LYME DISEASE
Considerations in Diagnosis and Management

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OVERVIEW

1. Lyme Disease. Who gets it?
   - Tick-borne infection
   - Corollary diseases, interactions and multi-systemic syndromes

2. Diagnosis of Lyme disease and Co-infections
   - Clinical features
   - Laboratory support and diagnostic directions
   - When diagnosis is unclear

3. Treatment of Lyme Disease and co-infections:
   Accepted theories of disease guides treatment
   - Antibiotics
   - Alternative therapies
   - Adjunctive therapies
Lyme Disease

- HHV-6, West Nile, HIV, Chlamydia pneumonia, Klebsiella, Mycoplasmas, yeast, flu, parasites, Morgellons…

- What about Lyme disease? A spirochetosis that trumps most infections in aggression against the body and mind.
  - Maybe it’s protective for Ebola or something yet to come?

- Elderly typically do better. Kids can be cured. Adults get everything in between if they work hard enough to get well.
  - Some people kill themselves.
  - Some people want to but are too tired to find their sticky notes written how they were going to pull it off.
The discipline of Lyme disease including investigations into the extent of this disease and its optimal treatment is still in its infancy. There have been scarcely two fractional generations of clinicians who are confronting the full nature of this affliction.
Lyme, who gets it?

- People who have been bitten by infectious ticks.
- Those with multiple tick bites and co-infection exposure.
- Children born by infected mothers.
- Children breast-fed by infected and/or untreated mothers.
- Other theories: blood and fluid-borne transmission.
- Those people who have experienced trauma, emotional or physical collapse, and adrenal exhaustion.
- Those people who become imbalanced, i.e. with a root canal or other surgery, postpartum, or with steroid inducements.
- Patients who have been told they couldn’t possibly have Lyme.
Case # 1

- 38 year-old female
- Diagnosed with RA and MS

History:
- 1986: Tick embedded in back; red rash with central clearing; soon after, developed leg numbness
- Flu-like symptoms, joint pain/swelling, fatigue, leg paresthesia, headaches, trouble multi-tasking, poor memory
- Was given courses of high-dose prednisone x several years

Labs:
- 2004:
  - IgM: IND 30,31,34; positive 39, 41
  - IgG: IND 30, 34,39,93; positive 31,41
- Co-infections: Babesia WA-1
- Probable Bartonella (seronegative)
Case # 1

- **Treatment:**
  - Doxycycline, amoxicillin, Biaxin, Augmentin, Ketek, Levaquin, Avelox, Zithromax, Ciprofloxacin, Minocycline, Septra DS, Lariam, Mepron, Malarone, Flagyl
  - IV Rocephin (Dec. 27, 2005)
    - Severe flare-up of joint pain and neuralgia one week into treatment
    - Feb. 10, 2006: Remarkable improvement. Joint pain improved, couple days of numbness-free, better energy, cognitively clearer.
    - Reassessed q 2 months: Continual improvements.
    - Oct. 27, 2006: Sxs still improving, patient has not plateaued, Rocephin was increased to 2 grams bid 4 days a week.
    - Feb. 13, 2007: Rocephin stopped. Within a week of stopping Rocephin, nervous system issues worsened, developed left foot drag and numbness, poor balance and gait, wrist swelling, shoulder pain. Upon restarting Rocephin x 1 week, symptomatology immediately improved.

- **Last office visit: May 30, 2008**
  - Off antibiotics. Tapering with Cowden protocol. Doing well.
Case # 2

- 59 year-old male
- Diagnosed with dementia

History:
- Severe car accident injuring hippocampus and right temporal lobe; Pt recovered with some short-term memory loss.
- Became a successful stock broker and securities trader.
- 2002: significant memory problems, personality changes, headaches.
- Fired from work due to severe memory loss and overt symptoms of dementia.
- Several neurologists felt symptoms due to remote effects of previous trauma.
- Wife was being treated for Lyme disease. Provider recommended pt get a Western blot.

Labs:
- March 2006:
  - IgM: IND 31, 34, 39, 41; positive 23, 30, 83-93
  - IgG: IND 39; positive 41
- Apr. 30, 2007
  - SPECT: Abnormal CNS perfusion SPECT exam, with a relatively diffuse pattern of cortical hypoperfusion, consistent with encephalitis of any etiology, including moderate-to-advanced neuroborreliosis.
Case # 2

- **Treatment:**
  - **Initial treatment**
    - Placed on Augmentin and Tindamax with some improvement.
    - Started IV Rocephin with remarkable improvement, getting much of his memory back, personality normalized.
    - Developed trouble with PICC line, started oral abx and sxs worsened.
  - **Following SPECT scan**
    - Re-started IV Rocephin 2 grams bid, 4 days a week.
    - Remarkable improvement in memory and cognition.
Case # 3

- 48 year-old female

**History:**
- 2005: Bite on ankle with round, expanding rash; tick was not seen.
- Several weeks later, developed profound fatigue, hand twitches and pain, tingling and burning sensation on soles, brain fog, cognitive slowing, memory loss; after 4 mos unable to walk due to calf and foot pain.

**Labs:**
- Feb 2006
  - IgM: IND 23-25, positive 31, 39, 41, 83-93
  - IgG: positive 41
Case # 3

- Treatment:
  - Zithromax, Mepron, Rifampin
  - IV Rocephin

- 3 months into IV Rocephin, pt was able to travel to Washington DC and ride a bike for several days without any problems.
- Improved cognition, balance, and stamina. Some fatigue, memory loss better, no headaches.
- IV line pulled.
Case #4

- 4 year-old male
- Diagnosed with Pervasive Developmental Disorder / Autism

History:
- Born to Lyme-infected mother, unknown at the time…breast-fed x 1 month.
- Developmental milestone delays, tics, fears, poor eye contact. Minimal speech.
- No vaccinations, not colicky, slept a lot, multiple strep throats.
- Tonsillectomy and adenoidectomy.
- No interaction with other children during pre-school; played by himself.

Labs:
- Sept 2007:
  - IgM: positive 23-25, 39, 41; IND 31
  - IgG: positive 41; IND 31
Case #4

- **Treatment:**
  - **Prior to 1st visit:**
    - Amoxicillin 250mg/5mL – 1 tsp qd x 14 days.
      - Behavior and sweating worsened; Light sensitivity improved.
    - Azithromycin 100mg/5mL – 1 tsp qd x 14 days.
      - Speech improvement: more communication, full sentences rather than single words.
  - **Subsequent treatments**
    - Azithromycin 100mg/5mL – 1 tsp qd.
    - Fluconazole 25 mg qd.
    - Alinia 100mg/5mL – 1 tsp bid.
    - Cedax 200-400mg qd.
Case #4

- Last visit: June 5, 2008
  - Remarkable improvement in symptoms.
  - Better eye contact.
  - Better energy; no longer sleeping all day long, although still fatigued.
  - No longer crying in pain from activity.
  - Still has significant photophobia, although improved.
  - More engaged in preschool.
  - Improved by 3.5 years in developmental milestones over previous 6 months.
  - Very talkative and using full sentences.
  - Hugs people and tells them he loves them.
  - Happy and playful.
  - Fears have diminished.
Interactions

headaches, night sweats, neuronal death, cardiomyopathy, breathlessness
Interactions

- BARTONELLA
- BABESIA
- BACTERIOPHAGES
- LEAKY GUT
- MOLD
- YEAST
- BIOTOXINS
- VIRUSES
- DYSBIOSIS / SIBO
- DEPRESSION / ANXIETY
- GENETIC MUTATIONS
- ELECTROMAGNETIC STRESS
- PRIONS
- WORMS
- ANAPLASMA / EHRLICHIA
- PARASITES
- MYCOPLASMA
- MORDELLIONS
- HEAVY METALS
- ALLERGY
- HORMONAL DYSREGULATION
- ADRENAL FATIGUE
- PESTICIDES / ENVIRONMENTAL POLLUTANTS
- GEOPATHIC STRESS

fever, myalgia, fatigue
Interactions

- BABESIA
- BARTONELLA
- ANAPLASMA / EHRLICHIJA
- BACTERIOPHAGES
- LEAKY GUT
- MOLD
- YEAST
- BIOTOXINS
- VIRUSES
- DYSBIOSIS / SIBO
- DEPRESSION / ANXIETY
- GENETIC MUTATIONS
- ELECTROMAGNETIC STRESS
- PRIONS
- WORMS
- MYCOPLASMA
- MORGELLONS
- HEAVY METALS
- ALLERGY
- HORMONAL DYSREGULATION
- ADRENAL FATIGUE
- PESTICIDES / ENVIRONMENTAL POLLUTANTS
- GEOPATHIC STRESS

constipation, depression, headache, myalgia, brain fog, fatigue, pain
Interactions

- Lyme
- Babesia
- Bartonella
- Anaplasma / Ehrlichia
- Parasites
- Mycoplasma
- Morgellons
- Heavy Metals
- Allergy
- Hormonal Dysregulation
- Adrenal Fatigue
- Pesticides / Environmental Pollutants
- Electromagnetic Stress
- Geopathic Stress
- PRIONS
- Worms
- Leaky Gut
- Molds
- Yeast
- Biotoxins
- Viruses
- DYSBIOSIS / SIBO
- Depression / Anxiety
- Genetic Mutations
- Bacteriophages
- Psych disturbances, arthritis
Interactions

- BABESIA
- BARTONELLA
- ANAPLASMA / EHRlichia
- PARASITES
- BACTERIOPHAGES
- LEAKY GUT
- MOLD
- YEAST
- BIOTOXINS
- VIRUSES
- DYSBIOSIS / SIBO
- DEPRESSION / ANXIETY
- GENETIC MUTATIONS
- ELECTROMAGNETIC STRESS
- PRIONS
- WORMS
- GEOPATHIC STRESS
- MYCOPLASMA
- MORGELLONS
- HEAVY METALS
- ALLERGY
- HORMONAL DYSREGULATION
- ADRENAL FATIGUE
- PESTICIDES / ENVIRONMENTAL POLLUTANTS

neuropathy, autism, fatigue, prolonged response to abx

LYME
Interactions

- Lyme
- Babesia
- Bartonella
- Anaplasma / Ehrlichia
- Bacteriophages
- Parasites
- Mycoplasma
- Morgellons
- Heavy metals
- Allergy
- Hormonal dysregulation
- Adrenal fatigue
- Pesticides / environmental pollutants
- Geopathic stress
- Worms
- Prions
- Yeast
- Mold
- Biotoxins
- Viruses
- Dysbiosis / SIBO
- Depression / anxiety
- Genetic mutations
- Leaky gut
- Fatigue, dizziness, bad die-off sx's
Interactions

- Lyme
- Babesia
- Bartonella
- Anaplasma / Ehrlichia
- Bacteriophages
- Parasites
- Mycoplasma
- Morgellons
- Heavy metals
- Allergy
- Hormonal dysregulation
- Adrenal fatigue
- Pesticides / environmental pollutants
- Geopathic stress
- Worms
- Prions
- Yeast
- Mold
- Viruses
- Biotoxins
- Dysbiosis / SIBO
- Depression / anxiety
- Genetic mutations
- Leaky gut
- Electromagnetic stress

fatigue, chemical sensitivities
Interactions

- Lyme
- Babesia
- Bartonella
- Anaplasma / Ehrlichia
- Bacteriophages
- Parasites
- Mycoplasma
- Morgellons
- Heavy metals
- Allergy
- Hormonal dysregulation
- Adrenal fatigue
- Pesticides / environmental pollutants
- Geopathic stress
- Worms
- Prions
- Yeast
- Mold
- Biotoxins
- Viruses
- Dysbiosis / SIBO
- Depression / anxiety
- Genetic mutations
- Leaky gut
- Electromagnetic stress

Nervous system dysfunction, poor sleep
headache, breathing difficulties, abdominal pain, irritability
Interactions

- Babesia
- Bartonella
- Anaplasma / Ehrlichia
- Parasites
- Mycoplasma
- Morgellons
- Heavy metals
- Allergy
- Hormonal dysregulation
- Adrenal fatigue
- Pesticides / environmental pollutants
- Geopathic stress
- Worms
- Prions
- Leaky gut
- Molds
- Yeast
- Biotoxins
- Viruses
- Dysbiosis / SIBO
- Depression / anxiety
- Genetic mutations
- Electromagnetic stress
- Lyme
- Death
Interactions

BABESIA  BARTONELLA  ANAPLASMA / EHRLICHIA

BACTERIOPHAGES  PARASITES  MYCOPLASMA

LEAKY GUT  MORGELLONS  HEAVY METALS

MOLD  ALLERGY  HORMONAL DYSREGULATION

YEAST  HEAVY METALS

BIOTOXINS  PESTICIDES / ENVIRONMENTAL POLLUTANTS

VIRUSES  ADRENAL FATIGUE

DYSBIOSIS / SIBO

DEPRESSION / ANXIETY  PRIONS

GENETIC MUTATIONS  WORMS

ELECTROMAGNETIC STRESS  GEOPATHIC STRESS

bad response to treatment, fatigue, weakness
Interactions

- BABESIA
- BARTONELLA
- ANAPLASMA / EHRlichia
- BACTERIOPHAGES
- PARASITES
- MYCOPLASMA
- MORGELLONS
- HEAVY METALS
- ALLERGY
- HORMONAL DYSREGULATION
- ADRENAL FATIGUE
- PESTICIDES / ENVIRONMENTAL POLLUTANTS
- GEOPATHIC STRESS
- INABILITY TO DETOXIFY
- YEAST
- BIOTOXINS
- VIRUSES
- DYSBIOSIS / SIBO
- DEPRESSION / ANXIETY
- GENETIC MUTATIONS
- ELECTROMAGNETIC STRESS
- PRIONS
- WORMS
Interactions

- Lyme
- Babesia
- Bartonella
- Anaplasma / Ehrlichia
- Parasites
- Mycoplasma
- Morgellons
- Heavy metals
- Allergy
- Hormonal dysregulation
- Adrenal fatigue
- Pesticides / environmental pollutants
- Geopathic stress
- Worms
- Prions
- Yeast
- Mold
- Biotoxins
- Viruses
- Dysbiosis / SIBO
- Depression / Anxiety
- Genetic mutations
- Electromagnetic stress
- Leaky gut
- Suicide risk
headaches, dizziness, heightened sx's, fatigue, neuropathy, pain
Interactions

BABESIA  BARTONELLA  ANAPLASMA / EHRLICHIA

BACTERIOPHAGES  PARASITES

LEAKY GUT  MYCOPLASMA

MOLDS  MORGELLONS

YEAST  HEAVY METALS

BIOTOXINS  ALLERGY

VIRUSES  HORMONAL DYSREGULATION

DYSBIOSIS / SIBO  ADRENAL FATIGUE

DEPRESSION / ANXIETY  PESTICIDES / ENVIRONMENTAL POLLUTANTS

GENETIC MUTATIONS  GEOPATHIC STRESS

ELECTROMAGNETIC STRESS  PRIONS

WORMS  WORSENING OF EVERYTHING
Interactions

- BABESIA
- BARTONELLA
- ANAPLASMA / EHRLICHIA
- BACTERIOPHAGES
- LEAKY GUT
- MOLD
- YEAST
- BIOTOXINS
- VIRUSES
- DYSBIOSIS / SIBO
- DEPRESSION / ANXIETY
- GENETIC MUTATIONS
- ELECTROMAGNETIC STRESS
- PRIONS
- WORMS
- PARASITES
- MYCOPLASMA
- MORGELLONS
- HEAVY METALS
- ALLERGY
- HORMONAL DYSREGULATION
- ADRENAL FATIGUE
- PESTICIDES / ENVIRONMENTAL POLLUTANTS
- GEOPATHIC STRESS

Varies from insignificant to inability to treat

LYME
Interactions

- BABESIA
- BARTONELLA
- ANAPLASMA / EHRLICHIA
- BACTERIOPHAGES
- PARASITES
- MYCOPLASMA
- MORGELLONS
- HEAVY METALS
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- GEOPATHIC STRESS
- WORMS
- PRIONS
- YEAST
- MOLD
- BIOTOXINS
- VIRUSES
- DYSBIOSIS / SIBO
- DEPRESSION / ANXIETY
- GENETIC MUTATIONS
- ELECTROMAGNETIC STRESS
- LEAKY GUT

bad die-off sx, all sx worse
Interactions

LyME

- Babesia
- Bartonella
- Anaplasma / Ehrlichia
- Parasites
- Mycoplasma
- Morgellons
- Heavy Metals
- Allergy
- Hormonal Dysregulation
- Adrenal Fatigue
- Pesticides / Environmental Pollutants

- Bacteriophages
- Leaky Gut
- Mold
- Yeast
- Biotoxins
- Viruses
- Dysbiosis / SIBO
- Depression / Anxiety
- Genetic Mutations
- Electromagnetic Stress
- Prions
- Worms
- Geopathic Stress

Unknown
What can the clinical state of the infection mimic?

- Lupus
- Rheumatoid arthritis
- Polymyalgia rheumatica
- Polymyositis/dermatomyositis
- CFIDS
- Fibromyalgia
- Multiple Chemical Sensitivity
- Bipolar d/o
- ADHD
- Autism
- Chronic EBV
- Schizoaffective d/o
- Multiple sclerosis
- CIDP
- Amyotrophic lateral sclerosis
- Alzheimer's disease
- Parkinson's Disease
- Thyroid disease
- Addison's disease
- Hyperparathyroidism
- Reflex sympathetic dystrophy
- Menopause
Lyme Mimics MS

Does it actually cause this disease?

Often it’s a question of semantics

Pathology of MS Revisited
- Axonal Loss
- Demyelination
- Conduction Loss
- Reactive Gliosis

Pathology of Neuroborreliosis
- Axonal Loss
- Demyelination
- Conduction Loss
- Reactive Gliosis?

This is hard for many patients and practitioners to understand and accept. They think in terms of either/or. In the above example one can call the disease MS, Lyme, Lyme and MS, Lyme-induced MS.
MS vs. Lyme

Diagnosis of MS - Posen Criteria

- 2 clinical attacks
- Originating from separate white matter lesions.
- Lasting 24 hours with 3 months separation between 1st and 2nd episode.
- After all other causes ruled out.

Diagnosis of Lyme

- Clinical evidence of Bb with or without laboratory confirmation.
- Bb may cause any number of white matter lesions with attributable symptoms lasting variable amounts of time.
- Episodic attacks may occur or may be a progression of symptoms.
Diagnosis of MS - McDonald Criteria

- 1 episode of attack sufficient if a positive CSF or MRI confirmation.
- CSF confirmation includes oligoclonal bands different from any such bands in serum and an elevated IgG index.
- MRI confirmation defined as 4 hyperintense white matter lesions >3 mm; 3 lesions sufficient if 1 is periventricular.

Diagnosis of Lyme

- Presence of elevated IgG synthesis rate common.
- Often find oligoclonal bands and myelin basic protein in CSF.
- MRI may show any number of lesions of variable size, often periventricular in location.
- Specific Bb antibody, DNA or viable organism rare in CSF.
## Lupus vs. Lyme

### Criteria for Lupus

- **Arthritis** - Nonerosive arthritis involving two or more joints, characterized by tenderness, swelling, or effusion.

- **Renal disorder** - Proteinuria greater than 0.5g/d or greater than 3+, or cellular casts.

- **Neurologic disorder** - seizures without other cause or psychosis without other cause.

- **Hematologic disorder** - Hemolytic anemia or leukopenia, or lymphopenia, or thrombocytopenia in absence of offending drugs.

- **Immunologic disorder** - Positive LE cell preparation or ds-DNA or anti-Sm antibodies or false-positive VDRL.

### Lyme Findings

- **Arthritis** - Nonerosive arthritis involving any number of joints, characterized by tenderness, swelling, or effusion.

- **Renal disorder** - Proteinuria may occur.

- **Neurologic disorder** - seizures without other cause or psychosis without other cause.

- **Hematologic disorder** - Hemolytic anemia or leukopenia, or thrombocytopenia in absence of offending drugs.

- **Immunologic disorder** - ? Positive LE cell preparation or ds-DNA or anti-Sm antibodies or false-positive VDRL.
### Lupus vs. Lyme

<table>
<thead>
<tr>
<th>Criteria for Lupus</th>
<th>Lyme Findings</th>
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<tbody>
<tr>
<td>• Malar rash</td>
<td>• Malar rash</td>
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<tr>
<td>• Discoid rash</td>
<td>• Discoid rash</td>
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<tr>
<td>• Photosensitivity</td>
<td>• Photosensitivity</td>
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<tr>
<td>• Oral ulcers</td>
<td>• Oral ulcers</td>
</tr>
<tr>
<td>• Serositis</td>
<td>• Serositis</td>
</tr>
<tr>
<td>• Antinuclear antibodies</td>
<td>• Antinuclear antibodies</td>
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</tbody>
</table>

According to the American College of Rheumatology 1983, any 4 of the above criteria are sufficient to diagnose SLE. Any number of these findings are seen in Lyme.

Recently it was found that phages can shuttle Borrelia DNA into human cells and insert into human DNA. Presumably our host will make Ab against Bb DNA which is now part of our DNA - that's Lupus!
If Lyme can mimic so many diseases how can it be diagnosed?

- Use what we know about the organism and apply that knowledge to the clinical presentation.

- Ask questions that highlight possible characteristics of the organism.
  - Do you get worse at high altitudes?
    - *Bb thrives in low oxygen environments.*
  - Do you thrive in heat? Do your symptoms flare up in the heat?
    - *Bb is heat sensitive.*
If Lyme can mimic so many diseases, how can it be diagnosed?

- Patients generally flare every 28-32 days. Have patients keep a journal of their symptoms. Find patterns.
- Patients usually wake up at 3:30 in the morning and briefly flare.
- ETOH intolerance is likely. 1-2 drinks causes a dysphoria and malaise.
- Physical or emotional stress sparks a relapse or a flare up of symptoms.
If Lyme can mimic so many diseases, how can it be diagnosed?

A Lyme patient will usually experience 6-40+ symptoms at a time.

*Some wax and wane.*

- Joint pain
- Joint stiffness
- Joint swelling
- Lightheadedness
- Fevers / Chills
- GI upset
- Pelvic pain
- Blurry vision

- Myoclonus
- Fasciculations
- Severe depression (depressive episode)
- Body electric
- Word-finding problems
- Dysuria
If Lyme can mimic so many diseases, how can it be diagnosed?

Some symptoms tend to remain constant.

- Fatigue
- Sleep disturbance
- Headache
- Tinnitus
- Muscle pain
- Worsening symptoms 4 days before menses
- Neck pain (buffalo hump pain)

- Joint crepitus
- Low frustration tolerance
- Poor executive functioning
- Low libido
- Hypoesthesia (regions of numbness)
- Hyperacusis
If Lyme can mimic so many diseases, how can it be diagnosed?

Some symptoms are variable.

Many patients will constantly experience these symptoms. Other patients will sporadically experience them.

- Dysthymia
- Neuropathic pain
- Restless leg
- Tremor
- Anxiety
- Encephalopathy
- Subdermal fibrous cysts
- Osteophytes
- Blood pressure instability
- Autonomic dysreflexia
- Muscle weakness
- Abdominal pain
If Lyme can mimic so many diseases, how can it be diagnosed?

1. **Obtain a complete review of systems.**

There are many symptoms and historical markers common with Lyme patients. Look for them.

- Endurance tolerance problems.
- Low frustration tolerance.
- Feeling overwhelmed with paperwork.
- Photophobia.
- False onset flu-like symptoms in the late afternoon.
- Heightened fatigue during at least two periods of the day.
- Multitasking problems.
- Has seen more than eight doctors for “depression, old age, fibrositis or malingering”.
- Is on klonopin or other muscle relaxants.
- Has pain unresponsive to narcotics.
- Has been told by a previous doctor that they “definitely do not have Lyme”.

If Lyme can mimic so many diseases, how can it be diagnosed?

2. Establish likely exposure
   - Leisure activities
   - Residence vacations
   - Pets (are they sick?)
   - Occupation

3. Ascertain prior experience with antibiotics
   - Improvement
   - Worsening symptoms
   - No change

4. Focus on life events surrounding transition from wellness to illness
   - Surgeries
   - Accidents
   - Hiking trips
   - Steroids
   - Root canals
Know Thy Co-infections

Babesia

- Headaches
- Night sweats
- Fevers
- Dry cough
- Air hunger
- Easy bruising
- Tinnitus
- Rage
- Despair
- Chills
- Flushing

- Vivid or violent dreams
- Dysphagia
- Psychic phenomena
- Severe neurological illnesses
- Thirst/Polydipsia
- Fatigue
- Rheumatoid arthritis
- Nausea (severe)
- Malaise
- Anemia, thrombocytosis, thrombocytopenia

Lyme patients with features of MS, ALS, PD, severe chronic depression have Babesia until proven otherwise (current test are not sufficient as proof of absence).
Know Thy Co-infections

Bartonella

- Brain Fog
- Fever
- Headaches (ice pick)
- Photophobia
- Tachycardia
- Bowel problems IBS>>>IBD
- Swollen glands
- OCD behavior
- Anxiety
- Endocarditis
- Retinitis
- Peripheral neuropathy

- Rapid relapse off of antibiotics
- Immediate illness following tick bite
- Subcutaneous nodules
- Swollen joints
- Swollen lymph nodes
- Psychiatric problems
- No response to previous ABX
- Plantar pain, costal margin pain
- Rapid mood shifts
- Development of these symptoms during Babesia treatment
Know Thy Co-infections

Ehrlichia

- Fatigue
- Myalgias
- Tendon pain
- HA (mild)
- Fevers
- Right upper quadrant pain
- Elevated LFTs with hepatitis R/O
Mycoplasma fermentans

- Fatigue
- Fever
- Insomnia
- Headache
- Bowel problems
- Psychiatric problems
- Joint swelling
- Joint pain
- No response to previous antibiotics
What To Look For During An Exam

 Lyme

- Diffuse myofascial tenderness
- Increased fluid pressure on ballottement of fundi
- Adies pupil
- Oscillating pupils
- Hyperreflexia
- Vertical ridging in nails
- Clammy hands and feet

- Hypothermia 96.0-97.9
- Joint fluctuance – fingers, elbows, knees
- Joint crepitus
- Arrhythmia
- Nerve palsy CN 3,4,6,7,8
- Paraspinal spasms – especially C7
What To Look For During An Exam

Lyme

- Skin mottling
- Hypermelanosis
- Psoriasis
- Dermographia
- Horizontal nystagmus
- Thrush (co-habitation by yeast is common)
- Oiling of skin
- Abdominal distension
- Non-pitting edema
- Brown exudate on teeth

- Plantar tenderness
- SI joint
- Myofascial bundles
- Hoffman reflex
- Cold acral extremities
- Black flecks within skin ulcers (Morgellons)
- Subdermal fibromas
- Vagus nerve instability: vasovagal, hypomotility
What To Look For During An Exam

Co-infections

Bartonella:
- Purple non-blanching abdominal striae
- Tiny papulovesicular rash
- General Lymphadenopathy (axillary, cervical)
- Fever (99-102)
- Photophobia
- Fasciculations
- Hyperesthesia (usually extremities)
- Abdominal tenderness
- Subcutaneous nodules
- Anxiety

Mycoplasma fermentans:
- Swollen joints
- Fever
- Tenderness
What To Look For During An Exam

Co-infections

Babesia:
- Temp above 99 degrees
- Cherry angiomas
- Babinski reflex
- Hypothenal atropy
- Papulovesicular rash
- Ecchymosis
- Petechiae

Ehrlichia:
- Slumped Posture
- Extreme soft tissue tenderness
- Hepatomegaly
- Diaphoresis
- MM Spasms
Laboratory support in diagnosis

- Lyme borreliosis appears identical to some conditions. The typical symptom patterns do not fit except for some pronounced symptoms.

- Some examples include:
  - Multiple sclerosis
  - ALS
  - Parkinson's disease
  - Rheumatoid arthritis
  - Dementia
  - Chronic fatigue without pain
  - Bipolar disorder
  - Recurrent acute aseptic meningitis
  - Charcot Marie-Tooth
  - Guillain Barre
  - Scleroderma
In these situations lab support is crucial. One may find higher than 30% of these patients test positive for Lyme by antibodies, usually IgM Western blot, bands 31 kDa, 34 kDa, 23-25 kDa, 39 kDa, 58 kDa, 83-93 kDa in some combination **AND** Bb PCR in either serum, whole blood, urine or tissue. CSF positivity is rare.

- Tissue biopsies for PCR are typically more sensitive in most Lyme patients- cartilage, bladder, gallbladder and cystic duct, small intestine and colon, endometriosis lesions, jaw, fascia and tendons as well as birth organs.

- Bartonella can also be analyzed by DNA probes for tissue presence. Placenta, foreskin, cord segments, colon, heart will often test positive.
Lyme Disease Testing

- Indirect Tests
  - Detection of patient’s immune response to *Borrelia burgdorferi*, the causative agent in Lyme disease.
  - Types:
    - Serology (Standard ELISA, C6 peptide)
    - Western Blot
    - Immunofluorescence

- Direct Tests
  - Detection of *Borrelia burgdorferi*-specific proteins (antigens), DNA and RNA, in patient clinical specimen (blood, serum, urine, CSF, etc).
  - Types:
    - Lyme Urine Antigen
    - PCR
Active Lyme Disease

Antigen

Detection Limit

Start of Infection

2 Weeks

3 Months

Months to Years

PCR

IgM

Ab/Ag Complex

Ab/Ag Complex
Laboratory support in diagnosis
Why Does IgM Persist?

- Epitope switching.
- Intracellular organism often avoids immune detection.
- Monthly burst out of lymphocytes probably reactivates antibody response.

IgM Antibodies have no ‘memory’. As they are large molecules, they are broken down readily in the liver. IgM antibody represents either new infection or persistent infection.
The Western Blot

- The Western blot is an entry point to confirmation of diagnosis.

- The IgM Western blot will indicate immune system recognition of and response to the organism within 3-4 months of exposure. In other words, the organism was likely in the bloodstream at some point over the last 3-4 months.

- In contrast to common belief expressed in popular medical literature, false positives are quite rare (except for possibly 31 kDa).

- If two or more bands are present, officially 23-25 kDa, (31 kDa), (34 kDa), 39 kDa, 41 kDa, then according to Dr. Burrascano’s inclusion criteria there is a likely presence of Lyme disease.

- Unofficially, according to Dr. Charles Ray Jones, if 18 kDa, 23-25 kDa, 30 kDa, 31 kDa, 34 kDa, 37 kDa, 39 kDa, 83 kDa, 93 kDa in any combination or in isolation, the Lyme spirochete is likely present in the individual.
Laboratory support in diagnosis

- **Outer surface protein A (Osp A) – 31 kDa**
  - A positive band 31 kDa on IgG and/or IgM Western Blot may be a false positive.
  - There is cross-reactivity between *Borrelia* and several viruses.
  - To confirm that a positive band 31kDa is due to *Borrelia*, order the following test from IGeneX, Inc.
    - # 488 – 31 kDa epitope IgM
    - # 489 – 31 kDa epitope IgG
  - I recommend ordering this test only if band 31 kDa is positive in isolation, i.e., no other species-specific bands are positive.
CONTROVERSY
Antibodies of Importance

- 31 kDa (Osp A)
- 34 kDa (Osp B)
Comparison of the Frequency of Antibody Reactivity to Various *B. burgdorferi* Protein Bands Between Lyme Patients, Syphilis and Normal Controls

**B. burgdorferi** Proteins (kDa)

M a et al. 1992. JCM 30:376
Shah et. al

- Shah, JS, DuCruz I, Wronska D, Harris S, Harris NS. Comparison of Specificity and Sensitivity of IGeneX Lyme Western Blots Using IGeneX Criteria and CDC Criteria for a Positive Western Blot., Townsend letter, April 2007

- Conclusion
  - IgG 18, 41, and 58 kDa
    - Statistically associated with tick-borne diseases
  - IgG 28, 30, 45, 66 kDa
    - Not specific markers for Lyme and other tick-borne diseases
  - IgG and IgM 23-25, 31, 34, 39, 83-93
    - Highly specific markers for Lyme disease

- Criteria for positive IgM and IgG WB should include bands 23-25, 31, 34, 39, 41, and 83-93
Laboratory support in diagnosis

Many patients will not develop a positive IgG response until the end of disease. If a positive IgG is present it will generally indicate one of several things:

- The patient does not have Lyme disease.
  - Many asymptomatic, healthy partners or siblings of Lyme patients may test positive if their immune system is exposed an/or are warding off a Borrelia infection.
  - One has had the Lyme vaccine.
  - Lab workers, veterinarians, dentists, and hunters.

- One has a healthy immune system and is fighting Bb well.
  - It is a positive predictor of length of time likely required for treatment.
One has multiple exposures to several infected ticks and is very sick.
- These people often come from the East Coast or Europe
- The elderly often mount a brisk IgG response.

Nevertheless, consider the likelihood of Lyme and treat if a clinical diagnosis is made. Don’t treat a test result. Treat a patient
CONFIRMED CASE
A Case with EM, or
A Case of Late Manifestation that is Laboratory Confirmed

Laboratory Confirmation
Isolation of *Borrelia burgdorferi* from a clinical sample or demonstration of IgM or IgG antibodies to *B. burgdorferi* in serum or CSF.
A two-test approach using a sensitive ELISA or IFA, followed by Western Blots.

NOTE: The above is a SURVEILLANCE case definition, developed for national reporting of Lyme Disease by CDC. IT IS NOT INTENDED FOR USE IN CLINICAL DIAGNOSIS.
Direct Detection

- Biopsy
- Culture
- Antigen Capture
- Polymerase Chain Reaction (PCR)
Culture


- Spirochetes more frequently isolated from the bladder (94%) followed by kidney (75%), spleen (61%), blood (13%) and urine (0%).
POLYMERASE CHAIN REACTION (PCR)
Multiplex PCR
Lyme Dot-Blot Principle

1. Unoccupied sites on the membrane.
2. Primary antibody to a Lyme antigens is incubated with the membrane.
3. Antibody–enzyme conjugate is added to bind to the primary antibody.
4. Color development reagent is added to the blot.
5. The Enzyme converts the substrate (S) to a blue precipitate (P) at the site of the antigen-antibody complex.

Lyme antigens in urine bound to membrane
Lyme Dot-Blot Assay

1. Add Lyme Ab
2. Add 2nd Ab
3. Add Substrate

Transfer

Urine

Results

Blue Dot = Positive
Initial Lyme - Typical Lyme

- IgG and IgM Western Blots
  - IgM and/or IgG Western Blot Positive
    - STOP
  - IgM and/or IgG Western Blot Negative
    - Antibiotic Challenge
      - Lyme Dot Blot (LDA) & Pooled Urine PCR

- Whole Blood PCR
  - Positive
    - STOP
Initial Lyme - Atypical Lyme

- IgG and IgM Western Blots
  - IgM Western Blot Positive
    - STOP
  - IgM Western Blot Negative or only IgG Western Blot Positive
    - Antibiotic Challenge
    - Lyme Dot Blot (LDA) & Pooled Urine PCR

- Whole Blood PCR
  - Positive STOP
Persistent/Recurrent (Chronic) Lyme

IgG and IgM Western Blots

IgM or IgG Western Blot Positive with Ab to 31 or 34kDa
STOP

IgM or IgG Western Blot Negative

Antibiotic Challenge

Lyme Dot Blot (LDA) & Pooled Urine PCR

Whole Blood PCR

Positive
STOP
**Diagnosis:** Induction of a High Yield Lyme Urine DNA and Protein

- If unchallenged serum Western Blot (WB) is negative and high suspicion of Lyme exists → can enhance diagnostic yield of WB without resorting to multi-drug urine challenge and costs associated.

- Give a macrolide x 3 weeks OR doxycycline 100mg bid x 3 weeks.

- On week 4 (four weeks after starting abx, obtain repeat IgM WB. Pay particular attention to 31 kDa and 34 kDa.

- If negative, wait 6-8 weeks before urine induction for protein and DNA.

Some patients may remain seronegative for years.
Diagnosis: Induction of a High Yield Lyme Urine DNA and Protein

- If a patient suspected of Lyme disease has had negative WB and negative whole blood PCR can obtain a higher yield of DNA or protein in the urine by strategically using antibiotics diagnostically.

- Theory:
  - Bb has a life cycle (about 4 months in the helical form). When the bacteria dies, many of its proteins will be shed into the urine. However, given the very low absolute numbers of Bb in the body, randomly testing the urine for pieces of dead bacteria will provide low yield. If one can markedly enhance the amount of dead bacteria being shed, one can maximize likelihood of obtaining a more accurate result.

- Caution: diarrhea, C. difficile, candidiasis, nausea, vomiting, allergy, Stevens-Johnson syndrome, individual drug side effects.

Warn your patients of the risks of using antibiotics in this manner.
Diagnosis: Induction of a High Yield Lyme Urine DNA and Protein

- Many protocols are being used in the US currently by doctors who are members of the International Lyme and Associated Diseases Society (ILADS).

- **Protocol 1**
  - Day 1: Ceftriaxone 2 grams IV or IM plus Benzathine Penicillin 1.2 million units IM
  - Days 2-5: Clarithromycin 500mg bid or azithromycin 500-600mg qd or doxycycline 100mg tid or minocycline 100mg tid plus cefuroxime 500mg bid or amoxicillin 1000mg tid or cefdinir 300mg bid plus metronidazole 500mg bid or tinidazole 500mg tid
  - Collect first morning urine samples on days 2, 4, and 6

- **Protocol 2**
  - Days 1-3: ceftriaxone 2 grams IV or IM (May also add azithromycin 500mg qd)
  - Days 2-5: metronidazole 500mg bid or tinidazole 500mg tid
  - Collect first morning urine samples on days 2, 4, and 6
Diagnosis: Induction of a High Yield Lyme Urine DNA and Protein

- Protocol 3 (lower yield, but easier to tolerate)
  - Days 1-7: amoxicillin or cefuroxime or cefdinir plus doxycycline or minocycline or azithromycin or clarithromycin
  - Collect first morning urine samples on days 3, 6, and 8

- Children:
  - Days 1-5: age-weighted dosages for protocol 3 with or without Benzathine or ceftriaxone on day 1
  - Do NOT use doxycycline or minocycline in children < 8 years old
  - Collect first morning urine samples on days 2, 4, and 6

Please have patients use lactobacillus and bifidus +/- saccharomyces to protect GI tract.

If menstruating female, time urine collection with menses.
Testing for Co-infections

Babesia:
- Test FISH and *B. microti* serology.
- If on the West Coast, test FISH (includes *B. microti* and *B. duncani*), *B. microti* serology, *B. duncani* (WA-1) serology and WA-1 PCR.
- One may need to test Babesia PCR. Is is often the only positive test. The reason it is not first tier is patient expense.
- A very basic screen is to test *B. microti* serology. If on West Coast, one must add WA-1 serology.
- Bone marrow biopsies have shown Babesia in dogs and at least 4 humans.

Ehrlichia:
- HME/HGE (Anaplasma) serology will usually catch most cases.
- A PCR can be performed on whole blood and buffy coat if more hard data is needed. Ehrlichia is the easiest infection to find by tests.
Testing for Co-infections

Bartonella:
- IgM positivity is rare. Any positive IgG should be considered closely.
- PCR is hit or miss as *B. henselae* is probably not the only species involved.
- Fry Labs blood smear may show more positives. Mycoplasma and Bartonella often read as Hemobartonella.

Mycoplasma fermentans:
- Send PCR to MDL (Medical Diagnostics Lab), RedLabs, or other lab.
Testing for Co-infections

If the diagnosis of co-infections is unclear…

- If Babesia FISH or PCR is negative and serology is negative or equivocal:
  - Consider Artemisinin or Artemisia or other anti-parasitic herb and assess response.
  - If night sweats, shortness of breath, headaches or night-terrors increase, or if one develops more cherry angiomas with these herbs, consider clinical Babesia.
  - It is unclear of an antibody response will be induced right away.

- If Bartonella tests are negative.
  - Either test again or consider a short empiric course of Bactrim/Septra or a fluoroquinolone if clinical condition warrants it.

Use your clinical instinct, but do not casually treat. Do not totally trust negative Bartonella and Babesia results. Many of our patients will test negative more than once.
Laboratory support in diagnosis

Ancillary tests to consider

- Candida Abs
- Arabinatol levels
- EBV (VCA, EA, NA)
- HHV-6
- HHV-7
- Coxsackie
- Parvovirus
- CMV
- HIV
- Mycoplasma pneumoniae
- Vitamin D 25, vitamin D 1,25
- ESR / CRP
- Total CK

- Urine heavy metals
- Stool pathogens
- H. pylori
- Hepatitis panel
- CBC with diff, reticulocytes
- CMP
- CD-57 (HNK-1 panel)
- Thyroid comprehensive panel
- Lipid profile
- Insulin levels
- Glucose tolerance test
- IgG and IgE food antibodies
- HLA typing
Laboratory support in diagnosis

Ancillary tests to consider

- Salivary cortisol
- DHEA
- Sex hormones
- SHBG
- Ferritin
- CEA
- RPR
- Phase 1 and 2 hepatic function
- ABO Rh
- UA
- Urine neurotransmitter
- Organic acids

- Urine amino acids
- Essential elements
- Nutrigenomic testing for methylation cycle
- Fibrinogen / TAT / Soluble fibrin monomer
- Thyroid loading tests
- Mucosal Barrier function
- RNase L activity and protein quantification
- Elastase
- Vitamin deficiencies
- Pregnenolone
- Aldosterone
Laboratory support in diagnosis

Ancillary tests to consider

- HLA typing
- IL-6
- IL-2
- IL-1
- IL-10
- TNF-α
- Coccidioides
- Histoplasmosis
- Toxoplasma
- Plasma porphyrins
- Ammonia
- Leptin, MSH, VEGF

- ANA with titer, SS-A, SS-B, anti DS DNA, Sm/Rnp AB, complement studies, anti-gliadin, TTG, RF
- Total Immunoglobulin and subclasses
- IgF-1
- Arginine stimulation for HGH
Don’t read the textbook!

Treating Lyme disease:

*Rules of thumb*

1. Treat the patient not the lab result.

2. Know drug interactions.

3. Don’t prescribe antibiotics without knowing all of the patient’s medications, allergies, and medical history.

4. While this seems obvious, in the age of indirect contact with patients and decisions made on the fly, it is easy to make mistakes. These mistakes are preventable but devastating. Protect your patient, your reputation and your job security.
Treating Lyme disease

- The basics of treating Lyme can be found in “Diagnostic Hints and Treatment Guidelines for Lyme and Other Tick Borne Illnesses” by Joseph Burrascano Jr, MD.

- Generally you can start fast and furious or slow and steady. Some patients do well with a quick aggressive treatment. Many doctors have tremendous success in the more hearty patients. Other patients may unexpectedly become quite sick 2-4 days after starting or even at 21-28 days after treatment begins.

- This is usually due to a Jarisch-Herxheimer reaction, in which a torrent of cytokines and toxins spill into the body humors.

- Symptoms can range from worsening fatigue, joint pain or swelling and dysuria to shock, coma and death.

- You may have to “play catch-up” for months.
Treating Lyme disease

Some conditions that I recommend not be treated too aggressively at first:

- Severe neurological conditions
- Baseline abdominal distress
- Chemically sensitive individuals
- Children
- The elderly
- If one suspects but does not know co-infection status
- Women with pelvic pain or frequent headaches
- In severe early Lyme, aggressive therapy is generally well tolerated.

Aggressive therapy defined:

- IV medications
- High dose antibiotic combinations
- Flagyl or tinidazole and a high dose anti-spiral medicine.
Two very different standards of care

- New England Journal of Medicine article states “Chronic Lyme disease, which is equated with chronic B. burgdorferi infection, is a misnomer, and the use of prolonged, dangerous and expensive antibiotic treatments for it is not warranted” (Feder et al)

- IDSA 2006 guidelines for the diagnosis and treatment of Lyme disease
- AAN guidelines; independent corroboration?
- “Prolonged Lyme disease treatment” (Halperin, Journal Neurology)

VS

- A randomized, placebo-controlled trial of repeated IV antibiotic therapy for Lyme encephalopathy (Fallon et al, Journal Neurology)
- ILADS guidelines for the diagnosis and treatment of Lyme disease
- Lyme disease: a turning point (Stricker and Johnson, Future drugs)
- Treatment of Lyme disease: a medicolegal assessment (Johnson and Stricker, Future drugs)
Evidence-Based Guidelines for the Management of Lyme Disease

- Since there is currently no definitive test for Lyme disease, laboratory results should not be used to exclude an individual from treatment.

- Lyme disease is a clinical diagnosis and tests should be used to support rather than supersede the physician’s judgment.

- The early use of antibiotics can prevent persistent, recurrent and refractory Lyme disease.

- The duration of therapy should be guided by clinical response, rather than by an arbitrary (i.e., 30 day) treatment course.

- The practice of stopping antibiotics to allow for delayed recovery is not recommended for persistent Lyme disease. In these cases, it is reasonable to continue treatment for several months after clinical and laboratory abnormalities have begun to resolve and symptoms have disappeared.

*Expert Rev Anti Infect Ther 2004;2(1 Suppl):S1-13*
Evidence for the use of long-term treatment

- Bayer ME, Zhang L, Bayer MH. Borrelia burgdorferi DNA in the urine of treated patients with chronic Lyme disease symptoms. A PCR study of 97 cases. Infection 1996; 24 No.5.

- Cameron, DJ. Lyme Disease Clinical Trial - Effectiveness of Retreatment on Health-Related Quality of Life. Abstract, Lyme & Other TBDs: Emerging Tick Borne Diseases, Fri Oct 28th, 2005, Philadelphia, PA.


Evidence for the use of long-term treatment


Evidence for the use of long-term treatment


Evidence for the use of long-term treatment


Evidence for the use of long-term treatment


Evidence for the use of long-term treatment


Evidence for the use of long-term treatment

Treatment of Chronic Lyme

What should one start with?

- Doxycycline 100mg tid or minocycline 100mg bid is a good first choice. Use for 6 weeks before considering adding a second agent or starting parenteral therapy

- Alternatively, may start with cefdinir 300mg bid-tid or cefuroxime 500mg bid-tid or amoxicillin 875mg tid

- After 3-8 weeks, may increase dose or add a second agent

Become comfortable with a few antibiotics. Know their side effect profiles. Consider increasing the dose before adding a second agent.
Treatment of Chronic Lyme

What should one start with?

- The second agent should be of a different class and work by a different mechanism.

- Azithromycin 500 - 600mg qd or clarithromycin 500mg bid is often a good choice if first medicine is a beta-lactam antibiotic.

- While the tetracyclines and the macrolides are both ribosomal inhibitors and often not used in combination, in actual practice, this combination has proven quite effective for Lyme.

When choosing an antibiotic think about intracellular activity, central nervous system penetration, bactericidal vs bacteriostatic activity and likelihood of patient compliance. Know how much each medicine costs.
Treatment of Chronic Lyme

What should one start with?

- Recommend against using macrolides as monotherapy for more than 4 weeks due to possible resistance.

- Benzathine PCN 1.2 million units 2-3x/week is a good adjunctive treatment as it has good CNS penetration.

- Metronidazole/Tinidazole is useful as pulse therapy 2-3 months at a time. Do not use without a cell wall-active drug.

- Many ILADS doctors recommend treating two months past the resolution of active symptoms. This can take more than a year.
Treatment of Chronic Lyme

What should one start with?

- Most patients with severe chronic persistent neuroborreliosis will require parenteral therapy. Recommend oral meds for 3-4 months prior to starting IV or IM.

- Parenteral drug of choice is Ceftriaxone 2 grams qd-bid 4-7 days a week.

- Cefotaxime 2 grams tid or Ampicillin 2-4 grams tid-qid is also effective.

Ceftriaxone is not a miracle drug. Very ill patients may be on this for more than one year. It should be used with an intracellular oral drug for at least part of the treatment. Also one should use ursodiol with Ceftriaxone to protect gallbladder.
Treating Lyme disease

- Prescribe one or more intracellular acting drugs (doxy, mino, macrolides, ketolide, rifampin, quinolones, sulfa).

- A cell wall (B-lactam) antibiotic (PCN, cephalosporin, carbapenem, vancomycin).

- A cyst buster (metronidazole, tinidazole, nitrosoxamide, hydroxychloroquine).

- The problem is tolerance. One has to tread a fine line. A great regimen could be Ketek, doxycycline, Omnicef and metronidazole were it not so toxic and the poor interaction between doxycycline and metronidazole.

- A more realistic approach would be to change combinations regularly (q 6-12 weeks) to affect different properties of the organism.

I ramp up most patients slowly, maintaining them on two or more medications.
Advanced antibiotic strategies

- After a patient has had 6-8 months of ceftriaxone or similar drug, the options for care become more complex.

- If a patient has had an IV cell wall drug with or without an intracellular and a cyst buster, I would often add IV azithromycin (500mg over 2-3 hours) or doxycycline (400 mg bolus over 3 hours). In addition I might use Imipenem, meropenem, or ertapenem (Invanz) instead of the cephalosporin. After 3-6 weeks one could switch one of the drugs for IV Flagyl. Later one might consider Zosyn or Tygacil, pulsed for 3-4 weeks.

- If co-infections have already been treated with standard orals, can rotate IV levofloxacin, moxifloxacin, clindamycin or IV rifampin.

- Many herbal protocols can be used in addition.
Treating Lyme disease

Monitor the patient

- Protect patients from harm. Probiotics, liver support, lymph drainage, regular blood monitoring for antibiotic levels, hepatic and renal function and blood count will prevent most problems.

- Adverse effects can be limited to less than 5%, with almost no serious effects.

- Hedge risks and benefits whenever possible.
Treatment of Chronic Lyme

What if there are co-infections?

Babesia:

- Atovaquone 750-2250mg bid plus Azithromycin x 4 months. If still positive 2 months after finishing course, treat for 8-10 months.
- Alternatively may use Clindamycin 300-600 tid plus Quinine 325-650 bid-tid or Mefloquine 250 q 3 days-weekly. Do not use Mefloquine for more than 5 1/2 months.

Ehrlichia:

- Doxycycline 100mg qid or Minocycline 100 mg tid-qid.
- For refractory cases, add Rifampin 300 bid.
- Fluoroquinolones may also be used.
Treatment of Chronic Lyme

What if there are co-infections?

Bartonella

- Moxifloxacin 400mg qd-bid or Levofloxacin 500-750 mg qd x 4-12 weeks.
- May add Trimethoprim-Sulfamethoxazole DS bid.
- May use Rifampin 600 mg qd with doxycycline or azithromycin.
- Azithromycin and Doxycycline sometimes effective in combo.
- Linezolid and Tygacil show promise.

Many ILADS’ doctors treat co-infections first. Others treat with as much overlap as safely possible. Consider treating Lyme initially x 2-3 months, then breaking therapy to engage a co-infection. Babesia and Lyme is amenable to co-treatment.
Non-Antibiotic Methods of Treatment

- Rife machines
- KMT
- B cell depletion therapies
- Magnetic pulser
- NAET
- Ozone steam tent
- Ozone treatments
- Hydrogen peroxide
- Salt/vitamin C
- Apiatherapy
- Infrared saunas
- Hyperbaric oxygen
- Valkion
- Heat therapy (intracellular)
- Stem cell therapy (Mexico, India, China)

- Beck device
- Zappers
- Transfer factors
- Silver
- Jaw surgery
- Bioset machine
- Ondamed machine
- Amethyst blanket
- Reiki
- Qi gong
- Jinshinjiutsu
- Psychic surgery (brazil)
- Bikram yoga
- Meditation
- Tibetan herbals (Dhonden/Lopsang)
- Craniopathy, structural work
- Bacteriophage therapy
Non-Pharmaceutical Approaches to Lyme

- Zhang protocol
- Buhner protocol
- Cowden protocol
- Deseret biologics
- Classical homeopathy
- Lyme nosodes
- Teasel root
- Rizols
- Garlic (oral/IV)
- Sanum isopathic remedies
- Jernigan protocol
- Monastery of herbs combinations