Comments on Biofilm Microbiology as distinct from Planktonic Microbiology

With implications for human Bacterial Endocarditis:

By Alan B. MacDonald MD, FCAP, FASCP

Dr. Bill Costerton practices outside of the perimeter of Planktonic Microbiology.

We Hospital pathologists were certified by the American Board of Pathology. Those who opt to Sit for the examination in Clinical Pathology achieve Certification in Microbiology. “Planktonic” Microbiology is now the correct modifier for this certification status because there are no American Board of Pathology Examination questions in Biofilm Science. So graduates of the usual Hospital clinical pathology training programs are uneducated in Biofilm type Microbiology. Biofilm microbiology operates Under a set of teachings which is foreign to Traditional Microbiology training at either the Medical Doctoral level (MD or DO); or at the Doctor of Philosophy level (PhD). Dr. Bill Costerton does have a following. I am a convert. Biofilms explain persistence of viable microbes in chronic infections, and all infections of medical prostheses.

I am very interested in persistence of Borrelia burgdorferi infections in the human host. Biofilms are communities with their own “… self generated Extracellular matrix protective shield,” and their own electrical nano-communication systems, and their own capricious behavior to break off and embolize to distant sites, or to "shower disseminate Planktonics from the biofilm community into the body fluids.

Costerton says, to paraphrase, that conventional microbiology is academically Great, but shackled by the " Microbiology nutrient agar plate type evaluation ". Academic microbiology with its focus on Planktonics is ill equipped to deal with biofilm medicine. Dr. Stephen Barthold’s favorite "VBNC" microbes; {Viable But Non Cultivatable(s)} add yet another reason as to why a living borrelia in mammalian biofilm community within living tissue would FAIL to grow in BSKH under conditions of Maximal Planktonic Support.

Biofilm communities, when explanted from human tissues (i.e. Infected hip prostheses for instance), will not grow on agar plates in a hospital laboratory. Costerton points out in his bibliography of 600 peer reviewed manuscripts and book chapters that Biofilm Science does not pretend to be governed by purely planktonic principles.

Internet Link: Dr. Bill Costerton - The "Father" of Biofilms - on YouTube Internet site: http://www.youtube.com/watch?v=M_DWNFFgHbE
In the Biofilm of Borrelia burgdorferi community, as my Hyper Spectral High Resolution Images from the CYTOVIVA research apparatus, demonstrate that specialization of microbes within a biofilm community [Non spiral forms, granular forms, cystic forms, and cell wall deficient forms].

is the rule, and part of that specialization is biochemical shifts in metabolic requirements, and indeed biochemical shifts in the constituents of cell wall structure and microbial shapes among the members of that community. Spiral bacteria (Leptospires =Biofilm formers, Oral Treponemes=biofilm formers) and now at long last Borrelia species= Biofilm formers; all of these undergo shape shifting, while maintaining viability.

Granular forms of borrelia burgdorferi are perhaps contentious entities for some career borrelia investigators to accept as bona fide viable replicating forms of a microbial life form which is “supposed” to be only spiral in profile. Cystic forms, [notwithstanding the omnibus of the works of the Drs. Brorson,] did not find a place in an encyclopedic excellent (and justifiably expensive) monograph on Borrelia published in year 2011. Cell wall deficient (spheroplast) forms have been documented by some researchers (funded for study at Johns Hopkins Medical School) but are rejected by many career borrelia researchers in active practice and in positions of Editorial power in the USA and European research communities. So morphologic diversity- legitimate, viable, part of a spirochete life cycle - are topics for a future monograph on borrelia microbes. I attach some very old work from Dr. Elisabeth Aberer and Dr. Paul Harrison Duray, and from Dr. Edward Delamater, and for historical interest.

Biofilm infections are the “stuff” of infections of the human heart valves (Bacterial endocarditis). In Bacterial Endocarditis, sessile biofilm communities attach themselves to the surface of the human Endothelial lined heart valves, and produce “vegetations” or “bumpy fibrin covered distortions” of the profiles of a healthy smooth surfaced delicate thin heart valve leaflet or cusp. Over time, the Biofilm communities which grow in size, are detectable by Radiologic imaging of the heart valves. The Heart valves are injury or in some cases completely destroyed by the biofilm communities of infecting microbes which have become attached to the valvular surface.

Over time, with persistence of the biofilm infection of the heart valve surface, bits of the Biofilm community break off from the parent biofilm unit and embolize (spread to distant Body sites). In addition, some biofilm infections of heart valves send out Showers “Seeding dissemination” of Planktonic bacteria into the blood stream. New sites of biofilm infection are thus established in the body of the host human with bacterial endocarditis.

In year 2012, the first report of Human Bacterial Endocarditis was reported from France.

Article (full text) reproduced below The Image within the article illustrates the microscopic profile of the Vegetation which was attached to the diseased heart valve. Attempts to visualize spiral (planktonic) Borrelia burgdorferi within the vegetation disclosed no spiral shaped microbes using a silver stain.
LYME ENDOCARDITIS

 Alan B. MacDonald MD - Comments of borrelia biofilms and borrelia human endocarditis case report 2012

Abstract

Lyme borreliosis (or Lyme disease) is the most commonly reported tick-borne disease in the northern hemisphere, notable in Europe and North America. The different species of the Borrelia burgdorferi sensu lato group are transmitted by infected ticks of the genus Ixodes. Whereas only one bacterial species, B. burgdorferi sensu stricto, is currently recognized as pathogenic in North America, several pathogenic species are present in Europe (mainly B. burgdorferi sensu lato, B. afzelii and B. garinii), whereas they cause a wider variety of clinical manifestations [1]. Typically, following a 1-3 week incubation period, an erythema migrans lesion at the tick bite site, those borreliae can spread to the skin to other tissues and organs, causing more severe manifestations such as arthritis and oculoutaneous and neurological disorders [2]. Cardiac Lyme borreliosis is rare, representing only 0.3-4% of cases in Europe, and is generally associated with severe antimicrobial treatment [3]. Cardiac involvement is a well-documented complication of Lyme endocarditis. A 20-year-old man was admitted, in March 2011, to Limoges University Hospital, France, for mitral valve replacement. The patient had an endocarditis, and a history of pectoral, auricular fibrillation, and had mitral insufficiency due to mitral valve prolapse. Initial investigations showed auricular fibrillation and dynamical mitral regurgitation with no mitral valve fusion. An surgical resection of the mitral valve was discovered, with prolapse of the posterior leaflet and a 3-mm perforation of the anterior leaflet. All trained cultures and serological community performed in the case of endocarditis (bacterial culture, borrelia serology, microscopic examination of peripheral blood smear). Microbiological analysis of the mitral valve showed endocarditis with positive borrelia microorganisms suggestive of multiresistant microorganisms (Photo 1). Gram, PAS and Gomes stains were negative. Whereafter, a new admission showed only

Keywords: B. afzelii, Borrelia, borreliosis, endocarditis, lyme

Original Submission: 1 July 2012; Revised Submission: 22 August 2012; Accepted: 24 August 2012

Editors: D. Zanuel

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References


A pertinent microscopic observation within the silver stained heart valve vegetation using the Warthin-Starry silver stain was to observation of “scarce curved rods which had a morphology that was not specific to Spirochetes”. This is indeed a pertinent microscopic observation. The work of Dr. Elisabeth Aberer And Dr. Paul Harrison Duray (below) illustrates that bona fide spirochetes in controlled Laboratory conditions, often show profiles which are Not Spiral, but indeed may show the Profile of “curved rods”. Lack of awareness of this peer reviewed manuscript from Year 1991 Is an extreme disadvantage to formulating a correct tissue Pathology diagnosis of Borrelia infection in tissue. The Molecular studies in this case of heart valve tissue which was surgically removed, rigorously confirm that The DNA of Borrelia burgdorferi group Sl (B. Afzelii) was resident in the diseased and resected heart valve tissues.
**Shape shifting in borrelia burgdorferi:**

**Non Corkscrew shaped forms:**

- Straightened forms
- Ring forms
- Crossed and Abutted Forms
- Granular forms
- Cystic forms
- Cell Wall Deficient forms
- Membrane duplicated (ameboid) forms
- Shrunked and Collapsed forms (Non-spiral)