



THE COMPLETE LYME REPORT

Overcoming Lyme Can be Easier Than You Think! Discover What These Maine Functional Medicine Practitioners Are Doing To Protect Their Families And Patients.

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If you live or vacation in Maine, you have probably heard about Lyme disease. Lyme disease is caused by the bacterium *Borrelia burgdorferi* (Bb) and is transmitted to humans through the bite of infected blacklegged deer ticks. Lyme can be an insidious disease if it goes untreated or undetected, causing symptoms masked as the flu, migraines, lupus, Parkinson's and even dementia. In the state of Maine, the incidence of Lyme disease has reached a record high. In 2013, Maine had 101 cases of confirmed Lyme per 100,000 people. The Center for Disease Control (CDC) defines an epidemic as 25 cases per 100,000 people, suggesting that Maine's Lyme disease problem has reached epidemic proportions. All 16 counties in Maine were found to have Lyme disease and of all the counties, 42% of confirmed Lyme cases were reported in Cumberland and York counties.

Clinicians and citizens of Maine need to be aware of the proper prevention of Lyme, symptoms of Lyme, misconceptions about Lyme, and the diagnosis and treatment of acute and chronic Lyme disease. Our goal at Precision Health Family Functional Medicine is to provide you with actionable information to become *Lyme literate* and provide a medical practice in the local community to help you protect, defend and recover if you and your family are ever affected by Lyme.

Preventing Lyme

The first step to avoiding Lyme disease is to prevent the tick bite in the first place! We recommend the following strategies to minimize your risk of exposure to infected deer ticks.

Prepare and protect yourself. Ticks range in size from small to extremely small, from the size of a head of a pin to the size of the tip of a pin, so they can be very difficult to spot. Careful examination is key. Regular tick checks throughout the spring, summer, and fall are critical. When you are going to be working or playing in the yard or taking a walk through the woods, wear light-colored clothing to more easily spot ticks and stay on the beaten path so you're not walking through tall grass. To deter tick attachment, apply permethrin to your boots or outdoor gear and/or use essential oil insect sprays rather than toxic chemical insecticides. Use a lint roller on your clothing and exposed areas before you come inside to pick up any unattached or crawling ticks before they attach. Ticks often grab onto your shoes or clothing, and then find their way to your skin, particularly warm areas like the groin, armpits and hairline. When you check yourself or a family member be sure to act like a monkey and comb through the hair and scalp, check the armpits, the groin, the back of the knees and legs. It is often recommended to shower immediately after being in an area of exposure so that you can fully check yourself and to run your clothes through the dryer for ten minutes on the highest setting

to kill any remaining attached ticks. Also, check your pets when they've been out in the yard or on the trail. Your dog or cat can unknowingly bring ticks inside and onto you. Keep your pet's hair trimmed short and be diligent and routine in your tick checks.

Prepare your property. Deer ticks thrive in wooded areas and are carried on deer, mice and other rodents, and birds. Eco-friendly companies control rodent and tick populations by spraying your property with natural essential oils and setting tick tubes (<http://www.ticktubes.com/>) around the perimeter of the property. Other natural methods of deterring ticks and the animals that carry them include installation of deer fences, owl houses, and barrier gardens between the woods and lawn. Remove dead leaves, keep the grass trimmed and edged, and if so inclined, introduce guinea hens or chickens to your property to feast on the ticks. Chemical pesticide options for tick prevention can have negative effects on your body and the ecosystem. Understand the risks to avoid potential hazards.

PROTECT AND PREVENT LYME

Top 6 Steps to Reduce Exposure to Ticks Carrying Lyme.

01

PERFORM TICK CHECKS

After coming in from the outdoors be sure to check yourself and your loved ones (and pets) for ticks pay additional care to check the armpits, groin, and areas with body hair. If you are alone utilizing a mirror can be beneficial.

02

SHOWER

To be sure that you have checked all areas showering with soap can be beneficial to double check and potentially sluff off any additional stowaways clinging on to your body.

03

WEAR LIGHT COLORED CLOTHING

Wear lightly colored clothes in order to help your ability in spotting ticks before they reach your skin.

04

STAY ON THE TRAIL

Staying on the trail is one of the best practices because the ticks tend to live in taller grasses and leaves where the beaten tends to have less.

05

CLOTHES DRYER

As soon as possible place your clothes into a dryer and turn it on the highest heat setting available for a cycle of at least ten minutes in an attempt to kill any remaining ticks still attached to your clothing.

06

YARD MAINTENANCE

Remove dead leaves or push back into the woods, keep grass trimmed and edged, utilize tick tubes, and/or spray with natural chemicals.



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Discovering Your Lyme

There are three different situations in which you or a family member may discover you have been bitten by a tick or that you are having symptoms of Lyme disease or other co-infections (other infections that ticks carry).

1. You see a tick attached to your body.
2. You develop symptoms of **acute lyme**, also known as early Lyme. Typically, you are unaware that you have been bitten by a tick, and, according to the Centers for Disease Control (CDC), experience symptoms including fever, headache, fatigue, and potentially a characteristic skin rash called erythema migrans.
3. You develop symptoms of **chronic Lyme**, also known as persistent Lyme. Typically, you are unaware that you have been bitten by a tick (or were bitten several weeks before and received inadequate treatment) and over time may develop symptoms of persistent fatigue, joint and muscle pain, sleep disruption, neuropathy, anxiousness, depression and/or cognitive decline.

In each of the sections that follow, we will discuss one of situations from the list above, and describe the treatment, testing and immune support protocols we recommend and provide for our patients at Precision Health Family Functional Medicine.

Lyme Disease

The Great Imitator

SYMPTOMS AND MISDIAGNOSIS

EARLY vs. CHRONIC

SYMPOMTS	SYMPOMTS
Fatigue	Fatigue
Rash	Joint Pain
Fever	Muscle Pain
Headache	Sleep Disturbances
Chills	Cognitive Decline
Cough	Neuropathy
Muscle Pain	Anxiousness
Joint Pain	Depression
Neck Pain	Headaches
Sleep Disturbances	
<hr/>	
	
MISDIAGNOSIS	MISDIAGNOSIS
Dermatitis	Multiple Sclerosis
Spider Bite	Lupus
Flu/Cold	Alzheimers
Anxiety Attack	Parkinsons
Migraine	Other Autoimmune
Allergic Reaction	Fibromyalgia/CFS
MORE...	Psychiatric
	MORE...



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A Tick is Attached to Your Body!

Treatment: Tick Removal

If you do find an attached tick, immediate and careful removal is critical. Transmission of Lyme and other tick borne illnesses can occur quickly after the tick attaches. A common misconception is that the tick must be attached for 36-48 hours to transmit disease.

1. *Using a magnifying glass and fine pointed tweezers, pinch the tick as close to its head as possible and apply constant pulling pressure until the tick is pulled out.* Be careful not to squeeze the body, which may or may not be engorged. You should **not** try to burn it off, smother it with alcohol or essential oils, or pinch and pull it with your fingers. All of these methods can aggravate the tick and may cause further infectious content to enter your body. The tweezers and magnifying glass can be found online (<http://www.mainelyticks.com/supplies-kit.php>) and should be kept in you car and your home in a medical kit. A plastic spoon-like tick puller can also be effective.
2. Once removed, *kill the tick with the tweezers and place it in a plastic bag* or other secure container so it can be sent off to a lab for proper identification as a deer, dog, or lone star tick.
3. *Clean the bite area and your hands thoroughly with alcohol, an iodine scrub or soap and water.*
4. *Take a picture (which includes a small ruler for size relation) of the tick and the bite area.*
5. *Draw a ring around the bite area and any developing rash* with a marker or pen and watch for expansion.
6. *Make note of where you were and what you were doing.*
7. *Go to a health care provider and request an antibiotic regimen* of doxycycline, azithromycin, ceftin, or amoxicillin. We follow the International Lyme and Associated Diseases Society (ILADS) protocol of a minimum of three weeks of antibiotic prophylaxis for an attached deer tick. **Call us at (207) 219-8445 for an ASAP LYME appointment.**

PROPER REMOVAL OF AN ATTACHED TICK



Here is HOW TO REMOVE AN ATTACHED TICK safely.

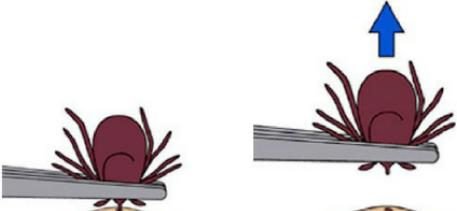


Image source: www.cdc.gov

FINE POINTED TWEEZERS



Use fine-tipped tweezers and magnifying glass to grasp the tick as close to the skin's surface as possible.

PULL UPWARD



Pull upward with steady, even pressure. Don't twist or jerk the tick; this can cause the mouth-parts to break off and remain in the skin.

CLEAN THE BITE



After removing the tick, thoroughly clean the bite area and your hands with rubbing alcohol, an iodine scrub, or soap and water. If there is a rash or redness trace the border of it with a marker and watch for expansion.

SAVE, SEND AND CALL



Place the tick in a small sealable plastic bag and go to tickreport.com and order tick identification and testing. Then call your local practitioner to receive antibiotics potentially.

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FOR MORE INFORMATION VISIT WWW.FAMILYFUNCTIONALMEDICINE.COM

Testing

We strongly recommend saving and testing any removed ticks. By having the tick tested, you can find out if you have been exposed to Lyme or any other infections ticks may carry. It is much easier to identify the infection in the tick than it is to identify a possible infection in a person due to many limitations to human testing, which we will review later in this article. Identifying the infection in the tick will help medical professionals determine if you should continue antibiotic prophylaxis or if additional treatments may be necessary. Simply go to www.tickreport.com, set up an account, pay the testing fee and obtain an ID number. Send your tick off to the lab according to their recommended mailing procedure.

Support During Antibiotic Treatment

Taking antibiotics in the early stages after a tick bite is important. However, we must continue to support all systems of the body while taking this medication. Antibiotics may cause some unwanted side effects. These side effects can create unwanted symptoms such as diarrhea and sensitivity to sunlight and may create side effects that are asymptomatic such as disruption of the healthy microbiome and mitochondria.

The two areas that need support when you are taking antibiotics are the gut *microbiome* and the *mitochondria*. Antibiotics negatively affect both areas, making repair and recovery from infection more difficult.

Antibiotics disrupt the *microbiome* by attacking both “good” and “bad” bacteria. Support of the microbiome, especially the gut microbiome, is essential. We encourage our clients and patients to take a probiotic and continue to eat foods (eg. fermented foods, fibrous vegetables) that aid in the growth of the “good” bugs and stay away from sugary and processed foods that may promote the growth of “bad” microbes (eg. Yeast).

The *mitochondria*, which are responsible for many metabolic processes, including providing the immune system with the energy to repair and rid the body of infection, also need support during antibiotic regimens. We accomplish this through supplementation (eg. CoQ10, B-Vit, Fatty Acids), exposure to natural light (vitamin D), and dietary recommendations such as high quality fats and vegetables.



PROPER STEPS TO TAKE FOR TICK BITE

Precision Health: Family Functional Medicine

STEPS TO TAKE IF YOU ARE BITTEN

- 1 Proper Removal [fine pointed tweezers and magnified glass]
- 2 Take a picture with a small ruler for size relation of both the tick and the bite site.
- 3 Place the tick in a container and order a kit to have it analyzed. (tickreport.com)
- 4 Draw a ring around any rash or the bite site with a marker or pen and watch for expansion.
- 5 Take note of where you have been and what you have been doing.
- 6 Get to a health care provider who understands Lyme and request an antibiotic regimen that may include doxycycline, azithromycin, or amoxicillin.

Acute Lyme

“Lyme is a clinical diagnosis supported by laboratory data.” - Dr. Charles Ray Jones MD

Read that quote very carefully. In fact, read it again. It indicates that it is first up to the physician and the patient to review signs, symptoms, and your outdoor exposure and activity in a Lyme endemic area, and then determine whether or not Lyme disease should be included in a diagnosis. A negative Lyme test does not rule out the possibility of Lyme disease, as we will review.

Diagnosis and Testing: Acute Lyme

The presence of a “bulls eye” rash at the site of tick attachment is a classic symptom of early Lyme. In truth, only about 30% of Lyme infected individuals actually develop the bulls eye rash. It is more common to see a red, expanding rash that travels uniformly, meaning it spreads in all directions, from the tick attachment site or a red, circular rash with a central clearing on other parts of the body. These rashes, called Erythema Migrans (EM), can be warm, raised, itchy, or largely asymptomatic. Rashes can develop within 3-30 days after the tick attachment. Some people never develop a rash at all.

As indicated, the *presence of an EM rash is diagnostic for Lyme*, especially if accompanied by a clinical history of outdoor activity in a Lyme endemic area and any other symptoms such as fever, joint pain, headaches or malaise. A diagnosis of Lyme and potential tick coinfections must be made clinically in acute stages as conventional testing lacks sensitivity, specificity, and may take several weeks to reveal a positive infection. Treatment should not depend on positive Lyme serology in the acute stage and *treatment should be initiated immediately* for best clinical outcomes.

The **ELISA**, although not the most sensitive test (meaning it has the potential for a false negative result) is the most common blood test for Lyme and measures the total amount of antibodies present against the bacterium *Borrelia burgdorferi* (Bb). If results are positive, a **Western Blot test** will be used to look for the specific protein patterns or bands that are present in the immune cells. We like to think of bands as fingerprints of the Lyme bacteria. If we are able to detect just one of these fingerprints specific to Lyme, we can potentially conclude that the body has been exposed or infected with Lyme.

Recommendation - *Get these tests first, as long as they are performed six to eight weeks after you think you have been infected.*

iSpot Lyme is a blood spot test that examines a specific type of immune cell chemical reaction toward the Bb antigen. We use this test to diagnose acute infections as it

typically shows positive lyme results within two weeks and has a sensitivity of 84% and a specificity of 94%. Additionally, this test can be helpful for monitoring response to lyme treatment or the presence of a new infection in someone who has already been treated for lyme. We love that this test looks at three important factors: 1) The total presence of detectable lyme; 2) The function of the immune system at baseline and; 3) The function of the immune system when stimulated against non-lyme antigens.

www.pharmasan.com

Treatment and Support: Acute Lyme

For acute Lyme, we follow the International Lyme and Associated Diseases Society (ILADS) protocol of antibiotic therapy for six to eight weeks if you have a positive iSpot result or are symptomatic with EM rash, fever, night sweats, cough, headaches, fatigue, muscle or joint pain, forgetfulness, sleep interruption or abdominal pain (often the primary symptom in children).

Lyme is known as the “great imitator” meaning the various symptoms of Lyme can mimic many other illnesses. Additionally, in acute stages, the immune system may not mount antibodies for 3-8 weeks after disease transmission, so running blood tests too early may reveal a false negative result. This is why we recommend starting antibiotic therapy immediately and not delaying for a confirmatory test. Refer to the *Support During Antibiotic Treatment* above for ways to address the side effects of antibiotic therapy.

You can review the ILADS treatment guidelines in more detail here:

<http://www.ilads.org/lyme/treatment-guideline.php>

Chronic Lyme

We can't emphasize enough the well earned reputation Lyme has as the “great imitator.” Why? Because with us, Lyme is personal. Like many others, our Lyme infections were misdiagnosed and we each suffered with different, debilitating symptoms. Once diagnosed with Lyme, we implemented a comprehensive functional medicine treatment protocol and completely recovered. At Precision Health Family Functional Medicine we are passionate about identifying and treating these infections so our clients do not have to suffer the way we have.

Rudy's Story:

“Being diagnosed with Lyme was a life changing experience for me. Prior to the diagnosis I had major medical workups done in order to understand what was creating some of the very hard to understand symptoms I was experiencing such as fatigue, muscle pain and difficulty sleeping. I self-medicated and supplemented in order to help

reduce symptoms and I went through a very brief time of depressive thinking, believing that it was all in my head. It was a very difficult time trying to understand the cause of my “weird” symptoms. This is a common story often echoed by my patients about their troubles.

Prior to becoming a “Lyme Literate” practitioner I had a known deer tick bite that I immediately identified and began two weeks of antibiotics. Within 24 hours of the bite I experienced insomnia, fever, rash, congestion, and other flu-like symptoms. However, because this occurred prior to my training on Lyme, my antibiotic regimen was not continued for long enough. Then nine months later an odd raised red inflamed rash appeared that continued to expand, causing me to develop a fever of 104 degrees and severe disorientation. I was quickly rushed to the emergency room where I was diagnosed with cellulitis (inflammation of the skin cells) and pumped full of IV antibiotics. I suspect this was a new tick bite and reinfection. It was after this incident that I slowly began to manifest symptoms of severe cognitive decline. I was very forgetful, had poor working memory, was unable to find the correct words when speaking or writing, and had severe insomnia. This was early in our marriage and Annette asked me “Are you developing early onset Alzheimer’s Disease?” She was worried. Additionally, after exercise, I had extensive muscle and joint pain in various areas that would last for weeks. I thought to myself, a 28-year old man should not be feeling this way! I felt so poorly, I contemplated giving up my career in healthcare. These persistent symptoms dragged on for almost a year before I had testing for Lyme and co-infections. Once I learned these symptoms were caused by Lyme and co-infections, I was able to implement a comprehensive functional medicine treatment protocol through nutrition, antimicrobial support, detoxification support, hormonal balance and cognitive support to help my body recover. Today I truly feel my best because my journey has allowed me to now be an integral part in others’ recovery from the battle against Lyme and other chronic conditions.”

Annette’s Story:

“I suspect I was bitten in the fall of 2010. I had just moved back to Maine after spending three years in Florida. I developed a red, raised bulls-eye rash on my left upper arm and it was misdiagnosed as shingles. Why does an otherwise healthy 27-year old woman have shingles? I figured I was just stressed out with the move. At the time, I felt achy, low grade fever, and general malaise. After the initial rash disappeared, I developed severe fatigue and joint pain. Previously a marathon runner and athlete, I remember getting out of bed in the morning that first winter back in Maine and thinking “either these Maine winters are really tough or I must have rheumatoid arthritis” because every joint in my body hurt and I could hardly move. I had extensive testing and everything was negative except for adrenal imbalance and multiple food

sensitivities. My Lyme testing was negative through conventional labs and nobody mentioned more sophisticated testing. Using supplements, nutrition, rest and exercise, I was able to get a handle on my health but still found myself falling asleep in the middle of the day and having severe night sweats and flu like symptoms several nights per week. I was doing everything right-perfect diet, perfect supplement regime, I had a great job helping patients all day-but I felt horrible. It wasn't until I had testing through Igenex laboratories, two years after my initial infection, that a diagnosis of Lyme and Babesia was confirmed. I was sick for a long time without answers. The implementation of a functional medicine treatment protocol using targeted antimicrobial support, detoxification support, gut support, hormonal balance, and an antimicrobial diet were pivotal to my recovery. Now I am running again. I am not running marathons because I don't have time for that with chasing my busy three year old son, but I can run 5-7 miles most days of the week and still have energy for my family and patients. My infections are gone and I adhere to a strict self-care routine to make sure they stay that way."

Symptoms of Chronic Lyme

The symptoms of chronic Lyme are consistent with those of acute Lyme, but are more disruptive to your life. Fatigue, joint pain, and muscle pain may be persistent. Sleep disruption becomes chronic insomnia. Forgetfulness manifests as cognitive decline and anxiousness and depression can be debilitating. Symptoms vary greatly among individuals and can often mimic more severe conditions such as cancer, heart disease, autoimmune disease, rheumatoid arthritis, lupus, neuropathy, hypothyroidism, multiple sclerosis, and psychiatric disorders. After being sent from specialist to specialist, patients commonly end up without a definitive diagnosis or receive a very broad umbrella diagnosis such as chronic fatigue syndrome or fibromyalgia. Unfortunately, some may be told it's all in their head. Although it is a relief not to receive some of the major condition diagnoses above, not knowing the cause of the "weird" symptoms is troubling and difficult. Not only does Lyme prove it is the great imitator, as in Rudy's cellulitis, muscle and joint pain and Annette's shingles, fatigue and joint pain; in more persistent/chronic cases, *Borrelia burgdorferi* (Bb) is capable of suppressing and hiding from the immune system, as it did in Annette's case, so that it is essentially undetectable with conventional testing.

Diagnosis and Testing: Chronic Lyme

Receiving a positive blood test result for Lyme is more likely when the infection has been present in your body for three to eight weeks. The test results are dependent on the presence of antibodies created by the body to fight infection. Mounting that defense takes time. Our recommendations for Lyme and coinfection testing include:

1. The *ELISA and a Western Blot test*. See more details above in the acute lyme section. **Recommendation - Get these tests first, as long as they are performed six to eight weeks after you think you have been infected.**
2. The gold standard test for detection and confirmation of Lyme is a *Bb culture*. This test examines whether or not it is possible to grow the Bb organism from the blood, tissue, or spinal fluid sample over a 4, 8 or 16 week cycle. This test is limited because Bb is a slow growing organism and the test is infrequently positive, but only after the organism has traveled outside of the blood stream and inside of the tissue. However, this test does show that you have Lyme because the sample taken from your body was able to grow the Bb organism.
Recommendation – This test can be completed if you suspect an infection and have current exacerbation of symptoms. It can be completed any time after infection.
3. *DNA or PCR (Polymerase Chain Reaction) test* determines if fragments of the Bb DNA are present within the blood. This test does not indicate an active infection or immune reaction; it only indicates whether fragments of the bacteria are present in the sample taken. A limitation is that test results are often found to be negative. Thoughts are that negative results occur because the Bb organism is only present in the blood for a short period of time or that the genetic load needed to test positive is not present within the blood. Either way, this test is often conducted to assist in the diagnosis of Lyme.
Recommendation – This test can be an add-on to the tests listed above or it can be used if the tests above are negative and you still suspect Lyme.
4. *IgeneX laboratory* is in California. We commonly use the *IFA and expanded Western Blot test* as well as co-infection testing through this laboratory. The testing can be an investment but, as Annette experienced, their labs were much more successful at detecting Lyme than conventional labs. If you can afford this testing, approximately \$1,000 for lyme and coinfection testing, it is a great option. Basic lyme testing without coinfections is approximately \$300. www.igenex.com.
Recommendation –This test can be an add-on to the tests listed above or it can be used if the tests above are negative and you still suspect Lyme or coinfections.
5. *DNA Connexions* test looks at the presence of DNA material of Bb and of the most common co-infections including Babesia microti, Babesia divergens, Babesia duncani, Bartonella bacilliformis, Bartonella henselae, Bartonella quintana, Borrelia miyamotoi, Borrelia recurrentis, Ehrlichia chaffeensis and Anaplasma phagocytophilum. www.Dnaconnexions.com

Recommendation –*This test can be an add-on to the tests listed above or it can be used if the tests above are negative and you still suspect Lyme or coinfections.*

Despite clinical advances in testing sensitivity and specificity, testing limitations create chances for false negative, and rarely, false positive, results. That being said, we support the use of the testing options and recommendations described above, as they are the most current way we have to detect this elusive disease and support a clinical diagnosis. We are glad we were personally tested as it allowed us to confirm a diagnosis and make a treatment plan. Having this confirmation is helpful, but if you are struggling to find answers, do not take a negative test as the “be all and end all” and forego pursuing treatment. Often one of the best options is to pursue a treatment trial while monitoring your symptoms.

Treatment Options and Immune Support for Chronic Lyme

Treatment of persistent Lyme disease is an ongoing process that takes time, diligence, and a knowledgeable team of “Lyme literate” practitioners, like our team at Precision Health Family Functional Medicine. However, preferred treatment options may vary greatly among Lyme specialists. Some practitioners believe that multiple rounds of antibiotics are the only way to treat chronic Lyme. Some favor natural herbs and nutrients. Other practitioners prefer homeopathy. And some will even say you need a combination of all of the above.

If anything, we have learned they are all right! Whatever works for you, works for you. If you have been diagnosed with Lyme, you should do anything and everything to pursue the treatment options that help you. The perfect treatment for you may be different from your neighbor, your family member or even, in our case, your practitioner. What allows us to customize the plan for you is a combination of testing, presenting symptoms, your genetics, lifestyle, goals, research findings and clinical experience. Lyme treatment is not a one size fits all approach but a one size fits YOU approach.

At Precision Health Family Functional Medicine, we view the body holistically and thus provide comprehensive treatment. As functional medicine practitioners, we know that it is vital to address the imbalances that result from infections by examining multiple systems of the body. Not only does this help the patient feel better while undertaking an extensive antimicrobial regimen, but also hastens recovery and increases chances of complete remission.

There are four key areas that we address through our proprietary Precision Health process:

- 1) Decrease total inflammatory load
- 2) Provide symptomatic relief
- 3) Provide targeted antimicrobial support
- 4) Support the entire human system including immunity, detoxification, mitochondrial, gut microbiome and hormones.

1) Decreasing the total inflammatory load is a critical part of treatment. Inflammatory compounds, such as cytokines (IL-1, IL-6, TNF- α , IFN- γ), are released from immune cells in areas of injury. The load of these inflammatory compounds can create sickness syndrome, fatigue, muscle aches, joint pain, mood disorders, and neuropsychiatric disorders. These inflammatory compounds create free radicals that perpetuate the inflammatory process and lead to additional damage. Decreasing inflammation involves removing offending agents, repairing injured cells and introducing compounds that help put out the inflammatory “fire” such as curcumin with piperine, antioxidants, fish oil, glutathione and its precursors, proteolytic enzymes, CoQ10, B-vitamins, amino-acids and minerals.

2) Providing symptomatic relief from the many devastating effects of chronic Lyme is essential for healing and often requires multiple modalities. Medications, herbs, nutrients, meditation or manual therapies such as chiropractic, acupuncture, or massage therapy may all improve symptoms. Symptoms that we commonly manage as we guide our clients through a treatment protocol include physical pain, fatigue, cognitive dysfunction, mood disorders, and sleep disturbance. Recommended remedies that support sleep include meditation, proper light exposure, supplementation (e.g. melatonin, 5-HTP, phosphatidylserine) and herbal teas. Through functional medicine laboratories, we also conduct specific genetic and sleep testing to determine which sleep protocols will be most effective.

3) Using targeted antimicrobial agents to eradicate the *Borrelia burgdorferi* spirochete and other diagnosed co-infections can be a very difficult task. As indicated in earlier parts of the article, the *Borrelia burgdorferi* spirochete has advanced capabilities that evade detection from the immune system and resist treatment. One way the spirochete evades detection is to assume multiple forms at any given time. Therefore, we often need multiple antibiotics, including intracellular, cell wall, and “cyst buster” antibiotics, used orally, intramuscularly, or intravenously to attack each of these existing forms. Prolonged courses are often prescribed. These antibiotic regimens can be an effective treatment option, but they may also have troublesome side effects due to the

duration of treatment and the combination of multiple medications. Routine blood monitoring by the prescribing practitioner, including white blood cell counts and liver enzymes, are essential when undertaking this treatment method in order to prevent any negative side effects. When we use prescription antibiotics, we typically follow ILADS dosing recommendations. However, this aggressive antibiotic approach may not be safe or effective for all patients. Fortunately, there are several other options for targeted antimicrobial therapy that are safe and effective.

Antimicrobial herbs such as Andrographis, Japanese Knotweed, Cat's Claw, Allicin, Artemisia and many more can be very effective for tick infections. These herbs should be taken under the guidance of a knowledgeable practitioner. It is generally recommended to begin herbal remedies by introducing one herb at time, and gradually titrating to higher doses until the optimal dose and herbal combination is achieved. There are also many commercially available herbal combinations that we use as part of a comprehensive program.

Many of our patients have had success with homeopathic treatments, transfer factors, CBD oil, silver hydrosol, intravenous nutrients, and other therapies.

4) Supporting the natural systems of the body is key to achieving the best treatment outcomes when dealing with any chronic condition, including ongoing infection. It is not adequate to simply prescribe an antimicrobial regimen and expect the body to recover. The body must be addressed in a holistic manner, recognizing that the immune system, mitochondria, detoxification, gut microbiome and hormonal systems are interconnected and in constant communication.

Immune system-The immune system is meant to act as a guard and army to protect our body from invaders, both “foreign” and “domestic”. When the immune system responds to a stimulus, it does so through a complex chemically based communication system. It is the job of the immune system to locate and eradicate the stimulus as quickly and efficiently as possible, which often happens through an inflammation based response. Problems develop when the immune system is overburdened with multiple and/or perpetual stimulation by different causative factors. When this happens, responses can become detrimental to the host, leading to symptoms like those seen in persistent lyme. To address the immune system appropriately, a comprehensive approach must be taken to find and address the causative factors that lead to the immune system’s switch being held in the on or off position. This approach often includes lifestyle modifications, stress reduction, reducing exposure to certain chemicals/toxins, balancing of hormones and targeted therapy for

specific microbial infections. We must squelch the immune system fire by pointing our functional medicine hoses toward the base of the fire, and not just wave our hands at the symptoms' smoke.

Mitochondria - Mitochondria are organelles ("small organs") within each cell that are responsible for producing the majority of cellular energy, called ATP. Mitochondria are now known to play important roles in responding to infection from microbes (like lyme and its co-infections), controlling chronic inflammation, triggering cell death, and controlling other metabolic processes. When dealing with chronic infection and inflammation it is important to realize that the mitochondria could be, and often are, a contributing factor to the occurrence of a sustained inflammatory response. It's like throwing gasoline on a fire. The mitochondria need to be addressed with therapies that restore normal efficient ATP production, reduce inflammation signaling by addressing their respective causes, and promote the death of dysfunctional and inefficient mitochondria. At Precision Health, we accomplish this with recommended therapies geared to your specific needs. Examples include supplementation of B-vitamins, CoQ10, fatty acids, intermittent fasting and carbohydrate restriction.

Detoxification-Prior to antimicrobial therapy, and throughout treatment, it is crucial to optimize the ability of the body to detoxify through the lymph, gut, liver, kidneys, and skin. Chronic infections burden detoxification capacity and introduction of antibiotics or herbs can further strain this system. Patients may experience a temporary worsening of symptoms when antimicrobials are introduced. Known as a Jarisch-Herxheimer reaction, or "herx" for short, this reaction occurs when large amounts of rapidly dying bacteria release fragments and toxins into the body. This massive inflammatory response can result in an exacerbation of Lyme symptoms and create new headaches, joint pain, insomnia, mood instability, rashes, and difficulty thinking. It can be troubling and a discouraging process to go through, but in the end can be managed by reducing the provoking agent (antibiotic or antimicrobial herb) and working to increase the natural detoxification, immune, and anti-inflammatory pathways of the body. Our favorite detoxification methods, because of their effectiveness and low side effect risk, include infrared sauna therapy, epsom salt baths, activated charcoal, protein supplements designed to support detoxification, glutathione, and specific herbs.

Gut Microbiome-The gut microbiome must be optimized before, during, and after antimicrobial therapy. Overgrowth of candida, pathogenic bacteria and parasites in the gut can often tax the immune system and impede full recovery from Lyme. We prefer to test the gut microbiome and balance this before starting any antimicrobial therapy. Throughout treatment, diarrhea is a common side effect of antibiotics or

antimicrobials herbs. Antimicrobials attack all bacteria in the body, including the beneficial bacteria in the digestive tract. This often causes diarrhea. Since a healthy digestive balance of bacteria is critical for enhancing immune function and helping to fight chronic Lyme disease, we recommend re-inoculating the gastrointestinal tract with a beneficial probiotic supplement. In many clinical trials, the probiotic *Lactobacillus rhamnosus* has prevented antibiotic-associated diarrhea. We would also recommend including foods that act as prebiotics and probiotics in our gastrointestinal tract such as kefir, sauerkraut, kombucha and other fermented vegetables. Following an extensive Lyme antimicrobial regimen, it is also important to repair any microbiome damage. We prefer to use a stool test to re-examine the gut and address any remaining imbalances.

Hormonal Balance-Persistent tick borne infections can have devastating effects on hormonal balance. It is not uncommon to find severe adrenal dysfunction, thyroid disease, low testosterone, and exacerbation of PMS and perimenopause symptoms in patients suffering with persistent infections. Initially, it is common to see elevations in cortisol levels as the body attempts to naturally mitigate inflammation caused by the infection. This may be accompanied by anxiety, sleeplessness, and agitation. Typically, adaptogenic herbs such as ashwaganda, rhodiola, and eleuthero and the phospholipid phosphatidylserine are helpful. If the infection remains untreated, the adrenals cannot keep up with the demand for cortisol, and cortisol levels appear low on testing. This presents as fatigue, lethargy, and other physical symptoms associated with low cortisol. Additionally, many patients develop hypothyroid symptoms and low body temperature, which keeps the body temperature too low to sufficiently fight back against infection. Many female patients develop menstrual, premenstrual and perimenopausal difficulties and our male patients often present with very low testosterone levels. Testing and addressing these imbalances through functional medicine approaches is key to helping the patient feel better and restore balance throughout treatment.

Though the treatment of chronic Lyme continues to be studied, the best options currently available address and treat the body as a whole. At Precision Health Family Functional Medicine, we implement advanced testing, multiple modalities and treatments that restore and support the immune, hormonal, digestive, and detoxification systems. Optimizing these systems allows for maximal effectiveness of antimicrobial agents, minimizes treatment side effects, provides adequate symptom control, and hastens recovery from chronic Lyme disease.

At Precision Health Family Functional Medicine, we help people who are having difficulty getting answers to their frustrating symptoms. We develop a customized

treatment plan geared toward addressing the underlying cause of your symptoms so you can regain your health and reach a higher potential.

We hope you found this information helpful. If you have any questions or would like to learn more, please contact us. We would be honored to be a part of you or your family's healing journey.

To get more information and/or schedule a consult, visit our website
www.familyfunctionalmedicine.com or call (207) 219-8445.

Your Health Detectives from Precision Health Family Functional Medicine
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