this disease. (Expert Rev Anti Infect Ther 2004;2(Suppl.1):S1-S13). For more information please see below.

**Main symptoms indicating nervous system involvement:**
Symptoms of cognitive loss such as:
• Memory impairment or loss ('brain fog')
• Word-finding problems and dyslexia/ problems dealing with numbers
• Visual/spatial processing impairment (losing things, getting lost, disorganisation)
• Slowed processing of information
• Poor abstract reasoning
• Losses in fields of attention/executive functions such as inability to maintain divided or sustained attention
• Poor auditory and mental tracking and scanning (loss in ability to follow daily affairs, which is complicated by persistent distractibility)

Neurological symptoms and signs including:
• Headaches
• Neuralgia, i.e. nerve pain
• Tremor
• Panic attacks
• Facial palsy, numbness and tingling, especially of the face
• Cranial nerve disturbances such as - optic neuritis, trouble swallowing, distortions of taste and smell, visual disturbance, certain movement disorders
• States that mimic other defined neurological disorders such as Parkinson’s disease or MS
• In children, indications of neurological involvement include behaviour changes, learning disabilities, school phobia, hypersensitivities of the skin and headaches.

Some patients have developed Lyme-related:
• Psychoses including hallucinations and delusions
• Seizures
• Violent behaviour, irritability
• Rage attacks/inability to control impulses/out of context crying spells
• Depression
• Anxiety/Panic attacks
• Rapid mood swings that may mimic bipolar disorder (mania/depression)
• Obsessive-compulsive disorder (OCD)
• Sleep disorders
• An Attention deficit/hyperactivity disorder (ADD/ADHD)-like syndrome
• Autism-like syndrome
• Progressive dementia

**Further Sources of Information.**
*More information on treatment is available at the website of The International Lyme and Associated Disease Society (ILADS), a professional medical and research society. The document ‘Diagnostic Hints and Treatment Guidelines for Lyme and Other Tick Borne Illnesses’ by Dr. Joseph Burrascano is recommended. See www.ilads.org*

*The Lyme Disease Research Program at Columbia University, New York has further professional information upon the role of neurology and psychiatry. Available at www.columbia-lyme.org*

*Dr. Robert Bransfield, a psychiatrist who specialises in infectious causes of neuropsychiatric illness, has developed a structured clinical interview to assess Lyme seronegative patients. See www.mentalhealthandillness.com*

LDA gratefully acknowledges the assistance of Drs. Virginia Sherr, Daniel Cameron and Joseph Burrascano and the ILADS Board of Directors in the preparation of this leaflet.

All our leaflets are available free of charge from our website where you can find out more about Lyme disease, including links to many other resources. www.lymediseaseaction.org.uk

Leaflets are also available from: Lyme Disease Action
PO Box 235, Penryn, TR10 8WZ, UK. Including a donation/sae will help us in our work for people affected by Lyme disease.

Disclaimer: Lyme Disease Action publications are not a substitute for professional medical advice and are intended as general information only. If you have, or suspect you may have, Lyme disease you should consult a doctor.

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Lyme disease can affect various systems in the body, particularly the nervous system. Common neurological symptoms include:

- **Facial palsy**
- **Facial weakness**
- **Sensory distortions**
- **Numbness or pains**
- **Shoulder drop**
- **Disturbance of the nerve roots (radiculopathy with pain and/or numbness)**
- **Panic attacks and other neurological signs**
- **Suspected gastrointestinal motility disturbances**
- **At any time after infection, symptoms affecting a person’s reasoning and comprehension may appear. These symptoms, known as cognitive symptoms,** are listed at the end of this leaflet.

Disorders of the nervous system have been found in up to 40% of late-stage Lyme patients.

### What are the symptoms that might develop over time?

As noted, neuro-psychiatric symptoms that mimic primary psychiatric disorders may develop at any stage of untreated or undertreated disease. Studies at Columbia University Department of Psychiatry, New York, indicate that many nervous system symptoms, in both mild and severe forms, are recorded in people with Lyme disease. The main groups of symptoms that may occur are listed at the end of this leaflet.

### Where do the ticks that carry this disease occur in Europe?

According to surveys, many parts of mainland Europe have large areas where the ticks that carry these diseases occur. Human infection rates for the described species tend to reflect the geographical distribution of these ticks. Mainland Europe, especially Eastern Europe, appears to have a greater number of cases than the British Isles. However, recent publications about ticks, their ecology and distribution, indicate that scientific knowledge is still likely to be incomplete in the latter area.

### How do the signs of the disease differ between Europe and the USA?

Both North American and European *Borrelia burgdorferi sensu stricto* cases frequently tend to have arthritic symptoms as a major aspect. Of the additional European species, *B. afzelii* tends to cause skin and connective tissue symptoms and *B. garinii* tends to cause nervous system symptoms. All species may cause an enlarging red rash, termed Erythema migrans or EM, which may be in the form of a 'Bull's eye' rash. However, not every case of Lyme infection exhibits an enlarging rash or even a rash at all.

How this infection affects a particular individual is unpredictable, therefore the differences in typical symptoms between the species of bacteria are only general trends.

### How many cases of Lyme disease occur in the UK?

The Health Protection Agency (HPA) has recorded at least 500 confirmed cases per annum in recent years. However, it is thought that confirmed cases are an under-estimate. The degree of underestimation is unknown but the HPA suggest that somewhere closer to 2,000 cases may occur each year. Lyme Disease Action believes that in reality the number may be higher still. Definitive figures are difficult to arrive at whilst a number of factors that could affect infection rates remain unknown. Co-infections with other tick-borne parasites may also complicate the picture. The situation for all European countries can be seen at the website for European Union concerted action on Lyme borreliosis [EUCALB](http://www.oeghmp.at/eucalb/index.htm).