge of the benefits of high quality probiotics), infections of various body part implants, and a finite number of other serious infections. Many of these are very hard to treat, such as AIDS, which requires the care of someone trained in very advanced medical science.

The point is, however, that infection physicians do not usually have the time to research all the options to handle biofilms because even to become an infection "expert" on just one infection, it takes about a year to read all the applicable articles, ponder, and see how they may apply to many people. Therefore, our goal is to advance this area involving all healers and millions of patients.

Most traditional healers are limited by the options of pharmaceutical companies. I have appreciated receiving small grants awarded by some of these companies in the past. They have given me grants knowing the resulting information published was outside their control. It is not true that all synthetic medications are bad, however, some can be dangerous to use and some can be far worse options than those used in functional medicine or by integrative physicians. On the other hand, the situation could be better if the education on effective dosing, delivery flexibility and risks of many alternative treatments, herbs, etc. were better.

Starting with hospitals and traditional medicine, the current approach of removing biofilms using another antibiotic or other patented synthetic agent will fail today or next year in many or some cases. Profoundly unique agents that block signals between the bacteria involved in making the biofilm "fort," or the use of virus carriers to attack some part of the biofilm, will likely be introduced soon, along with dozens of other

advanced options. Much to our detriment, we do not have them now. The FDA approval hurdle is massive and takes many years.

The current treatments offered in integrative, alternative or functional medicine are often too simplistic, but some useful ones you may see are available today. At the other extreme, routine allopathic MD medicine seems to feel that only prestigious schools have solutions right now from multi-million dollar studies—they do not. Even some patients with biofilm infections who are very sick or dying in many traditional hospitals or under routine medical care are frankly "left by the side of the road" to suffer, become disabled or die.

Alternative or functional medicine options often result from very poor reasoning based on limited information. The most common trouble might be that treatment "d" or "e" or a mix of treatments "abcdefghijklm" helps Tom or Ann, so they are excited. They have found gold in the backyard, and in their sincere joy, they post this information. When research assistants follow up with these patients in one to three years, they are typically worse.

Smart physicians and other healers of any philosophy or training do not appreciate that destroying pathological biofilms is like trying to open a steel door using a banana as the key to a two ton lock. The limited treatment and supposed cures of many physicians and healers trying to remove biofilms did not take place when checked by long term follow up.

Preventing Suffering, Lower Functioning, Disability and Death from Biofilms

New Profound Education of "Biofilms" is a Health Emergency

As you are reading this, you likely have some infections hiding in their fortresses of biofilm. When you ponder your loved ones and closest friends, some may feel great, and some may feel fair or poor due to this slime defense that makes the immune system and routine treatments utterly useless.

Let me say this very clearly.

It is highly likely that some of you or your relatives have biofilm infections today that are not able to be treated because no optimal treatments are known to your healer. Clinicians and even full-time researchers do not have this information. Either you, your loved ones or both may become disabled or even die due to an infection or infections in biofilms and nothing will work in traditional or alternative medicine. We want to change that reality.

I was talking to a fellow scientist the other day, and after he read this book, he was fairly shaken, and said, "Oh my heavens, this is deadly serious stuff!" In contrast to other books, information about biofilms applies to ***every age and every reader.*** Biofilms cause disability and death in millions of people worldwide.

I once had a pool that taught me the power of biofilms to make medicine completely and utterly useless. It shows why your precious time is not wasted here.

After skipping two weeks of pool cleaning, a five by five foot patch of dark algae was at the bottom in the shallow end. Since no one was going to use it for many days, I placed immensely powerful four inch solid

round chlorine tablets to boost the ozone cleaner, and afterwards placed these very strong tablets **directly on the algae**…to no effect. So I added high potency acid that could rip off skin, also to no effect. Adding more chlorine, acid and algae killers did nothing.

So, since all was lost … and I was out of ideas, I read the owner's manual.

"Brush?" I thought. "This is the age of technology and super science." I left and came back the next day. The algae were doing the tango and eating bonbons, happy and living the high life. So I brushed it. In two minutes the algae were utterly obliterated. I removed the thick clear film covering it, and all my excessive poisons rushed it like a tidal wave.

That is what this book is about, reversing health failures caused by this routine defense-biofilm slime layer around infections.

Eliminating Biofilm First Makes Antibiotics Effective

To understand fully what you are reading, and see how it can help reverse pain, annoying persistent health troubles, disability and prevent death—we offer this potentially life saving information. Around the world, resistance is rapidly increasing to commonly used antibiotics, such as thirty million pounds used in USA food animals and aquaculture to increase the speed of growth—this is 80% of all American antibiotics (WedMD).*

"Resistance has emerged for all known antibiotics in use…[Resistance]…has…[emerged]…in hospitals, farms and aqua-culture ponds. Strains of bacteria resistant to antibiotics were shown to exist all around the world as early as the 1950s. In past years, only one new antibiotic class has been invented, the first since the 1970s. "We've come to a point, for certain infections, that we don't have [antibiotic] agents available," says Michael Blum, an FDA antibiotic expert.**

Part of the resistance to infections is caused by biofilms more complex than the simple algae film in my former pool. They are more like advanced military castles.

*The Use of Antibiotics in Food Producing Animals: Antibiotic-resistant Bacteria in Animals and Humans,' Joint Expert Technical Advisory Committee on Antibiotic Resistance (JETACAR) Canberra. October 1999.

**http://dwb4.unl.edu/chem/chem869k/chem869klinks/www.fda.gov/fdac/features/795_antibio.html. Accessed March 18, 2014.

Very Short Samples of People and Biofilms

In 2004, Richard Longland recovered very poorly from a mystery disease after spine surgery. In the months that followed, he suffered from many problems—headaches, joint pain, and later cardiac and brain issues, brutal fatigue and trouble thinking.

The medical system opposed him, but finally, in 2007, he was treated for mycoplasma that came from a possible surgery process, any place in the hospital or in a public location or a tick.

Most of my patients have seen 3 to 200 doctors before coming to me. I understand his experience. Mr. Longland had to see over twenty doctors for a diagnosis. During this difficult period, he created a superior film called "Why Am I So Sick?" He is a patient-champion of using pharmaceutical and naturopathic agents to rid his body of systemic bacterial biofilms.

***

Edward is 78 years old and he has three daughters and eight grand children. He was hospitalized for shortness of breath. He has a bad pneumonia or an infection in his lung. He is getting worse. Individuals have recovered using agents that defeat many biofilm-protected pneumonias.

***

Linda has been tired for some years and has trouble with school. I recently found she has a number of tick infections which have caused **over fifteen lab results to be abnormal.** Yesterday she called, and due to a pain behind her knee, I told her to go to the ER. In less than a day, she was found to have 23 clots in her lungs and legs. She suspects it is Babesia, inflammation and **FL1953**. We had agents that killed these agents, including FL1953, in 2006.

***

Kelly has had sinus troubles on and off for many years. She has read a vast range of books and some treatments help, but the sinus trouble comes back eventually. On special imaging, it was found she had a couple of infections showing a high amount of biofilm protective material. Her treatment was adjusted with options in this book to undermine her biofilm infections, and for fifteen months she has had no more sinus trouble.

***

Leonard has had aches in his sinus area for many years. Four surgeries and eight medical visits later, he still had daily left and modest right cheek pain. He followed some of the options in this book with his doctor and is doing exceptionally well.

***

There are likely over 100 major common illnesses involving these biological films.

- If resistance to antibiotics continues to increase in large part due to due to improper use in humans and over-use in food animals, and biofilms grow in frequency and toughness, **we may return to the pre-antibiotic world where a simple infection killed you or your loved ones.**
- **Biofilm infections are the number one medical cause of death for children under six.**

- Many infection doctors notice an antibiotic fails due to a resistant infection in a biofilm, but **the only option they have is another synthetic antibiotic.** That is like trying to use a pea shooter to break down a steel wall.
- Thankfully, there are dedicated research clinicians interested in solutions: people who think and treat ill people and also take immense time to read and research.

Solutions

The options offered here exist now or are possibly coming in the next year. Yet they often do not have dosing information. **Dosing should reflect how many medical problems exist in a patient along with a consideration as to the patient's age, weight, medical history and body's response and the determination of what strains of infections are involved.**

Not even a fast food restaurant has only one option for a protein meal, side options, or drinks. Multiply that 30 item menu by a trillion and you are getting closer to the complexity of the human body and its response to infectious agents. Please also understand that many or most of these pathogens have effects on vast numbers of body systems, so checking six tubes of blood is a simplistic 1970s denial of the fact that infections can domino through many human biochemical systems.

Years ago, I wrote a dozen books on Bartonella, Babesia and Lyme disease for a few thousand readers. These readers wanted enough information to self treat, or have their healers be able to make them 100% better. What do ill and frustrated people do when a book is not infinite? They can become frustrated and blind to things like the creation of a dermatology physical exam to help diagnose an infection that is highly common, and, at times, can turn off antibody reactions to miscellaneous tick and flea infections. The cost to search extensively for this infection using all the best tests from three laboratories is likely over $1,500 USD. The book was a fraction of this cost, and reported that our patients with treatment failures were showing very clear presence of this bacterium and other infections, hormone alterations, anti-inflammatory system drops and nutritional changes. In seven years it appears only **one** Carolina researcher has made any **major** contribution to the information on Bartonella and Babesia.

My point is that I agree with a respected herbalist who offers some proposed herbal infection treatments, and I like the information he lays out as he firmly expects readers to act like adults. It is realistic to understand that this book will NOT replace fifty hours with a top research and

clinical physician. However, if you get ten useful points from this book, which will be new, pearls not previously known, then I have reached the goal in writing this book.

For many clinicians and researchers the costs are prohibitive in time and income given to reading books and studying thousands of articles. Those who then go on to write books usually do not make back a fraction of what they put into the effort. This reality stops good clinicians and authors from writing other books that might help you.

The material below lists biofilm treatment options found in the literature. I hope they are of use to people who feel the destruction of biofilms creates greater success in the treatment of infections.

> Your infection may not be listed here. But these solutions do not apply to one infection. At least you and your healer can make educated trials.

I also hope that physicians may find some information of use in hospitals, nursing homes and other medical facilities. Yet **my experience with my academic medical books is that 98% are read by smart, motivated and eager patients.**

Biofilms Are Very Diversified

Two Minute Solutions are Flawed

One of the erroneous notions about different kinds of biofilms is that they are fairly similar. This leads to the specious logic that **if treatment a, c and m work on a wound or a lung infection with a biofilm, it will work on the others, such as a biofilm-protected Candida infection, FL1953, Lyme or a serious sinus disease. This is as flawed as saying every house key works in every house lock.**

Examples of Profound Biofilm Diversity

New and mature biofilms are not the same.

Metals can be found in biofilms, and have a modest role, but they can also merely exist on the surface or just slightly peppered throughout the film.

The components of biofilms differ depending on the infection.

Response to enzymes is variable.

Response to essential oils is variable.

Response to antibiotics is variable-both synthetic and herbal.

The available materials to build the biofilm vary among species and within a species, meaning that a biofilm of the same bacteria will differ between a dog and a human. Also, a healthy man taking supplements, and a man that eats rarely and has many diseases will not have the same biofilm.

> It would be an error to say that nattokinase, lumbrokinase, serrapeptidase, EDTA, gentamicin, vancomycin, Samento, Banderol, olive products, poorly known herbs with fair lab testing in humans, clove bud oil, diet, chelation, three to four part amino acid mixes, NAC, Rife, diet changes or a vast range of other options not listed, will **work for all biofilms.** For example, an elderly patient dying of a lung infection or another person with painful and treatment-resistant sinus infection *will not* have the same biofilm.

As a trend, trying different options to destroy a biofilm is less dangerous than allowing it to spread.

The Double Punch

Bacteria with Biofilm and Drug Resistance

Skipping the biofilm part of this double team, I only want to quickly mention infection resistance to antibiotics.

Currently, I have a patient under the care of an infection physician, Dr. M.P. Worstod; he prescribed "brief" antibiotics, and C. difficile emerged with its characteristic diarrhea and other possible serious effects. It is speculated that the C. difficile might have come from exposure to a relative who repeatedly visited a hospital where Dr. Worstod is the antibiotic consultant. He prescribed vancomycin which vast research shows often fails to kill C. difficile. (Also, Dr. Worstod did not include any good probiotic strains to displace the C. difficile—he does not know about optimal probiotic strains).

The point here with Dr. Worstod? Virtually every treatment for any type of infection no longer works with some infections, yet these treatments worked well in the past.

In a review of every major class of synthetic pharmaceutical antibiotics, editor Douglas Mayers assembled a superior wealth of profound bacterial resistance approaches. In a careful review of each family of antibiotics, I was left wondering what synthetic antibiotic will be used with confidence in ten years. (See *Antimicrobial Drug Resistance, Volume 1, Mechanisms of Drug Resistance, 2009*).

Returning to the **sincere but ineffective use of vancomycin,** I was very surprised that a very smart Dr. Worstod could only consider another antibiotic after the failure of a synthetic antibiotic. The notion that a phenomenal basketball athlete like Michael Jordan could also play another sport such as track running is very rare. Synthetic options are very limited. We lose a part of medicine when solutions for the real clinical world come only from massive corporations, who routinely ignore fantastic superior products that arise outside of their domain.

A drug company, an insurance company or the government should never have authority over the role of the healer which is immense. If the only medicine we will have will be where physicians report to lawyers, the government run by lawyers and MD's on the payroll of a lawyer, insurance companies or politically-focused physicians, we will have junk medicine.

And even "peer-review," in which physicians review and evaluate new science that is over their heads, is limiting. I have been a reviewer and have been reviewed, and it is a reasonable system, as long as the editor is aware of medicine's resistance to change. When asked about *preventative probiotics,* Dr. Worstod paused and said he does not use them, probably meaning that he could not tell you what to try or if it is worth doing. It is likely that some "alternative" medicine physicians or even veterinarians can point out the brands that offer what many healers were doing 15 years ago—**only using strains that bind to human intestines, proliferate to take over the intestinal wall and work together.**

Many hospitals can have resistant bacteria as we know, but many common locations can also have them—like vast numbers of rivers when billions of gallons of rain hit any part of a community. Rain water and sewage can often be mixed in some communities and the strains can be resistant. A famous Ironman competition in the huge Hudson river was cancelled due to the presence of high bacteria levels and four resistant strains in the river.

Specifically, Young published that she found in the Hudson River sickness-producing Pseudomonas, which can cause everything from swimmer's ear and skin rashes to pneumonia; Acinetobacter, also linked to pneumonia and blood infections; Proteus, which causes urinary infections; and Escherichia, commonly associated with food poisoning.

These bacteria were resistant to ampicillin and tetracycline, drugs commonly used to treat them (James M. O'Neill, for www.northjersey.com, Friday, July 19, 2013).

Antibiotic-Resistant 'Superbugs' are a Grave Threat 'In Very Near Future'

The Lancet published a a dire warning on "superbugs" that are resistant to antibiotics.

The article points to a danger that isn't some far-off concern, but something "in the very near future." In just 20 years, routine surgeries such as hip replacements could result in death if the patient develops an infection, said England's Professor John Watson.

Routine bacteria death levels "might return to those of the early 20th century." Without antibiotics, minor infections could kill you and would put an end to basic and advanced surgery.

Patients need to stop demanding virus infections be treated with antibiotics. Routine antibiotics in animal feed is a disaster. (*Lancet.* Nov 2013 summarized by Greg Richter *Newsmax.* November 18, 2013)

A Brief Word on Biofilms in Lyme

At times, individuals who have tick- and flea-borne infections, like Bartonella, Babesia and Borrelia (Lyme disease), can feel their treatment is minimal or incomplete. Debates rage over the diagnosis and treatment of Lyme and tick-borne diseases; whether the pain is from residual dead infection incorporated into tissue or one of the many infections carried by the I. scapularis tick, we still have patients' misery.

After writing **twelve books** which include many pages on non-Borrelia infections, "Lyme testing" seems like alphabet testing in which ***one only looks for the vowel "a."*** Due to the lack of acceptance of the number and complexity of tick-borne infections, there is a lack of up to date education, leaving quality medical doctors to evaluate tick and flea infections in the ***abstract,*** by which I mean that they very falsely and sadly do not realize the full magnitude of ***"the alphabet."***

Specifically, they "diagnose" by ignoring inflammation alterations, nutrient changes, hormone deficits, immunity changes caused by tick-borne infections, and chemicals made or suppressed by direct tick and flea infectious agents. I discuss these in my three most recent tick and flea infection books. All are available in English. All can be found free through inter-library loan, for less than $20 USD, or at www.personal-consult.com under the "free books" button. No one can expect to become an expert in this massive area after reading any guide or merely going to ten conferences, because these cluster infections impact twenty areas of medical and scientific knowledge.

In the last four years, researchers like **Dr. Eva Sapi have shown Lyme is like some other spirochetes—it has biofilms. These are very tough biofilms to defeat unless caught in the "acute stage."** A tough, "mature biofilm" allows organisms to "**laugh at" many antibiotics.**

Some medical professionals interested in Lyme often ignore the immune suppressing Bartonella bacterium, which is more common than Lyme. Ignoring coinfections may increase the risk of fatality with Babesia and possibly **FL1953**. These healers also may not realize that the highly

genetically complex Lyme spirochete appears to have a troublesome biofilm. Performing a simple direct test at laboratory companies whose testing kits have reduced sensitivity will probably result in more negatives for tick-borne diseases. The ultimate result is anti-science and anti-truth. Searching for tick infections with one test is like writing in "Lincoln" at the next presidential election.

Lyme Disease (Borrelia) and Biofilms

Several researchers believe *Borrelia burgdorferi,* the active agent of Lyme disease, has biofilms. Lyme organism biofilms have been found in culture and in the tick gut. Lyme cysts and biofilms have also been noted in patient skin biopsies using focus floating microscopy according to Dr. Eisendle publishing in the *American Journal of Pathology.*

Further, we see in Lyme that biofilm formation is dependent on cyclic di-GMP expression and we see that in Lyme (Stricker and Johnson).

Brihuega B, Samartino L, Auteri C, Venzano A, Caimi K. In vivo cell aggregations of a recent swine biofilm-forming isolate of Leptospira interrogans strain from Argentina. Rev Argent Microbiol. 2012 Jul-Sep;44(3):138-43. PMID:23102459

Cogoni V, Morgan-Smith A, Fenno JC, Jenkinson HF, Dymock D. Treponema denticola chymotrypsin-like proteinase (CTLP) integrates spirochaeteswithin oral microbial communities. Microbiology. 2012 Mar;158(Pt 3):759-70. Epub 2012 Feb 7. PMID:22313692

Sapi E, Kaur N, Anyanwu S, Luecke DF, Datar A, Patel S, Rossi M, Stricker RB. Evaluation of in-vitro antibiotic susceptibility of different morphological forms of Borrelia burgdorferi. Infect Drug Resist. 2011;4:97-113. Epub 2011 May 3. PMID:21753890

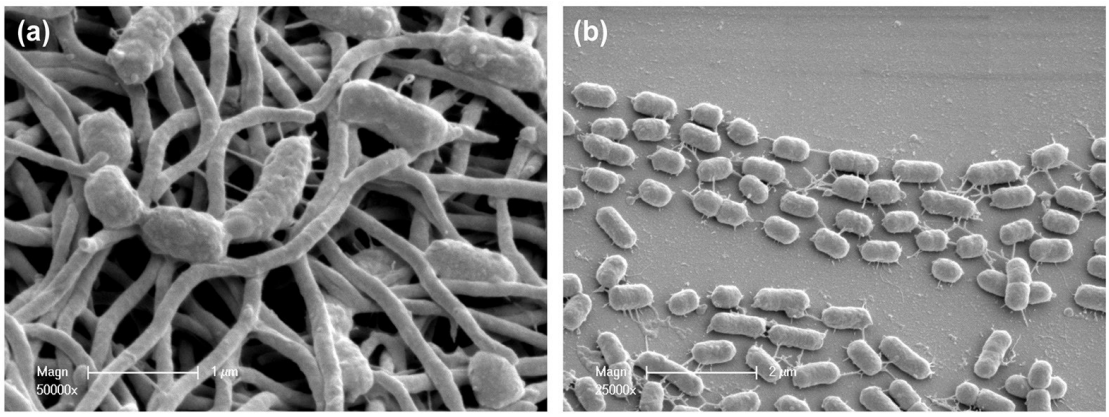
Stricker RB, Johnson L. Lyme disease: the next decade. Infect Drug resist. 2011; 4: 1-9. PMID: 21694904

Sapi E, Bastian SL, Mpoy CM, Scott S, Rattelle A, Pabbati N, Poruri A, Burugu D, Theophilus PA, Pham TV, Datar A, Dhaliwal NK, MacDonald A, Rossi MJ, Sinha SK, Luecke DF. Characterization of biofilm formation by Borrelia burgdorferi in vitro. PLoS One. 2012;7(10):e48277. Epub 2012 Oct 24. PMID:23110225

Two Different Bacteria in One Biofilm Spells Disaster

Common Dental Hygiene

Treponema denticola is an oral spirochete that has been strongly associated with chronic periodontitis. It exists in deep plaque and is shown below.



The left panel shows P. gingivalis cells associated with a T. denticola microcolony; the right panel shows P. gingivalis cells at the outer edge of a T. denticola microcolony. **This is a two infection biofilm community of the mouth.**

In the genes of the spirochete T. denticola, there was also an upregulation of genes encoding several virulence factors, toxin-antitoxin systems and powerful enzymes. These powerful weapons found in T. denticola mean it has in place a very effective and routine potential for genetic modifications to survive in human tissue when growing as a biofilm.

Zhu Y, Dashper SG, Chen YY, Crawford S, Slakeski N, Reynolds EC. Porphyromonas gingivalis and Treponema denticola synergistic polymicrobial biofilm development. PLoS One.2013 Aug 26;8(8):e71727. PMID:23990979

Mitchell HL, Dashper SG, Catmull DV, Paolini RA, Cleal SM, Slakeski N, Tan KH, Reynolds EC. Treponema denticola biofilm-induced expression of a bacteriophage, toxin-antitoxin systems and transposases. Microbiology. 2010 Mar;156(Pt 3):774-88. Epub 2009 Dec 10. PMID:20007650

Sample of Biofilm Care

A Biofilm Approach to "Lyme Patients"

Let us use Lyme as a sample of some concerns in treating other biofilms, especially complex ones.

One concern in complex biofilms is that infections caught in the biofilms can be released by biofilm killers, making the cure actually a mechanism to spread the infection. So, Babesia and Bartonella in a **FL1953** biofilm may be blocked from removal by the huge **FL1953** biofilm. Also, Lyme and **FL1953** may spread better if parts of the biofilm they are in break off rather than remain intact.

A tornado will throw off branches, rock and dust, and a dissolving biofilm infection will throw off bacteria or fungi, parts of the biofilm and waste of growing infections.

When a bacterial biofilm is the glue holding vast bacteria together, and the "glue" were suddenly to dissolve or disassemble, some fear the re-

lease of bacteria in the human body will be like a dangerous tornado in a field. It is a wise concern.

For these two problems regarding biofilm-held infections suddenly being released, here are useful solutions:

1. You need many infection killing options for use since more is better to prevent "seeding" of dispersed infection.
2. You want the biofilm killing options to destroy biofilms by different mechanisms. This makes the dispersed seeded infections naked to the immune system.
3. Biofilm tools are given initially at low doses and then increased gradually to large doses since often in the beginning patients have massive inflammation and a drastic increase in killing of biofilm organisms in a short time could cause trouble with bone marrow, liver, heart, eye, or kidney issues, or merely create more dead infectious debris resulting in patient misery.
4. You may need to pulse (use every other day) or fully stop this treatment because once a wave of biofilm eroding agents strips off or severely damages a biofilm of an infection, the same antibiotics that were useless in the past can become very effective.
5. There is no single master biofilm destroyer, yet some are broader than others.

Some people feel a single biofilm agent will kill every biofilm in the "ocean."

The notion of a single key biofilm remover is rare or does not exist. Many human body biofilms are not removed with one agent.

Bartonella and Babesia Biofilms?

Most people have heard of the profoundly common tick infection Lyme disease, but they may not know Bartonella is more common than Lyme and is carried by far more vectors (Breitschwerdt). Babesia decimated the cattle population in the southern United States many decades ago and is more dangerous in humans than Lyme.

Currently, we have no solid data showing Bartonella and Babesia have biofilms.

Tick and Flea-Borne Biofilms Conclusion

Below you will see that mouth spirochetes routinely have biofilms. Another spirochete is Leptospira which is able to make biofilms in many environments and may contribute to lost pregnancy in mammals (Brihuega).

In terms of tick and flea infection biofilms, I would focus on **FL1953** (Protomyxzoa) and Lyme, since both have been known and treated by us since 2006, though the former was killed without knowing its genetic uniqueness. We are learning what decreases their biofilm pathology and have agents that should work if one is open to look at diverse approaches. A synthetic "antibiotic only approach" to biofilms, including antibiotics targeted to hit biofilms, might be similar to typing with one finger.

There are herbalists, such as Stephen Buhner, who propose selected herbs to treat some tick infections. And, in terms of **primary treating herbs to kill organisms,** there are also credible options that are not always herbal in use for a tick or flea infection. We will continue to use **advanced lab testing,** typically only allowed under physician supervision, to determine by serious extensive ***indirect*** **blood exam** biochemistry tests to see which infection is actually destroyed in people experiencing benefit from herbal therapy. In any event, I enjoyed this line from Buhner: *"I can't really say what will clear all biofilms."*

While I may not agree with all of his opinions, Buhner's work saves health professionals like me hours sifting through possible agents of use.

Until we learn more, no one can say what will clear all human biofilms.

Brihuega B, Samartino L, Auteri C, Venzano A, Caimi K. In vivo cell aggregations of a recent swine biofilm-forming isolate of Leptospira interrogans strain from Argentina. Rev Argent Microbiol. 2012 Jul-Sep;44(3):138-43.

http:/buhnerhealinglyme.com/miscellaneous/clearing-biofilm/

http://www.ncbi.nlm.nih.gov/pubmed/?term=Breitschwerdt+EB. Accessed March 29, 2014

Biofilms and Lung or Sinus Infections

Anatomy of a Mill Medicine Disaster

Ann is a 55-year old female with a productive cough for two years showing orange coloring and very rare red tinge in the sputum. It was diagnosed as Pseudomonas aeruginosa.

The material she coughed up showed this infection and that it was susceptible to treatments which included Cipro, gentamicin and other synthetic antibiotics. After 18 months, she has not gotten better and now her surface skin is falling off like the shedding of a snake skin, only in 1 cm pieces or smaller which exposes a red and inflamed surface tissue. Biofilms were never discussed with her, possibly because her physicians didn't consider that this brutal Pseudomonas infection would have a biofilm.

Her practitioners also seemed not to realize that this is one of many common bacteria that have a biotoxin.*

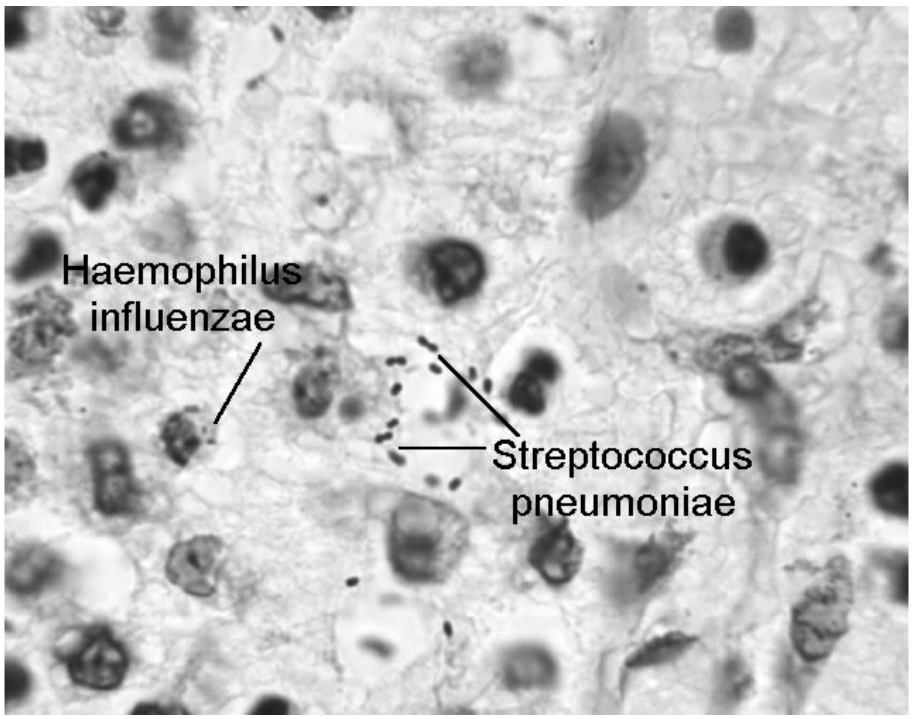
*Mazor R, Vassall AN, Eberle JA, Beers R, Weldon JE, Venzon DJ, Tsang KY, Benhar I, Pastan I. Identification and elimination of an immunodominant T-cell epitope in recombinant immunotoxins based on Pseudomonas exotoxin A. Proc Natl Acad Sci U S A. 2012 Dec 18;109(51):E3597-603. Epub 2012 Dec 3. PMID:23213206

Team Sports: When Multiple Infections All Make Biofilms

Many common infections in people make biofilms. As you may recall, communities are the norm with infections, not isolated bacteria. While biofilms grab and protect a wide range of other infectious particles, I am discussing very different bacteria combining efforts in a "double biofilm."

In the journal *Diagnostic Pathology,* it was stunning to see the evidence for two routine infections making a biofilm with contributions from both unrelated bacteria. Therefore, in biofilm-killing work, it is not enough to know that other types of infections can be stuck in a biofilm or protected by it, but one also must consider other infections present can mean other types of biofilms, probably increasing treatment failures against both infections.

Tikhomirova A, Kidd SP. Haemophilus influenzae and Streptococcus pneumoniae: living together in a biofilm. Pathog Dis. 2013 Nov;69(2):114-26. Epub 2013 Sep 10.



Double infection and double biofilm in human bodies is common and a serious problem for physicians. http://web.mst.edu/~microbio/BIO221_2010/H_influenzae-2.html

Warning: Biofilms and Short, Rushed Medical Sessions

In response to NASCAR-type speed medical sessions with physicians and their lack of knowledge of many of these non-patented, non-pharmaceutical company options, some patients are seeking alternative help.

Others are going to functional medicine practitioners who offer time, but may over-sell options and do not have ways to test legally what is happening with one or more treatments.

Finally, I would advise you to avoid being your own healer. I call even physician self-treaters "patients," because I rarely see home runs from them being both doctor and patient.

Consider a few people in the healing arts that don't insult or dismiss you if you have a complex problem, and who are interested in healing. It is utterly amazing that I actually have to write this, but many readers know exactly what I mean. People who are "experts" generally do not read enough or write any books and have no desire to learn more than the 20 hours of required courses **per year.** I read 40 hours **a week.** If I did not, I know I would lose my handle on new science and new discoveries and I would be left with fewer options to offer my patients.

The best advice is to stay with thinkers who love healing and are careful, and never assume one person has all the answers.

Essential Oils

Not All Oils and Doses are Safe

When an herbalist or aroma therapy or essential oil expert says these have no side effects—run. It means that they have not read the immense body of publications about the side effects from things like essential oils and herbs.

***Clove bud oil with high eugenol content** is a biofilm treatment with vast research and is typically tolerated, but if too much is used medically or if you are exposed to high amounts, it may be toxic. For example, does your functional medicine healer know the best dose for you? First, a healer should know it is already in a vast number of products in these areas: medications, perfumes, flavorings, agricultural chemicals and cosmetics. Kamatou reminds us its medicinal uses include use as an antibiotic, anti-inflammatory, pain killer, an anti-oxidant and as an anti-cancer agent. It is used often in protecting food from microorganisms during storage, and it is also used as a pesticide and fumigant.

A healer cannot assume the only exposure to clove bud oil or eugenol is the dose the healer is prescribing. The processing of the oil by each person will vary. Some will need to be given their dose in unfamiliar ways such as drops placed into a small 4 or 0 capsule, or both so the 4 size fits into the 0 size. Or an 0 is used and put inside a 00 sized capsule. Also, some need to take this powerful oil with marshmallow root or slippery elm as a gut protecting herb that slows release. The capsule would look wet with thick green/brown powder.

***Heracleum Sosnowskyi** was discovered in 1772 and has a number of ways it can harm humans. For example, sunlight creates a “photoallergic” response, in part due to the intensely toxic furanocoumarin in its sap. Furanocoumarins are found in the leaves and stem and are the components of the essential oil. They may penetrate the skin through the epithelial layer, posing a direct threat to human health. Contact may cause large blisters and burn sensations. If taken orally it causes farm animals and most likely also humans to experience internal bleeding.

Achillea ligustica essential oils are believed to be able to kill a number of bacteria, including ones likely to have biofilms. In a head to head study, Cecchini compared essential oils derived from A. ligustica, Listerine® and clove oil (containing 89% eugenol).

The most susceptible microorganisms were Bacillus cereus, Streptococcus pyogenes, and Candida albicans. Listerine® did not exert a strong inhibition on bacteria microbial strains tested. However, ***its effectiveness increased significantly when essential oil of A. ligustica was added.*** The study provides additional evidence for the inhibitory activity of A. ligustica essential oils on several pathogens. It is suggested they may be useful in mouth rinse formulations to limit oral infections.

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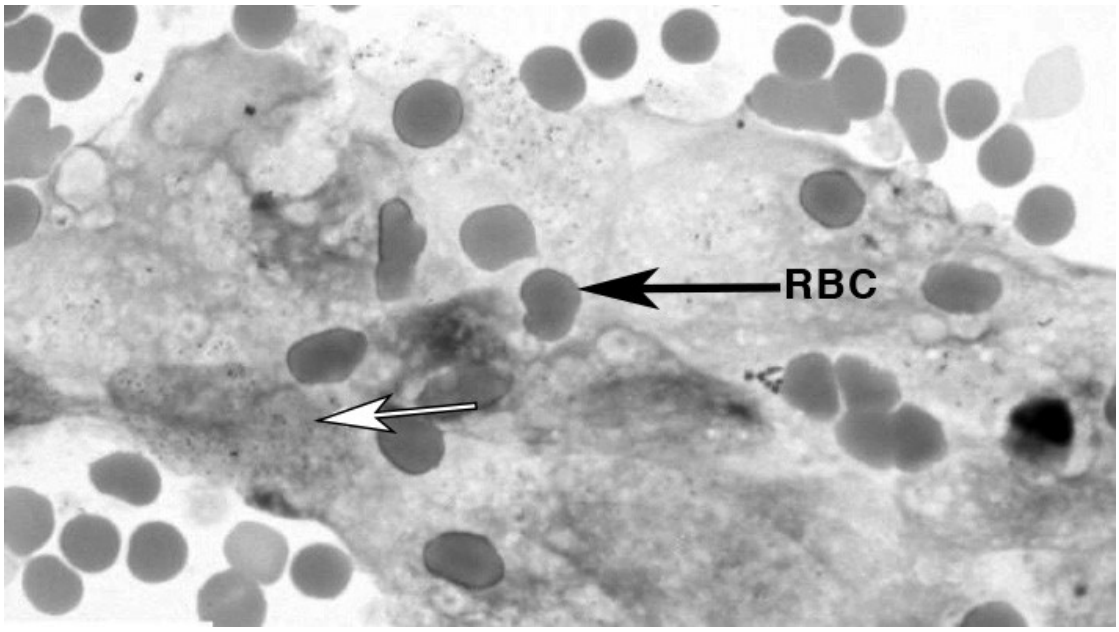
Another Sample Biofilm Image



The dark round ovals are red blood cells (see black upper arrow). The "sheet" that starts from the right lower corner, moving toward the left upper corner, is all biofilm material. The lower arrow is pointing to a small bacterium. (Fry Laboratories)

Eugenol Basics

Eugenol is found in many essential oils and herbs. For example, it is found at a high potency in clove bud essential oil but also at a lower dose in cinnamon leaf and its essential oil. It is also found in pimento, bay, sassafras, massoy bark oils, oil of camphor and chamchwi plants according to PubChem. The potency and concentration varies widely depending on the source and extraction method. Further, this is not merely **a powerful biofilm agent;** it has other amazing properties such as anti-viral actions and anti-cancer effects.

For example, Tragoolpua and Jatisatienr showed that eugenol affects oral and genital Herpes depending on the species, strain and other factors. They made it clear that the essential oil can be more powerful than a simple extract. **Indeed, oral and genital Herpes, HSV-1 and HSV-2, respectively, could not reproduce in the presence of eugenol.** Al-Sharif has shown significant cancer effects. A very low concentration (2 μM) has specific toxicity against different breast cancer cells. This killing effect was mediated through inducing a cancer cell death path and decreasing the levels of E2F1 and survivin--two molecules that are essential to cell survival. **It also hindered breast cancer**

genes. Importantly, these anti-proliferative and pro-cancer cell death effects were also observed inside body grafts placed in non-human animals.

http://pubchem.ncbi.nlm.nih.gov/summary/summary.cgi?cid=3314

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Eugenol and Biofilms

Recently, Dr. Zhou has reminded us of a special process that is involved in the formation of dangerous biofilms. Basically, many bacteria have a "chatty" way of talking to other cells such as other bacteria. So, bacteria use chemicals or cause other bacteria to make chemicals to help them survive and often act to harm you or a loved one.

Eugenol is so effective that at very low amounts, it still disrupted bacteria chemical communication. This is very important in a biofilm destroying agent. If cells cannot communicate, it is doubtful they can form communities. Biofilms are community creations. **Further, eugenol at very low doses, called "sub-inhibitory concentrations" inhibited biofilm formation.**

One type of biofilm research being conducted compares biofilm killers head to head. The results are not always the same, perhaps in part because the infections are not always the same. Note that in an Epub abstract before publication, Malic explains that the best essential oil for urinary catheters, with or without biofilms, against fourteen different bacteria was eugenol. This is why I believe this substance is a "double killer." It can defeat many biofilms, and then kill the organism making the biofilm. Finally, in this study, eugenol did better than tea tree oil.

http://pubchem.ncbi.nlm.nih.gov/summary/summary.cgi?cid=3314

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For further references see Appendix.

Linalool

According to the Merriam-Webster dictionary, the word linalool is derived from a Medieval Latin phrase meaning "wood of the aloe." Linalool has a nice smelling alcohol and essential oils. It is used in perfumes, soaps, and flavoring materials.

In terms of biofilms, it seems to be most effective when **the essential oil part** is used, which has **the most evidence of killing Candida albicans.** (Candida albicans is the cause of yeast infections.) Yet, again, it is the essential oil fraction that not only **inhibits the growth** of Candida albicans but also of the bacteria Lactobacillus casei, Staphylococcus aureus, Streptococcus sobrinus, Porphyromonas gingivalis and Streptococcus mutans cell suspensions, all of them associated with oral cavity disease, according to Alviano and Mendonça-Filho. Yet, Budzyńska reported this essential oil did not fully remove biofilms formed by Staphylococcus aureus (ATCC 29213) and Escherichia coli (NCTC 8196) on the surface of routine medical materials such as urinary catheters, infusion tubes and surgical mesh.

Hsu found that linalool could be effective against Candida albicans due to its many genetic blocking effects. For example, using a scanning electron microscope and other technology, many signs of the effect of linalool to destroy Candida or inhibit its growth could be noted. Hsu found blocking actions against genes involving adhesion production and the formation of "branches" or the mold's hyphae were both decreased by linalool.

http://www.merriam-webster.com/dictionary/linalool

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Alviano WS, Mendonça-Filho RR, Alviano DS, Bizzo HR, Souto-Padrón T, Rodrigues ML, Bolognese AM, Alviano CS, Souza MM. Antimicrobial activity of Croton cajucara Benth linalool-rich essential oil on artificial biofilms and planktonic microorganisms. Oral Microbiol Immunol. 2005 Apr;20(2):101-5.

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Magesh H, Kumar A, Alam A, Priyam, Sekar U, Sumantran VN, Vaidyanathan R. Identification of natural compounds which inhibit biofilm formation in clinical isolates of Klebsiella pneumoniae. Indian J Exp Biol. 2013 Sep;51(9):764-72.

Reserpine

Reserpine is a substance found in the roots of some types of Rauwolfia that has been made into a traditional medicine. It is used to lower high blood pressure and help with psychotic symptoms, but side effects have limited its use.

While it may not be comfortable to use at modest or high dosing, very low dosing, according to Magesh, showed it to be profoundly powerful against Klebsiella pneumoniae. In one report, he used reserpine and was able to stop biofilms in this pneumoniae infection at a fraction of the dose thought to inhibit growth.

Specifically, a tiny fraction of this drug, a mere 0.0156 mg/ml, stopped biofilm production in Klebsiella pneumoniae. So, it may be possible that we have another example of a medical truth I use every day:

"Change the dose and you change the drug or herb."

In this case, perhaps it is possible that 1/10th of the lowest size tablet, 0.1 mg, could harm Klebsiella and other infections and be safe for the patient. However, the raw materials for making it may be hard to find some months according to ASHP who tracks pharmacy shortages.

Magesh H, Kumar A, Alam A, Priyam, Sekar U, Sumantran VN, Vaidyanathan R. Identification of natural compounds which inhibit biofilm formation in clinical isolates of Klebsiella pneumoniae. Indian J Exp Biol. 2013 Sep;51(9):764-72.

http://www.ashp.org/DrugShortages/Current/Bulletin.aspx?id=975

"Stacking" Biofilm Killers

While physicians may ponder the problems caused by biofilms in practice, I rarely encounter the doctor who understands that it is usually better to have more than one treatment. In the article below, **oral biofilm infections were controlled best by three agents, not merely one.** For example, Alves explains that when you are going to irrigate or clean a root canal area, that two mouth bacteria infections protected by their biofilms have these same film barriers decreased significantly by treatment with farnesol, xylitol and lactoferrin together.

The same results were found in wounds. One of the best treatments for wounds is the use of a silver-based wound dressing or bandage, together with a gel containing xylitol and lactoferrin (Ammons).

Alves FR, Silva MG, Rôças IN, Siqueira JF Jr. Biofilm biomass disruption by natural substances with potential for endodontic use. Braz Oral Res. 2013 Jan-Feb;27(1):20-5. PMID:23306623

Ammons MC, Ward LS, James GA. Anti-biofilm efficacy of a lactoferrin/xylitol wound hydrogel used in combination with silver wound dressings. Int Wound J. 2011 Jun;8(3):268-73. Epub 2011 Apr 1. PMID:21457463

Terpenoids

I would like to mention a class of options that come from a familiar substance, chemicals from tea tree oil. We have already mentioned linalool which is part of this class individually, since it comes up as a leading biofilm killer. According to Raut, as many as 14 terpenoids derived from tea tree oil inhibit biofilms, and α-terpineol, nerol, isopulegol, carvone, linalool, α-thujone and farnesol are worthy of special note. Eight terpenoids have effects on **mature** yeast biofilms (Candida albicans).

A study by Ramage shows tea tree oil (TTO), terpinen-4-ol (T-4-ol), and α-terpineol displaying potent activity against 69 biofilm-forming Candida strains, of which T-4-ol and α-terpineol displayed rapid kill action.

Of these three, T-4-ol displayed no significant toxicity to cells. These data provide further laboratory evidence that TTO and its derivative components, specifically T-4-ol, exhibit strong antimicrobial properties against fungal biofilms. Further, T-4-ol appears to possess safety advantages over the complete essential oil (TTO) and may be suitable for prevention and treatment of established oral and upper throat cavity candidosis. Certain terpenoids are components of spices or food ingredients generally regarded as safe (GRAS) (Pauli 2006).

In another study, several chemicals from plants were tried against two very common bacteria (Budzyńska), Staphylococcus aureus (ATCC 29213) and Escherichia coli (NCTC 8196), both with biofilms on the surface of ***routine*** medical products, i.e., urinary catheter, infusion tube and surgical mesh. All three are present in most advanced hospitals and other settings. Surgical mesh was the surface most prone to persistent colonization since the biofilms that formed on it, both by S. aureus and E. coli, were difficult to destroy.

Melaleuca alternifolia is the source of Tea Tree Oil (TTO). Lavandula angustifolia yields Lavender, English Lavender and True Lavender (LEO). Melissa officinalis is Lemon balm (MEO). Tea Tree oil, Lemon balm, alpha-terpineol and terpinen-4-ol showed stronger anti-biofilm

activity than Lavender and linalool or linalyl acetate (Budzyńska).

Recently, various studies have reported the anti-Candida biofilm activities of several important terpenes (Dalleau et al. 2008; Khan & Ahmad 2012). In this study, the activities of 28 terpenoids were analysed, 18 of which were studied against biofilms of C. albicans for the first time.

Diflucan (fluconazole) was used as a standard drug, and was completely ineffective against Candida biofilm development. This routine yeast had significant growth even at a high drug concentration: 250 times more than the MIC for planktonic growth (single yeast cell growth) (Raut).

Addition of terpenoids to early-phase biofilms (i.e. immediately after adhesion) prevented biofilm development.

Farnesol, isopulegol, thymol, carvone, nerol, carvacrol, eugenol, α-thujone and β-ionone were also potent inhibitors of biofilm development.

Terpene hydrocarbons were relatively less effective and found to restrict biofilm development at concentrations as high as 2–4mg/mL. Interestingly, α-thujone, carvone, menthol, isopulegol, nerol, and linalool exhibited antibiofilm activity at concentrations much lower than the growth inhibitory concentrations (Raut).

It is hypothesized that these terpenoids may be developed as specific inhibitors of biofilm formation. Most of the molecules grouped as potent inhibitors of biofilm development are also good inhibitors of morphogenesis. Hence, screening for yeast to hyphal dimorphism in C. albicans would be a good strategy to search for inhibitors of biofilm formation.

Treatment with effective concentrations of isopulegol, carvone, α-thujone, and farnesol caused removal of C. albicans biofilm cells.

Certain terpenoids act as specific inhibitors of yeast to hyphal morphogenesis and biofilm formation. Although the toxicity of these molecules needs to be examined in living animals, many are components of spices

or food ingredients generally regarded as safe (GRAS) (Pauli 2006). Hence, terpenoids of plant origin can be developed into novel therapeutic strategies for prevention and eradication of Candida biofilms

Raut JS, Shinde RB, Chauhan NM, Karuppayil SM. Terpenoids of plant origin inhibit morphogenesis, adhesion, and biofilm formation by Candida albicans. Biofouling. 2013;29(1):87-96. PMID:23216018

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Budzyńska A, Wieckowska-Szakiel M, Sadowska B, Kalemba D, Rózalska B. Antibiofilm activity of selected plant essential oils and their major components. Pol J Microbiol. 2011;60(1):35-41. PMID:21630572

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Allicin and Garlic

Garlic has been used as a medicine throughout human history. Allicin is considered one of the medically useful components of garlic. Other useful components are discussed in Chinese language pharmacology texts.

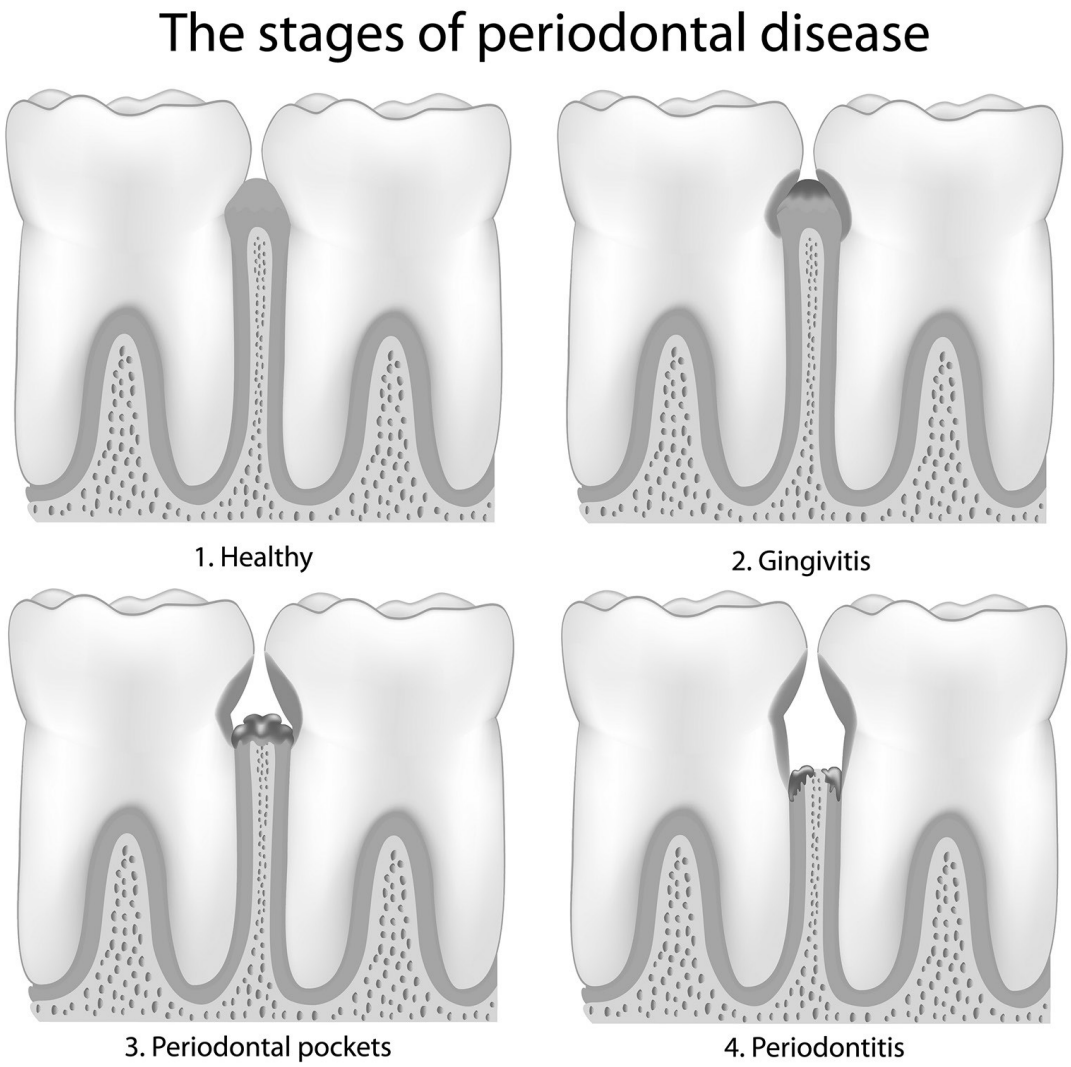
As early as 2003, the use of allicin against Staphylococcus epidermidis had reported effects on biofilm formation at low dosing. Pérez-Giraldo reported that lab testing showed that allicin diminished biofilm formations.

Lihua reported ten years later that allicin impacts Pseudomonas aeruginosa biofilm. This is hardly casual information, since P. aeruginosa is likely resistant to multiple antibiotics, and this resistance may be due to biofilms. Organosulfur allicin has been shown to inhibit surface-adherence of bacteria and Lihua demonstrated that allicin could inhibit early bacterial adhesion which is a first step to bacterial community formation, usually just before biofilm production.

Other researchers isolated various components of garlic and tested the most active components. The following three components were examined:

1. garlic extract
2. allicin
3. diallyl sulfide (DAS)

They were tested against the serious mouth and dental infection Aggregatibacter actinomycetemcomitans, the primary cause of severe aggressive periodontitis and other non-oral infections.



Garlic extract, allicin, and DAS all significantly inhibited the growth of A. actinomycetemcomitans. However, heat, which may be involved in some production steps or shipping, altered the garlic extract. Allicin lost all of its antibiotic effect when heated. But DAS demonstrated an antimicrobial effect even when heated, suggesting it may be one of the key components that makes the use of garlic effective.

Treatment with DAS showed a significant reduction in biofilm cell numbers as evidenced by two methods: confocal microscopy and growth of these bacteria in cultures. Biofilms of A. actinomycetemcomitans when treated with DAS showed alterations in colony shape (Velliyagounder).

We believe garlic-derived treatments are not limited to the bacteria mentioned above, and it clearly has an effect on yeast. **In a head to head test of Diflucan (fluconazole) and allicin against Candida albicans biofilm, it appears that allicin is superior** (Khodavandi).

Candida grows in biofilms. The biofilms are a barrier to antifungal drugs. Allicin showed significant reduction in biofilm growth compared to fluconazole. Amazingly, allicin also altered Candida genetics to decrease biofilm formation.

Lihua L, Jianhuit W, Jialini Y, Yayin L, Guanxin L. Effects of allicin on the formation of Pseudomonas aeruginosa biofilm and the production of quorum-sensing controlled virulence factors. Pol J Microbiol. 2013;62(3):243-51. PMID:24459829

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Khodavandi A, Harmal NS, Alizadeh F, Scully OJ, Sidik SM, Othman F, Sekawi Z, Ng KP, Chong PP. Comparison between allicin and fluconazole in Candida albicans biofilm inhibition and in suppression of HWP1 gene expression. Phytomedicine. 2011 Dec 15;19(1):56-63. Epub 2011 Sep 15. PMID:21924600

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Cruz-Villalón G, Pérez-Giraldo C. Effect of allicin on the production of polysaccharide intercellular adhesin in Staphylococcus epidermidis. J Appl Microbiol. 2011 Mar;110(3):723-8. Epub 2011 Jan 18. PMID:21205098

Pérez-Giraldo C, Cruz-Villalón G, Sánchez-Silos R, Martínez-Rubio R, Blanco MT, Gómez-García AC. In vitro activity of allicin against Staphylococcus epidermidis and influence of subinhibitory concentrations on biofilm formation. J Appl Microbiol. 2003;95(4):709-11. PMID:12969283

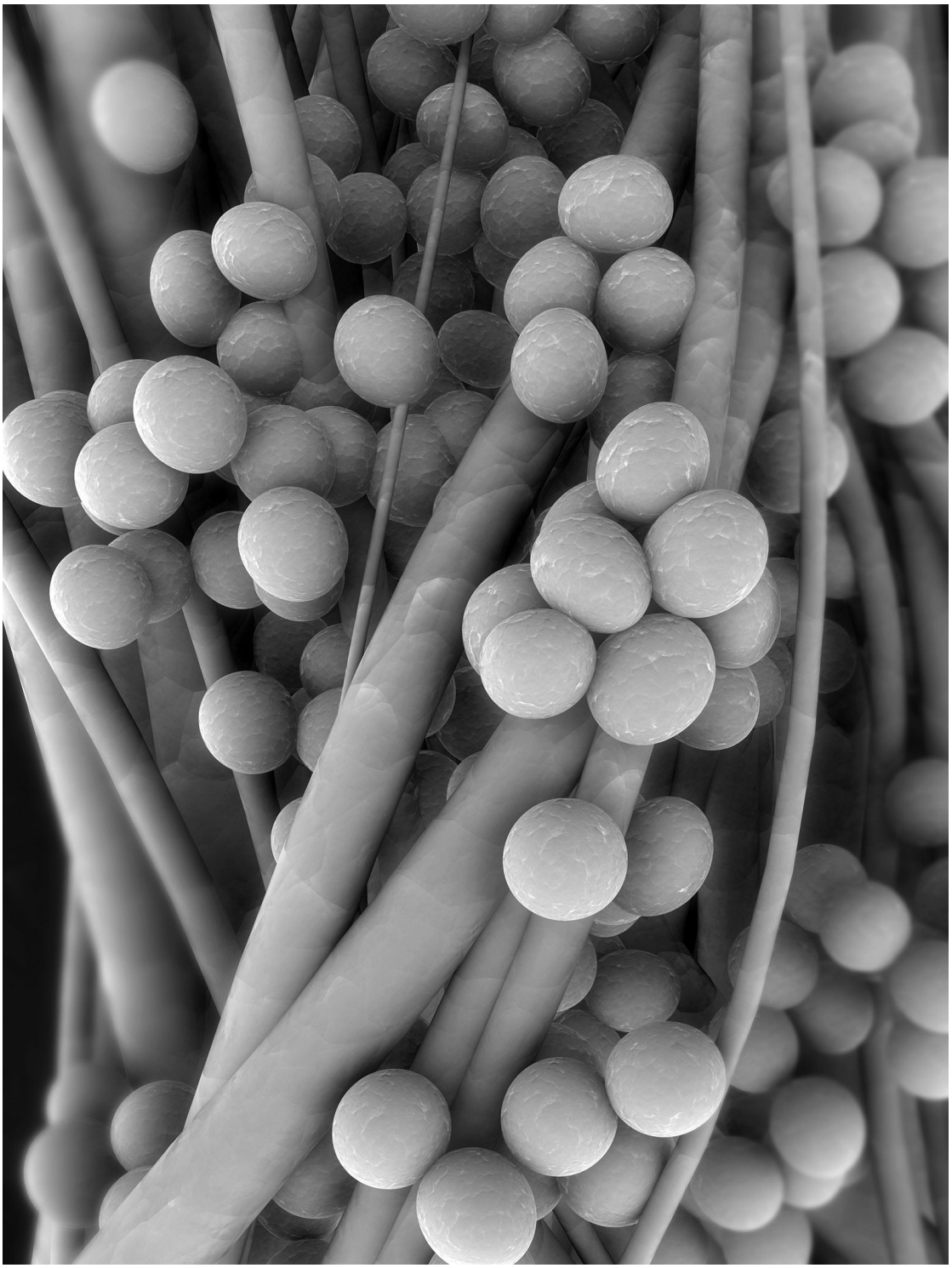
Serrapeptidase

For decades, serrapeptidase, also known as serratiopeptidase, has been sold to improve health. It has been reported to aid in the treatment of tick infection and to offer a number of benefits. As always, we do not doubt people who report feeling better on any agent. We simply do not know why they feel better, and they are really not equipped to tell us why.

For example, I was once "corrected" by an ill man who reported high amounts of oral vitamin C were superior to Artemisia derivatives used for many years on at least tens of millions of people worldwide to prevent and treat malaria. I do not doubt he felt better on Vitamin C for many possible reasons. But, if the world took his advice and he was wrong, it is possible millions would die. Short pamphlets, guide articles or booklets, a local family practitioner, suggestions from members of a specialty group or waiting for huge studies that take ten to twenty years to design and complete may be helpful; however, some physicians become scientists in order to seek better ways of determining optimal care.

Looking at serrapeptidase with more of a scientific eye, Papa's team recently found this enzyme **"could be developed as a potential 'anti-infective agent' able to hinder the entry of S. aureus into human tissues, and also impair the ability of this pathogen to adhere to prostheses, catheters and medical devices."**

Based on an examination of the biofilm-making Staphylococcus aureus found on most people and in hospitals, we know it has many cell surface survival factors, including proteins that **promote adhesion to damaged tissue** and to the surface of victim cells, and that bind proteins in blood to help evade immune responses. Serrapeptidase appears to undermine one or more of these processes.

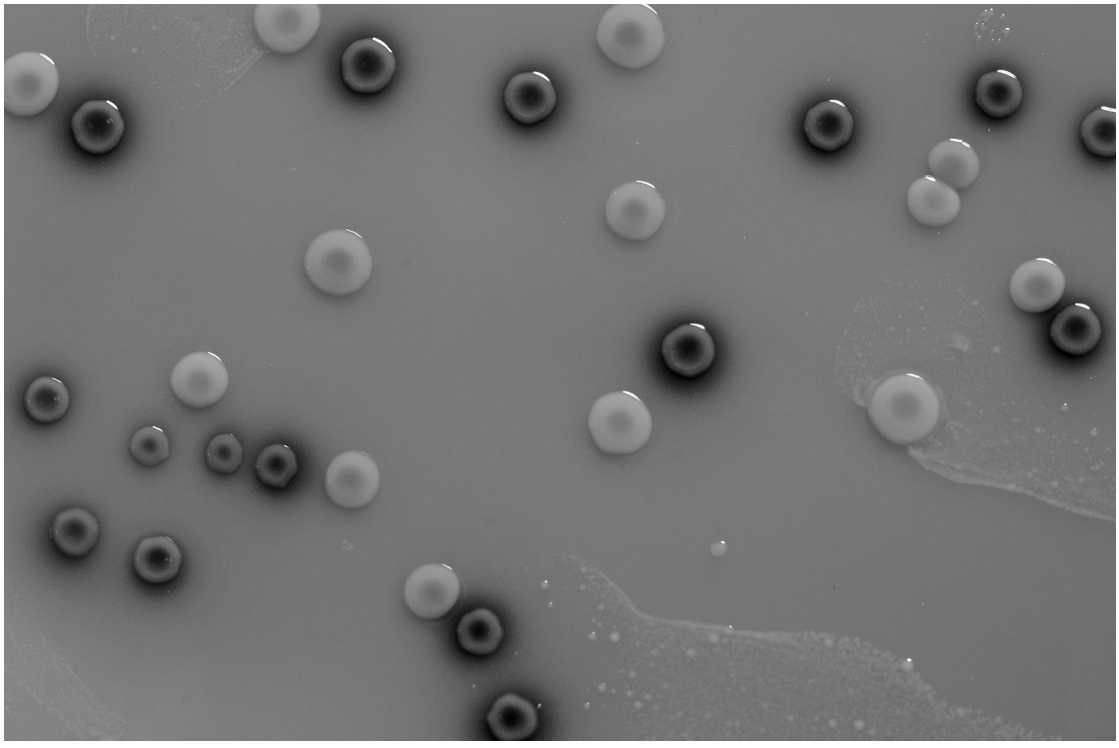


3-dimensional rendered close up of staphylococcus aureus bacteria.

Bhagat explains that serratiopeptidase is an enzyme prescribed in surgery, orthopaedics, otorhinolaryngology, gynaecology and dentistry for its anti-inflammatory, anti-edemic and analgesic effects. He mentions some patients are said to have had a reduction of heart attack risks. *But, he believes the research on all these uses is lacking.* I do not fully agree, but I admit studies exist showing no effect, such as Chopra's work which shows no relief of inflammation or pain with dental surgery.

I do however see potential uses. For example, in damaged skin such as wound healing, the addition of serrapeptidase appears to increase the effectiveness of other treatments. For example, Singh shows that by adding this enzyme to gentamicin in a slurry that becomes a hydrogel, wounds heal faster. My understanding is that wounds have bacteria biofilms.

Listeria is a food-borne bacterium that can cause life-threatening disease in humans. Treatment of L. monocytogenes with low amounts of serrapeptidase reduced their ability to form biofilms and to invade host cells (Longi).



Listeria shown in a culture.

Kai reminds us that even supplements can have side effects. He describes the impact of this enzyme on the lungs and other tissues. A 32 year-old woman developed shortness of breath with a cough and fever. She had two hospitalizations for eosinophilic pneumonia, meaning that the upper tubes of the lungs showed huge numbers of eosinophils which are parasite killers and allergy reaction cells. Her chest X-ray showed reactivity throughout the lungs.

A special test was done showing the cause was a brand of serrapeptidase. So her pneumonia was “drug related” and caused by this easy to find enzyme.

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Lumbrokinase

We appreciate that some people interested in progressive medicine feel this enzyme, Lumbrokinase, is a useful substance. Some have suggested it is useful in the removal of biofilms. If that is true, we had trouble finding the evidence for that position. However, it does seem that some researchers see a potential for this enzyme to "digest" pathological clots. This possibility seems to have some support, and at this time we will only wait for further research. Since we are only proposing biofilm options that are supported by research and since human use is just starting in research settings, we do not promote this agent at this time.

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Nattokinase

Nattokinase is an enzyme derived from natto, a traditional Japanese fermented soybean food meal. Multiple authors have described clot prevention benefits (Ero). However, while there are many articles showing clot help, there is not much on nattokinase and biofilms.

The idea of confusing clot-busting and biofilm capacities as being the same is probably a mistake. Some think that thinning blood leads to biofilm killing, which might be true. But how would you know? It would not surprise me if nattokinase made debris move out more efficiently and caused improved treatment. I just do not see biofilm effects based on any study that I can find. Feeling better can be due to many reasons.

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Terminalia chebula Retz

The fruit of Terminalia chebula has been used in India and Asia for centuries and for over ten medical problems, which include tissue protection and anti-inflammatory effects. Gaire reports cell protection by many means and found brain cells were protected from low oxygen levels. Now, chemicals are being isolated to see their individual actions. One action is its bacteria-killing properties. One way it undermines bacteria is by defeating chemicals that allow bacteria to work together as a community. One way they work together is by making biofilms (Miller).

Specific examples of T. chebula Retz working against bacteria are:

- An extract of T. chebula Retz fruit blocked bacteria communication which is used to make biofilms. Specifically, in this pneumonia bacteria strain P. aeruginosa PAO1, where PAO1 is the strain, **biofilm formation with this extract was significantly reduced.** The ex-

tract also made the pneumonia far more susceptible to the antibiotic tobramycin. Further, genes involved with resistance to antibiotics were down-regulated.

- Bag published that highly resistant urine organ infections were more vulnerable to treatment with T. chebula but proposed this is due to its ability to collect iron, since adding iron reduced its effect. However, Bag only tested one of many chemicals from this fruit, and I would suggest other components may have antibacterial action and work by other means.
- Four carefully chosen antibacterial plants *(P. guajava, T. chebula, A. aspera,* and *M. elengi)* are combined with four solvent extracts (hexane, ethyl acetate, ethanol, and methanol) by Kamal Rai Aneja, who initially evaluated their anti-cavity activity against *S. mutans.* All four of the plants showed activity against *S. mutans.* Ethyl acetate extracts of the four plants showed high antibacterial activity against *S. mutans,* superior to the other solvent extracts. Further, *T. chebula* ethyl acetate extract acts as an effective anti-cavity agent by inhibiting *S. mutans* and *C. albicans.* However, we were unable to find evidence if the benefit of these chemicals involved biofilm removal.

In conclusion, we appreciate that this medicine is proposed to both dissolve Lyme biofilms and also destroy the underlying Lyme bacteria. We offer no opinion on this belief. We do not want to oppose or support its use in terms of biofilm ability. It appears this fruit does act on the bacteria biofilm of P. aeruginosa, but Lyme bacteria are not the same as P. aeruginosa bacteria. Lyme is also profoundly more genetically complex than a “relative” spirochete bacterium, syphilis.

Therefore, while we do note that this medicine has antibacterial and cell protection actions, and **we accept some patients feel better,** we presently cannot say it is due to biofilm removal in those with tick-borne infections.

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Cancer

Cancer has many causes. Some things increase your risk and other things can decrease your risk. It is rarely pure genetics, even in those with genetic vulnerability. We know some types of plastics increase rates of breast cancer. We know the 200 poisons in cigarettes cause lung cancer. We know various chemicals made by various companies can increase cancer, despite the reality that most US and international chemicals have limited or no top research on their safety.

I like my dental hygientist. And, I like making sure my gums and teeth are "safe." Why? At first it was because I want to have teeth in twenty years. But, she correctly reminds me that heart attacks are increased by gum disease which is routine in many countries.

Yet, even this passionate healer was not aware of the role of biofilms in cancer. Yes, I said cancer. We are only beginning to understand the role of infections in triggering cancer diseases.

Many years ago, I was working with a physician who asked me to help research possible cures for his cancer. Eventually, that cure was found and written up, taking over 200 hours and many months to complete, with the help of a top medical editor in North America—the former editor of the *Journal of the American Medical Society* and forty other journals, specifically, George Lundberg, who worked feverishly to get this death disorder cure in print ASAP (Schaller).

Years later, he asked me to write a follow up, and we had found that over eight top infection specialists in the United States had missed Babesia, a common parasite that is harder to kill than malaria and which can occasionally increase eosinophils (Schaller). The patient's trouble included the fact that he had so many eosinophils, his blood could clot quickly. The point? Eosinophils are a type of white blood cell designed to kill parasites. The man's disorder (HES) Idiopathic Hypereosinophilic Syndrome, which is often fatal and means that eosinophils reproduce out of control, was primed by a Babesia infection. Not all patients with HES also have a Babesia infection, but after writing six books which

include Babesia information, I believe it is likely **the science of Babesia detection and treatment is ten to twenty years behind** what is known. The routine treatment is actually eighteen years old.

We know bad teeth increase disability and death risk. We know that infections can promote cancer. To these beliefs we find Atanasova proposing that a common biofilm mouth infection significantly promotes cancer.

Atanasova writes:

> "There is emerging evidence that Porphyromonas gingivalis…[a common disease-making bacteria and]…prominent constituent of oral biofilms, best known for its involvement in periodontitis, may be an important mediator in the development of…orodigestive cancers. Orodigestive cancers represent a large proportion of the total malignancies worldwide, and include **cancers of the oral cavity, gastrointestinal tract and pancreas."**

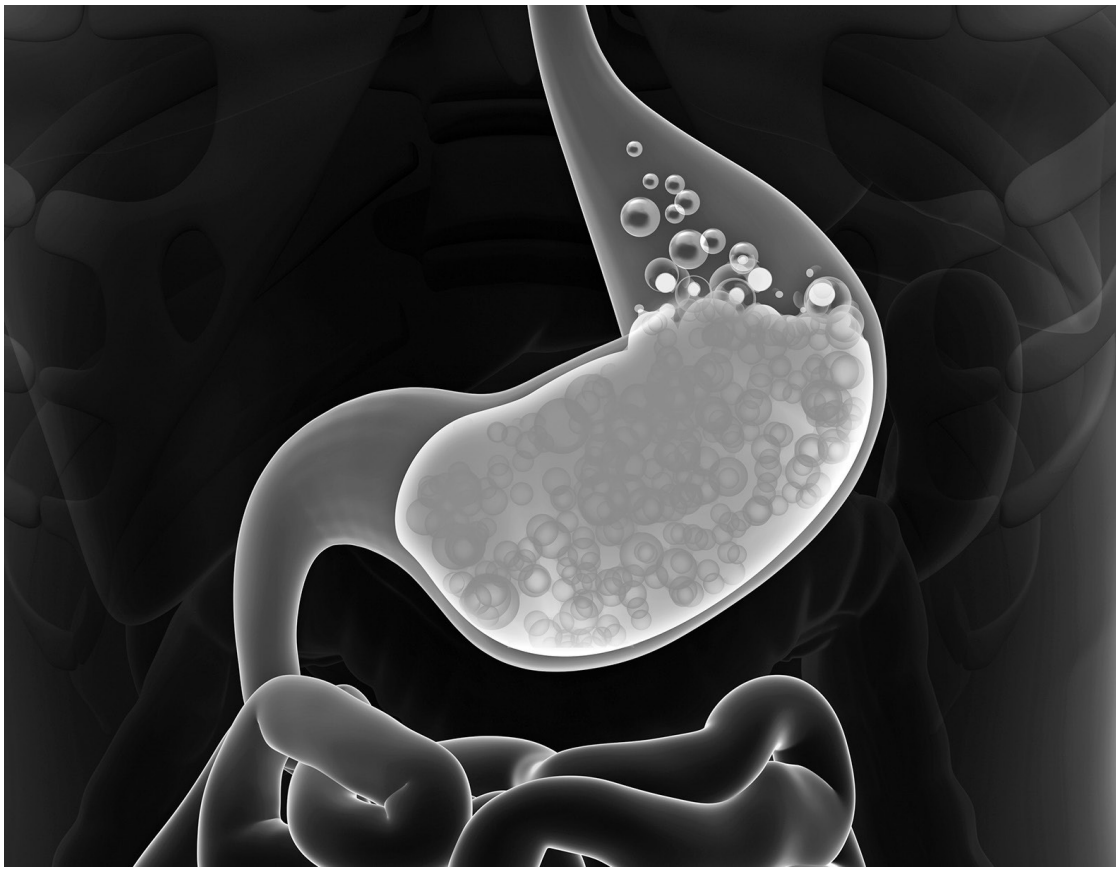
The recent review introduces the knowledge on P. gingivalis's plausible association with cancer as a risk modifier and proposes cancer-promoting molecular mechanisms from this bacteria's biofilm community.

The relationship of bacterial biofilm and cancer includes the relation of post-cancer surgery and biofilm bacteria in surgical wounds from tumor removal. Fromantin and Seyer characterized biofilms in 32 malignant wounds associated with breast cancer and bacterial floras in 25 such wounds…[with] 54 different bacterial types. While one might imagine the that the cancer surgery to remove the malignant cancer fully is the only risk, Fromantin explains the risk of infections and their symptoms represent serious troubles in malignant wounds. An average of over five diverse bacteria were found in the wounds, and biofilms were common. The author explains that this common problem in tumor wounds shows an "absolute need for new therapeutic options that are effective for use on circulating bacteria as well as on bacteria organized in biofilm."

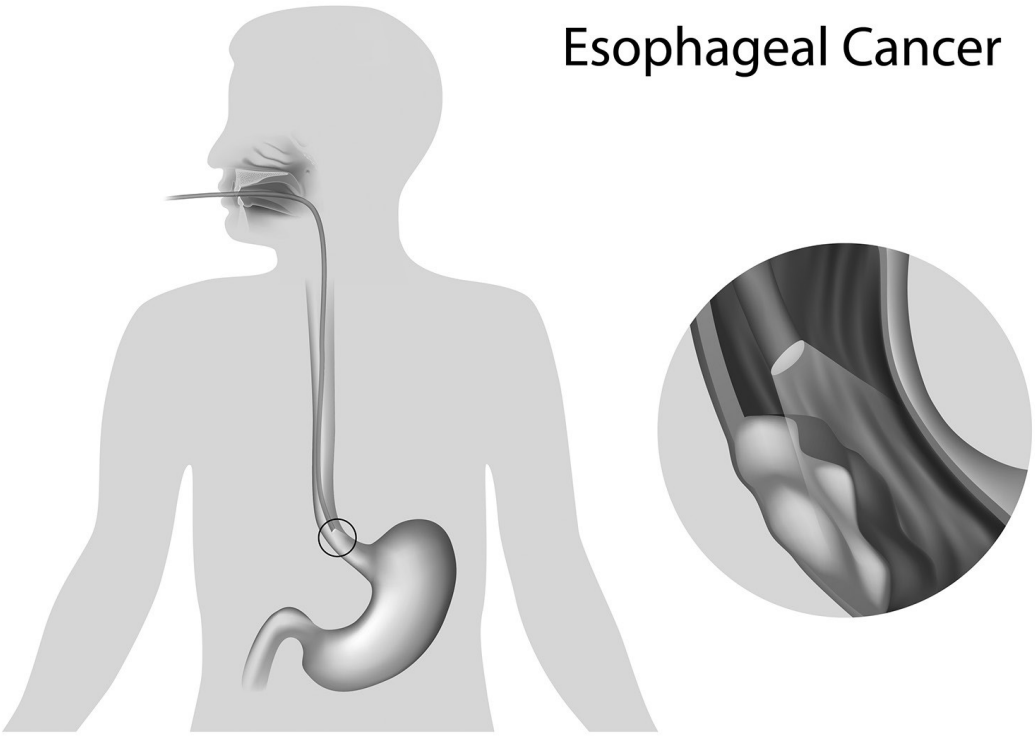
Other authors suggest that the stimulation of various body chemicals promotes cancer. For example, Blackett reminds us that Barrett's esophagitis and gastro-esophageal reflux disease (GERD) are precursors of esophageal adenocarcinoma, cancer of the feeding tube between the mouth and stomach.

A biofilm on the esophagus lining may be a sign of increased infection and cancer risk, and this article suggests a mechanism.

To be clear, GERD is when stomach contents flow back up into the esophagus. This reflux includes stomach acid which burns the lining of the esophagus, causing heartburn or "acid indigestion" and damaging the cells in the esophagus. Barrett's esophagitis is the erosion of esophageal muscle in the lining, perhaps due to acid reflux damage, which causes a change to the tissue, priming it for another change—cancer.



Stomach acid can rise into the esophagus, causing acid reflux or acid indigestion. After repeated stomach acid erosion, the muscle may be lost, resulting in Barrett's esophagitis.



The finding in the research of diseased esophageal tissue was powerful. While 111 species of bacteria were found in GERD and Barrett's esophagitis, Campylobacter concisus was the dominant species and is a routine biofilm maker (Lavrencic). So this bacterium, C. concisus, takes over in GERD and the presence of these bacteria created increased expression of inflammatory chemicals, cytokines, which are related to promotion of cancer. Perhaps Blackett has found the trigger to this cancer. One source of support is that irritated, damaged and inflamed tissue is often more likely, over time, to become cancerous. This includes prostate and colon cancer.

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Lactoferrin

I recently read an article by a physician suggesting that lactoferrin was a great treatment for biofilm disruption. While I agreed it is worth discussing, I was confused at the notion that one substance would kill every biofilm on earth.

Summarizing WebMD:

> Lactoferrin is a protein found in cow milk and human milk. Lactoferrin is also found in fluids in the eye, nose, respiratory tract, intestine, and elsewhere. Most medicinal human lactoferrin is taken from specially engineered rice and not cows.
>
> Lactoferrin is used for treating stomach and intestinal ulcers, diarrhea, and hepatitis C. It is also used as an antioxidant. Other uses include stimulating the immune system, preventing tissue damage related to aging, promoting healthy intestinal bacteria, preventing cancer, and regulating the way the body processes iron. In industrial agriculture, lactoferrin is used to kill bacteria during meat processing.
>
> Lactoferrin helps regulate the absorption of iron in the intestine and delivery of iron to the cells. It also seems to protect against bacterial infection, possibly by preventing the growth of bacteria by depriving them of essential nutrients or by killing bacteria by destroying their cell walls. The lactoferrin contained in mother's milk is credited with helping to protect breast-fed infants against bacterial infections. In addition to bacterial infections, lactoferrin seems to be active against infections caused by some viruses and fungi.

In terms of biofilms, Ammons calls it an "anti-biofilm therapeutic," and notes that biofilm troubles increase with obesity and aging. Specifically, these groups have more chronic wounds, pressure ulcers, venous leg ulcers, and diabetic foot wounds that are very hard to treat. The prima-

ry reason wound and ulcer treatments fail is the presence of bacterial biofilms.

Lactoferrin is a complex substance and may help wound or ulcer infections with a variety of strains or species.

Cindy Sheffield placed lactoferrin against single species biofilms composed of either a Klebsiella pneumoniae or Escherichia coli. The goal of her study was to determine the destructive activity of lactoferrin, dextranase and lysozyme against single species biofilms. Treatments resulted in E. coli biofilm reduction ranging from 73 to 98%. Lactoferrin produced a significantly higher-percentage reduction than lysozyme.

Similar treatments resulted in reductions of K. pneumoniae biofilms. No treatment was capable of complete destruction of both single species biofilms. Therefore, a treatment proposed to "cure" biofilms should only be accepted if it is able to kill at 100%. Lactoferrin could not do this with E. coli.

However, low concentrations of lactoferrin (and lysozyme) removed 100% of a strain of K. pneumoniae. Therefore, low concentrations of lactoferrin might be beneficial to prevent biofilm formation by K. pneumoniae.

http://www.webmd.com/vitamins-supplements/ingredientmono-49-LACTOFERRIN.aspx?activeIngredientId=49&activeIngredientName=LACTOFERRIN. Accessed February 23, 2014

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Purchasing Lactoferrin

According to the LEF organization summary, lactoferrin is a natural constituent of whey protein found in milk. High quality whey protein supplements contain about 0.5% lactoferrin. That means a 20 gram scoop of high quality whey protein isolate provides about 100 mg of lactoferrin.

An adequate and cost effective dose of lactoferrin for the adjunctive treatment of disease is estimated to be 300 mg a day. There are dietary supplements that provide potent doses of lactoferrin extracted from whey. When using these supplements, it is important to use a form of lactoferrin called "apolactoferrin" that is depleted of iron. The apolactoferrin form has been shown in studies to provide the benefits of lactoferrin as an antioxidant, and studies show the "apo" form may have additional benefits over that of other forms of lactoferrin. Since iron is essential to almost all life processes, the exceptional ability of apolactoferrin to bind iron deprives bacteria of the free iron they need to survive.

I have no strong opinion on the suggestion above, but it does appear that apolactoferrin has the ability to bind more iron and to act in very different ways than other options. Human apolactoferrin was used against pneumococcal otitis media, a common ear infection, in lab animals. Amazingly, bacterial counts in the middle ear effusions dropped profoundly, and the number of inflammatory cells were also significantly lower in the apolactoferrin group. The implication of this finding is quite powerful. Why? **We are considering apolactoferrin as a nonantibiotic approach for the treatment of otitis media.**

In addition, apolactoferrin, the iron-free form of human lactoferrin, can kill many species of bacteria, including Streptococcus pneumoniae. Lacto**ferricin** is a protein fragment of apolactoferrin, which kills more bacteria than apolactoferrin. After a complex study on these two chemicals, Mirza and Wilson feel the way apolactoferrin kills Streptococcus pneumoniae is through the release of a lactoferricin-like protein which kills pneumococci.

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Mirza S, Wilson L, Benjamin WH Jr, Novak J, Barnes S, Hollingshead SK, Briles DE. Serine protease PrtA from Streptococcus pneumoniae plays a role in the killing of S. pneumoniae by apolactoferrin. Infect Immun. 2011 Jun;79(6):2440-50. Epub 2011 Mar 21. PMID:21422179

Lactoferrin Xylitol Combination Treatment

In a fascinating look at this proposed double treatment, Mary Ammons shares that treatment of Pseudomonas aeruginosa biofilm with both lactoferrin and xylitol inhibits the ability of bacteria to respond to damage resulting from lactoferrin iron chelation.

Pseudomonas aeruginosa has been identified as the most common biofilm-forming infection in chronic wounds. The immune stimulating molecule lactoferrin and the rare sugar alcohol xylitol, together, were effective in the lab against P. aeruginosa biofilms.

How? Lactoferrin iron chelation was identified as the primary means by which lactoferrin undermines the bacterial membrane. Amazingly, this combination showed huge alterations in the expression of the bacteria's genes, but these changes are too complex for a summary. The findings mean that critical chemicals made by P. aeruginosa had changed.

Siderophore detection verified that xylitol is the component of this unique double treatment that inhibits the ability of the bacteria to produce siderophores under conditions of iron restriction. Siderophores sound complicated—here is the simple meaning: they are some of the strongest iron binders in the world and they are made by bacteria, viruses and fungi.

The study concludes with two points:

1. Lactoferrin treatment of P. aeruginosa biofilms results in destabilization of the bacterial cell membrane through iron chelation.

2. Combining lactoferrin and xylitol inhibits the ability of P. aeruginosa biofilms to respond to environmental iron restriction.

Access to iron is profoundly hard for bacteria when this combination is used.

Limiting Traditional Sugars

Dropping Inflammation and Biofilms?

Many feel that they are better when they drop mono sugars from their diet. Obviously high fructose corn syrup (also known as glucose-fructose in Canada, Isoglucose or Glucose-Fructose syrup and high fructose maize syrup in other countries) is bad since it is vastly worse than eating straight cane sugar from a bowl. Others feel fructose is fine to consume especially if it is in the form of a solid fruit, and not from a broken down juice. Some report sucrose helps biofilm growth.

My only comment is that if you have severe pain, headaches, pain, psychiatric troubles, rashes, herbal or medicine sensitivities, high mold or chemical sensitivities, you may want to limit your sucrose and fructose along with breads, flours, pastas and cereals for a month, and see if you feel better. Some feel you can be cured by diet. It is typically a drop in food-related inflammation.

For illustrative purposes, let us use an arbitrary scale for inflammation level where 150 is highly inflamed and 20 is normal. After using a low pasta, cereals and breads diet, and only eating whole fruit infrequently, for a modest period of time, your inflammation level may go from 150 to 115. This is lower and you can feel better, but it is not 20, which we will call “normal” to make this point.

The Sugar Xylitol

Xylitol has a long history of use to decrease dental plaque in alternative medicine. In one powerful study, xylitol gum that was used for 39 months was still limiting dental plaque and altering mouth bacteria **15 months after it was stopped.**

However, it may be likely that new alternative medication solutions, if not used wisely, could lead to the pool algae I mentioned that laughed at chlorine. And while xylitol is a useful biofilm tool, it is possible some bacteria are developing resistance.

Further, while newer studies still point to an effect on "lowering biofilm mass" (Alves), and reporting its effect in complex dental procedures, it is very likely this is not the only way or even the primary way this sugar undermines infections.

Xylitol was also found to be very useful in lab evaluation for use with **wounds**. Simply, the more xylitol used, the better the effect.

The sugar was tested on a simulation of very tough wound infections that make biofilms: Pseudomonas aeruginosa, Enterococcus faecalis and Staphylococcus aureus. These are three of the most important species associated with biofilms. **Biofilm formation was completely inhibited with treatment of 20% xylitol** (Dowd).

Xylitol's effects are not limited to oral mouth health. In a summary article it was accepted that in clinical trials, xylitol decreased the occurrence of acute otitis media in day-care children—a common problem for children. Obviously this shows benefits in another organ outside the mouth.

Another comment in this study may be of use in lifestyle health. Let me quote: "Exposure to xylitol lowered [biofilm marker] values…but when the [lab bacteria growth substance or] medium was supplemented with glucose or fructose, biofilm formation was enhanced and the inhibitory effect of xylitol on biofilm formation was not observed." The impres-

sion I have is that glucose and fructose are the two most common sugars consumed by humans in the developed world.

So in cases of ear infections caused by Strep, pneumonia or throat infections, it is possible that dietary restrictions of "high access" sugars like sucrose, and fructose found in fruit juice can aid in lowering biofilm. I suspect corn syrup would also be a problem. I do not know if the slow release of fructose such as eating an apple or pear would make xylitol useless.

While this is a lab study, I think that the finding that routine dietary sugars helping biofilm formation and undermining a useful treatment should be noted.

Marttinen AM, Ruas-Madiedo P, Hidalgo-Cantabrana C, Saari MA, Ihalin RA, Söderling EM. Effects of xylitol on xylitol-sensitive versus xylitol-resistant Streptococcus mutans strains in a three-species in vitro biofilm. Curr Microbiol. 2012 Sep;65(3):237-43. Epub 2012 May 30. PMID: 22645015

Mäkinen KK, Alanen P, Isokangas P, Isotupa K, Söderling E, Mäkinen PL, Wenhui W, Weijian W, Xiaochi C, Yi W, Boxue Z. Thirty-nine-month xylitol chewing-gum programme in initially 8-year-old school children: a feasibility study focusing on mutans streptococci and lactobacilli. Int Dent J. 2008 Feb;58(1):41-50. PMID:18350853

Alves FR, Neves MA, Silva MG, Rôças IN, Siqueira JF Jr. Antibiofilm and antibacterial activities of farnesol and xylitol as potential endodontic irrigants. Braz Dent J. 2013;24(3):224-9. PMID:23969910

Dowd SE, Sun Y, Smith E, Kennedy JP, Jones CE, Wolcott R. Effects of biofilm treatments on the multi-species Lubbock chronic wound biofilm model. J Wound Care. 2009 Dec;18(12):508, 510-12. PMID:20081576

Kurola P, Tapiainen T, Sevander J, Kaijalainen T, Leinonen M, Uhari M, Saukkoriipi A. Effect of xylitol and other carbon sources on Streptococcus pneumoniae biofilm formation and gene expression in vitro. APMIS. 2011 Feb;119(2):135-42. Epub 2010 Dec 1. PMID:21208281

Erythritol

Erythritol is an amazing sugar. For example, when it was given to children head-to-head with xylitol or sorbitol it was clearly superior. Here is a summary of the research:

Runnel writes: "Three-year consumption of erythritol-containing candies by initially 7- to 8-year old children was associated with reduced plaque growth, lower levels of plaque acetic acid and propionic acid, and reduced oral counts of mutans streptococci compared with the consumption of xylitol or sorbitol candies."

In a similar way, Japanese researchers show highly advanced reasons for erythritol superiority over xylitol and sorbitol (Hashino). While this study is very dense, let me at least try to list the stunning findings:

1. By advanced confocal microscopic observations, the most effective sugar used to reduce P. gingivalis accumulation onto an S. gordonii substratum was erythritol, as compared with xylitol and sorbitol.

2. In addition, erythritol moderately suppressed S. gordonii monotypic biofilm formation.

3. To examine the inhibitory effects of erythritol, they analyzed the metabolomic profiles of erythritol-treated P. gingivalis and S. gordonii cells. Metabolome analyses showed that a number of critical bacteria chemicals were decreased by erythritol.

4. Next, metabolites of erythritol- and sorbitol-treated cells were examined. Erythritol significantly decreased the levels of P. gingivalis dipeptides. They tended to be increased by sorbitol.

Amazingly, it appears erythritol has inhibitory effects on two diverse species with biofilms, and it acts by at least five very distinct mechanisms.

Dowd reported that biofilm formation was completely inhibited in a standard wound approach by 10% erythritol in either of the two San-

guitec gel formulations. Erythritol had an inhibitory effect on P. aeruginosa and S. aureus growth at over 5% concentrations.

A Reminder of Custom Biofilm Killing Shown in this Article

Dowd goes on to offer a pearl that is in need of being highlighted: biofilm killing varies by infection. In the way that not all children grow up to be astronauts or race car drivers, biofilm killing can be unique to each infection. In this study, different treatments targetted specific populations within a biofilm.

1. Salicylic acid preferentially targeted S. aureus
2. Xylitol preferentially targeted P. aeruginosa
3. Erythritol preferentially targeted both P. aeruginosa and S. aureus.
4. The two highly innovative Sanguitec gel formulations, which can be a firm semi-solid and exist in highly diverse forms (www.sanguitec.com), provided a broad inhibition of biofilm development, in excess of the three threatments above.

In another study that examined the formation of biofilms of an important marine yeast, lactic acid, glycerol, glucose, edible oils and **even erythritol supported the formation of biofilms** (Dusane).

Candida albicans biofilm showed the nuanced treatment required to kill it. Erythritol, xylitol, and sorbitol alone had no effect on this organism. However, despite the immense power of Benzethonium chloride (BTC), the very broad killing disinfectant which kills many hardy bacteria, viruses, mold and fungi, it was made **more effective in combination with the sugars.** The fungal killing effect on the Candida was highest with a combination erythritol and some BTC. The more the erythritol, the more effective the treatment. Enhanced killing was most significant when using erythritol, as opposed to the other sugars (Ichikawa).

Runnel R(1), Mäkinen KK, Honkala S, Olak J, Mäkinen PL, Nõmmela R, Vahlberg T, Honkala E, Saag M. Effect of three-year consumption of erythritol, xylitol and sorbitol candies on various plaque and salivary caries-related variables. J Dent. 2013 Dec;41(12):1236-44. Epub 2013 Oct 3. PMID:24095985

Hashino E, Kuboniwa M, Alghamdi SA, Yamaguchi M, Yamamoto R, Cho H, Amano A. Erythritol alters microstructure and metabolomic profiles of biofilm composed of Streptococcus gordonii and Porphyromonas gingivalis. Mol Oral Microbiol. 2013 Dec;28(6):435-51. Epub 2013 Jul 29. PMID:23890177

Dowd SE, Sun Y, Smith E, Kennedy JP, Jones CE, Wolcott R. Effects of biofilm treatments on the multi-species Lubbock chronic wound biofilm model. J Wound Care. 2009 Dec;18(12):508, 510-12. PMID:20081576

http://books.google.com/books?id=nSIBtoKpVfwC&pg=PA50&lpg=PA50&dq=Sanguitec+gel&source=bl&ots=bnNl-Hb4WY&sig=9zqUk9mDZNGvZQphg1utLvl1Y64&hl=en&sa=X&ei=drIKU5y3JLLOsAS37oGgCQ&ved=0CDkQ6AEwAg#v=onepage&q=Sanguitec%20gel&f=false. Accesssed February 23, 2014.

Dusane DH, Nancharaiah YV, Venugopalan VP, Kumar AR, Zinjarde SS. Biofilm formation by a biotechnologically important tropical marine yeast isolate, Yarrowia lipolytica NCIM 3589. Water Sci Technol. 2008;58(12):2467-75. PMID:18845860

Ichikawa T, Yano Y, Fujita Y, Kashiwabara T, Nagao K. The enhancement effect of three sugar alcohols on the fungicidal effect of benzethonium chloride toward Candida albicans. J Dent. 2008 Nov;36(11):965-8. Epub 2008 Sep 7. PMID:18778883

Organoselenium

This compound is the fusion of the trace element selenium with some type of carbon compound. While selenium has many benefits, excessive amounts should be avoided. A deficiency in selenium (Se) has been linked to heart disease, diabetes, liver problems, and male and female fertility pregnancy troubles. Selenium supplementation has recently moved from the realm of correcting nutritional deficiencies to one of pharmacological intervention, especially in the clinical domain of cancer prevention (Soriano-Garcia).

Recently, a tremendous effort has been directed toward organoselenium compound use as antioxidants, enzyme modulators, antitumor tools, antibiotics, antihypertensive agents, antivirals and lowering cytokines or inflammation and immunity chemicals (Soriano-Garcia).

Wang published a very powerful finding regarding organoselenium-coated "ear tubes," which are a common tool used by ENT physicians. One problem that is obvious is that they stay in a child's ear for a long time, and this area of the ear grows bacteria. So, these tubes were exposed to Staphylococcus aureus, H. influenzae or M. catarrhalis (Mc) for 48 hours at human body temperature. (M. catarrhalis is a bacterium causing a wide range of troubles, especially in the lungs and head, such as otitis media, bronchitis, sinusitis, and laryngitis. Elderly patients and long-term heavy smokers can get bronchopneumonia). After these tubes were exposed to the three bacteria, all biofilms were quantified by counting colonies.

The researchers looked at the uncoated ear tubes or tympanostomy tubes and compared them to the organoselenium-coated tympanostomy tubes. The non-coated tubes had significant thick and mature biofilms containing considerable biomass. The coating of organoselenium (OS) resulted in profound inhibition of biofilms, and it undermined biofilm formation against all three bacteria. The OS coating should be considered as a potential long-lasting agent to prevent biofilm development on tympanostomy tubes.

Does Magnesium Deprivation Hinder Biofilms?

Before we decide to remove an element that is used in vast numbers of important enzymes, we have to have a foundation. First, in some basic physiology texts, calcium displaces magnesium inside human cells. My impression of this research is that suboptimal magnesium increases systemic inflammation, vascular death such a heart attacks, and cancer. Dibaba shows that the higher the magnesium in diet the lower C-reactive protein. This protein is associated with inflammation. If you lower inflammation you decrease deaths.

Qu pooled studies of approximately a half a million people to examine the results. The greatest risk reduction occurred when magnesium intake increased from 150 to 400 mg/day. A significant inverse association was found between dietary magnesium intake and total cardiovascular events. Serum magnesium concentrations are linearly and inversely associated with the risk of cardiovascular troubles such as heart attacks and brain strokes. Since magnesium is poorly absorbed even when chelated to an amino acid, it is perhaps useful to note the useful dose was 400 mg, when compared to minimal benefit from 150 mg orally.

Del Gobbo also examined vast studies and wrote: “Clinical hypomagnesemia and experimental restriction of dietary magnesium increase cardiac arrhythmias.” Deadly ischemic heart disease, in which a person dies due to poorly oxygenated blood reaching the entire heart, was more common in those with no magnesium supplementation or very low oral magnesium dosing. Simply, “circulating and dietary magnesium are inversely associated with [cardiovascular disease].” Further, Qu shows, in another study, a significant drop in intestinal cancers with a reasonable magnesium intake. While we may not know the mechanism for these useful findings, they are not felt to be due to chance.

Song and Leff clearly show why a small number of scientists and physicians have pondered lowering human magnesium Mg2+ levels. They remind us that Mg2+ can influence bacterial adhesion, which is part of biofilm process. In their study, the bacterium Pseudomonas fluorescens was used to investigate the influence of Mg2+ on biofilm growth.

Mg2+ concentration had no influence on the growth of isolated free-ranging planktonic cells. However, during biofilm formation, Mg2+ increased the abundance of attached cells. Biofilm depth increased with increasing Mg2+ concentrations. Clearly, Mg2+ increased initial attachment of bacteria—a first step in moving from isolated cells to biofilm communities of bacteria. Mg2+ enhanced biofilm formation and structure. This is why a few researchers or clinicians would like to decrease magnesium as a treatment.

I respect those who make this point, but I feel further reductions in poor intracellular magnesium levels would increase auto-immunity, inflammation, allergies, cancer, heart attacks and strokes. One can kill biofilms with hemlock, but that is not the best option. It shows a lack of understanding of the poor magnesium levels in first-world human cells that currently exists, and a lack of understanding about how much help is given by administering gram quantities of magnesium. Oral delivery is the poorest route even when chelated or bound to a good carrier. That this fact is not appreciated shows how far physicians and some other healers are from advanced nutraceutical science.

Since diversity exists throughout the bacterial world, it is important to mention that some biofilms might not be altered by magnesium, but it is not fully clear. Carvalhais writes in *Dormancy within Staphylococcus epidermidis biofilms:*

"…the pH of the culture medium did not change after the addition of magnesium, and genes related to magnesium transport did not seem to impact entrance of bacterial cells into dormancy."

Dormancy is not identical to making biofilms, but is typically part of the process—the bacteria become less mobile.

Magnesium may or may not increase the formation of specific infectious biofilms, but the risks are high for disease or death in dropping body magnesium levels. We should do the opposite and add magnesium to low levels which are routinely low inside human cells. We do have a vast number of other options to kill biofilms.

Dibaba DT, Xun P, He K. Dietary magnesium intake is inversely associated with serum C-reactive protein levels: meta-analysis and systematic review. Eur J Clin Nutr. 2014 Feb 12. [Epub ahead of print]. PMID:24518747

Qu X, Jin F, Hao Y, Li H, Tang T, Wang H, Yan W, Dai K. Magnesium and the risk of cardiovascular events: a meta-analysis of prospective cohort studies. PLoS One. 2013;8(3):e57720. Epub 2013 Mar 8. PMID:23520480

Del Gobbo LC, Imamura F, Wu JH, de Oliveira Otto MC, Chiuve SE, Mozaffarian D. Circulating and dietary magnesium and risk of cardiovascular disease: a systematic review and meta-analysis of prospective studies. Am J Clin Nutr. 2013 Jul;98(1):160-73. Epub 2013 May 29. PMID:23719551

Qu X, Jin F, Hao Y, Zhu Z, Li H, Tang T, Dai K. Nonlinear association between magnesium intake and the risk of colorectal cancer. Eur J Gastroenterol Hepatol. 2013 Mar;25(3):309-18. PMID:23222473

Song B, Leff LG. Influence of magnesium ions on biofilm formation byPseudomonas fluorescens. Microbiol Res. 2006;161(4):355-61. Epub 2006 Mar 6. PMID: 16517137

Carvalhais V, França A, Cerca F, Vitorino R, Pier GB, Vilanova M, Cerca N. Dormancy within Staphylococcus epidermidis biofilms: a transcriptomic analysis by RNA-seq. Appl Microbiol Biotechnol. 2014 Feb 7. [Epub ahead of print]. PMID:24504458

Restricting Fat to Treat Biofilms

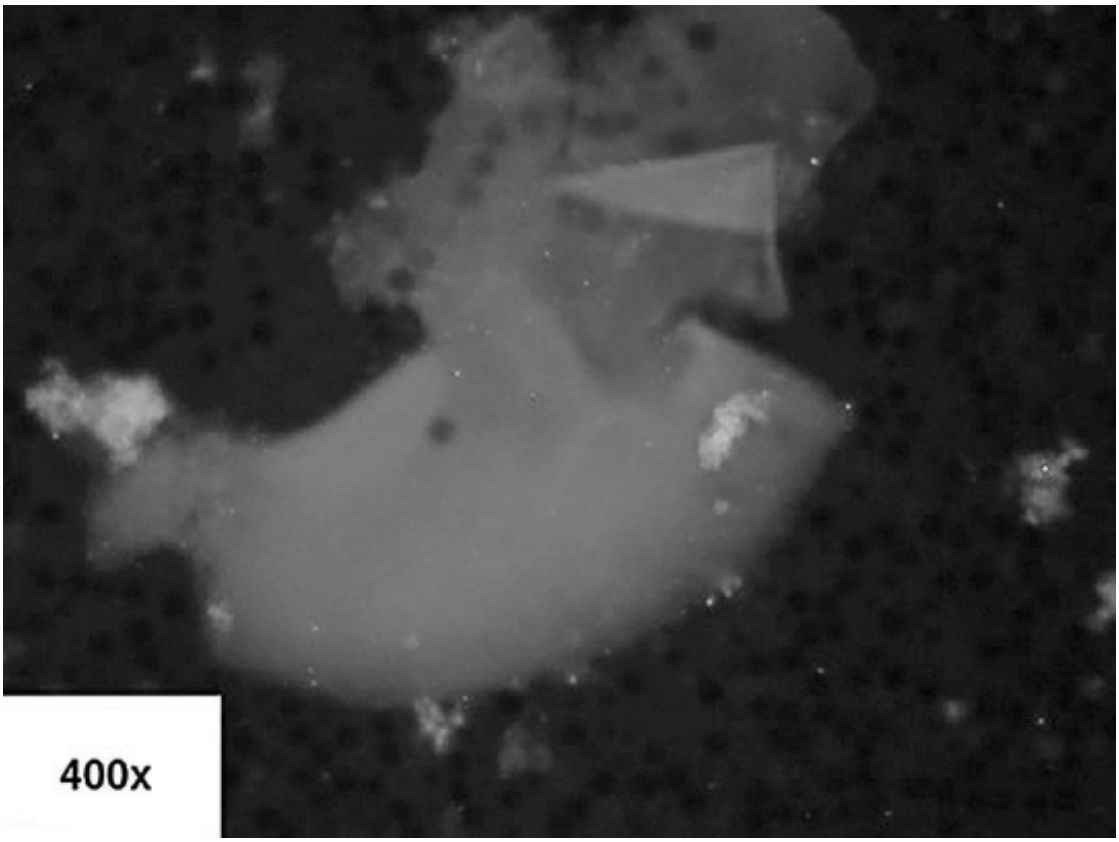
Some researchers of biofilms feel that a very low fat diet will help undermine biofilms. The thinking is that fat is a part of biofilm structure, and perhaps they are also aware that some types of fat chemicals promote biofilms. Let us first look and see if this is true, and then discuss the option of a very low fat diet.

Biofilms have various structures, but even if the primary structure uses a complex carbohydrate sugar like a polysaccharide (poly or "many" sugars), it also uses fats or lipids routinely.

A Candida albicans infection causes a release of arachidonic acid from the infected host. The biofilm of Candida secretes significant amounts of fat chemicals called prostaglandins (Mishra). When comparing the fat of community C. albicans biofilms and planktonic free cells, biofilms contained higher levels of fats like phospholipid and sphingolipid fats (Lattif).

Dr. S. Fry's genetically-distinct protozoan Protomyxzoa rheumatica (seen below) is reported to respond to lower lipid diets. A number of studies on this single-celled infection are in process. But, the CDC has reported to him this ring shaped biofilm-making single-celled parasite is neither Babesia nor malaria.

Fry S. Biofilms in Nature and Disease. Role of Hypercoagulation & Biofilms in Chronic Illness Conference; April 2, 2011. Fairfax, VA.



This image is from the blood of a 17 year-old female with exposure to grass, three foot tall wild grass, small mammals, and ticks on a pet dog. The tiny black circles are red blood cells. What is the huge sheet-like pale material in the blood smear slide? It is reported to be a large biofilm. The organism that created this film was first called **FL1953**, and is related to Babesia and malaria but unique. Multiple studies are in process. (Fry Laboratory).

Currently, there are likely over a hundred different approaches to handling biofilms. One proposed approach by S. Fry, who reports it has origins in past biofilm foundational research, is to weaken this biofilm with very significant low lipid diets. I do not oppose or promote this approach for this unique protozoan. I simply propose at least other options also be used.

I also suggest patients be tracked by lipid lab testing as the results below, from a very nutritionally educated doctor, show deficits in fats required for optimal human health. This patient is now consulting a veteran dietician monthly.

In his attempt to limit fats, this doctor also accidentally dropped other important items and one part of this problem may be that **fats are required for the function of many biological reactions and for cells and organs to work.** Every human cell must have fats to exist. If fat levels drop too far, other functions may become a problem, and possibly other nutritional defects may exist. We are not saying that a low fat diet is the cause of all these defects shown in his labs; we are saying it is possible.

This individual was eating protein and complex carbohydrates that should not have resulted in such serious defects.

UREA NITROGEN (BUN)		**6 L**	7-25 mg/dL	
CREATININE	0.70		0.70-1.33 mg/dL	
For patients >49 years of age, the reference limit for Creatinine is approximately 13% higher for people identified as African-American.				
eGFR NON-AFR. AMERICAN	105		> OR = 60 mL/min/1.73m2	
eGFR AFRICAN AMERICAN	122		> OR = 60 mL/min/1.73m2	
BUN/CREATININE RATIO	9		6-22 (calc)	
SODIUM		**124 L**	135-146 mmol/L	
POTASSIUM	4.8		3.5-5.3 mmol/L	
CHLORIDE		**86 L**	98-110 mmol/L	
CARBON DIOXIDE	29		19-30 mmol/L	
CALCIUM	9.5		8.6-10.3 mg/dL	
PROTEIN, TOTAL	7.3		6.1-8.1 g/dL	
ALBUMIN	4.7		3.6-5.1 g/dL	
GLOBULIN	2.6		1.9-3.7 g/dL (calc)	
ALBUMIN/GLOBULIN RATIO	1.8		1.0-2.5 (calc)	
BILIRUBIN, TOTAL	0.5		0.2-1.2 mg/dL	
ALKALINE PHOSPHATASE	80		40-115 U/L	
AST	33		10-35 U/L	
ALT	17		9-46 U/L	
MAGNESIUM, RBC		**3.5 L**	4.0-6.4 mg/dL	AMD
LIPASE	37		7-60 U/L	MI
T4, FREE	1.0		0.8-1.8 ng/dL	MI
T3, FREE		**1.4 L**	2.3-4.2 pg/mL	MI
NONESTERIFIED FATTY ACIDS (FREE FATTY ACIDS)				EZ
FATTY ACIDS, FREE	0.13		0.07-0.88 mmol/L	
AMINO ACID ANALYSIS FOR MSUD, LC/MS, PLASMA				EZ
INTERPRETATION	SEE NOTE			
THE BRANCHED-CHAIN AMINO ACIDS ARE DECREASED IN THIS SAMPLE. A DECREASE IN BRANCHED-CHAIN AMINO ACIDS SUGGESTS LOW PROTEIN INTAKE. Interpretation reviewed by: Rajesh Sharma, Ph.D., DABMG IF YOU HAVE ANY QUESTIONS REGARDING THESE RESULTS, PLEASE CONTACT THE QUEST DIAGNOSTICS BIOCHEMICAL GENETICS LABORATORY AT 1-800-642-4657 ext 4817 or ext 4423 AND ASK TO SPEAK WITH THE LABORATORY DIRECTOR ON CALL. FOR GENERAL QUESTIONS ABOUT QUEST DIAGNOSTICS GENETIC TESTING, PLEASE CALL THE GENE INFO LINE AT 1-866-GENE-INFO.				
DATE OF BIRTH	03/18/1957			
VALINE		**34 L**	132-313 umol/L	
ISOLEUCINE		**10 L**	34-98 umol/L	

These lab results show a wide range of defects in nutrition such as very low sodium, low iron, and low protein in a low fat eater. Look at the next labs below.

Labs Showing a Serious Fat Defect

OMEGA-3 (EPA+DHA) INDEX REPORT

RISK

High	**Moderate**	**Low**
(<1.1%)	1.1%-3.3%	(>3.3%)

Test Name	In Range	Out of Range	Reference Range/ Comments
OMEGA 3 and 6 FATTY ACIDS, PLASMA			
OMEGA 3 (EPA+DHA) INDEX	3.9		0.5-6.4%
OMEGA 3/OMEGA 6 RATIO	1.4		1.3-12.0
ARACHIDONIC ACID/EPA RATIO		0.1L	0.2-7.0
ARACHIDONIC ACID		0.1L	0.3-2.3%
EPA	1.6		<2.3%
DHA	2.3		0.4-3.0%

Please note the low level of Arachidonic acid which is almost zero and is required for many body functions. This low fat diet was intentional and the omega-3's present due to a good supplement.

Bales PM, Renke EM, May SL, Shen Y, Nelson DC. Purification and Characterization of Biofilm-Associated EPSExopolysaccharides from ESKAPE Organisms and Other Pathogens. PLoS One. 2013 Jun 21;8(6):e67950. Print 2013. PMID:23805330

Mishra NN, Ali S, Shukla PK. Arachidonic acid affects biofilm formation and PGE2 level in Candida albicans and non-albicans species in presence of subinhibitory concentration of fluconazole and terbinafine. Braz J Infect Dis. 2014 Jan 2. pii: S1413-8670(13)00288-2. [Epub ahead of print]. PMID:24389279

Lattif AA(1), Mukherjee PK, Chandra J, Roth MR, Welti R, Rouabhia M, Ghannoum MA. Lipidomics of Candida albicans biofilms reveals phase-dependent production of phospholipid molecular classes and role for lipid rafts in biofilm formation. Microbiology. 2011 Nov;157(Pt 11):3232-42. Epub 2011 Sep 8. PMID:21903752

Bruno L, Di Pippo F, Antonaroli S, Gismondi A, Valentini C, Albertano P. Characterization of biofilm-forming cyanobacteria for biomass and lipid production. J Appl Microbiol. 2012 Nov;113(5):1052-64. Epub 2012 Aug 21. PMID:22845917

Houttuynia cordata Thunb (HCT)

Houttuynia cordata Thunb (HCT) is commonly used in Taiwan and other Asian countries as an anti-inflammatory, anti-cancer, anti-bacterial and anti-viral herbal medicine.

Houttuynia cordata

In a conversation with Dr. Q. Zhang, a leading national Chinese herbal pharmacologist, he reported that Houttuynia cordata Thunb has biofilm defeating properties. It is available from www.hepapro.com in two strengths, HH and HH-2. The latter is double strength with a low increase in cost over HH.

One appeal I would make is that before taking HH you should probably fix any insomnia, depression, anxiety, personality change or excess anger issues. HH in most people can make these worse at an effective dose. Based on the experience of inherited patients using very wide range of doses of HH, it seems the optimal dose must be tailored to each patient and may need to be adjusted a few times. Over time, HH may help insomnia, depression, anxiety, personality change or excessive anger. If it helps decrease these in the first week, it might only be stunning but not killing an infection.

HH has had significant advanced study and increasingly the research is available in English. Sodium new houttuyfonate (SNH) is an analogue of houttuynin, the main antibacterial ingredient of Houttuynia cordata Thunb. SNH demonstrated in vitro antibacterial activity against 103 hospital-associated MRSA isolates. Combinations of sub-MIC levels of SNH and oxacillin or netilmicin significantly improved the in vitro antibacterial activity against MRSA compared with either drug alone. The SNH-based combinations showed promise in combating MRSA (Lu and Yang). However, it is not certain if part of its killing action with this specific organism is an anti-biofilm action.

Zhang, QC. Personal interview February 26, 2014 and other dates.

Shao J, Cheng H, Wang C, Wang Y. A phytoanticipin derivative, sodium houttuyfonate, induces in vitro synergistic effects with levofloxacin against biofilm formation by Pseudomonas aeruginosa. Molecules. 2012 Sep 20;17(9):11242-54. PMID:22996347

Lu X, Yang X, Li X, Lu Y, Ren Z, Zhao L, Hu X, Jiang J, You X. In vitro activity of sodium new houttuyfonate alone and in combination with oxacillin or netilmicin against methicillin-resistant Staphylococcus aureus. PLoS One. 2013 Jul 2;8(7):e68053. Print 2013. PMID:23844154

Chen YF, Yang JS, Chang WS, Tsai SC, Peng SF, Zhou YR. Houttuynia cordata Thunb extract modulates G0/G1 arrest and Fas/CD95-mediated death receptor apoptotic cell death in human lung cancer A549 cells. J Biomed Sci. 2013 Mar 19;20:18. PMID:23506616

Lai KC, Chiu YJ, Tang YJ, Lin KL, Chiang JH, Jiang YL, Jen HF, Kuo YH, Agamaya S, Chung JG, Yang JS. Houttuynia cordata Thunb extract inhibits cell growth and induces apoptosis in human primary colorectal cancer cells. Anticancer Res. 2010 Sep;30(9):3549-56. PMID:20944136

Duan X, Zhong D, Chen X. Derivatization of beta-dicarbonyl compound with 2,4-dinitrophenylhydrazine to enhance mass spectrometric detection: application in quantitative analysis of houttuynin in human plasma. J Mass Spectrom. 2008 Jun;43(6):814-24. PMID:18286671

Lu H, Wu X, Liang Y, Zhang J. Variation in chemical composition and antibacterial activities of essential oils from two species of Houttuynia THUNB. Chem Pharm Bull (Tokyo). 2006 Jul;54(7):936-40. PMID:16819207

Sample Biofilm Trigger Chemicals Turned Back Against the Bacteria

In the *Journal of Bacteriology,* there is a short reminder of the simple steps in the formation of a biofilm and information about a fat used to impact many biofilms from a number of bacteria—not just one species.

As a reminder, bacteria primarily live on a surface in communities of biofilms. They go from being alone to attaching to a surface, forming different looking colonies as biofilms, and then some or most bacteria disperse. What is curious in this study by Davies is that Pseudomonas aeruginosa makes a fat called cis-2-decenoic acid, which causes dispersal and stops biofilm production. It also disperses other bacteria colonies found with Escherichia coli, Klebsiella pneumoniae, Proteus mirabilis, Streptococcus pyogenes, Bacillus subtilis, Staphylococcus aureus, and the yeast Candida albicans.

The point? First, what would happen if the part of this chemical that stops biofilms from forming could be isolated? You would have a biofilm blocking treatment. Would it be useful to give this biofilm blocking chemical at the same time as heavy antibiotic treatment, so the dispersed bacteria would all be killed? You could also disperse the biofilm bacteria and run the blood through a high killing blood machine with many antibiotic processes. I propose that these biofilm and bacteria treatment ideas will facilitate treatment success.

Davies DG, Marques CN. A Fatty Acid Messenger Is Responsible for Inducing Dispersion in Microbial Biofilms. J Bacteriol. 2009 Mar;191(5):1393-403. Epub2008 Dec 12. PMID:19074399

Double Treatments

A double treatment can take different forms. You can add a biofilm weakening agent to an antibacterial or antifungal agent, or use emerging nanoemulsions that are so profoundly advanced and tiny they can last years and may be able to carry killing agents right through biofilms. Additionally, one can combine two agents, such as in our example below of giving two drugs together in a simulated nebulizer. If these or other combinations do not negatively interact, they might be used in pneumonia which kills tens of millions, is a leading cause of death in the elderly and the top cause of death in the world in children under six. This approach may also help cystic fibrosis patients or smokers with infected, chemically scarred lungs, who may die from biofilm infections.

In a trial by Wollstadt, Kramer and Kamin, two antibiotics, colistin and tobramycin, were given to cystic fibrosis patients. The pH remained unchanged and within physiologically acceptable ranges. Neither the colistin methanesulfonate (CMS), nor the tobramycin, lost antibiotic potency. The mixtures of nebulizer solutions were compatible. The combination of tobramycin and colistin was found to be superior to monotherapy in killing P. aeruginosa in biofilms in cystic fibrosis patients.

Wollstadt A, Krämer I, Kamin W. Physicochemical compatibility of nebulizable drug admixtures containing colistimethate and tobramycin. Pharmazie. 2013 Sep;68(9):744-8. PMID:24147342

Plant Sources Rarely Yield Only One Useful Chemical

Simply, if you look at a plant, animal or liquid that is natural, it is rarely pure. For example, if you treat a plant to isolate its primary chemicals you can get 500 birthday presents falling into your lap. And what do you do with all these chemicals? Some scientists take some and test one after the other. But which ones do you start examining?

Mothana took the essential oil of Soqotraen Leucas virgaga Balf f. and found 43 chemicals from the distilled essential oils of which these are mere samples:

- camphor
- exo-fenchol
- fenchon
- borneol
- β-Eudesmol
- caryophyllene oxide

The lesson is that we have many natural chemicals that have real potential as antibiotics and biofilm treatments in humans, domesticated animals and industry, but they are not ready for use today.

Mothana RA, Al-Said MS, Al-Yahya MA, Al-Rehaily AJ, Khaled JM. GC and GC/MS analysis of essential oil composition of the endemic Soqotraen Leucas virgata Balf.f. and its antimicrobial and antioxidant activities. Int J Mol Sci. 2013 Nov 21;14(11):2312

Nitroxoline

We are not going to spend significant time on this fifty year-old antibiotic because it is not used in many countries, and it is a quinolone, and quinolones all seem to have serious risk of tendon damage. For example, it is possible nitroxoline has the same risks as other quinolones (www.drugbank.ca/drugs/DB01422).

Quinolones easily enter cells and are often used to treat intracellular pathogens such as Mycoplasma pneumoniae.

The FDA has increased warnings regarding side effects since the drugs were first approved. I just want to focus on three side effects that might not be routine but are possible risks with many quinolones:

- Damage to nerves outside the brain: This could present as sensory nerve or muscle nerve injury causing paresthesias, hypoaesthesias, dysesthesias, and weakness. New pain, burning, tingling, numbness and/or weakness, or new decreased abilities to detect light touch, pain, temperature, position sense, vibratory sensation, and/or motor strength are basic nerve functions and show damage; these are reasons to stop taking the drug.
- Tendon damage: While some focus on the Achilles tendon, actual tears of tendons have occurred in the hand, the shoulder, the thigh, or other locations. Some are helped with surgery. Other patients feel the surgical or other treatment still leaves them with damage. It is believed by some that the use of prednisone and other cortical steroids meant to drop inflammation increases the risk of tendon damage. Perhaps this is especially true in older seniors. Surprisingly, tendons can rupture after the medication is stopped. Some have suggested that IV, transdermal or sublingual magnesium might decrease the risk, but I am not aware this hypothesis has been proven (Schaller).

One patient wrote this clear experience to quinolones:

> I was prescribed Levaquin nine months ago for a sinus infection, and possible bronchitis. It was 12 days of 500 mg per day. That was the end of my life as I knew it. Like many of you, my life has changed profoundly. I went from having an extremely active life professionally and with my family to no longer being able to work or throw a baseball to my son (Schaller).

Nitroxoline decreased biofilm density of P. aeruginosa infections. It appears to bind iron and perhaps also zinc, both of which have some role structurally in maintaining this bacteria's biofilm matrix (Sobke). Currently, this treatment is not available in the United States.

http://www.drugbank.ca/drugs/DB01422

http://www.personalconsult.com/articles/fluoroquinolonedamage.html

Sobke A, Klinger M, Hermann B, Sachse S, Nietzsche S, Makarewicz O, Keller PM, Pfister W, Straube E. The urinary antibiotic 5-nitro-8-hydroxyquinoline (Nitroxoline) reduces the formation and induces the dispersal of Pseudomonas aeruginosa biofilms by chelation of iron and zinc. Antimicrob Agents Chemother. 2012 Nov;56(11):6021-5. Epub 2012 Aug 27. PMID:22926564

Lysozyme

Sheffield attempted to determine the destructive activity of lysozyme against Klebsiella pneumoniae biofilms. Low concentrations of lysozyme removed significant biofilm formation by a type of K. pneumoniae.

Sheffield CL, Crippen TL, Poole TL, Beier RC. Destruction of single-species biofilms of Escherichia coli or Klebsiella pneumoniae subsp. pneumoniae by dextranase, lactoferrin, and lysozyme. Int Microbiol. 2012 Dec;15(4):185-9. PMID: 23844477

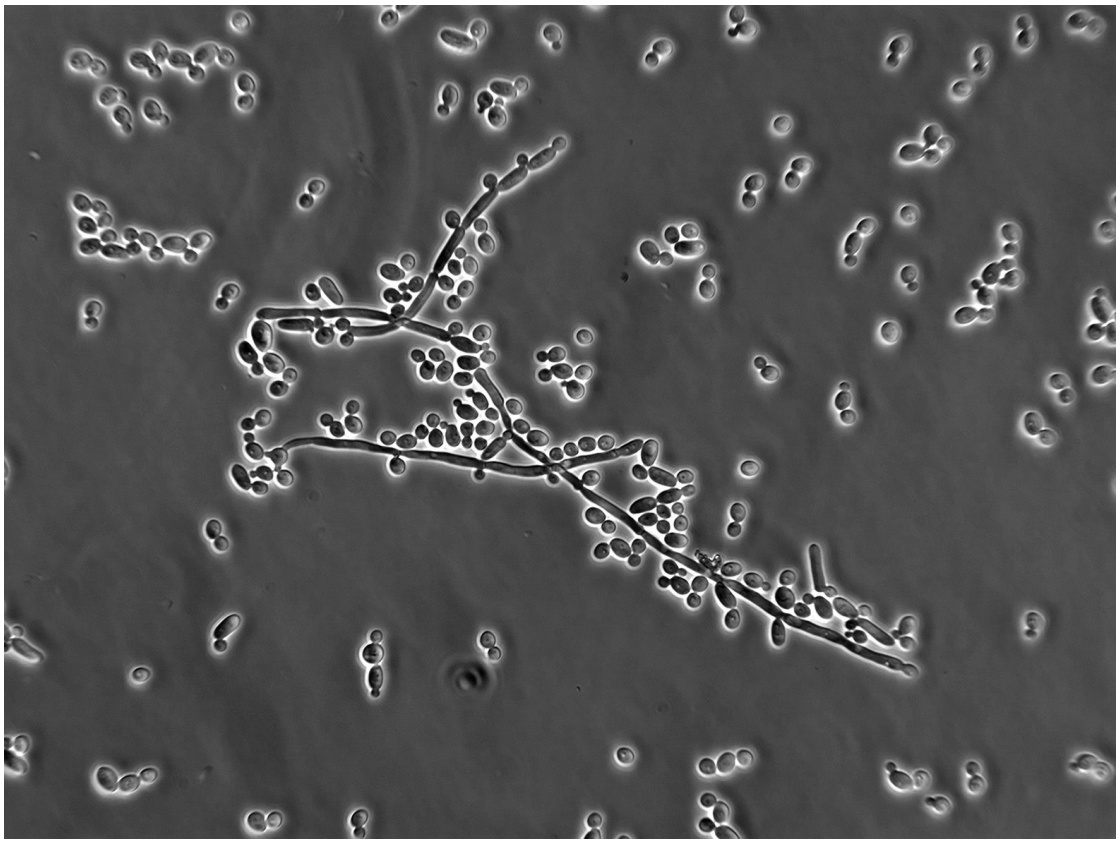
Aspirin and NSAIDS

We have previously said it is best to see biofilms like a key, and using AIDS as an example, it was only after AZT in 1996 with **the arrival of protease inhibitors that those quickly dying, experienced a "Lazarus effect," in which AIDS patients who looked to be ready to die recovered markedly in 30 days.** Medications used in AIDS are tough medications, even if they are miracles. Some may question offering a section on the tough medications aspirin and NSAIDS.

While we appreciate that aspirin and various other over the counter NSAIDS may not be optimal, perhaps due to concerns of liver, kidney or ulcer issues, we are discussing infections that invade and cannot be stopped by your body. You might need all the help you can get. So we offer some synthetic options here that may offer help against a top killing and disabling problem—**biofilm-protected** infections.

For example, fluconazole-resistant Candida is increasing worldwide. Fluconazole is also called Diflucan. Biofilms are one reason for a decreased effect in treatment. Aspirin, diclofenac, ketoprofen, tenoxicam, and ketorolac all undermined biofilms or their processes. They all reduced fungal adhesion, and increased biofilm detachment with low concentrations of anti-inflammatory agents. Microscopic examination confirmed the tested drugs had a significant effect on reduction of Candida adhesion and biofilm development. The drugs also made fluconazole work more effectively against fluconazole-resistant C. albicans (Abdelmegeed).

Another useful way to involve aspirin is by teaming it up with the chelation chemical EDTA. Both aspirin and EDTA possess broad antimicrobial activity for biofilm cultures. Aspirin used for 24 hours was successful in eradicating P. aeruginosa, E. coli and C. albicans biofilms. Moreover, exposure to the Aspirin-EDTA combination completely destroyed bacterial biofilms after only four hours in simulation lab testing (Al-Bakri).



Photomicrograph of the hyphal form of the fungal pathogen Candida albicans. Taken with a phase-contrast microscope and Normarski optics.

http://www.nytimes.com/2012/09/21/movies/how-to-survive-a-plague-aids-documentary-by-david-france.html?_r=0. Accessed February 28, 2014.

Abdelmegeed E, Shaaban MI. Cyclooxygenase inhibitors reduce biofilm formation and yeast-hypha conversion of fluconazole resistant Candida albicans. J Microbiol. 2013 Oct;51(5):598-604. Epub 2013 Sep 14. PMID:24037655

Zhou Y, Wang G, Li Y, Liu Y, Song Y, Zheng W, Zhang N, Hu X, Yan S, Jia J. In vitro interactions between aspirin and amphotericin B against planktonic cells and biofilm cells of Candida albicans and C. parapsilosis. Antimicrob Agents Chemother. 2012 Jun;56(6):3250-60. Epub 2012 Mar 5. PMID:22391539

Jung CJ, Yeh CY, Shun CT, Hsu RB, Cheng HW, Lin CS, Chia JS. Platelets enhance biofilm formation and resistance of endocarditis-inducing streptococci on the injured heart valve. J Infect Dis. 2012 Apr 1;205(7):1066-75. Epub 2012 Feb 21. PMID:22357661

Carvalho AP, Gursky LC, Rosa RT, Rymovicz AU, Campelo PM, Grégio AM, Koga-Ito CY, Samaranayake LP, Rosa EA. Non-steroidal anti-inflammatory drugs may modulate the protease activity of Candida albicans. Microb Pathog. 2010 Dec;49(6):315-22. Epub 2010 Aug 12. PMID:20708674

Al-Bakri AG, Othman G, Bustanji Y. The assessment of the antibacterial and antifungal activities of aspirin, EDTA and aspirin-EDTA combination and their effectiveness as antibiofilm agents. J Appl Microbiol. 2009 Jul;107(1):280-6. Epub 2009 Mar 10. PMID:19302313

Beathard GA, Urbanes A. Infection associated with tunneled hemodialysis catheters. Semin Dial. 2008 Nov-Dec;21(6):528-38. Epub 2008 Sep 24. PMID:19000122

Van Dyke TE. Control of inflammation and periodontitis. Periodontol 2000. 2007;45:158-66. PMID:17850455

Alem MA, Douglas LJ. Prostaglandin production during growth of Candida albicans biofilms. J Med Microbiol. 2005 Nov;54(Pt 11):1001-5. PMID:16192429

Azithromycin (Zithromax)

This medication is almost a household name and is known as the "Z-Pak" which contains brand name Zithromax pills that are still in use today. Despite being in use many years and used very routinely, this medication still has a strong use in addressing biofilms.

For example, Maezono showed that azithromycin was markedly superior compared to other routine antibiotics in killing gum infection bacteria. Specifically, azithromycin at **very low dosing** undermined four strains of Porphyromonas gingivalis. This determination involved the use of two fascinating techniques.

Azithromycin dropped the bacteria "gasoline" or ATP in the bacteria, which means the bacteria had decreased function or were dead. Cyanide kills humans in part due to dropping ATP levels—it is not a trivial substance. Further, the power of azithromycin was seen clearly with a confocal laser scanning microscope, which has the ability that the long name suggests—seeing the decreased amount of bacteria.

One of the most common hospital infection risks is MRSA; it causes a number of potentially deadly diseases. This "MRSA"simply means routine staph aureus is no longer able to be killed or it is resistant to methicillin, so it reproduces unchecked. Azithromycin is proposed as one solution to MRSA based partly on its biofilm defeating abilities at very low dosing.

Gui shows that azithromycin was active against methicillin-resistant Staphylococcus aureus (MRSA) strains. It reduced the production of α-hemolysin and biofilm formation at very low "sub-inhibitory" concentrations. So, azithromycin may be useful in the treatment of α-hemolysin-producing and biofilm-forming MRSA infections.

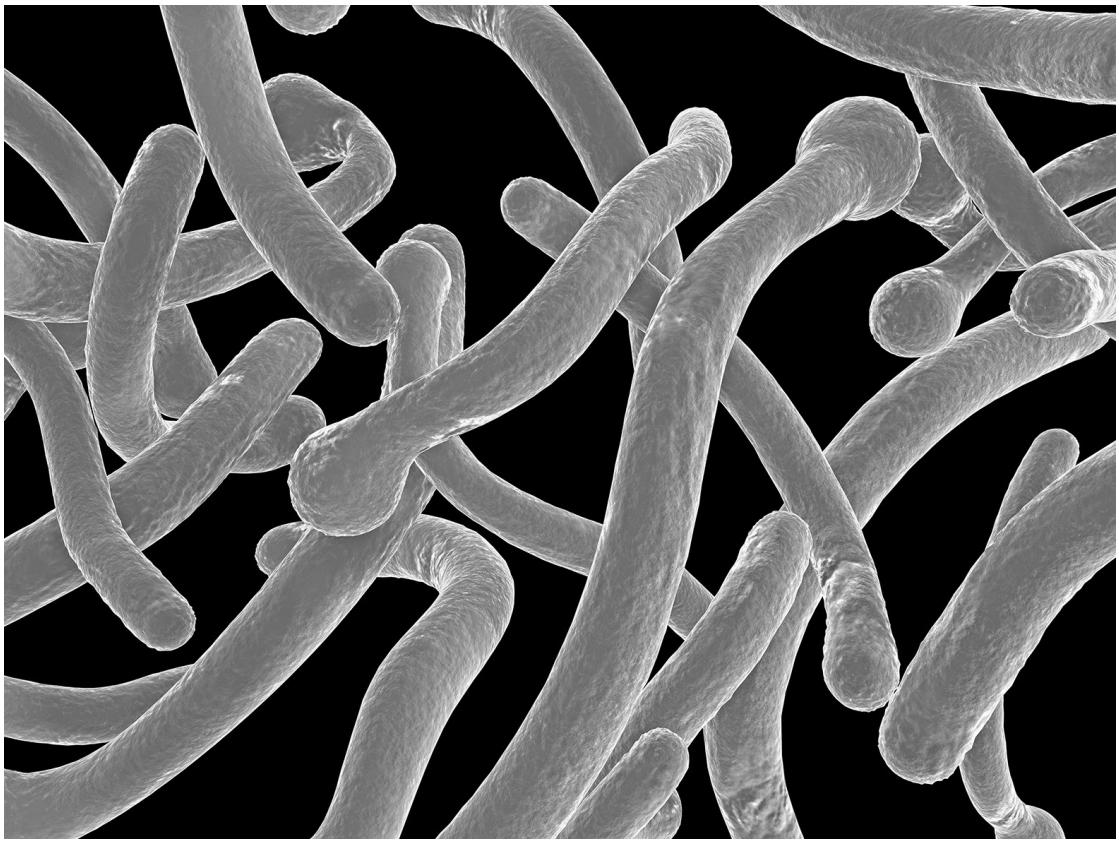
Maezono H, Noiri Y, Asahi Y, Yamaguchi M, Yamamoto R, Izutani N, Azakami H, Ebisu S. Antibiofilm effects of azithromycin and erythromycin on Porphyromonas gingivalis. Antimicrob Agents Chemother. 2011 Dec;55(12):5887-92. Epub 2011 Sep 12. PMID:21911560

Gui Z, Wang H, Ding T, Zhu W, Zhuang X, Chu W. Azithromycin Reduces the Production of α-hemolysin and Biofilm Formation in Staphylococcus aureus. Indian J Microbiol. 2014 Mar;54(1):114-7. Epub 2013 Nov 21.

Silver

Silver treatment used against the biofilms in wounds has clearly been effective. Indeed, a 1% silver cream has been used successfully to treat and prevent infections in burn patients all over the world.

A review by the International Wound Infection Institute shows the data still points to silver as a top treatment. For example, Monteiro tested colloidal silver against fungal biofilms. The conclusion of that work is very firm: irrespective of concentrations used in the study, silver affected the matrix composition and structure of Candida biofilms.



3-dimensional rendered close up of Candida albicans.

These positions are not surprising as traditional synthetic antibiotics and antifungals fail. Silver has a strong foundation in medicine. Its antimicrobial properties were first documented around 400 B.C. when Hippocrates described its use to enhance wound healing and to preserve water and food. It has a long-standing history of proven activity against treatment-resistant bacteria.

One issue with treatment solutions for biofilm-resistant infection is whether they possibly apply to many other serious bacterial infections. Clearly, we have mentioned wound infections resist many antibiotics. Infectious disease physicians are looking for new antibiotics, but ionic

silver was found to be markedly useful. Silver alginate and silver carboxymethyl cellulose (SCMC) dressings were used on wound infections of challenging bacteria in burn victims. Both dressings at high and low pH helped defeat all of these bacteria:

- vancomycin-resistant Enterococcus faecium
- methicillin-resistant Staphylococcus aureus (MRSA)
- multidrug-resistant Pseudomonas aeruginosa
- multidrug-resistant Vibrio species
- multidrug-resistant Stenotrophomonas maltophilia
- extended-spectrum ß-lactamase producing Salmonella
- extended-spectrum ß-lactamase producing Klebsiella pneumoniae
- extended-spectrum ß-lactamase producing Proteus mirabilis
- extended-spectrum ß-lactamase producing Escherichia coli
- multidrug-resistant Acinetobacter baumannii

All forty-nine antibiotic-resistant bacteria isolated from burn wounds showed susceptibility to the antimicrobial activity of both silver containing wound dressings over all pH ranges. In addition, the study showed that the performance of both dressings apparently increased when the pH became more acidic (Percival).

We will not discuss the issue of excess silver causing skin coloration damage. It is real, but this fear has caused the FDA and others to limit careful safe use of silver.

We do want to mention briefly possible ways silver works against infections. These are for serious thinkers, and if you do not care, skip ahead. The use of ionic silver (Ag+) in a silver nitrate salt (AgNO3) had profound antimicrobial activity against Escherichia coli. Silver or Ag+

appeared to induce OH^- production and increase membrane permeability (Morones-Ramirez). The possible mechanisms also include:

1. disruption of normal bacterial cellular reactions
2. disulfide bond damage
3. metabolism interference
4. iron balance disruption
5. increased reactive oxygen chemicals
6. increased cell membrane permeability (Percival)

In mice and in the lab (in vitro), silver appeared to increase the activity of and potentially restore antibiotic susceptibility to antibiotic-resistant bacteria. For example, silver treatment of hardy bacteria in mice, as well as lab-generated biofilms, expanded the antibacterial capacities of vancomycin. Finally, both in vitro biofilms and biofilm infections in mice were made more vulnerable to destruction by silver (Morones-Ramirez 2013).

Leaper DJ, Schultz G, Carville K, Fletcher J, Swanson T, Drake R. Extending the TIME concept: what have we learned in the past 10 years? Int Wound J. 2012 Dec;9 Suppl 2:1-19. PMID:23145905

Monteiro DR, Silva S, Negri M, Gorup LF, de Camargo ER, Oliveira R, Barbosa DB, Henriques M. Silver colloidal nanoparticles: effect on matrix composition and structure of Candida albicans and Candida glabrata biofilms. J Appl Microbiol. 2013 Apr;114(4):1175-83. Epub 2013 Jan 11. PMID:23231706

Percival SL, Thomas J, Linton S, Okel T, Corum L, Slone W. The antimicrobial efficacy of silver on antibiotic-resistant bacteria isolated from burn wounds. Int Wound J. 2012 Oct;9(5):488-93. Epub 2011 Dec 19. PMID:22182219

Morones-Ramirez JR, Winkler JA, Spina CS, Collins JJ. Silver Enhances Antibiotic Activity Against Gram-Negative Bacteria. Sci Transl Med. 2013 Jun 19;5(190):190ra81. PMID:23785037

Gingerol

In a study by Yonsei, it is reported that gingerol or [6]-Gingerol, a major compound derived from ginger, has anti-bacterial, anti-inflammatory and anti-tumor activities. He reports death of pancreatic cancer cells. Several mechanisms have been described to explain its effects on cells in the lab and in live animals; the underlying mechanisms by which [6]-gingerol exerts anti-tumorigenic effects are largely unknown. I would add that we do not yet have clear evidence this essential oil has biofilm effects. However, Nagoshi has shown increased permeability of some antibiotics by a "detergent" action that increases the killing effect of the antibiotic. Most biofilm solutions clearly increase permeability, since biofilms stop antibiotic or antifungal entrance. Below are some brief comments on this subject.

Park explains that two highly alkylated gingerols, [10]-gingerol and [12]-gingerol, effectively inhibited the growth of three bad oral pathogens at a minimum concentration (MIC) range of 6-30 microgram/mL. For killing, the gingerol concentration must be higher. However, other ginger compounds, 5-acetoxy-[6]-gingerol, 3,5-diacetoxy-[6]-gingerdiol and Galanolactone, had no effect.

Wang and Chen offer useful information for treating a top (nosocomial) hospital infection, Acinetobacter baumannii, which is becoming of world-wide importance. Developing new agents against it is critical. The two researchers examined four known components of ginger: [6]-dehydrogingerdione, [10]-gingerol, [6]-shogaol and [6]-gingerol. All these compounds showed antibacterial effects against Acinetobacter in clinical trials.

Combined with tetracycline, they showed good resistance-modifying effects to modulate tetracycline resistance. Using the 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging method, these four ginger compounds demonstrated antioxidant properties. Indeed, when their antioxidant property was blocked, their antimicrobial benefits were attenuated significantly.

Wang HM, Chen CY, Chen HA, Huang WC, Lin WR, Chen TC, Lin CY, Chien HJ, Lu PL, Lin CM, Chen YH. Zingiber officinale (ginger) compounds have tetracycline-resistance modifying effects against clinical extensively drug-resistant Acinetobacter baumannii. Phytother Res. 2010 Dec;24(12):1825-30. PMID:20564496

Park M, Bae J, Lee DS. Antibacterial activity of [10]-gingerol and [12]-gingerol isolated from ginger rhizome against periodontal bacteria. Phytother Res. 2008 Nov;22(11):1446-9. PMID:18814211

Pumbwe L, Skilbeck CA, Wexler HM. Induction of multiple antibiotic resistance in Bacteroides fragilis by benzene and benzene-derived active compounds of commonly used analgesics, antiseptics and cleaning agents. J Antimicrob Chemother. 2007 Dec;60(6):1288-97. Epub 2007 Sep 20. PMID:17884830

Park YJ, Wen J, Bang S, Park SW, Song SY. [6]-Gingerol induces cell cycle arrest and cell death of mutant p53-expressing pancreatic cancer cells. Yonsei Med J. 2006 Oct 31;47(5):688-97. PMID:17066513

Nagoshi C, Shiota S, Kuroda T, Hatano T, Yoshida T, Kariyama R, Tsuchiya T. Synergistic effect of [10]-gingerol and aminoglycosides against vancomycin-resistant enterococci (VRE). Biol Pharm Bull. 2006 Mar;29(3):443-7. PMID:16508142

Ficker C, Smith ML, Akpagana K, Gbeassor M, Zhang J, Durst T, Assabgui R, Arnason JT. Bioassay-guided isolation and identification of antifungal compounds from ginger. Phytother Res. 2003 Sep;17(8):897-902. PMID:13680820

Stevia

The plant Stevia rebaudiana is well-known due to its sweet-tasting components. Stevioside and rebaudioside A are the most abundant and best analyzed, but more than 30 additional steviol chemicals have been described in the scientific literature to date. Most of them were only detected in the last two years (Wölwer-Rieck). Stevia leaves contain non-cavity and non-caloric sweeteners (steviol-glycosides) according to Gardana.

Stevia leaves and powdered stevia used to replace table sugar.

Giacaman made biofilms by taking a specific strain of bacteria, S. mutans-UA159 with its **routine biofilm growth,** and growing them on cattle enamel to test for dental health risks in humans. Sucrose (table sugar) was the worst of typical sugars and sugar substitutes, in that it encourages the most biofilm growth.

Stevia was able to drop the number of living biofilm-protected bacteria. It reduced dental damage but did not eliminate it fully. Stevia also seemed to interfere with bacteria biochemistry.

Further, in head to head testing, the Stevia-treated sample had less of the S. mutans infection and less biofilm production when compared to table sugar (Brambilla). In terms of biofilm effects, Dr. Eva Sapi's preliminary in vitro laboratory results showed that Stevia had the ability to kill Lyme spirochetes but did not affect the biofilm communities.

Wölwer-Rieck U. The leaves of Stevia rebaudiana (Bertoni), their constituents and the analyses thereof: a review. J Agric Food Chem. 2012 Feb 1;60(4):886-95. Epub 2012 Jan 24. PMID:22250765

Gardana C, Scaglianti M, Simonetti P. Evaluation of steviol and its glycosides in Stevia rebaudiana leaves and commercial sweetener by ultra-high-performance liquid chromatography-mass spectrometry. J Chromatogr A. 2010 Feb 26;1217(9):1463-70. Epub 2010 Jan 6.

Giacaman RA, Campos P, Muñoz-Sandoval C, Castro RJ. Cariogenic potential of commercial sweeteners in an experimental biofilm caries model on enamel. Arch Oral Biol. 2013 Sep;58(9):1116-22. Epub 2013 Apr 28.

Brambilla E, Cagetti MG, Ionescu A, Campus G, Lingström P. An in vitro and in vivo Comparison of the Effect of Stevia rebaudiana Extracts on Different Caries-Related Variables: A Randomized Controlled Trial Pilot Study. Caries Res. 2014;48(1):19-23. Epub 2013 Nov 6.

Theophilus PA, Burugu D, Poururi A, Luecke DF. Sapi E. Effect of Medicinal Agents on the Different Forms of Borrelia burgdorferi Lyme disease or Lyme borreliosis is a tick-borne multisystemic disease caused by different species of Borrelia. http://healthyeats-nl.blogspot.com/2013/07/effect-of-medicinal-agents-stevia-and.html

Cumunda Basics

Cumunda comes from Campsiandra angustifolia, a common water-dispersed tree from the Peruvian Amazon. It comes in an alcohol tincture form and also in solid herbal capsule form from Nutramedix (2007). The professionals at Nutramedix are committed to making herbs from new special locations available to diverse healers and patients. Cumanda showed evidence of killing Bartonella in our **treatment-resistant patients suffering with multiple tick infections** and who rejected synthetic medicine options. These individuals self-treated with these options and showed signs that correlated with a decrease in Bartonella (2006-2007). This was published in the first current advanced text showing the use of VEGF **blood vessel and skin change** effects seen in Bartonella positive patients (direct microscopic exam and indirect testing) **to help patients save hundreds to thousands of dollars on diagnosis, and to prevent disability or death from Bartonella.**

Some physical exam markings only seen on close physical exam were found to always match a positive Bartonella diagnosis. Some were merely suggestive of a Bartonella diagnosis. Forty markings were suggested in print but many more have been found and are unpublished. They are not mere basic stretch marks or highly posted horizontal lines which most Bartonella patients do not have on their body. The book containing these body markings is called, ***The Diagnosis, Treatment and Prevention of Bartonella: Atypical Bartonella Treatment Failures and 40 Hypothetical Physical Exam Findings*** (The color editions come in two parts since Amazon's publishing department at the time was limited to 250 page full color books). This text also discusses the many treatments with very advanced direct and indirect testing support typically only legally available to a physician or supervising physician. These lab tests show what really works in or on the skin. However, it would be an error to assume that testing a treatment only in a lab applies to the chemically dynamic Bartonella in humans. It also does not assume Bartonella is the only infection present if it was acquired from ticks. The book can likely be acquired from intra-library loan or medical library interlibrary loan.

Farji-Brener AG, Durán S, Valerio A, Herbas E, Castañeda M, Ochoa J, Romo M. [The seeds of Campsiandra angustifolia (Fabaceae: Caesalpiniodeae) as a reflex of selective pressures on dispersal and establishment].[Article in Spanish]. Rev Biol Trop. 2005 Mar-Jun;53(1-2):63-71. PMID:17354420

Cumanda and Biofilms

Dr. Eva Sapi and her colleagues found in their superior laboratory that cumanda had some mild killing effects on the Lyme bacteria, but more importantly for this book, Lyme **biofilm** communities grown in her lab were reduced 43% by this herb at low dosing. The dosing for a dynamic human or animal body was not explored or proposed by this researcher or any other researcher as of February 2014. Searching by its Latin and popular name did not yield any articles relevant for use on infections.

Finally, while Lyme disease is a common and disabling infection, it is hardly the only infectious agent in the many infections carried by Ixodes ticks. While this preliminary research is very useful, it is possible cumanda may have impact inside a body for Lyme and Bartonella treatment. More study is needed. I regret that we only examined cumanda for Bartonella and not Lyme.

Our conclusion was that cumunda hindered Bartonella more than Levaquin (levofloxacin), Zithromax (azithromycin), Rifabutin (mycobutin) and other proposed options. To determine treatment effect one needs to know **the indirect actions of Bartonella, Babesia, FL1953, Lyme, inflammation systems, etc. by *lab analysis using different companies.***

Theophilus PA, Burugu D, Pourur i A, Luecke DF. Sapi E. Effect of Medicinal Agents on the Different Forms of Borrelia burgdorferi Lyme disease or Lyme borreliosis is a tick-borne multisystemic disease caused by different species of Borrelia. http://healthyeats-nl.blogspot.com/2013/07/effect-of-medicinal-agents-stevia-and.html

Erythromycin

Gomes found that erythromycin at low doses actually enhanced the growth of biofilms in C. diphtheriae. Penicillin acted the same way. Of further concern is that not only did these antibiotics increase biofilm formation but in this case they enhanced infections by strains of C. diphtheriae. Diphtheriae is a very dangerous infection without access to effective antibiotics. It is dangerous enough with good ones.

Returning to biofilm-promoted gum disease such as gingivitis, in the United States, over 50% of adults had gingivitis on an average of 3 to 4 teeth. Adult periodontitis, measured by the presence of periodontal pockets > or = 4 mm, was found in about 30% of the population on an average of 3 to 4 teeth. Lost gum attachment to teeth of at least 3 mm was found in 40% of the population (Oliver).

The density of adherent P. gingivalis cells were significantly decreased by using erythromycin at very low dosing called “sub-MIC levels.” One strain was not affected by erythromycin. Finally, erythromycin was not effective for inhibition of P. gingivalis biofilm cells at very low dosing.

Erythromycin Key Findings

- Low doses actually grew some biofilms
- Penicillin also grew some biofilms
- It enhanced strains of dangerous C. diphtheriae
- Gum disease from P. gingivalis cells was much less sticky at very low dosing.
- Erythromycin was not effective for inhibition of P. gingivalis biofilm cells at very low dosing.

Oliver RC, Brown LJ, Löe H. Periodontal diseases in the United States population. J Periodontol. 1998 Feb;69(2):269-78. PMID:9526927

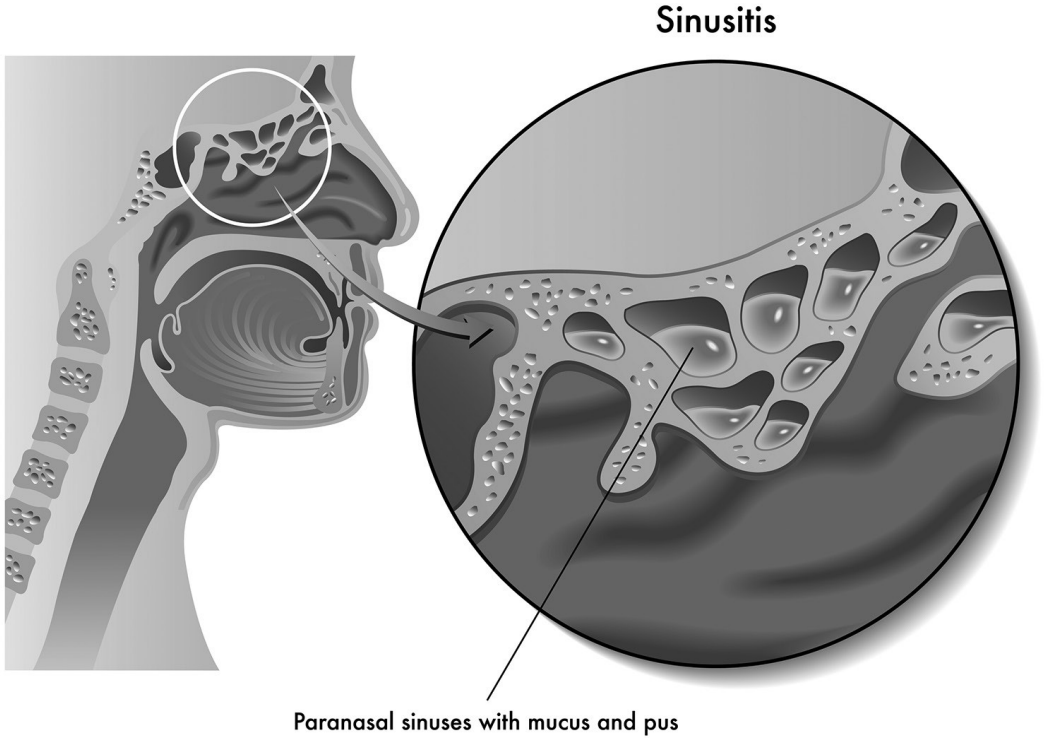
Gomes DL, Peixoto RS, Barbosa EA, Napoleão F, Sabbadini PS, dos Santos KR, Mattos-Guaraldi AL, Hirata R Jr. SubMICs of penicillin and erythromycin enhance biofilm formation and hydrophobicity of Corynebacterium diphtheriae strains. J Med Microbiol. 2013 May;62(Pt 5):754-60. Epub 2013 Feb 28.

Maezono H, Noiri Y, Asahi Y, Yamaguchi M, Yamamoto R, Izutani N, Azakami H, Ebisu S. Antibiofilm effects of azithromycin and erythromycin on Porphyromonas gingivalis. Antimicrob Agents Chemother. 2011 Dec;55(12):5887-92. Epub 2011 Sep 12. PMID:21911560

Honey

While most people are very familiar with honey in their households, they do not appreciate that it has been used medicinally for thousands of years. Synthetic chemical drugs are felt to be superior as honey is used mainly to sweeten tea. Yet honey has many broad medical uses as long as one is careful not to introduce various spores found in raw honey into a live tissue area.

Honey has uses against strong biofilm infections in the nose. Specifically, bacterial biofilms contribute to treatment-resistant chronic rhinosinusitis (CRS), a condition in which patients have persistent infections of the deep nose and sinus cavities.



Manuka honey and its active component methylglyoxal (MGO) have demonstrated antibiofilm activity in lab or "test tube" studies. So, in one study, sheep had one frontal sinus area flushed with this honey in fluid and the other frontal sinus flushed with salt water (saline) as a control. (As a reminder, in humans the frontal sinuses are just behind your forehead.) Tissues were examined using an advanced scanning microscope technique.

These sheep had Staphylococcus aureus biofilms in their sinuses. Twice-daily irrigation for 5 days used either:

1. salt water alone
2. the active component methylglyoxal (MGO) alone
3. or the special Manuka honey containing MGO

Since the best effects appear to be in a specific dose range, let me mention the conclusion. Specifically, sinus irrigation with Manuka honey and MGO, at MGO concentrations between 0.9 and 1.8 mg/mL is both safe to mucosa and efficacious against S. aureus biofilm. Manuka honey/MGO irrigation could represent a viable treatment option for treatment-resistant chronic rhinitus/sinusitis (Paramasivan). Currently, it does not appear patients can purchase methylglyoxal alone.

A 50% concentration of manuka honey (50 mg/100mL) is the proven concentration to have bacteria killing actions against biofilms of Pseudomonas aeruginosa and Staphylococcus aureus; however, this concentration appears to have **caused severe or intense inflammatory changes that produced facial paralysis, vestibulotoxicity, and hearing loss in chinchilla animals.** This reaction is of concern. The extreme reaction may result from the route, the dose per kilogram of body weight, or from an unusual chemical processing of chinchillas. Nevertheless, despite daily use of this honey by some as a food product for years, it is possible an aggressive pharmacologic medical dose could produce a different result from low daily dietary use.

Therefore, it seems wise to continue studies in mammals with graduated dosing before pushing human dosing to doses higher than are currently used in diet. I assume any human dose will be well below 50 mg/100ml (Talukdar). However, some researchers argue such conservatism is unwise, saying, “conclusions about the potential beneficial effects of methylglyoxal have often been neglected, thus hindering the advancement of medical science and causing some confusion in fundamental understanding. Overall, the potential beneficial effects of methylglyoxal far outweigh its possible toxic role in vivo [in the body], and it should be utilized for the benefit of suffering humanity” (Talukdar).

Maddocks reports useful actions of Manuka honey hindering bacteria adhesion and invasion of medically important wound bacteria in the lab. Simply, manuka honey effectively disrupted and caused extensive cell death in biofilms of Staphylococcus aureus, Pseudomonas aeruginosa and Streptococcus pyogenes. Very low non-killing doses of manuka honey inhibited bacterial adhesion to key human body chemicals—fibronectin, fibrinogen and collagen. Manuka honey impaired adhesion of S. aureus, P. aeruginosa and S. pyogenes to dead human surface skin cells that form a protective outer layer.

In summary, manuka honey can directly affect bacterial cells embedded in a biofilm and exhibits antiadhesive properties against three common wound pathogens.

Close up of a fruit of a jujube tree.

Ansari reports another honey is worthy of note—Jujube honey. Jujube honey affects biofilms by decreasing the size of mature biofilms and disrupting their structure. At a concentration of 40% w/v or 40mg/100 ml, it interferes with the formation of Candida albicans biofilms and dis-

rupts established biofilms, including, among other mechanisms, making them thinner and altering the shape and image of this fungus.

Finally, Majtan explains that several honeys tested against biofilms all hindered the biofilms. The best of those tested was manuka. While it was difficult to make an impact on one strain of bacteria, this honey showed killing of bacteria in deep wounds infected with biofilms.

Paramasivan S, Drilling AJ, Jardeleza C, Jervis-Bardy J, Vreugde S, Wormald PJ. Methylglyoxal-augmented manuka honey as a topical anti-Staphylococcus aureus biofilm agent: safety and efficacy in an in vivo model. Int Forum Allergy Rhinol. 2014 Jan 10. [Epub ahead of print]. PMID:24415444

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Bad Breath

Diane is a surgeon and a friend, and we often discuss medicine. During a conversation she mentioned she was struggling with bad breath and that teeth cleaning and routine brushing 2 times a day and flossing at night was not removing the bad breath or halitosis.

Frankly, I just thought she forgot to brush her teeth at times. So, I discussed some research on some select essential oils and reminded her that many mouthwashes have very low doses of essential oils. Like all surgeons, she thought in big life and death terms, and felt that if very tiny fractions were in famous mouthwashes, higher amounts would be better. So, she put essential oil of clove from a top company and essential oil of oregano and cinnamon in her mouthwash and would do cinnamon in the morning and others at bedtime. In three days she had no more bad breath, and it has never returned over 30%.

She reports if it is starting to return, and her children are quick to point out any return to poor breath, she uses the essential oils 2-3 times a day and it is gone again. She still keeps to having her teeth cleaned every 4 months and performs good dental hygiene daily. Her optimal treatment is a variable water jet water pick device.

Liu explains halitosis (bad breath) is estimated to influence more than half of the world's population. Some have it mildly and others have more severe troubles. I would suggest it undermines a wide range of relationships because people are literally suffering from the smell.

More than 85% of bad breath comes from bacterial infections of the mouth. Foul-smelling breath mainly results from bacterial production of **volatile sulfur compounds.**

Liu explains that periodontal therapy, antibiotics, bacterial killing agents or direct physical cleaning of teeth and tongue, at best, work briefly, yet warns these may create toxicity. They may increase resistant bacteria and change the population of bacteria in the mouth to favor bad infections. The problem is so bad, that a study proposes a vaccine against

plaque biofilms that are a prime creator of the sulfur smell, typically derived from degradation of the sulfur-containing amino acids cysteine and methionine.

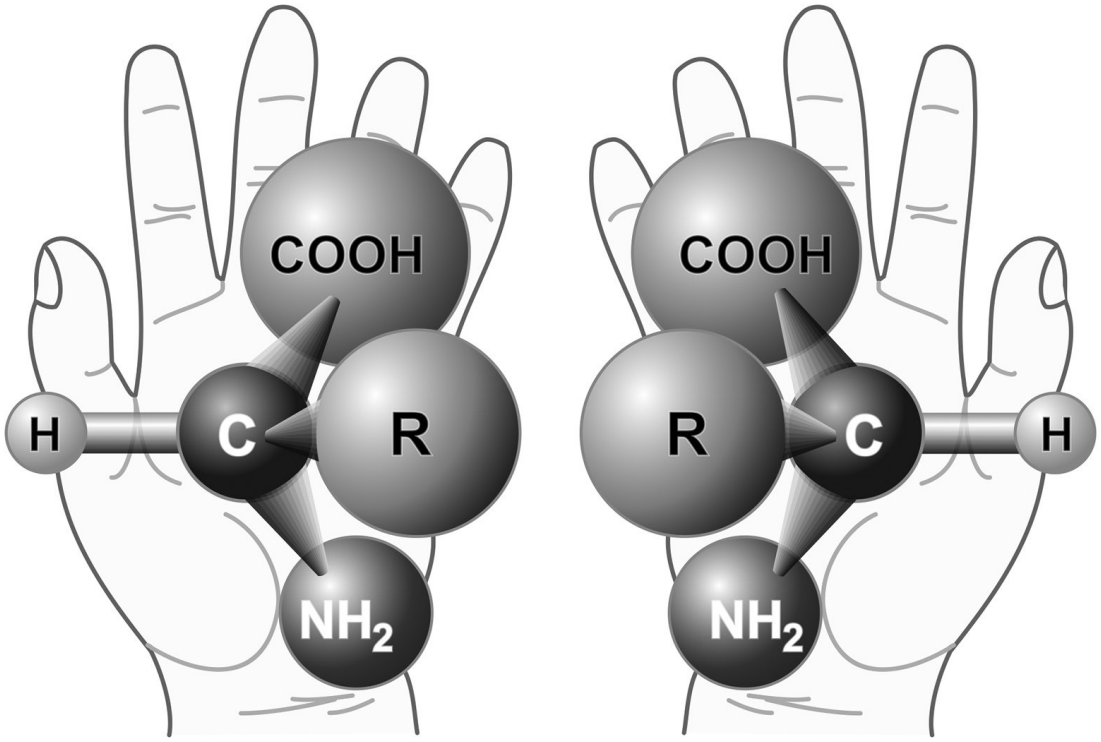
Bad breath or chronic halitosis illustrated with a man breathing fire on someone as he goes to shake hands.

Fusobacterium nucleatum (F. nucleatum) is the top bacterial strain related to halitosis. FomA, the major outer membrane protein of F. nucleatum, recruits other bad oral bacteria such as Porphyromonas gingivalis (P. gingivalis) in the periodontal pockets. So, Liu proposes a halitosis vaccine targeting F. bacterium FomA to undermine many mechanisms associated with associated with the teamwork of the bacteria in the creation of biofilms, production of sulfur compounds and gum inflammation.

Liu PF, Huang IF, Shu CW, Huang CM. Halitosis vaccines targeting FomA, a biofilm-bridging protein of fusobacteria nucleatum. Curr Mol Med. 2013 Sep;13(8):1358-67

Reversed Amino Acids Undermine Biofilms

In some societies people shake hands as a greeting. In most of these societies people use their right hand. Offer your left hand, and people pause because it is not "normal." If you apply this concept to biofilm proteins, it is interesting to see what happens. First, we need to recall protein is made up of amino acids. Look at the twin amino acids below and see that one is the mirror of the other, just like right and left hands mirror each other. The goal is to have biofilms incorporate useless amino acids that are of the wrong type. One proposed way to remove biofilms is by using "wrong-handed" amino acids. For example, many chemicals used in the body have a very specific design and this includes amino acids being L or D in orientation. If you change a compound's shape from L to D, you may create an entirely different action. This difference in action is one reason humans can be so ill if any basic chemical DNA is altered by 0.01%. The same applies to use of D-amino acids instead of L-amino acids.



Notice these amino acids are not the same. One amino acid has most of its parts on the left, and the other is largely oriented to the right. Yet, they are the same components. The point here is that right or left matters

a great deal in human biochemistry. It may mean the difference between a functional chemical required to live and serious illness due to a chemical defect.

A way to disassemble a biofilm is to supply amino acids that are similar to using the wrong hand to shake hands. These D-amino acids do not work for biofilm building. For example, a chemical can dissolve a Bacillus subtilis biofilm. This biofilm-dissolving factor was a mixture of D-leucine, D-methionine, D-tyrosine and D-tryptophan that was effective at even very low dosing (Kolodkin-Gal).

D-amino acid treatment caused the release of fibers that linked cells in the biofilm together. D-amino acids created alterations in a protein for the formation and anchoring of the fibers to the cell. D-amino acids also prevented biofilm formation by Staphylococcus aureus and Pseudomonas aeruginosa. Curiously, D-amino acids are produced by many bacteria and might be used to trigger other bacteria to dissolve their biofilms (Kolodkin-Gal). Using these D-amino acids is like making a house with bricks of dust—they dissolve. Biofilms dissolve or have defects if they are given the wrong types of amino acids.

D-tyrosine, D-leucine, D-tryptophan, and D-methionine were active in inhibiting biofilm formation both in liquid and on solids. In contrast, the corresponding L-isomers and D-isomers of other amino acids, such as D-alanine and D-phenylalanine, were inert in biofilm inhibition.

Next, the minimum concentration needed to prevent biofilm formation was examined by Kolodkin-Gal and colleagues. Individual D-amino acids varied in their activity, with D-tyrosine being more effective than D-methionine. **A mixture of all four D-amino acids was particularly potent; the D-amino acids could act synergistically.** These four D-amino acids not only prevented biofilm formation, but also disrupted existing biofilms. The addition of D-tyrosine or a mixture of the four D-amino acids, but not the corresponding L-amino acids, caused the breakdown of a critical film.

Finally, they wondered whether D-amino acids would inhibit biofilm formation by other bacteria. The pathogens Staphylococcus aureus and Pseudomonas aeruginosa form biofilms on plastic surfaces (Otto). D-tyrosine and the D-amino acid mixture were effective in preventing biofilm formation, whereas L-tyrosine and L-amino acids had no effect. Further, the effect of D-amino acids was prevented by the presence of D-alanine, suggesting that D-amino acids acted to block biofilm formation by replacement of D-alanine in a side chain.

Given that many bacteria produce D-amino acids, D-amino acids may provide a general strategy for biofilm disassembly. If so, then D-amino acids might prove widely useful in medical and industrial applications for the prevention or eradication of biofilms (Kolodkin-Gal).

It is important to mention that a patent with this general approach lists a very large number of D-amino acids, D-amino acid combinations, and over twenty infections treated with possible D-amino acid combinations. Many of these D-amino acids already exist from chemical wholesalers. Various countries will approve of this option soon or with more research. Some countries may see these formulations as a supplement and other countries will treat them as a drug.

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Cathelicidin LL-37

If you are not a biochemist, this name seems very complex, and perhaps sounds more like a government form. First, let us start by making this simpler. Small chemicals that are made up of amino acids are called peptides. It is like the letters “c”, “a” and “t,” make up the word “cat,” only replace the letters with amino acids and the word “cat” is a peptide.

The reason these small collections of peptides are exciting is that they show power to hit a wide range of infections and their critical chemistry. These peptides can kill or inhibit the growth of microorganisms and activate the two main systems of immunity to attack more aggressively.

The cathelicidin family has a “C-terminal” area that is an antimicrobial mainly expressed by neutrophils and epithelial cells. The cathelicidin designation “LL-37” is best thought of as a very specific address, since this is a very specific chemical, just like progesterone or thyroid are very specific chemicals. LL-37 has many actions, including killing bacteria, increasing body attack against infections, increasing movement of cells, increased blood vessels, wound repair and activation of chemicals to focus the body systems on killing infections.

For example, the antimicrobial chemical LL-37 is produced from human cells during infection of mycobacteria and exerts a killing or “cidal” effect on this bacterium (Mendez-Samperio).

Wang has further explained the use of this chemical, including its actions against biofilms. These chemicals, as a group, are key components of human immunity that play an indispensible role in human health. While there are multiple copies of cathelicidin genes in horses, cattle, pigs, and sheep, **only one cathelicidin gene is found in humans.** Interestingly, this single cathelicidin gene can be processed into different forms of anti-infection chemicals.

LL-37 is the most commonly studied form and is not merely only an antimicrobial, but also possesses many other actions such as wound healing and involvement in handling cancer metastasis. **Human LL-37 and**

its fragments have antibacterial, **anti-biofilm** and antiviral activities. Although the peptide chemicals reported in journals vary slightly, **most believe the core of LL-37 is essential for disrupting superbugs (e.g., MRSA), bacterial biofilms,** and even viruses such as human immunodeficiency virus 1 (HIV-1).

In conclusion, Lowry explains that 1α,25-dihydroxyvitamin D3, or the active form of vitamin D, regulates cathelicidan. Simply, active and sufficient Vitamin D3 is critical in the killing of pathogens by immune cells from the two major forms of infection defense (innate and adaptive). During infections, activated immune cells seem to increase **levels of 1,25D3, which increases the production of LL-37.** In peripheral blood-derived cells treated with 1,25D3, active vitamin D3, the most profound response seemed to be from macrophages.

Méndez-Samperio P. The human cathelicidin hCAP18/LL-37: a multifunctional peptide involved in mycobacterial infections. Peptides. 2010 Sep;31(9):1791-8. Epub 2010 Jun 25. PMID:20600427

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RNAIII Inhibiting Enzyme (RIP)

We appreciate this is a very complex name for an enzyme, so let us simply call it RIP. During work over the last few years, we have seen a variety of open lesions, wounds and even amputations. Some are from accidents, car injuries, falls, sports injuries, diabetes, war wounds or after surgeries. When you break the skin barrier sometimes you are at significant risk for trouble. For example, "staph" infections kill 90,000 people a year in the United States alone (Chang).

We wanted to introduce this chemical to you due to the work of Randall Wolcott and his work in handling very complex skin damage wounds as mentioned in his chapter in *Biofilm Highlights.* His simple appeal is to consider RIP and other options instead of 100,000 amputations per year in the United States or tens of thousands of deaths. Over 90% of these "unavoidable" amputations could be prevented by a novel standard of care with informed and smart biofilm options.

Wolcott explains this amazing chemical undermined "staph" biofilms and every form of staph aureus and epidermidus including MRSA and VISA forms. This latter form, VISA, is the staph form with intermediate resistance to treatment with vancomycin.

RIP decreases staph infections by these mechanisms:

1. inhibits bacteria toxin production
2. decreases colony formation
3. decreases biofilm formation by downregulation of multiple genes
4. undermines bacteria survival so even a meager immune response ends the infection

Chang W, Toghrol F, Bentley WE. Toxicogenomic response of Staphylococcus aureus to peracetic acid. Environ Sci Technol. 2006 Aug 15;40(16):5124-31. PMID:16955917

H.-C. Flemming et al (eds.), Biofilm Highlights, Springer Series on Biofilms 5, DOI 10.1007/978-3-642-19940-0_7, C Springer-Vertag Berlin Heidelberg 2011

Tinidazole (Tindamax) and Metronidazole (Flagyl)

The studies on these antibiotics are limited in terms of biofilms. Therefore, we will only mention that Struss reported evidence that metronidazole and tinidazole may interfere with bacterial communication systems. One core part of biofilm formation is communication, since biofilms come from a bacterial community.

Struss suggests that these antibiotics may themselves act as bacterial signaling molecules and affect quorum sensing.

Sapi, in her laboratory work, summarized that only tinidazole reduced viable organisms by ~90%. Following treatment with doxycycline, amoxicillin, tigecycline and metronidazole, living organisms were detected in 70%-85% of the biofilm-like colonies. We will continue to watch the evolution of these interesting findings in animal research.

Struss AK, Pasini P, Flomenhoft D, Shashidhar H, Daunert S. Investigating the effect of antibiotics on quorum sensing with whole-cell biosensing systems. Anal Bioanal Chem. 2012 Apr;402(10):3227-36. PMID:22290388

Sapi E, Kaur N, Anyanwu S, Luecke DF, Datar A, Patel S, Rossi M, Stricker RB. Evaluation of in-vitro antibiotic susceptibility of different morphological forms of Borrelia burgdorferi. Infect Drug Resist. 2011;4:97-113. Epub 2011 May 3. PMCID:PMC3132871

Tuberculosis (TB)

Recent research has identified a substance that may undermine TB biofilms.

The rationale for discussing this agent becomes clear when the World Health Organization (WHO) reminds us of the facts about TB.

Key facts

- Tuberculosis (TB) is the second greatest killer worldwide due to a single infectious agent.
- Over 95% of TB deaths occur in low- and middle-income countries, and it is among the top three causes of death for women aged 15 to 44.
- In 2012, an estimated 530,000 children became ill with TB and 74,000 HIV-negative children died of it.
- TB is a leading killer of people living with HIV.
- Multi-drug resistant TB (MDR-TB) is present in virtually all countries surveyed, including the United States.

Tuberculosis (TB) is caused by bacteria *(Mycobacterium tuberculosis)* that most often affect the lungs. TB is spread from person to person through the air. When people with lung TB cough, sneeze or spit, they propel the TB germs into the air. A person needs to inhale only a few of these germs to become infected. About one-third of the world's population has latent TB, which means people have been infected by the TB bacteria but are not (yet) ill with disease and cannot transmit the disease (WHO and CDC).

http://www.who.int/mediacentre/factsheets/fs104/en/. Accessed March 4, 2014.

http://www.cdc.gov/tb/publications/pamphlets/tb_infection.pdf. Simple TB information from the CDC.

A New Tool to Help Kill TB?

Wang reported that in a search for biofilm inhibitors against TB they identified the small molecule TCA1, which has bactericidal (bacteria killing) activity against both routine TB and the dangerous TB drug resistant form (MDR TB) in lab testing combined with routine TB medications. TCA1 was so powerful that it was the only chemical that strongly inhibited treatment-resistant TB in a biofilm culture. Trials in mice infected with TB who were treated with routine drugs showed profound benefit when TCA1 was added. Futher information about TB's biofilms is available in the references below.

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Sample TB Biofilm References

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Food Powder, Antibacterial Power

Friedman designed a fascinating study looking at very precise parts of common foods. Frankly, we were surprised at the level of antibacterial effects. But, all experts on herbs know the part used can often matter profoundly. That was true in this study.

In summary, the study showed effects against very serious food illness infections: Escherichia coli, Listeria monocytogenes, Salmonella enterica, and Staphylococcus aureus. The research team was very exact in the part of each food used, and this was the outcome:

- Olive pomace, olive juice powder, and oregano leaves were active against all 4 pathogens. This may mean these are all very broad antibacterial killers.
- All powders exhibited strong antimicrobial activity against S. aureus.
- Apple skin extract, olive pomace and grape seed extract showed **profound S. aureus killing ability.**
- Listeria bacteria were highly susceptible to apple skin extract.

The primary reason some of these infections are destroyed is through biofilm disruption. We have researched most of these in past years. These treatments kill infections profoundly. Even apple skin extract is not new to antibiotic examination. However, it is not yet known if the superior killing mentioned above was entirely or partly by biofilm reduction in every instance. But, it does seem these organisms are not successfully killed by agents that ignore biofilms.

Friedman M, Henika PR, Levin CE. Bactericidal activities of health-promoting, food-derived powders against the foodborne pathogens Escherichia coli, Listeria monocytogenes, Salmonella enterica, and Staphylococcus aureus. J Food Sci. 2013 Feb;78(2):M270-5. Epub 2013 Jan 14. PMID:23317422

Conclusion

We could have made this a 600 page textbook. The amount of material in research studies is very encouraging. However, realistically, patients and healers are finite. Our goal was to introduce a new way of examining infections to you, to show different tools, to allow you to see the vast number of options present now **and to present the many options coming.**

APPENDIX

Additional Eugenol References for Researchers

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Dr. Schaller has been published in:

Journal of the American Medical Association

Journal of Clinical Neuroscience

Medscape (Academic Journal of WebMD)

Journal of the American Society of Child and Adolescent Psychiatry

American Journal of Psychiatry

European Journal of Child and Adolescent Psychiatry

Compounding Pharmaceuticals: Triad

Fleming Revell Press (Four Languages)

Internal Medicine News

Family Practice News

Spire Mass Market Books

Internet Journal of Family Medicine

Greenwood Press

Child and Adolescent Psychiatry Drug Alerts

Hope Academic Press

Clinical Psychiatry News

Psychiatric Drug Alerts

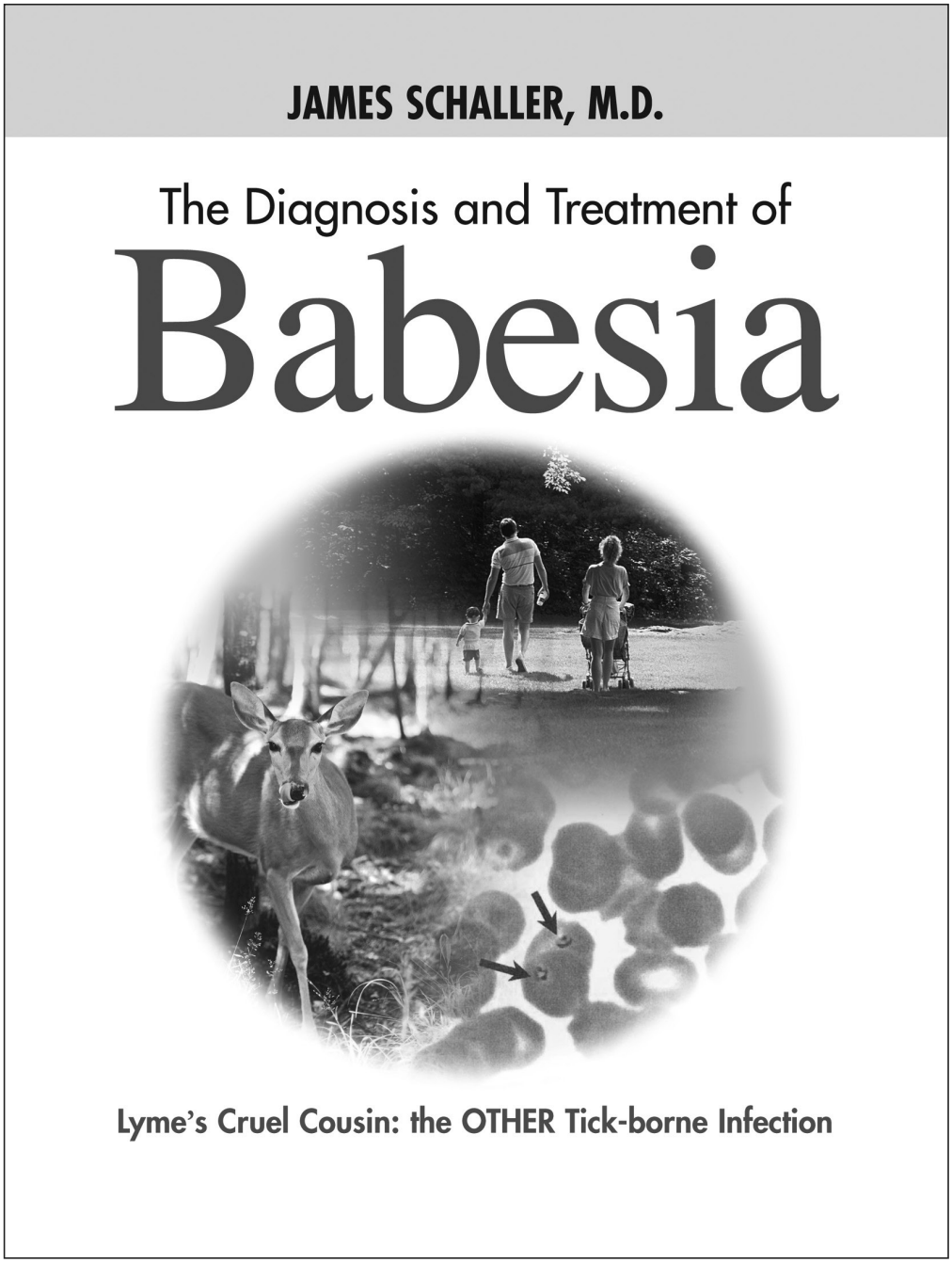
Townsend Journal

OB/GYN News

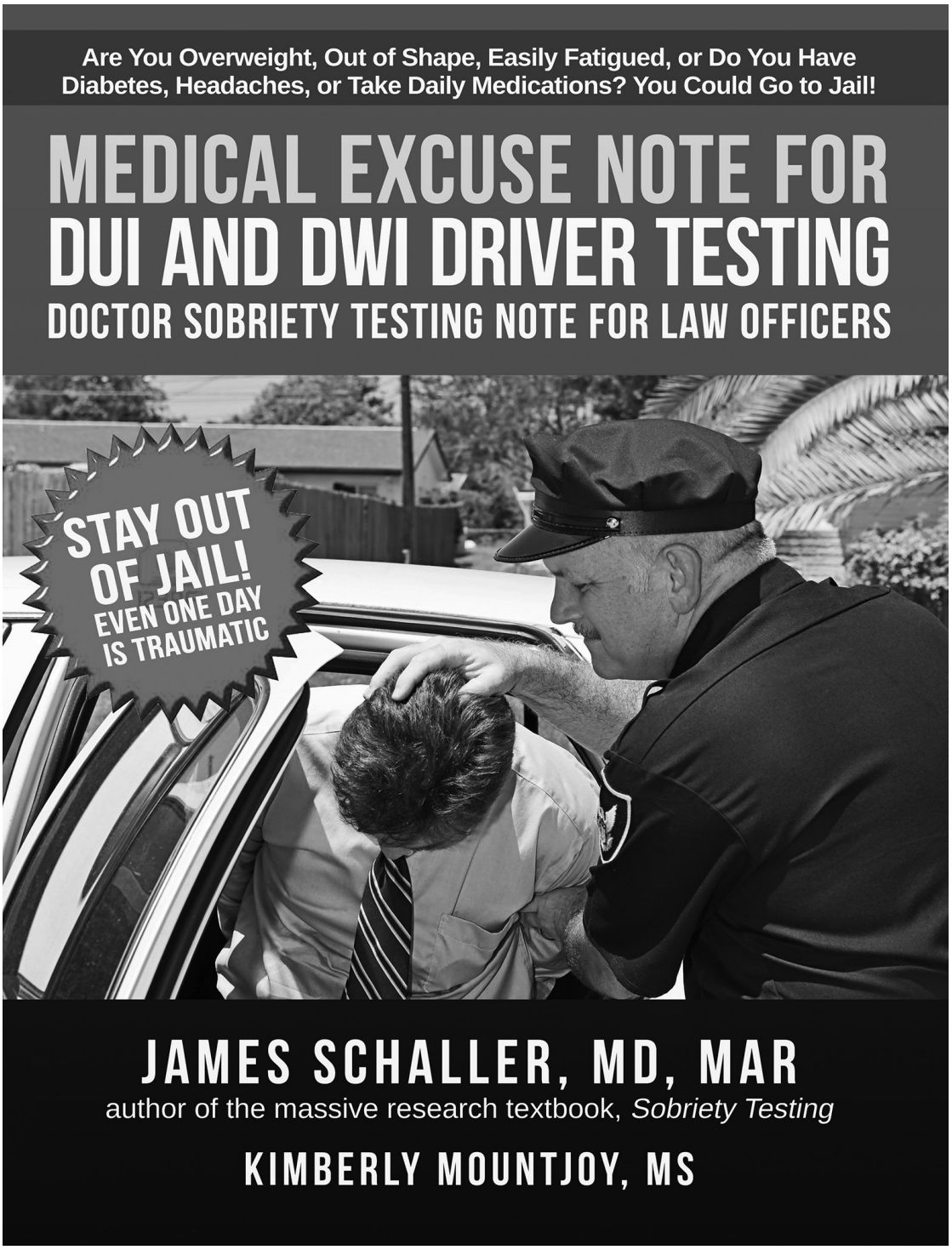
AMA News

Currents

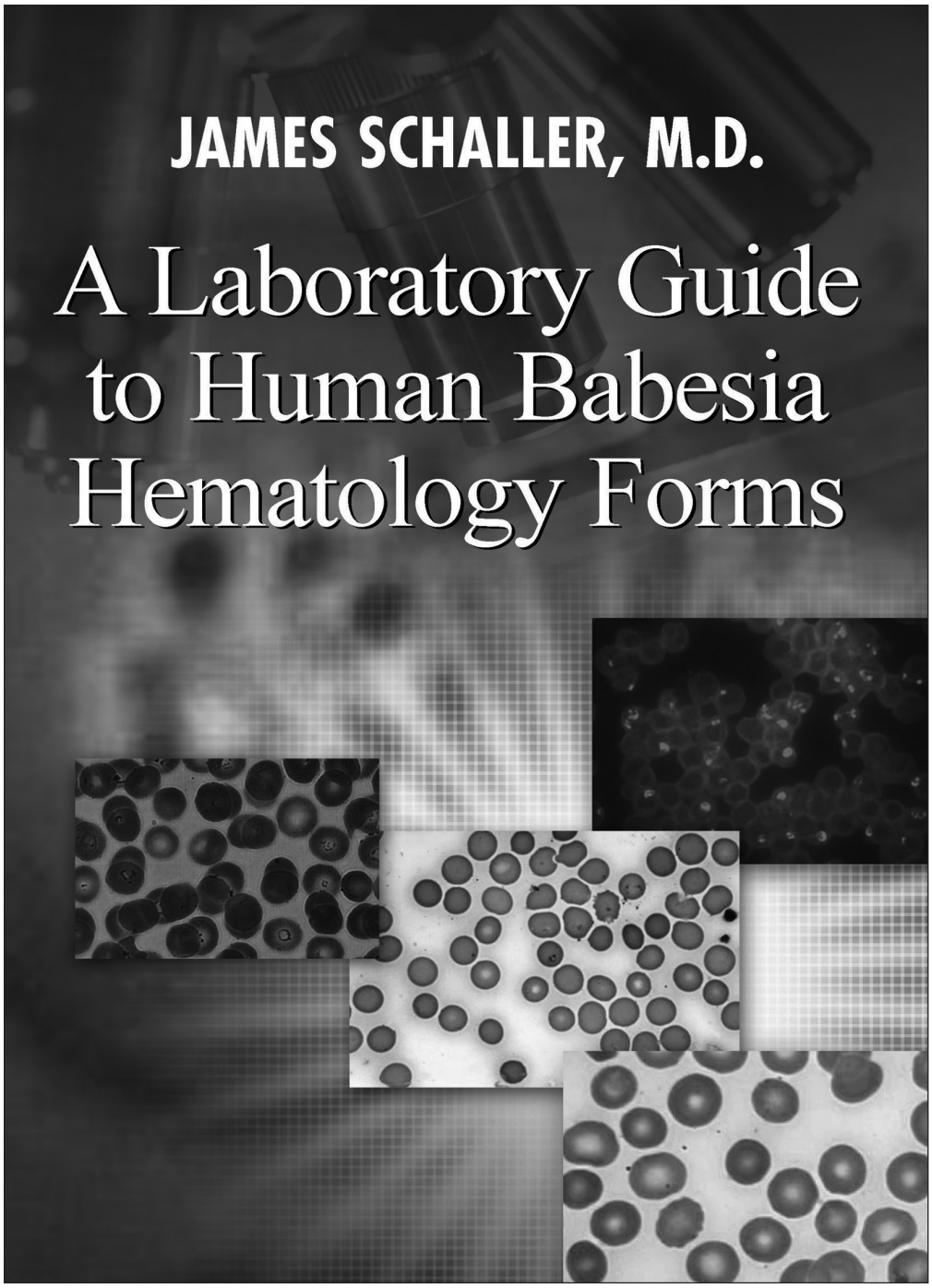
A Sample of Other Books by Dr. Schaller



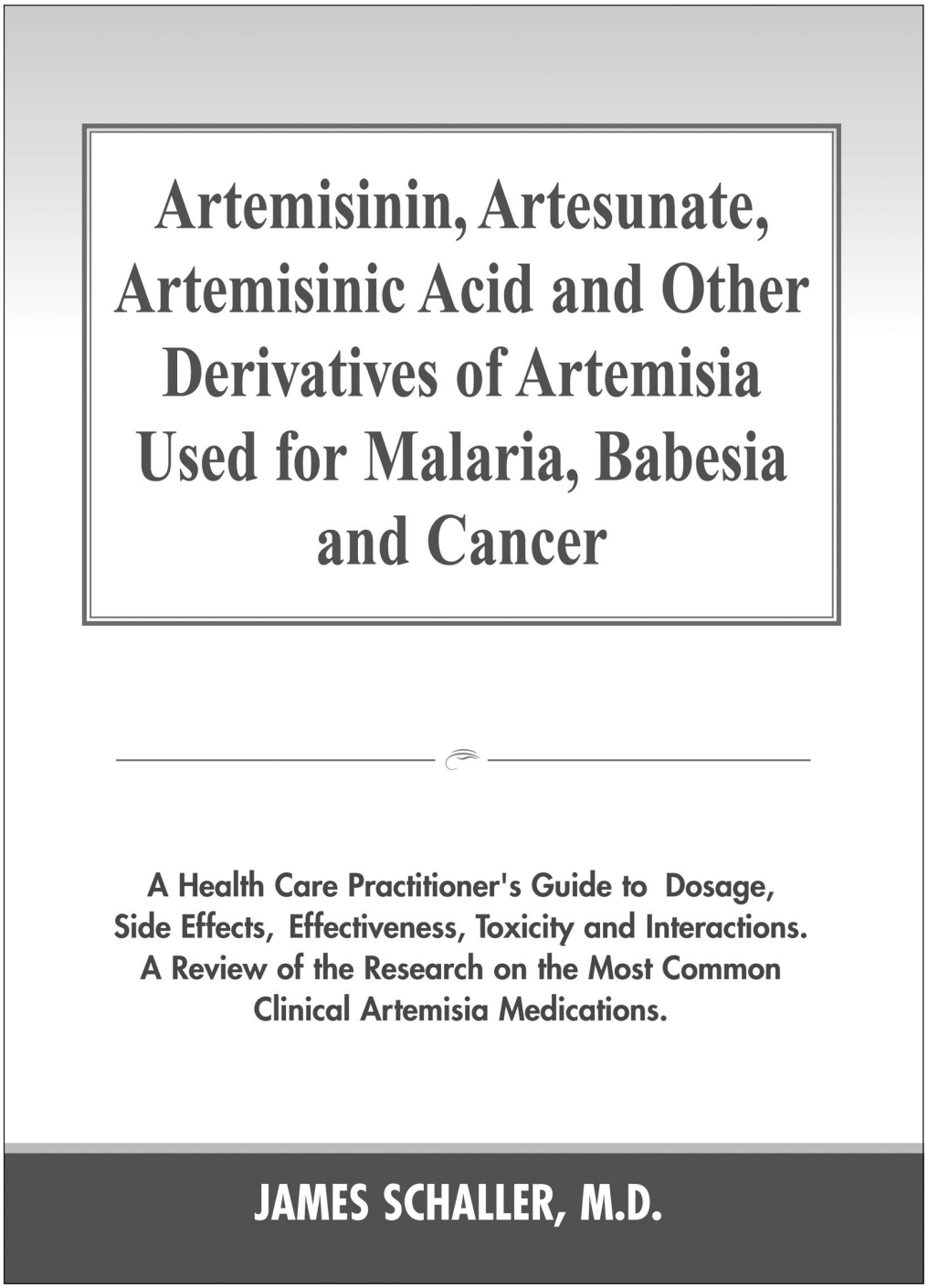
This large textbook is clear and easy to read. It is really three books. While some points are partially outdated since 2006, much would be considered new to most readers.



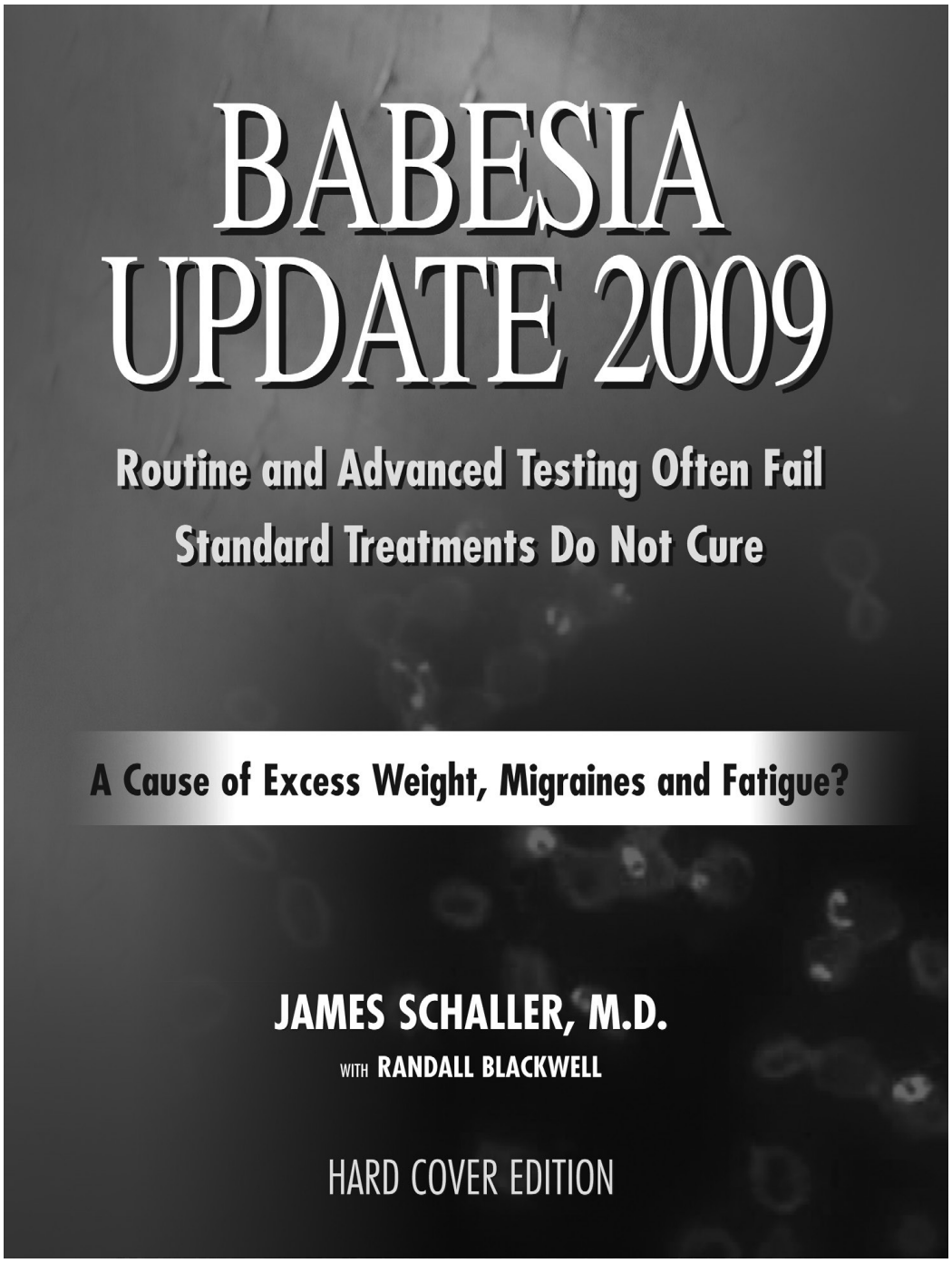
It appeals to all peace officers, legislatures, and concerned citizens to rethink the science of these super medical examinations which help save lives, **but also often allow for many to be placed under arrest for over 500 medical problems.**



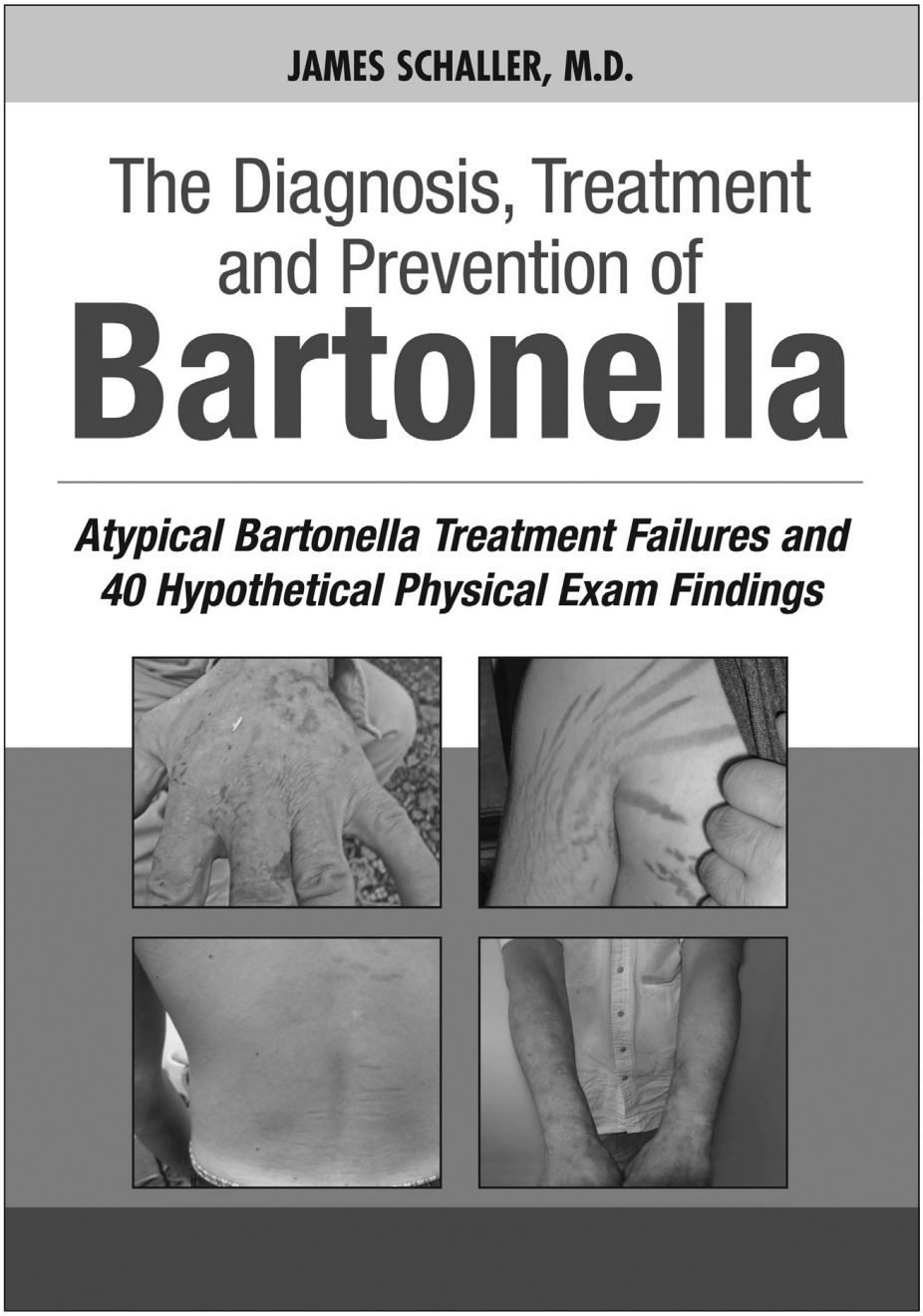
The only hematology book exclusively dedicated to Babesia.



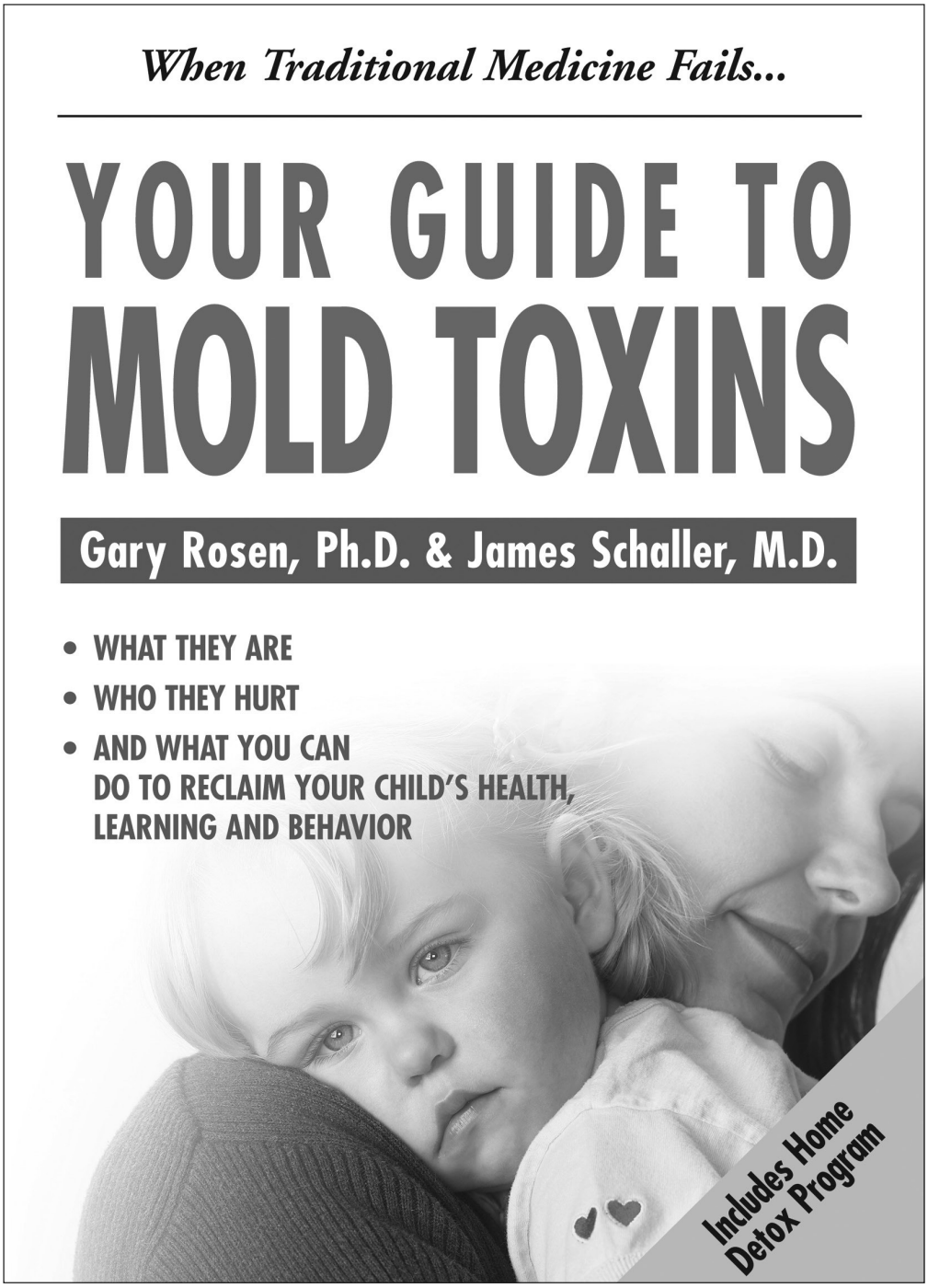
The most up-to-date academic and patient-centered book on practical Artemisia Babesia issues.



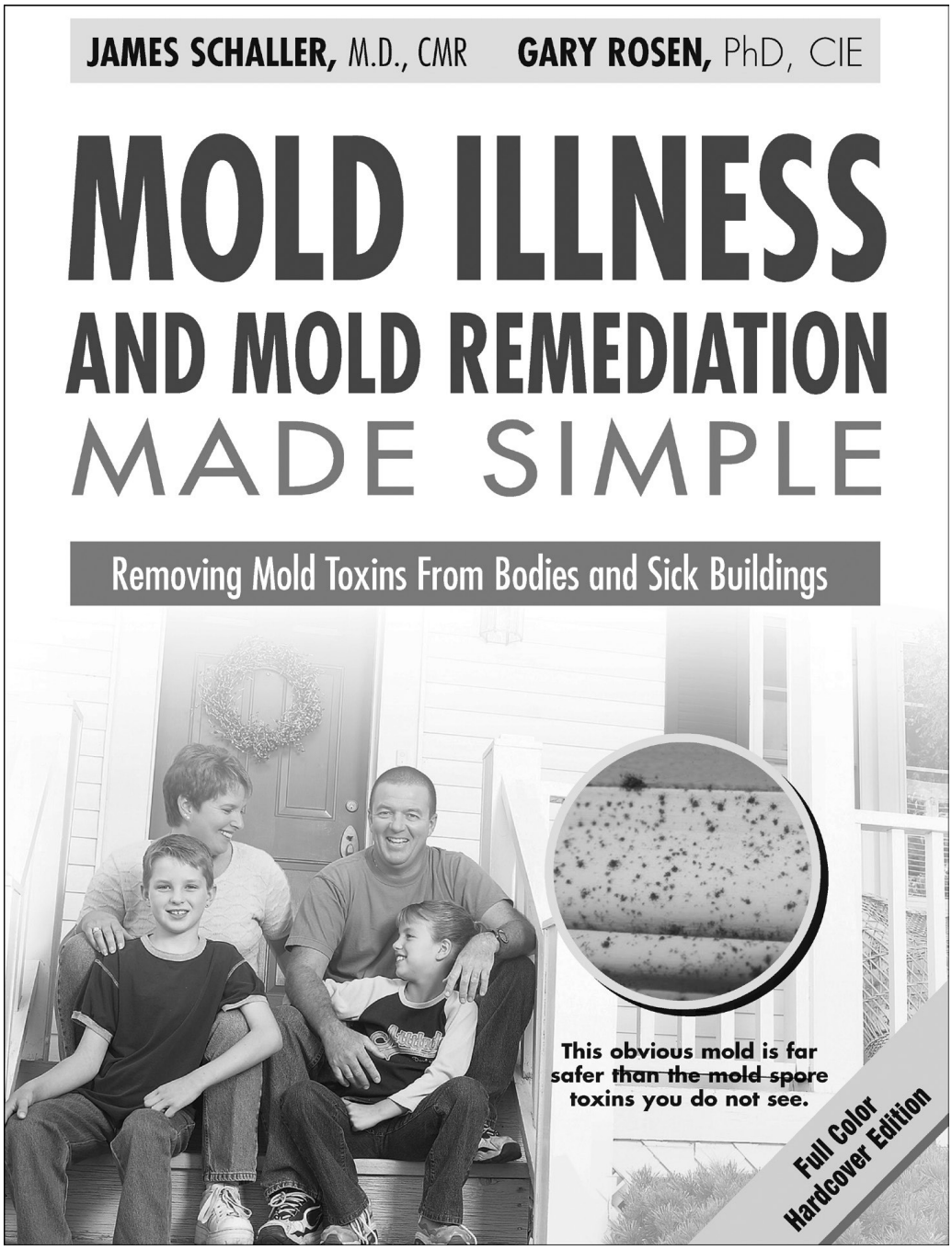
A book with advanced research based information, that moves Babesia medicine into a new decade. It presents highly practical information on ways to detect Babesia that are not mere IgM/G titer tests. Learn how to detect new species being discovered routinely and which seriously undermine function. This text also discusses why some individuals do not experience the easy and fast cure promised in other writings.



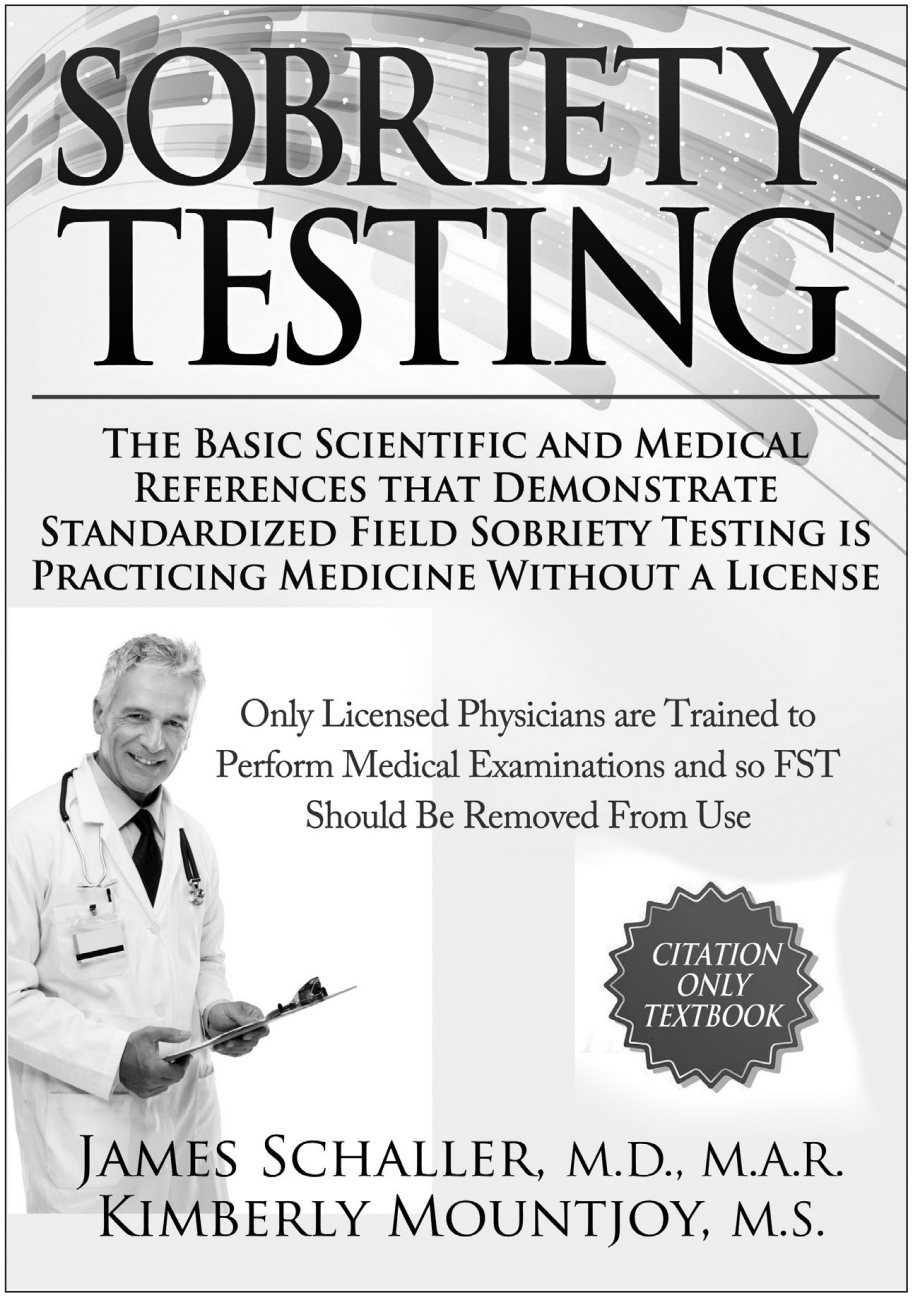
Bartonella diagnosis is very complex. This current text creatively uses a new set of tools to assist in diagnosis based on solid research of blood vessel and skin augmentation chemicals created by Bartonella. It literally creates a new Bartonella physical exam. This book helps with limited basic lab testing, and **prevents the use of routinely relapsing or poor treatments promoted in both traditional and integrative medicine.** No other book on this topic is based on over a thousand top research articles, and no one has published anything remotely close to replacing this work in over five years.



Dr. Schaller is a Certified Mold Investigator and a Certified Mold Remediator. Here is a practical and readable mold mycotoxin book.

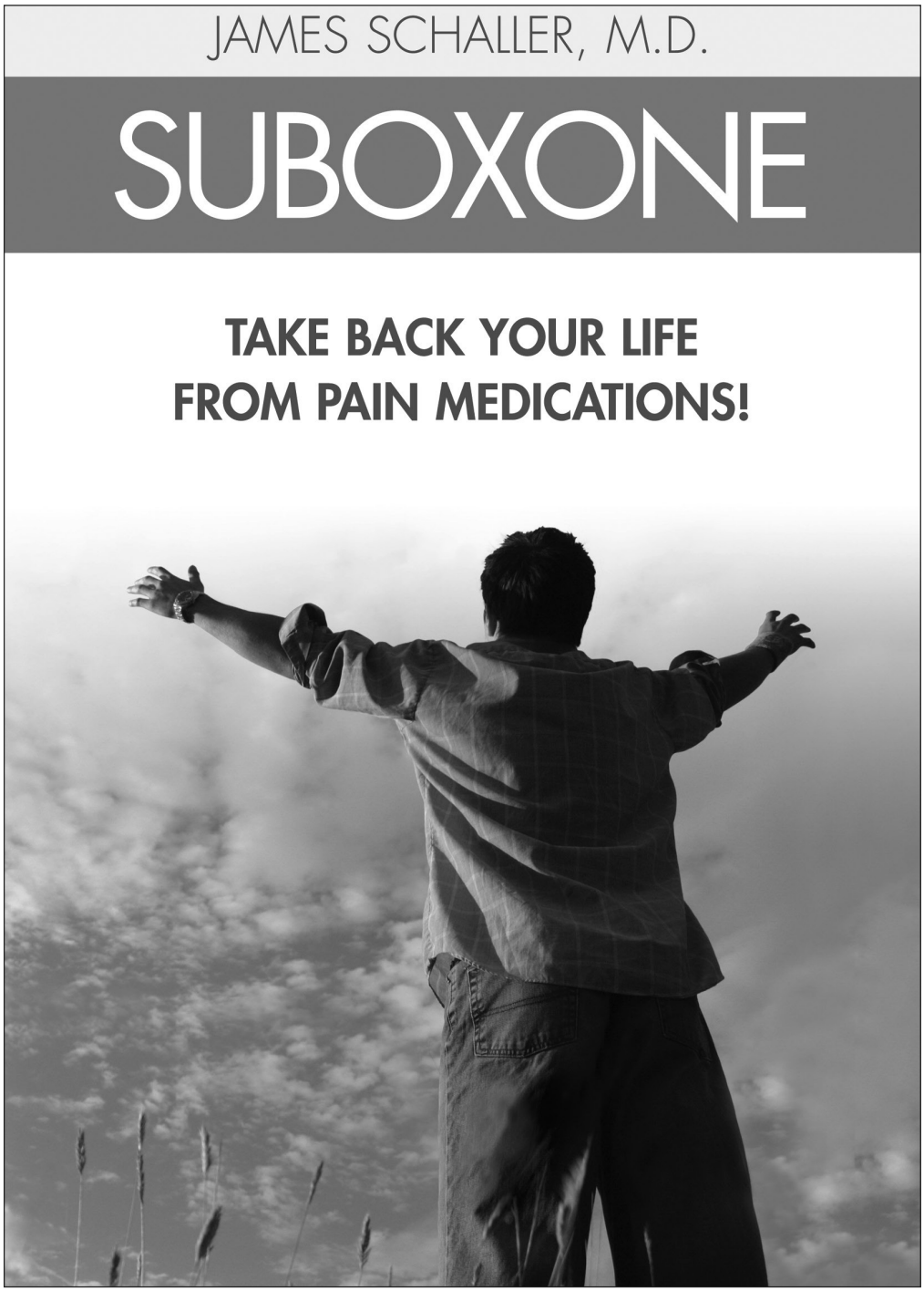


This book is helpful for people who are ill, or have trouble thinking and reading science materials. This is very practical and shows the clean-up errors made by 95% of experienced and expensive licensed mold remediators and renovation workers. Just reading ten pages from this book has shown people why they are not getting better. And this text helps you spot a poor remediators after simply reading 40 easy to understand comics. Most remediations fail and most building hygiene actions are flawed. See why fast. The six best mycotoxin binders **cannot cure you if you are *still* in a "sick" home or moldy work location.**

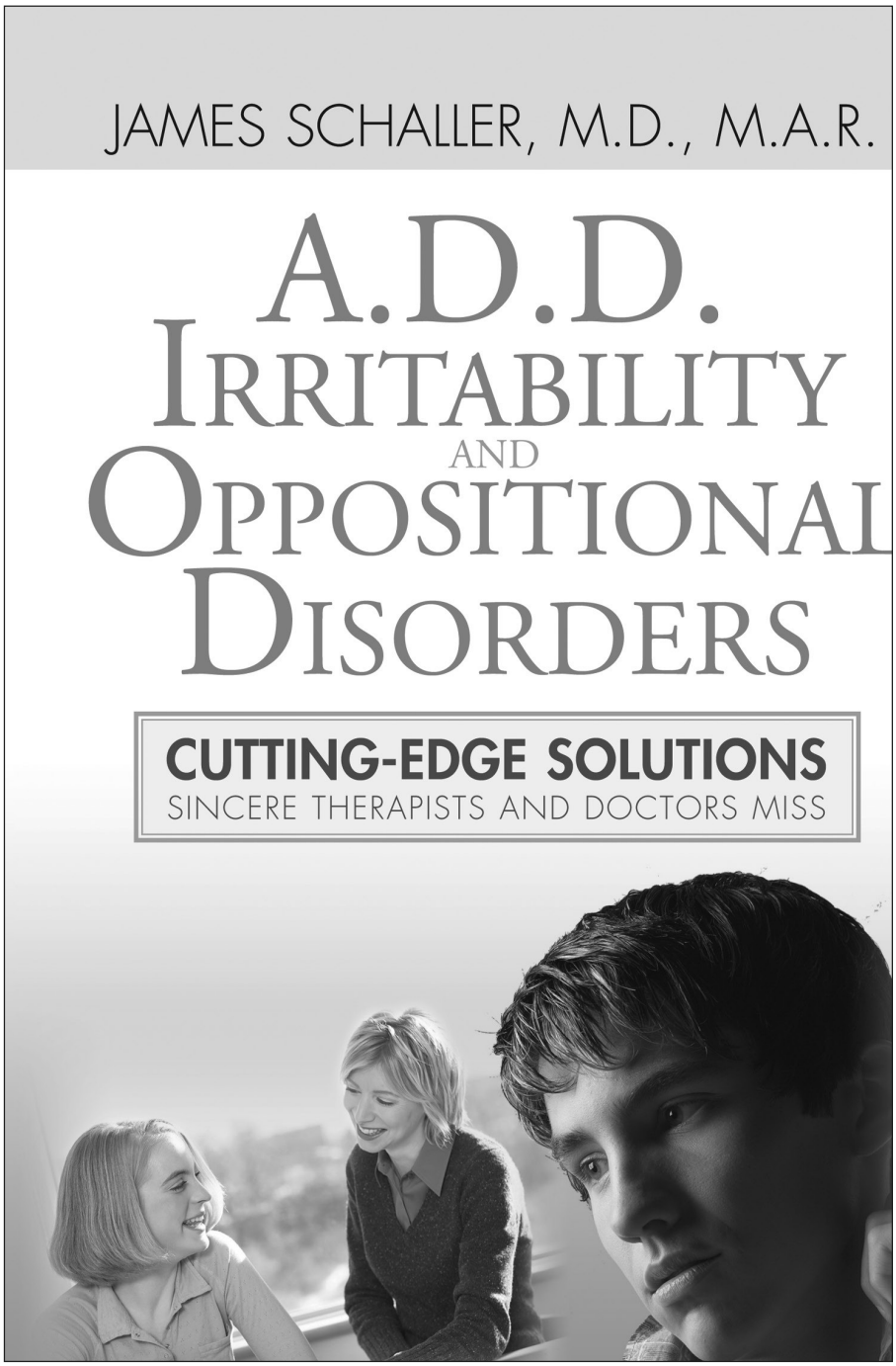


This firm book is a strong appeal for all involved in preventing impaired driving, which often causes profound disability and death, to appreciate the medical testing done on dark sidewalks or streets is a practice of advanced medical testing. FST has hundreds of routinely missed medical troubles which cause false positive tests. All civilized societies must lower the many arrests based on a lack of knowledge in human physiology and human pathology.

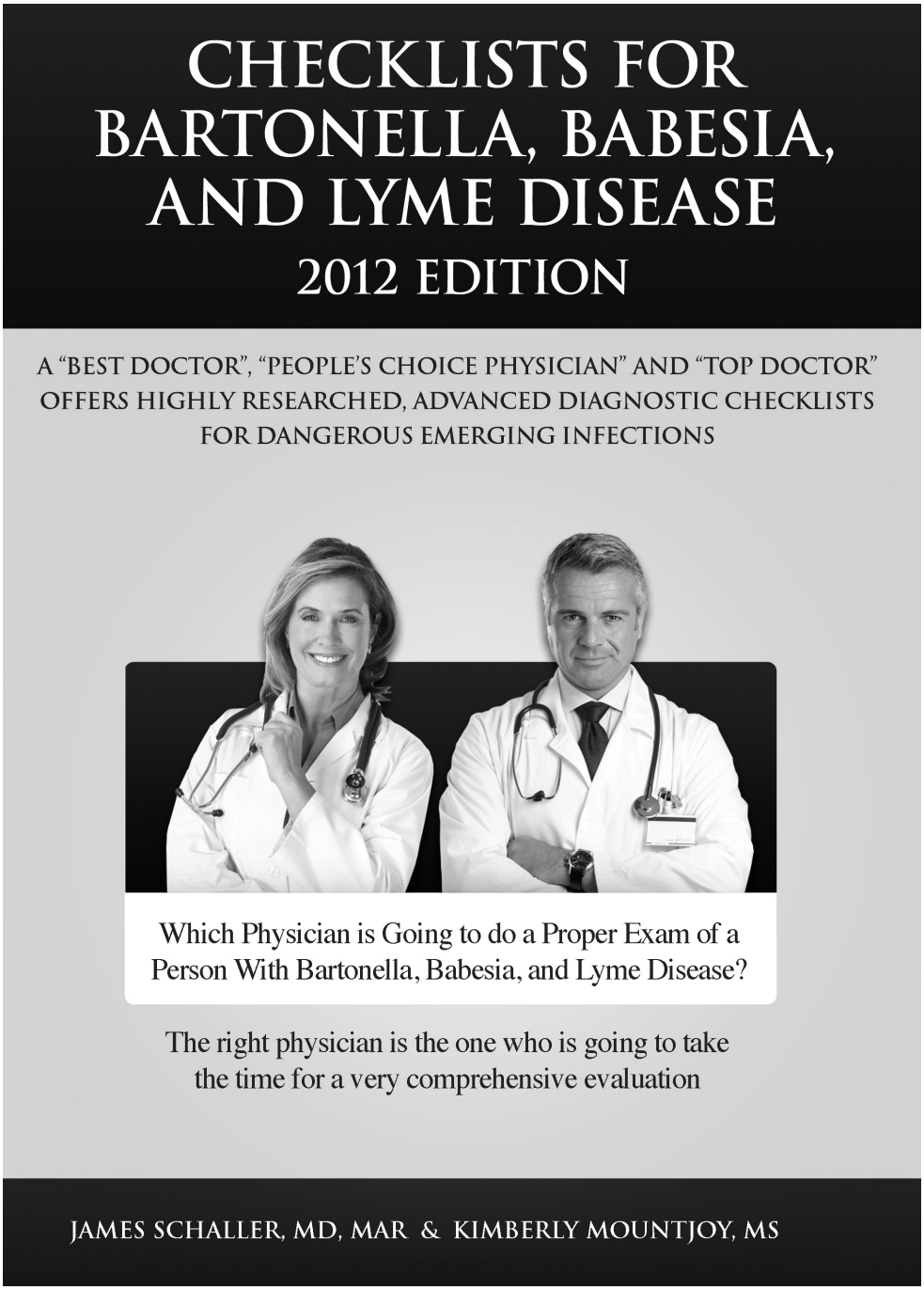
Further, the simplistic teaching that field sobriety testing is very easy for sober people is wrong. How many adults can walk on a balance beam a mere few feet off the ground?



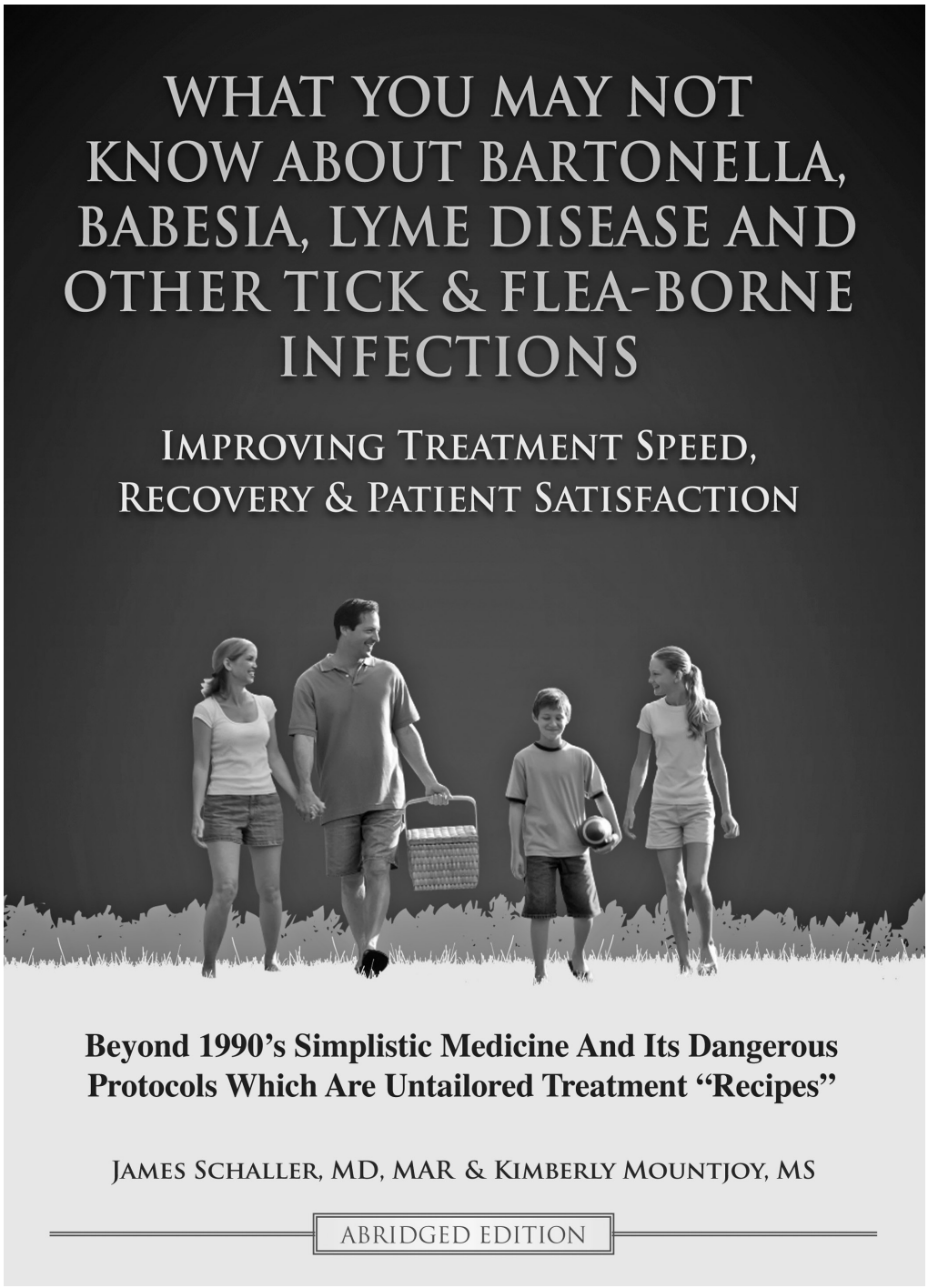
The only current, practical and advanced clinical book on this revolutionary treatment for opioid addiction and modest pain.



The many missed **medical and neurological** causes of poor focus and bad behaviors can no longer be ignored. This unique text advances medicine and shows how much in youth psychiatry has medical roots that are ignored or unknown even in solid child and adolescent psychiatry practices.



The only tick and flea-borne infection diagnostic checklist book based on over 6,000 references related to Bartonella, Babesia and Lyme disease. It seeks to prevent false negative diagnosis, meaning, the advanced and expanded criteria are set to catch these three infections. This book is available from www.personalconsult.com under "free books" or from Amazon.com.



If you are interested in advanced and broad information on tick infections such as Bartonella, Babesia and Lyme, this is unique. Patients have said it is possibly the best book written by these clinical researchers. It is filled with pearls that cover 20 areas of medicine. It is written clearly with new information not available in other locations. Dr. Schaller is a **full-time researcher looking for clinical pearls,** so he reads vast amounts of fascinating information in only one year.

Disclaimer

Dr. Schaller is not a specialist in infectious disease medicine. He is also not a pathologist. Both of these specialties have over 2,000 diseases to treat and study. Dr. Schaller is only interested in a dozen infections and has read and published on only these twelve. The medical ideas, health thoughts, health comments, products and any claims made about specific illnesses, diseases, and causes of health problems in this book are purely speculative, hypothetical, and are not meant to be authoritative in any setting. Never assume any United States medical body, society, or the majority of American physicians endorse any comment in this book. Nothing in this book is to be used to diagnose, treat, cure or prevent disease. The information provided in this book is for educational purposes only. It is not intended as a substitute for the advice from your physician or other health care professionals. This book is not intended to replace or adjust any information contained on, or in, any product label or packaging.

No patient should use the information in this book for the diagnosis or treatment of any health problem or for prescription of any medication or other treatment. You should consult with a health care professional before deciding on any diagnosis or initiating any treatment plan of any kind. Dr. Schaller does not claim to be an expert in any illness, disease or treatment. In this book, he is merely sharing one of his interests. Please do not start any diet, exercise or supplementation program, or take any type of nutrient, herb, or medication, without clear consultation with your licensed health care provider.

No treatment should be rejected or embraced by anyone based on the preliminary research and study in this book.

In this book, Dr. Schaller makes no proven claim about any diagnosis, lab testing or treatment. Dr. Schaller only offers hypothetical ideas. Dr. Schaller makes no authoritative claims about medications, nutrients, herbs or various types of alternative medicine. The ideas in this book will need to be submitted to your local expert in allopathic, osteopathic or progressive medicine, or to other licensed health care practitioners. **This book is not meant to be an informal or formal guideline book that presumes to control 750,000 physicians, or the 314 million patients they serve.** You are asked to let the wisdom of your health care practitioners, and your own study, be a starting point to guide treatment tailored specifically to your body.

Contacting Dr. Schaller

Should you wish to talk to Dr. Schaller he offers individualized education consults, which can be arranged by calling 239-263-0133. Please leave all your phone numbers, a working email and a fax number. These consults are typically in 15 minute units and can last as long as you wish. All that is required is the completion of a short informed consent form.

If you would like a full diagnostic consult or to see Dr. Schaller as a patient, know he treats patients from all over the USA and from outside the country. He meets with you first and then does follow-up care with you by phone.

If you would like to fly in to see Dr. Schaller, his staff are very familiar with all the closest airports, and we have special hotel discounts.