

LYME DISEASE's EFFECT PREVENTION & CURE

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SCHOOL OF MEDICAL AND ALLIED SCIENCE
BONAFIDE CERTIFICATE

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Approval Sheet

This report entitled “LYME DISEASE’S EFFECT PREVENTION & CURE” by **ARSALAN HUSSAIN** is approved for the degree of **BACHELOR OF PHARMACY**.

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4. Specifications regarding thesis format have been closely followed.
5. The contents of the thesis have been organized based on the guidelines.
6. The report has been prepared without resorting to plagiarism.
7. All sources used have been cited appropriately.
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ABSTRACT

Lyme disease is a seriously complex multi-organ inflammatory and is a vector borne disease from the class of spirochetes *bacterium burgdorferi* usually spread from the forest prone areas but can travel all over the world via vector primarily the ticks (deer tick *Ixodes scapularis*) and secondary humans it needs blood for carrying out its life cycle and cause severe disease which can lead to various complications to deal with like rash, fever, arthritis, erythema, encephalitis and well as after treatment effect to and really dangerous to people aged >40. Women and kids who play outside are more suspected to get effected by it and more prone to it. Studies found out that like rhino virus every time you get bitted by or say infected by different B.burgdorferi your body doesn't get immune to it, in early stages it doesn't diagnosed for about a month before the symptoms could appear in the body making disturbances in the life style with various health issues. For its treatment antibiotics like doxycyclin and amoxicillin is given and in some cases cefuroxime for adults were given and dosage for children is mentioned inside the paper. Due to occurring symptoms and problems NSAIDS as well as Paracetamols were given to counter the elevated temperature and anti allergens in case of rashes and irritations. Herbal and ayurvedic treatment reliability is also present in case of lyme disease to treat the chronic type ayurvedic drugs. Therefore, the aim of this project is to summarize our current knowledge of the symptoms, clinical diagnosis and treatment of Lyme borreliosis.

Keywords: Lyme disease, NSAIDS, Amoxicillin

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1. INTRODUCTION

Lyme sickness, otherwise called Lyme borreliosis, is an irresistible infection communicated by ticks (deer ticks, *Ixodes scapularis*), which was first discovered in the early 1980s. WILLY BURGDORFER, a scientist, discovered a connection between the so-called deer tick and Lyme disease in 1981, earlier Willy was studying the rock mountain fever which is also caused due to bite of the “ticks”. By his complete he finds out the bacteria behind the cause of this disease which is spreading in the north American forests since last 60k years before human existence causing so much problems in the people and the reason was the spirochete bacterium.[1]

Individuals who work outside, particularly in different professions like scrutinizing, logging, farming, and usefulness aids, are at a higher danger of contracting Lyme sickness. Hiking, trekking, camping, hunting, and gardening are all things that raise the danger of contracting Lyme infection. Ticks that bear this illness dwell in muddy, lush, or wooded areas. Diseased ticks are less likely to be found around pruned, well-cared-for trees, but more likely to be found around unmaintained shrubby or brushy plants. As a result, living near or visiting wooded or brushy areas will put you at risk. Lyme disorder is most common in children under the age of 15 and adults aged 25 to 44. This is due to the fact that they engage in recreational activities that expose them to ticks. [2]

1.1 The Actual reason behind Lyme Disease

Caused by the spirally shaped or say the eubacterial phylum spirochetes *Borrelia burgdorferi* bacterium (actually gram negative) this bacteria actually lives as a parasite in the ticks body and usually do not harm the ticks rather say tick acts as vector for these spirochetes they cause certain disease like from *treponoma pallidum syphilis*(by sexual contact), from *treponoma pallidum* yaws(direct contact from the infected person),from *borrelia pediculus* relapsing fever(from infected animal to human) , lyme disease(tick bite).

1.1.1 Stages of Tick Life Cycle

Ticks are usually known as the deer ticks classified in *ixodes scapularis* (lyme disease) having life cycle of 2 year which passes on few stages those are :-

1st Stage (egg) – Females that have been fed blood or are bloated lay eggs on the ground in late spring, normally near where they disconnect from their hosts.

2nd Stage (larva) –Eggs laid in late spring hatch into six-legged larvae that prey on a variety of small mammals and birds during the summer of year one. The engorged or bloated larvae fall to the ground,

where they overwinter and molt. Tick-borne pathogens, such as the bacteria *Borrelia burgdorferi*, which causes Lyme disease, are not carried by larvae after hatching, but they may pick up pathogens during their first blood feed from a diseased host and ultimately pass them to nymphs or adults during their second and third feedings as nymphs or adults. Larval stage *I. scapularis* are seldomly infected with *Borrelia burgdorferi* or other tick-borne pathogens. Larvae emerge as eight-legged nymphs the next year in the spring.

3rd Stage (nymph) – Blacklegged ticks in the nymphal stage will begin to feed in their second year, with peak activity occurring between May and July though it could start earlier depending on the climate.

When they feed upon infected white-footed mice (*Peromyscus leucopus*), chipmunks (*Tamias striatus*) or certain types of birds, both larvae and nymphs have the ability to become infected with Lyme disease bacteria (*B. burgdorferi*) and other tick-borne pathogens. The white-footed mouse is the main vector (reservoir) of *B. Burgdorferi*, *Babesia microti* (which causes the majority of human babesiosis cases), and *Anaplasma phagocytophilum* (which causes human granulocytic ehrlichiosis).

Because of their small size (less than 2 mm– about the size of a poppy seed), which makes them difficult to spot and kill, the nymphal stage is more likely to transmit tick-borne pathogens to humans. Adult blacklegged ticks are more likely to be found on a person's or domestic pet's body and discarded, even if they may be infected with tick-borne diseases.

4th Stage (adult): – Nymphs molt into mature male and female ticks in the summer. During the fall and warm days of winter and spring, adults follow medium to large mammalian hosts, notably white-tailed deer (*Odocoileus virginianus*).

Females hunt on deer and other large mammals, breed, lay eggs, and die. If females do not feed in the fall, they may attempt to find a large mammal host in the spring. Blacklegged ticks are not killed by snow, and adults will become active as soon as the temperature rises above zero. During a brief defrost in the winter, they can be visible sometimes. Adult male blacklegged ticks adhere to a host and wait for females, but they don't appear to take a blood meal and thus aren't thought to transmit tick-borne pathogens. However, they may be infected in the larval or nymphal stages if they feed on the blood of an infected host animal.

Adult ticks' primary host, white-tailed deer, is a significant mode of transportation, and tick proliferation is closely related to the abundance of these species. *White-tailed deer* aren't thought to be Lyme disease reservoirs.

Ixodes pacificus, additionally called as the bear tick found in some part of the west coast US. Typically, a hardbodied tick found in the Eastern and northern US it also *acts* as *a* vector for spreading

disease in animals as well as humans like **lyme, babesiosis, anaplasmosis, powassan virus disease and more**. Mainly parasitize white tailed deer, mice, lizard, migratory birds specially when in larval and nymph stage.

Ixodes ricinus is known as the European tick typically the castor bean tick usually hard bodied attains the length of around 10-11mm or approx. 0.40 inches when mainly fed with blood meal and has the capability to transfer both bacterial as well as viral pathogens leading to diseases like Lyme and tick borne encephalitis.

Ixodes persulcatus another hard bodied tick distributes or say found in the range from Europe to northern and central Asia (China – Japan) it marks the unusual difference of male being smaller than the female and known to host man, dog, rodents like dormouse, amur hedgehog and rarely birds. [3]



Figure 1.1: This figure represents the various stages of deer tick starting from egg to adult (from right to left). [4]

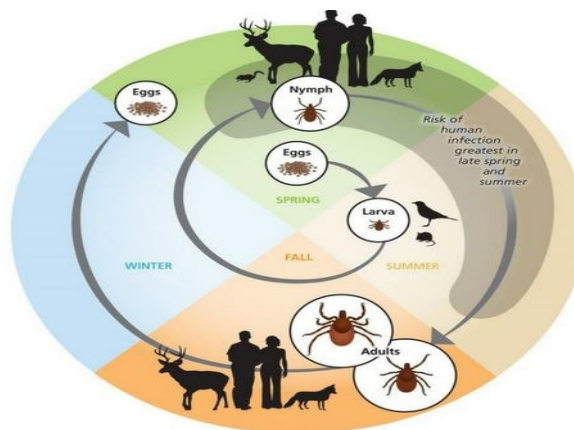


Figure 1.2: This figure shows the two-year life cycle of a tick. [5]

1.2 Symptoms of Lyme Disease

The most frequent symptom of infection is an expanding red rash called erythema migrans, which occurs around a week after the tick attack. Most of the time, the rash is neither itchy nor sore. Infected individuals develop a rash in 70–80% of cases.

It was usually said that tick might take around 36-48 hours to get the person infected but according to latest studies it has the tendency to infect in not more than 16 hours so if you find a tick is spotted attached to your skin with swollen part it might have already transmitted the bacteria or say make you infected.[6]

Fever, headaches, and exhaustion are some of the more early symptoms.

When left untreated, signs can include lack of facial balance on one or both sides, joint pains, extreme headaches and neck stiffness, and heart palpitations, among others. Multiple symptoms of joint pain and swelling can occur months to years later.

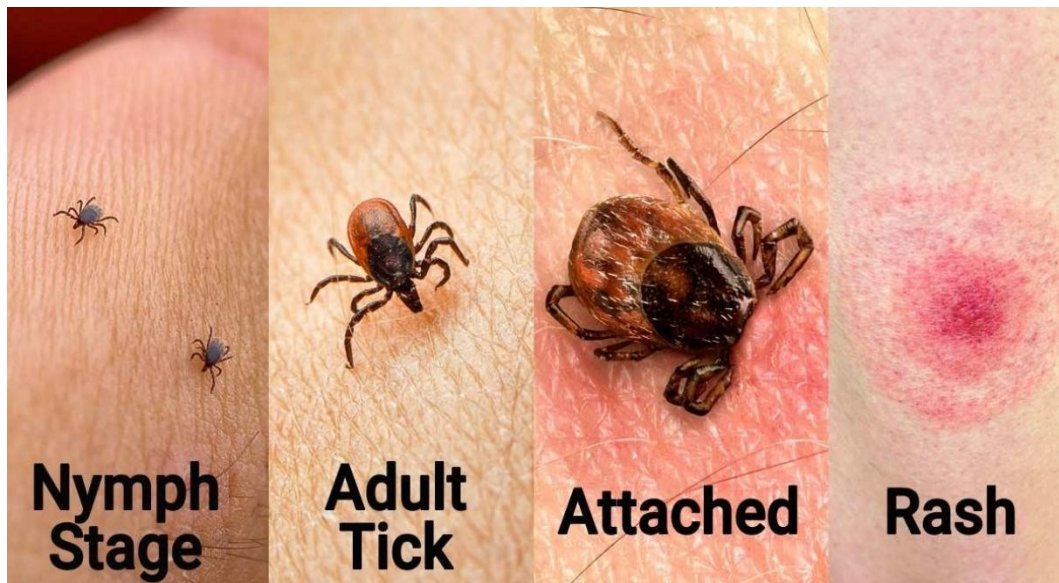


Figure 1.3: This figure shows an expanding rash that appears at the site of the tick bite.

1.2.2 Stages of Lyme Disease

Borrelia burgdorferi is transmitted to humans by the bites of infected *Ixodes ticks*. Ticks of interest in the United States are usually *Ixodes scapularis*, and they must be attached for at least 36 hours before the bacteria can propagate. Ticks of the *Ixodes ricinus* species can spread the bacteria more easily in Europe. Lyme disease is caused by the bacteria *Borrelia burgdorferi* and *Borrelia mayonii* in North America. *B. afzelii* and *B. garinii* are also responsible for the disease in Europe and Asia. The disease does not seem to be spreadable amongst humans, livestock, or by food. The diagnosis is based on a variety of symptoms, tick infection history, and perhaps blood tests for particular antibodies. In the early stages of the condition, blood samples are almost always negative. Individual tick testing isn't really helpful.

The three stages of Lyme disease are as follows:

- *Early localized*
- *Early disseminated*
- *Late disseminated*

The signs you have can vary depending on the level of the disease.

The development of Lyme disease can vary from individual to individual. Not all who have it go through all three stages.

Stage 1: Early localized disease

Lyme disease symptoms typically appear one to two weeks after the tick bite. A **bull's-eye rash** is one of the first symptoms of the disease.

The rash appears as a central red spot surrounded by a clear spot with redness at the edge most frequently, though not always, at the site of the tick bite. It may feel warm to the touch, but it is neither uncomfortable nor itchy. In most people, it disappears with time.

Erythema migrans is the medical term for this form of rash. Lyme disease is believed to be associated with erythema migrans. However, many people do not experience this symptom. Some may have a solid red rash, and those with dark complexions may have a rash that looks like a bruise..

The rash may appear with or without symptoms of a virus or flu.

Chills, fever, enlarged lymph nodes, sore throat, vision changes, fatigue, muscle aches, and headaches are all the other common symptoms during this stage of Lyme disease.

Stage 2: Early disseminated Lyme disease

Many weeks to months after the tick bite, early disseminated Lyme disease develops. A rash may occur in areas other than the tick bite, and you will have a general feeling of being unwell. This stage of the disease is marked by the presence of systemic infection, which means that the infection has spread across the body, including other organs.

Stage 2 Symptoms can include:	
➤	Multiple erythema multiforme (EM) lesions.
➤	Neurologic conditions, such as insensibility, facial, tingling, and cranial nerve palsies, and meningitis
➤	Lyme carditis can cause interference in heart rhythm.

Table 1.1: Enlists the symptoms of Stage 2

Stage 3: Late disseminated Lyme disease

- In the event that the contamination has not been treated in stages 1 and 2, late scattered Lyme illness creates. Stage 3 can require months or even a long time after a tick chomp.
- This stage is portrayed by:
- At least one enormous joints are affected by arthritis.

- Brain issues, such as neurological disease, induce acute momentary cognitive decline, trouble focusing, difficulty understanding discussions, and rest disruption.
- Senselessness in the limbs.[6]

1.2.2 Advised Tests

It is not recommended to perform the test during the early stages of a localized infection. Blood samples are most reliable a few weeks after the initial infection that is when antibodies are present.

Your healthcare provider may direct the following tests:

<i>TEST</i>	<i>USE</i>
<i>Enzyme-linked immunosorbent assay (ELISA)</i>	To uncover antibodies against B. burgdorferi.
<i>Western blot</i>	To verify a positive ELISA test. It checks for the existence of antibodies to specific B. burgdorferi proteins.
<i>Polymerase chain reaction (PCR) Trusted Source</i>	To assess people with persistent Lyme arthritis or nervous system symptoms. It is executed on joint fluid or cerebrospinal fluid (CSF). PCR testing on CSF for diagnosis of Lyme disease isn't recommended habitually due to low sensitivity. A negative test doesn't eliminate the diagnosis. In contrast majority of the people will have positive PCR results in joint fluid if tested before the antibiotic therapy.

Table 1.2: Shows the list of advised tests

Despite adequate care, about 10 to 20% of people experience joint pains, memory problems, and fatigue for at least six months.[7]

1.3. Prevention of Lyme Disease

Tick bites can be avoided by using vestures that cover the arms and legs and using Diethyltoluamide (DEET) based insect repellents. The use of pesticides to decrease tick populations might be beneficial. Tweezers should be used to kill ticks. If the severed tick had blood, a solitary portion of doxycycline might be utilized to keep away from disease, albeit this isn't ordinarily prompted since contamination is exceptional. If this type of illness occurs, a number of antibiotics are available for this infection like *amoxicillin, doxycycline and cefuroxime*. Traditional care usually lasts two to three weeks. Few patients have a pyrexia and myalgia and arthralgia as a result of the procedure, which can last for 1 to 2 days. The treatment of illness with antibiotics for a long time has not been beneficial for those who experience chronic symptoms. [8]

2. CHRONIC LYME DISEASE AND ITS TREATMENT

Chronic Lyme disease happens where a person's symptoms persist after being treated with antibiotics for the disease. This is also known as Post-Lyme disease syndrome or post-treatment Lyme disease. According to the NEJM(New England Journal of Medicine), 10-20% of patients would have disease symptoms even after taking all of the antibiotics recommended. These signs, which may include weakness, myalgia and arthralgia , and cognitive disability, can last for upto 6 months or prolonged. These signs may trigger emotional distress by interfering with a person's daily activities. However, most people's symptoms take six to twelve months to heal.

It is unknown why few individuals evolve post-treatment Lyme disease syndrome and others do not. It is also not clear what precisely causes the chronic symptoms? As per the **Columbia University Medical Centre** said the cases should be treated on individual basis by the doctors. A person's specific symptoms and case history, as well as the latest research, should be used to guide treatment. [9]

2.1 People susceptible to LD at most

It's possible to get Lyme disease even though you don't have any of the threat mentioned down. The greater threats you have, the more likely you are to develop the disease. If you have many risk factors, talk to your doctor about what you can do to reduce your risk.

Anyone who lives in an environment where ticks are present is at risk of being bitten by a tick carrying Lyme disease. The amount of time a person spends outside in areas with a lot of ticks is always directly proportional to their danger.

Lyme disease is usually found in three geographical locations of the US:

❖ Northeast and Mid-Atlantic	Maine to Maryland
❖ North Central	Minnesota and Wisconsin
❖ Pacific Northwest	Northwestern California and Oregon
Ticks are found to be most active during the warm months of the year. Peak times differ from region to region on the basis of temperature.	
❖ Northeast, Mid-Atlantic, and North Central US	high risk between April and November, with the peak in July. ^[10]
❖ Southern US	Ticks are active year-round
Other areas can be variable again on the basis of temperature.	

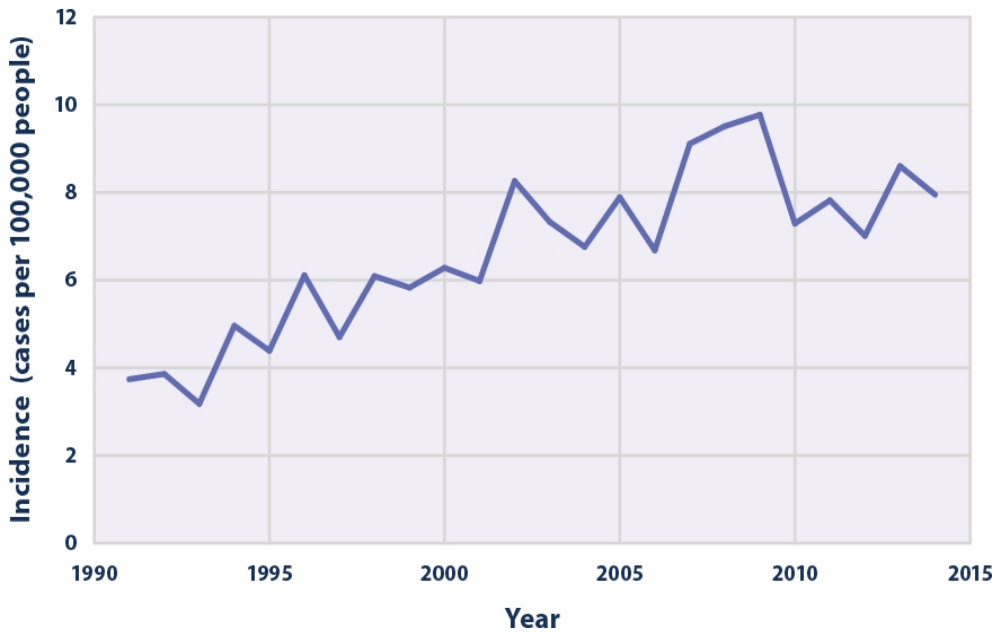


Figure 2.1: This figure represents the number of individuals affected with LD between the year 1990 to 2015 in United State. [11]

<i>Australia</i>	<i>Canada</i>	<i>Estonia</i>	<i>Luxembourg</i>	<i>Iraq</i>	<i>Norway</i>	<i>Spain</i>
<i>Austria</i>	<i>China</i>	<i>Finland</i>	<i>Ireland</i>	<i>Macedonia</i>	<i>Peru</i>	<i>Sweden</i>
<i>Argentina+</i>	<i>Chile+</i>	<i>France</i>	<i>Israel</i>	<i>Mali</i>	<i>Poland</i>	<i>Switzerland</i>
<i>Algeria</i>	<i>Colombia</i>	<i>Georgia</i>	<i>Italy</i>	<i>Malta</i>	<i>Portugal</i>	<i>Taiwan</i>
<i>Andorra</i>	<i>Croatia</i>	<i>Greece</i>	<i>Japan</i>	<i>Mauritania</i>	<i>Romani</i>	<i>Tajikistan</i>
<i>Belarus</i>	<i>Cuba+</i>	<i>Germany</i>	<i>Kazakhstan</i>	<i>Mexico</i>	<i>a</i>	<i>Tunisia</i>
<i>Belgium</i>	<i>Cyprus</i>	<i>Herzegovin</i>	<i>Kenya</i>	<i>Moldova</i>	<i>Russia</i>	<i>Turkey</i>
<i>Belize</i>	<i>Czech Rp.</i>	<i>a</i>	<i>Korea Dem.</i>	<i>Mongolia+</i>	<i>Scotland</i>	<i>Ukraine</i>
<i>Bolivia+</i>	<i>Denmark</i>	<i>Honduras+</i>	<i>Korea Rep.</i>	<i>Montenegr</i>	<i>Serbia</i>	<i>Uruguay</i>
<i>Brazil</i>	<i>Egypt+</i>	<i>Hungary</i>	<i>Latvia</i>	<i>o</i>	<i>Senegal</i>	<i>Uzbekistan</i>
<i>Br.Columbi</i>	<i>England</i>	<i>Iceland</i>	<i>Liechtenstei</i>	<i>Morocco</i>	<i>Siberia</i>	<i>Mozambiqu</i>
<i>a</i>		<i>India</i>	<i>n</i>	<i>Venezuela</i>	<i>Slovakia</i>	<i>e</i>
<i>Bulgaria</i>		<i>Iran</i>	<i>Lithuania</i>	<i>Netherlands</i>	<i>Slovenia</i>	<i>Wales</i>

Table 2.1: The table enlists the countries already affected by Lyme Disease.[12]

2.2 Risk factors for post-treatment LD syndrome

If you have Lyme borreliosis after being bitten by a diseased tick, you're more likely to have post-treatment Lyme disease syndrome. Your effects may last for weeks, months, or even years after the tick bite if the infection progresses to the chronic level.

If you do not take the antibiotics recommended, you might have a better chance of having long-term symptoms. Nonetheless, even those who are taking antibiotics are at risk. There's no way to tell whether post-treatment Lyme disease syndrome can advance to the chronic stage because the cause is unclear. [13]

2.3 Symptoms of post-treatment LD syndrome

Symptoms in post-treatment *Lyme borreliosis* disease syndrome are mostly similar to those seen in the early stages. Tiredness, sleep disorder, pain, myalgia and arthralgia, and ache and inflammation of the legs, shoulders, elbows, and other big joints are common in people who have recurring symptoms along with a lack of concentration or a drop in short-term memory a speech disorder.

2.4 Treatment for post-treatment LD syndrome

When this disease is detected at an early stage, the normal treatment is a 2-3-week course of oral antibiotics. *Amoxicillin*, *cefuroxime axetil* and *Doxycycline*, are the most commonly used antibiotics for this disease. Other antibiotics therapy or an intravenous(I/V) injection may be needed, depending on the diagnosis and symptoms.

The precise explanation for post-treatment LD Syndrome is unknown, there is considerable controversy over how to cure it. Any researchers believe that antibiotic therapy should be continued. There is proof, however, that such long-term antibiotic treatment would not increase the chances of healing. Long-term use of these medications will lead to complications.

The aim of therapy for post-treatment Lyme disease syndrome is to alleviate pain and discomfort. Joint pain should be treated with prescription or over-the-counter pain relievers. Nonsteroidal anti-inflammatory drugs(NSAIDs) and intra-articular hormones should be used to relieve joint swelling, *Diclofenac*, *Acelofenac*, *Nimesulide*, *Ibuprofen*, and *Acetaminophen* are some examples. [13].

Age Category	Drug	Dose	Maximum	Duration, Days
Children	Amoxicillin or	50mg/kg/day orally Divided into 3 doses	500mg/dose	14 days
	Doxycycline or	4.4mg/kg/day orally Divided into 2 doses	100mg/dose	10-14 days
Adults	Amoxicillin or	500mg, 3times/day orally	N/A	14 days
	Cefuroxime	500mg, twice/day orally	N/A	14 days
	Doxycycline or	100mg, twice/day orally	N/A	10-14 days

Table 2.2: This table shows the dosage of prescribed medicines to be taken for different age groups. [14]

2.5 Ayurvedic View and Treatment Option

All microorganisms are classified as Krimi(Sanskrit word which means worm) in Ayurveda, whether they are bacteria, viruses, rickettsiae, or parasites.

External and Internal krimi are the two major divisions that all krimi fall under. Microorganisms that come out of the human body or live on the surface are classified as External krimi. Internal krimi are microorganisms that reside inside the human body and are classified according to environment, with three types: those produced in or inhabiting in mucus – **Kaphaja** those generated or inhabiting in blood – **Raktaja** and those developed in the stool or living in the lower digestive tract – **Purishaja**.

The Ayurvedic therapy of LD helps to reduce or eliminate symptoms, avoid complications, and improve the body's immune system. Immunoaugmentative and antimicrobial drugs that can also alleviate skin irritation, according to **Dr. William Courson** (an Ayurvedic Practitioner), may be used in early phases of the illness, including the following multiherbal formulations:

Table 2.3: This table shows the ayurvedic Multiherbal Formulations for early phase of illness

S.No	Multiherbal formulation
1.	<i>Mahamanjishthadi-Qadha</i>
2.	<i>Gandhak-Rasayan</i>
3.	<i>Sukshma-Triphala</i>
4.	<i>Chandraprabha-Vati</i>
5.	<i>Panch-Tikta-Ghrut-Guggulu</i>

LD can cause heart muscle inflammation, which can lead to arrhythmia (abnormal heart rhythm) and heart failure. The following single herbs and multiherbal formulations should be used to relieve heart muscle inflammation:

Table 2.4: This table shows single herbs and multiherbal formulations used to relieve heart muscle inflammation.

S. No	Formulation (Single herbs & multi-herbal)
1.	Nimba (<i>Azadirachta indica</i>)
2.	Amalaki (<i>Emblica officinalis</i>)
3.	Patol (<i>Tricosanthe dioica</i>)
4.	Haritaki (<i>Terminalia chebula</i>)
5.	Musta (<i>Cyprus rotundus</i>)
6.	Arjunarishta (Formula)
7.	Saarivasava (Formula)
8.	Punarnavadi-guggulu (Formula)
9.	Draksha (<i>Vitis vinifera</i>)
10.	Dashmoolarishta (Formula)
11.	Triphala-guggulu (Formula)
12.	Kutaj (<i>Holarrhina antidysentica</i>)

An inceptive formula contains *Ashwagandha* (*Withania soniferum*) an adaptogen, *Manjishtha*-(a lymphatic detoxification agent), and *Nimba*-(Neem) as a microbicidal agent in addition to traditional treatment.

2.5.1 Antibiotic therapy with multiherbal formulations

The multiherbal formulations which are beneficial in the treatment of cardiac arrhythmias which is once in a while connected with the infection:

- *Maha-Vat Vidhwans-Ras*
- *Ekang-Veer-Ras*
- *Bruhat-Vat-Chintamani*
- *Tapyadi-Loh*

Table 2.5: This table shows single herb or multi-herbal formulations used for Nervous system and joint involvement treatment.

S.No.	Nervous system involvement	Joint Involvement
1.	<i>Ekang-Veer-Ras (formula)</i>	<i>Rasna (Pluchea lanceolata)</i>
2.	<i>Maha-Vat-Vidhvans-Ras (formula)</i>	<i>Nirgundi (Vitex negundo)</i>
3.	<i>Kaishor-Guggulu (formula)</i>	<i>Guduchi (Tinospora cordifolia)</i>
4.	<i>Yashti madhu (Glycerrhiza glabra)</i>	<i>Vishwa (Zinziber officinal)</i>
5.	<i>Bruhat-Vat-Chintamani (formula)</i>	Additional Multi-herbal formulation
6.	<i>Tapyadi-Loh (formula)</i>	<i>Yograj Guggulu</i>
7.	<i>Nirgundi (Vitex negundo)</i>	<i>MahaRasnadi Guggulu</i>
8.	<i>Shalparni (Desmodium gangeticum)</i>	<i>MahaYograj Guggulu</i>
9.	<i>Vishtinduk-Vati (formula)</i>	<i>Gokshuradi Guggulu</i>
10.	<i>Prushnaparni (Uraria picta).</i>	

Symptoms of this disease will sometimes occur long after the Lyme bacterium has been eradicated, this is usually due to a continuing auto-immune reaction in the body, which can be treated with herbal medicines such as:

- *Tulsi (Ocimum sanctum)*
- *Shatavari (Asparagus racemosus)*
- *Bhringaraj (Eclipta alba)*
- *Mandukparni (Centella asiatica)*
- *Suvarna Malini-Vasant (formula)*
- *Suvarna-Bhasma (formula)*
- *Abhrak-Bhasma (formula)*
- *Bala (Sida cordifolia)*
- *Ashwagandha (Withania somnifera) [15]*

2.6 Herbal plants / drugs showing antimicrobial activity against *b.burgdorfer* and some research over the persisting effects of lyme disease when reliability over allopathic drugs found faded.

Taking a look at a variety of botanical drugs and natural ingredients that certain people use to treat their symptoms. Their Lyme disease symptoms persisted, and it was discovered that some of them

do, in fact, have very high anti-*B. burgdorferi* activity. Among them are:

- *Cryptolepis sanguinolenta*
- *Polygonum cuspidatum*
- *Juglans nigra*
- *Artemisia annua*
- *Uncaria tomentosa*
- *Cistus Incanus*
- *Scutellaria baicalensis*

These discoveries may serve as a reason for the clinical improvement of patients who take these medications and furthermore by implication propose that their current side effect might be because of persevering Bacteria that are not in a real sense executed by conventional anti-microbial Treatment of Lyme. Surprisingly, the plants *A. paniculata*, *S. Rebaudiana*, *Colloidal silver*-(Argentyn 23TM), *Monolaurin*-(LauricidinTM), *Dipsacus spp.*, and *W. somnifera*, which were expected or recently archived to have hostile anti-borrelia activity, didn't demonstrate remarkable activity against either fixed stage or emerging *B. burgdorferi* in this detailed study.

C. sanguinolenta is a plant which is indigenous to Africa and traditionally used to treat Hepatitis, Malaria and septicemia. *C. Sanguinolenta* roots have been appeared to have antiinflammatory, anti-fungal, antibacterial, anti-amoebic, and anti-malarial effects in preclinical trials.

Two preliminary clinical trials have shown that the treatment is successful. Different secondary metabolites which have antimicrobial activity has been accounted in the treatment of uncomplicated malaria without evidence of over toxicity, the most well-studied of which is an alkaloid named *cryptolepine*. *Cryptolepine's* Antimicrobial activity of *Cryptolepine's* is due to a combination of mechanisms i.e bactericidal and bacteriostatic impact. It induces morphological changes, cells breakdown, along with DNA intercalation and topoisomerase-II inhibition.

Some cryptolepine constituents, in addition to cryptolepine, have been found to have antimicrobial activity in *C. sanguinolenta*. *C. sanguinolenta* is usually well tolerated, but in humans, few after effects have been recorded in the areas of China and India where it has been used for a long time. In rat tests, doses of the extract were found upto **500mg/kg** which is reasonably stable [16]. *C. sanguinolenta* demonstrated good activity against developing *B. Burgdorferi* along with a low Minimum Inhibitory concentration which is a novel finding in this research.

Though traditionally used to treat malaria, *Cryptolepis Sanguinolenta* has shown to be effective in the treatment of *Babesia spp.* in the Lyme population. This may be a malaria-like co-infecting organism.

As per our Knowledge, the anti-Borrelial effect of *C. sanguinolenta* has not been recorded

previously and further in vitro and in vivo studies are warranted to investigate the potential role *Cryptolepis sanguinolenta* may help with Lyme disease management. The antioxidant, antibacterial, antitumor, and chemoprotective properties of *Juglans nigra* and its constituents are well established. In Vitro tests previously revealed that juglans nigra had bacteriostatic activity against log phase *Spirochetes of Borrelia burgdorferi* and *Borrelia garinii*, as well as bactericidal activity against *Borrelia* round bodies. In Vitro tests also revealed that two separate botanical formulation which is commercially available in the market containing *J. nigra* and that had action against log phase spirochetes of *B. burgdorferi* strain GCB726 and biofilm formation (64). Juglone, phenolic acids, flavonoids, and catechins including epigallocatechin gallate are the antimicrobial constituents contained in *J. nigra*.

J. nigra is well endured and has few side effects. It also can cause bowel problems and skin pigmentation changes in some people. Few allergic cross reactions have been identified in those people who are allergic to tree nuts, just as instances of dermatitis in people.

The active compound, *Juglone*, was discovered to have an *Oral LD50 of 112 mg/kg* in rats.

P. cuspidatum that has anti-tumor, antimicrobial, neuroprotective, and cardioprotective properties, with polyphenol resveratrol being one of the most active constituents against *B. burgdorferi* and *B. garinii*.

P.cuspidatum's possess antibacterial activity due to the presence of stilbenes (including resveratrol) and *hydroxyanthraquinone* material.

Emodin is another active constituent that is active against fixed stage of *B. Burgdorferi* cells.

Preclinical testing has shown additional antibacterial and anti-biofilm effects.

P. cuspidatum has been shown it is non-toxic in human and animal research. Gastrointestinal disruption and diarrhoea can occur, but this is resolved by reducing or halting the intake. Although several human trials have been conducted, a 2010 study discovered that it is all around assimilated and quickly used. [17]

3. CONCLUSION

Lyme disease the vector borne disease caused by the bacterium burgdorferi from deer tick (ixodes scapularis) it then feed inside the human body following stages causing certain problems like rash, fever, arthritis, erythema and encephalitis where as in people age >40 are more critical to handle if got infected. For primary treatment few antibiotics like amoxicillin , doxycyclin and cefuroxime for around 10-14 days ,symptomatic treatment should be done accordingly with paracetamol , diclofenac and other NSAID's . Some symptoms arise after the treatment of the disease and are more devastating to the body termed as chronic lyme disease effects like cardiac arrhythmia, arthritis, fatigue, restlessness usually occur after 6-8 months of treatment. For lyme treatment there are some ayurvedic medicines which are reportedly more beneficial in treating post lyme or chronic lyme disease. Some herbs were musta , nimba , patol (formulation) , ashwagandha , manjishtha and more , also other herbal drugs for symptomatic treatment of other complications arising in the body. *Cryptolepis sanguinolenta* ,*Polygonum cuspidatum* , *Juglans nigra* , *Artemisia annua*, *Uncaria tomentosa*, *Cistus Incanus* and *Scutellaria baicalensis*. Some herbal plants used by people as home remedies for treatment of various diseases like malaria have shown bacteristatic and antimicrobial activity in small doses against *b. burgdorferi* in which *cryptolepis sanguinolenta* roots were found which have antimicrobial activity and some other after treatment effects also occur in long term use by countries like INDIA & CHINA. However its invitro and invivo studies are warranted as per record it doesn't show antiborrelia activity. However, antioxidant juglans nigra has been shown to have bacteriostatic activity against *B. burgdorferi* and *B. garinii* log phase spirochetes as well as bactericidal activity against Borrelia round bodies.

The active compound, **Juglone**, was discovered to have an **Oral LD50 of 112 mg/kg** in rats. ***Polygonum cuspidatum*** that has anti-tumor, antimicrobial, anti-inflammatory, neuroprotective, and cardioprotective properties, with polyphenol resveratrol being one of the most active constituents against *B. burgdorferi* and *B. garinii*. ***Emodin(6-methyl-1,3,8-trihydroxyanthraquinone)*** has action against stationary phase B. Burgdorferi cells.

In animal and human trials, *P. cuspidatum* was shown to be non-toxic. Although a variety of human trials have been conducted, a 2010 study discovered that it is all around assimilated and quickly used. The best strategy in decreasing Lyme illness contamination is to expand attention to approaches to forestall the sickness and perceiving the signs, which is advanced by associations

like Lyme Disease Action and Global Lyme Alliance.

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