

Comments on Biofilm Microbiology as distinct from Planktonic Microbiology

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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 Cultivable(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 (Leptospire =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.

**Shape Shifting : Routinely observed by Expert Borrelia Research Pathologists
Elizabeth Aberer MD (Germany) and
Paul Harrison Duray MD (Yale School of Medicine)**

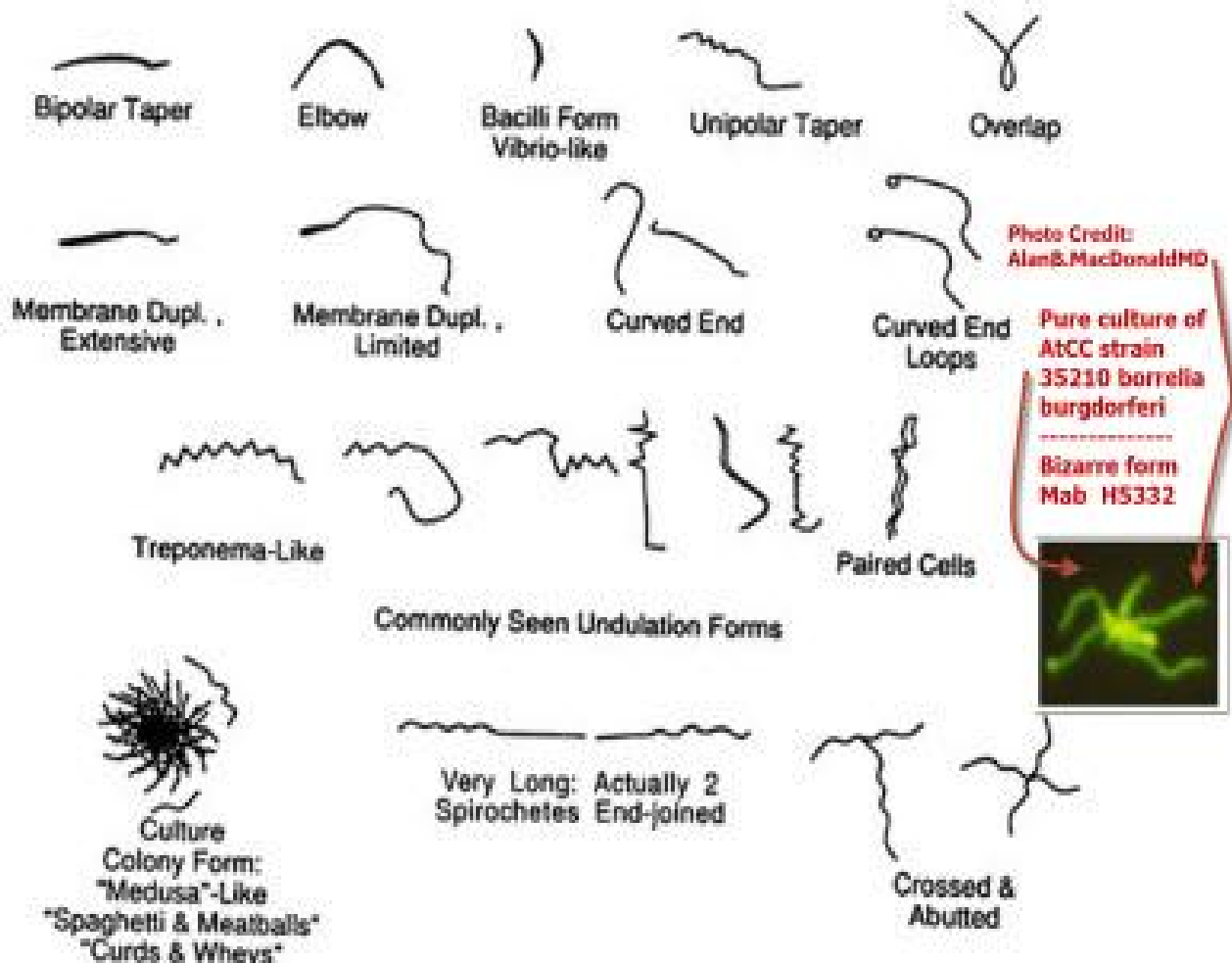


FIG. 1. Common morphologies of *B. burgdorferi* B31.

J Clin Microbiol. 1991 Apr;29(4):794-72

Morphology of *Borrelia burgdorferi*: structural patterns of cultured borreliae in relation to staining methods.

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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)