Parasites, Bacteria, and Auto-Immune Disorders

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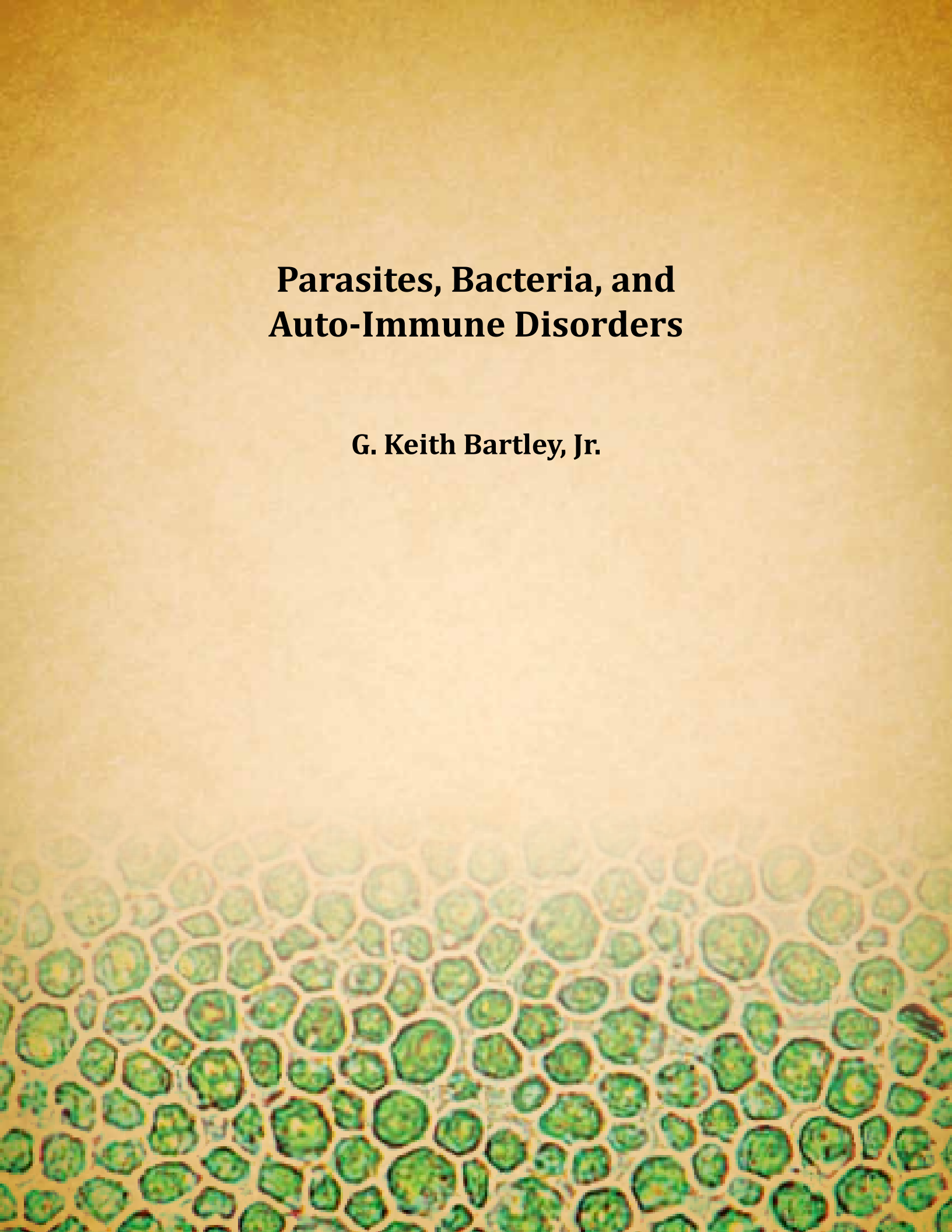


Early in the 20th century, John D. Rockefeller began to question the work ethic of southern Americans and the significant lack of contributions made by these individuals to the southern economy. In an effort to uncover the mysteries behind southern "laziness", Rockefeller sent doctors to investigate any environmental mechanisms that may be contributing to this perceived phenomenon. They found that individuals inhabiting areas with sandy loam soils exhibited this condition, while those with hard clay soils did not. The "laziness" in question was in fact anemia, a condition marked by an under-abundance of red blood cells, which causes fatigue due to reduced oxygen distribution throughout the body. This finding led doctors to not simply question the soil, but rather, what was in it. Known for its ability to thrive in sandy loam soils, hookworms immediately became suspect.

A parasitic organism can be defined as any species that derives benefits at the expense of the inhabited host. Hookworms are small, hair-sized parasitic nematodes that implant themselves on the lining of the intestines by piercing the feet of the host and traveling through the bloodstream. At the time, many southern Americans were not accustomed to using outhouses, and instead repeatedly defecated directly onto the surface of the ground in the same 4-foot radius, the maximum distance hookworms can travel before dying. As modern humans, we have spent over 99 percent of our history living as nomads, rarely inhabiting the same place for extended periods of time (Evans, 2000). By continuously defecating in the same areas, hookworms became overabundant in the intestinal tracts of southern Americans, triggering this anemic response. John D. Rockefeller has been attributed with eradicating hookworm related ailments through the formation of the Rockefeller Sanitary Commission, which raised awareness of the importance of sanitary conditions. Southern "laziness", as it pertains to hookworm-triggered anemia, was all but eradicated, allowing the southern economy to improve.

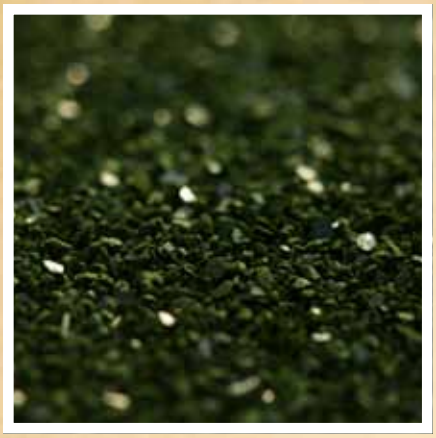
Despite the aforementioned roles of hookworms in causing anemia, these parasites should in no way be considered unnatural to our biology. As a nomadic species, it is likely that modern humans maintained a sustainable, yet non-harmful, number of hookworms in their intestines for tens of thousands of years. Consequently, it is readily considerable that parasites, such as hookworms, are an important aspect of human biology when maintained in proper numbers. The question quickly becomes, "What roles, if any, do parasites play in human biology, and of what importance are they to the sustainability of human health?" The answer may surprise you.

People suffering from autoimmune diseases most often come from an urban background, supporting the idea that humans with less interaction with the natural "unsanitary" environment are susceptible to what is known as the "hygiene hypothesis" (Kabeerdoss, Pugazhendhi, Subramanian, Binder, & Ramakrishna, 2011). The hygiene hypothesis states that reduced early childhood exposure to infectious agents, probiotics, and parasites contributes to an increased susceptibility to autoimmune diseases through an unnatural development of the immune system. Two studies published in 2011 demonstrated the effects that hookworms had in reducing the development of cells associated with celiac and Crohn's disease (Kabeerdoss et al., 2011; McSorley et al., 2011). Similarly, the porcine whipworm was shown to be beneficial in patients suffering from Crohn's disease and ulcerative colitis (Summers, Elliott, Urban, Thompson, & Weinstock, 2005). In the absence of exposure to organisms fundamental to our biology for tens of thousands of years, the immune system becomes overactive and begins to attack itself. The effects of these attacks couldn't be more real.

As someone who has suffered and survived the deadly effects of ulcerative colitis, I learned firsthand the damage that the human body can inflict upon itself. Deemed foreign to the framework of my biological makeup, my immune system rapidly deteriorated the tissue of my large intestine from the inside out. After mere weeks of abdominal pain, my large intestine looked like it had been put through a meat-grinder, barely capable of passing exorbitant amounts of blood, let alone bodily waste. But I am not alone. Researchers have identified anywhere up to 100 types of autoimmune diseases, including ulcerative colitis, asthma, multiple sclerosis, lupus, psoriatic and rheumatoid arthritis, celiac disease, Crohn's disease, and psoriasis to name a few. The National Institutes of Health estimate that up to 23.5 million Americans suffer from autoimmune diseases, a number that continues to grow each year.

So what becomes of a solution? Currently, there exists a gap between the hygiene hypothesis and reputable implementable therapy. While much of the pieces to the hypothesis puzzle appear to hold true, it by no means warrants the general public to start bathing in garbage, nor walk through excrement in their backyard. Rather, it provides us insight into the complexity of human biology. A more practical solution may exist in natural health food supplements and other methods of effectively calming the immune system response present in these disorders. One such supplement, which has made leaps and bounds in my treatment, is the single-celled algal protist *Chlorella pyrenoidosa*. I will

discuss more on the biology of my specific responses to this supplement in the following section. However, generally speaking, Chlorella pyrenoidosa, more commonly referred to as Chlorella, offers many benefits that relate to regulation of the immune system, and, unlike hookworms, is actually capable of improving instances of anemia (Gomi, Matsumura, Min, Sakurai, Taniguchi, & Nakamura, 2012). Chlorella is composed of the building block constituents that define health in our own species; so much so, that it has been investigated as a source of nutrition for the long-term survival of astronauts. It contains all the bodily nutrition needed to sustain the human body for extended periods of time.



One of the fundamental components in Chlorella's beneficiary function is the presence of large amounts of chlorophyll. Structurally, chlorophyll exists as a porphyrin ring consisting of Nitrogen atoms surrounding a centralized Magnesium ion. Recent evidence has shown Magnesium to play a significant role in the maintenance of both innate and acquired immune system responses (Tam, Gómez, González-Gross, & Marcos, 2003). Large amounts of chlorophyll also facilitate growth of the body's own naturally beneficial bacteria, otherwise known as flora.

Flora occur naturally in humans and their importance as a proponent in human health is rapidly gaining speed. The human intestinal tract has been shown to inhabit approximately 1,000,000,000,000,000 microorganisms, which is 10 times more than the number of cells in the human body (Björkstén, Sepp, Julge, Voor, & Mikelsaar, 2001; Sears, 2005). Following birth, complex combinations of flora develop to be uniquely specific to each person's biology. Through a mechanism similar to that of hookworm therapy, this exposure to bacteria helps occupy the immune system, preventing over-active responses from generating. However, these flora are extremely sensitive to antibiotic exposure. Because interactions between intestinal flora and immune cells delineate our body's responses to its environment, a deficiency in flora triggers chaos, often turning the body against itself. However, the ingestion of chlorophyll from Chlorella helps to restore lost flora, and regulate this delicate balance.

Chlorella: Genetics and the Autoimmune Response

A gene shown to alter its expression in response to Chlorella is the phosphatase and tensin homolog (PTEN) gene (Mizoguchi, Takehara, Masuzawa, Saito, & Naoki, 2008). The lack of proper PTEN expression, including mutation, has been implicated in a range of disorders related to autoimmune response and cancer development. PTEN represents the body's ability to execute cell differentiation, cycle rest, and death. Cancer occurs in the absence of these abilities, where a lack of cell differentiation, rest, or death can lead to undifferentiated cell growth (Di Cristofano, 1999). Consequently, PTEN is the most commonly mutated gene found in human cancers of the breast, prostate, endometrium, ovary, and colon. However, even a small reduction in expression is associated with the presence of cancer (Di Cristofano & Pandolfi, 2000). The ability of Chlorella to regulate the levels of expression in this gene may translate to a reduced risk of cancer.

Related to this mechanism are its roles in immune system responses. Where cancer presents the inability to commit cell death, autoimmune disorders are defined by the body's ability to attack itself. In fact, the PTEN gene may serve as one of the greater links between autoimmune conditions and cancer development. Challenging the idea that dual-allele tumor suppression gene loss is needed for cancer development, the loss of just one allele of PTEN is enough to cause both cancer and autoimmune disorders in mice through apoptosis impairment in lymphocytes, a type of white blood cell (Di Cristofano, 1999).

PTEN disruption has even been connected to expressive traits and symptoms in autism (Redfern et al., 2010). These mechanistic effects have been demonstrated to include, but should not be limited to, hyperactivity in auditory integration, which leads to an increased sensitivity to sounds (Xiong, Oviedo, Trotman, & Zador, 2012). This study also references the successful use of rapamycin for reducing hyperactivity caused by the PTEN gene disruption. Rapamycin is currently in use as an immunosuppressant in clinical practice to prevent immune system organ rejection following transplant. In fact, I was given rapamycin as a last resort before surgery when in the hospital for ulcerative colitis, which I ironically had an allergic reaction to. However, Chlorella has helped reduce the severity of my symptoms in both ulcerative colitis and autism spectrum disorder without any side effects. Specific to autism, I believe to have experienced reductions in the severity of symptoms related to auditory integration and a heightened sensitivity to sounds. As such, I cannot help but acknowledge the potential connection.

Autism is a neurodevelopmental disorder marked by social and communication deficits as well as a range of sensitivities to sound, light, and touch. The causal genetic, biological, and environmental mechanisms contributing to its development are largely unknown, and its complex nature continues to puzzle neurologists to this day. However, much evidence in autism development points to a role of immune system dysfunction (Ashwood & Van de Water, 2004). As someone who has made a career out of researching autism, despite having it, this topic is one that I hope to revisit further later. Still, as it relates to autoimmune disorders, the links between my ulcerative colitis and autism diagnoses are significant. The all too common comorbidity of autoimmune diseases and autism symptoms warrants further investigation into these mechanisms as they relate to the early intervention and treatment of both. While most likely one of many potentially beneficial mechanisms, the effects of Chlorella on PTEN gene regulation may exist as a common mechanism for reducing instances of autoimmune dysfunction.

In presenting these theories and postulations, I want to emphasize that I believe disorders, not formally connected to having any observed improvement through the double-blind studies utilizing singular mode-of-action synthetic drugs, are better corrected through the use of holistic mechanisms of improving health, which Chlorella has no doubt been connected to doing. However, this in no way warrants the disbarment of the effectiveness of pharmaceutical treatments approved and regulated by the FDA. I do not seek to question a drug's ability to save a life, but rather challenge its ability to improve the quality of one. In a world wrought with autoimmune diseases, the potential benefits of health food supplements are too important to overlook. Considering the wealth of evidence supporting these benefits, those suffering from autoimmune diseases owe it to themselves to try the natural supplement Chlorella, and experience the difference for themselves.

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