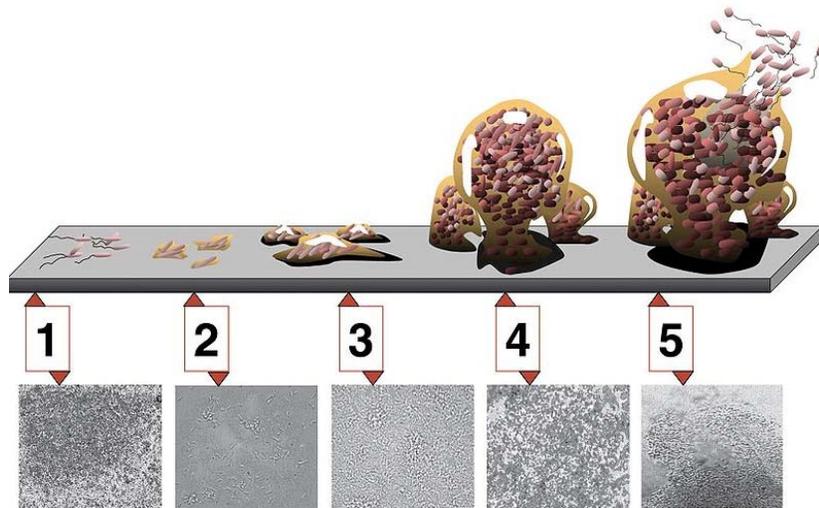


HALPERIN CHIROPRACTIC

Keith Halperin, DC

Biofilms and Disease

Have you ever experienced a biofilm? If you wake up in the morning with a slimy film over your tongue and mouth, if you have noticed dental plaque along the gum line of your teeth, if you have ever been impressed by the thick slime at the edge of a pond, then you've experienced a biofilm.



Biofilm is a gathering of sessile microorganisms that encase themselves in a protective matrix attached to a surface. Bacteria and fungi living in a biofilm community differ from free-living microorganisms. Biofilms are complex, almost like a multicellular organism. They are highly resistant to physical stress, such as the shear stress exerted by peristalsis in the gut.

Within biofilms, microbes are protected from predation by natural killer cells that are part of the body's primary immune response. In some cases they produce a pumping mechanism that removes antibiotics from the biofilm group. In other cases they produce polymers that render the antibiotics ineffective. Biofilms are over 1,000 times more resistant to antibiotics than their single cousins.

Future generations give rise to new adaptive organisms. The new organisms may actually assimilate new DNA that codes for new resistance to antibiotics.

Some organisms like *Candida albicans* (yeast) change the expression of their genes, creating a resistance to most attempts to eradicate them. They may become part of a biofilm complex that encompasses several different species of bacteria.

Other examples of human infections associated with biofilm include:

- Bacterial and yeast urinary tract infections (UTI)
*Did you know that cranberry juice and D-Ribose prevent the adhesion of the biofilms to the surfaces on which they form, thereby helping to prevent the spread of infection?

HALPERIN CHIROPRACTIC

Keith Halperin, DC

- Chronic prostate infection
- Chronic Candida / yeast infection
- Tonsillitis
- Cystic fibrosis
- Pneumonia
- Kidney stone infections
- Toxic shock syndrome
- Dental carries
- Hospital infection
- MRSA antibiotic-resistant staff infection
- Cellulitis of the skin
- Chronic fatigue syndrome
- Ulcers due to H. pylori infection

BIOFILM ADAPTATION

- Biofilms work together as multicellular organisms communicating with each other via quorum sensing, allowing changes in DNA expression which benefits the entire cooperative group:
 1. Some begin to change their bodies to build support structures, like mortar and bricks, providing a strong barrier to antibiotic attack
 2. Others produce a sugar/protein glue, one of the strongest adhesives found in nature, increasing the surface attachment of the group
 3. Some form the channels that allow food and water get to the middle of the colony and disperse to individual cells and organisms.
 4. The group may incorporate the DNA of multiple bacteria, plasmids and fungi in order to better adapt to new environments and increase their resistance to attack. They make new types of chemical weapons to combat the immune system assault by their host.

BODY DEFENSES

- Natural killer cells may be the first line of defense, attacking foreign cells directly.
- Lactoferrin cause a “twitch” response that weakens the ability or organisms to form biofilms
- Different arrays of immune defenses, including chemical responses to inflammation (e.g., Cytokines)
- Probiotics, microorganisms that aid the gut in digestion and immune response, produce chemical barriers to biofilm formation. They make several proteins, including strong proteases, that attack yeast and harmful bacteria.

HALPERIN CHIROPRACTIC

Keith Halperin, DC

Candida (yeast) – A source of chronic sensitivity and inflammation



Figure 1: Candida (yeast) overgrowth in the intestine

Over 90 different symptoms

- Fatigue / lethargy / depression
- Muscle weakness, muscle and joint aches
- Abdominal pain, diarrhea / constipation and flatulence
- Psoriasis, hives, eczema, dermatitis
- Vaginal infection
- UTI (urinary tract infections)
- Suppresses T-cell function and immunity to other disease
- Elevated antigliadin antibodies to gluten

Testing

1. Complete digestive stool analysis: It tests for relative amounts of yeast and other possible pathogens in the gut. It also tests for susceptibility and resistance of each pathogenic organism to various medications and herbal interventions. Tests like this also indicate enzyme action and the amounts and types of beneficial probiotic bacteria. Finally, these tests indirectly determine the level and type of inflammation found in the gut, which may lead to a more specific diagnosis of Irritable Bowel Syndrome vs. Irritable Bowel Disease.

HALPERIN CHIROPRACTIC

Keith Halperin, DC

Some treatment options

1. Carbohydrases, proteases to attack the carbohydrate/protein substrate that create biofilm
2. Chelating agents –e.g., EDTA—bond to and remove metals found in the biofilm wall, allowing it less resistance to antibiotics
3. Lactoferrin
4. Antifungals—S. Boulardi, oregano oil, mushroom extracts, or medicines for
5. Diet changes to eliminate sugars and carbohydrates that feed biofilm organisms
6. Probiotics – several different probiotics have strong antibacterial and antifungal properties
7. Prebiotics – indigestible fibers that feed normal gut flora, allowing them to flourish and grow within the gut.