

# Title: Neurological Lyme Disease Mimics Alzheimer's Disease and other Neurodegenerative Diseases

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It has been noted that approximately 40% of the cases of Lyme disease involve neurological manifestations (1). The term that has been applied to cases of Neurological Lyme Disease is "*Lyme Neuroborreliosis*".

These cases of Lyme Neuroborreliosis, have frequently been misdiagnosed as untreatable neurodegenerative diseases (ie Amyotrophic Latererel Sclerosis (ALS), Multiple Sclerosis (MS), Alzheimer's Disease, Epilepsy and Parkinson's Disease).

The main reason for such misdiagnoses is that Lyme Neuroborreliosis clinical manifestations mimic those of the aforementioned untreatable neurodegenerative diseases.

The emotional trauma to patients and their family members that occur when a misdiagnosis is made can be devastating !! Thus, efforts must be made to avoid misdiagnoses. This is often the case in geographic regions of the country that are endemic for Lyme Disease (1,2).

A case of Neurological Lyme misdiagnosis involved the Country and Western Singer Mr. Kris Kristofferson. The news media announced that Mr Kristofferson had Neurological Lyme Disease which had initially been diagnosed as Alzheimer's Disease (1). His case has become the Poster Child for Neurological Lyme Disease misdiagnosed as Alzheimer's Disease, as well as, other neurodegenerative diseases.

In areas endemic for Lyme Disease, it is of the utmost importance that Neurological Lyme Disease be initially considered and ruled out in patients who manifest Alzheimer's like clinical symptoms. There isn't any cure for true Alzheimer's disease. Early onset Neurological Lyme Disease can be treated with antibiotics (1,2).

This rule of thumb of initially ruling out Neurological Lyme Disease should also be applied to other potential mimicry/neurodegenerative diseases scenarios (ie Amyotrophic

Lateral Sclerosis, Multiple Sclerosis, Parkinson's Disease, etc) by physicians in areas that are endemic for Lyme Disease

Recent studies have indicated that early onset cases of true Alzheimer's Disease can be identified by the presence of specific biological agents called chemokines. These chemokines are found in the cerebrospinal fluid, and are: CCL2, CXCL8, and CXCL10 (2,3).

In cases of Neurological Lyme Disease by contrast, the chemokine CXCL13 is present in the cerebrospinal fluid.(2).

The chemokine CXCL13 is also seen in the cerebrospinal of patients with Neuro- or tertiary syphilis. Tertiary syphilis, however, is a disease rarely seen in the 21<sup>st</sup> century. Thus, CXCL 13 has been proposed as the best biomarker for Neurological Lyme Disease .(2, 3).

More recently, the microRNA markers: miR-122-5p, miR-135a-3p and miR-146b-5p have also been found to be useful indicators of early onset Neurological Lyme Disease (3). These newly emerging markers are present in the cerebrospinal fluid, as well as, in serum/plasma.

Thus, physicians who practice in Lyme Disease endemic regions, should be guided by both clinical manifestations, as well as, the newly emerging lab based markers, to distinguish Neurological Lyme Disease Mimicry from cases of true neurodegenerative diseases such as Alzheimer's Disease (1-3) !!

#### References :

1. Ollar, RA (2016): "Neurologists Take Heed Lyme Neuroborreliosis Mimicry is Afoot", *EC Neurology* ECO.01:05-06
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3. Ollar, RA (2019): "Distinguishing True Alzheimer's Disease from Lyme Neuroborreliosis Mimicry via the Application of MicroRNA Molecular Markers are Especially Important in Areas Endemic for Tick Borne Disease". *EC Neurology* 11.11: 52-53.

