



Fact Sheet

Spotlight on Batten Disease

Information Retrieved from: http://www.ninds.nih.gov/disorders/batten/detail_batten.htm

What is Batten disease? Batten disease is a fatal, inherited disorder of the nervous system that begins in childhood. Early symptoms of this disorder usually appear between the ages of 5 and 10, when parents or physicians may notice a previously normal child has begun to develop vision problems or seizures. In some cases the early signs are subtle, taking the form of personality and behavior changes, slow learning, clumsiness, or stumbling. Other symptoms that may develop include:- slowing of head growth with age in the infantile form, poor circulation in lower extremities with legs and feet cold as well as bluish-red in color, decreased body fat and muscle mass, curvature of the spine, hyperventilation and/or breath-holding spells, difficulty in swallowing and feeding, teeth grinding and constipation. Hearing may also be affected. Over time, affected children show mental impairment, worsening seizures, and progressive loss of sight and motor skills. Batten disease is often fatal by the late teens or twenties.

Batten disease is named after the British pediatrician who first described it in 1903. Also known as Spielmeyer-Vogt-Sjogren-Batten disease, it is the most common form of a group of disorders called neuronal ceroid lipofuscinoses (or NCLs). Although Batten disease is usually regarded as the juvenile form of NCL, some physicians use the term Batten disease to describe all forms of NCL.

What are the other forms of NCL? There are three other main types of NCL, including two forms that begin earlier in childhood and a very rare form that strikes adults. The symptoms of these three types are similar to those caused by Batten disease, but they become apparent at different ages and progress at different rates.

- **Infantile NCL (Santavuori-Haltia disease)** begins between about 6 months and 2 years of age and progresses rapidly. Affected children fail to thrive and have abnormally small heads (microcephaly). Also typical are short, sharp muscle contractions called myoclonic

jerks. Patients usually die before age 5, although some have survived in a vegetative state a few years longer.

- **Late infantile NCL (*Jansky-Bielschowsky disease*)** begins between ages 2 and 4. The typical early signs are loss of muscle coordination (ataxia) and seizures that do not respond to drugs. This form progresses rapidly and ends in death between ages 8 and 12.
- **Adult NCL (*Kufs disease or Parry's disease*)** generally begins before the age of 40, causes milder symptoms that progress slowly, and does not cause blindness. Although age of death is variable among affected individuals, this form does shorten life expectancy

How Many People have this Type of Disorder? Batten disease and other forms of NCL are relatively rare, occurring in an estimated 2 to 4 of every 100,000 live births in the United States. These disorders appear to be more common in Finland, Sweden, other parts of northern Europe, and Newfoundland, Canada. Although NCLs are classified as rare diseases, they may involve more than one person in a family.

How are NCLs Inherited? Childhood NCLs are autosomal recessive disorders; that is, they occur only when a child inherits two copies of the affected gene, one from each parent. When both parents carry one affected gene, each of their children faces a one in four chance of developing NCL. At the same time, each child also faces a one in two chance of inheriting just one copy of the affected gene. Individuals who have only one defective gene are known as carriers, meaning they do not develop the disease, but they can pass the gene on to their own children. Because the mutated genes that are involved in certain forms of Batten disease are known, carrier detection is possible in some instances.

Adult NCL may be inherited as an autosomal recessive or, less often, as an autosomal dominant disorder. In autosomal dominant inheritance, all people who inherit a single copy of the disease gene develop the disease. As a result, there are no unaffected carriers of the gene.

What Causes These Diseases? Symptoms of Batten disease and other NCLs are linked to a buildup of substances called lipofuscins (lipopigments) in the body's tissues. These lipopigments are made up of fats and proteins. Their name comes from the technical word lipo, which is short for "lipid" or fat, and from the term pigment, used because they take on a greenish-yellow color when viewed under an ultraviolet light microscope. The lipopigments build up in cells of the brain and the eye as well as in skin, muscle, and many other tissues. Inside the cells, these pigments form deposits with distinctive shapes that can be seen under an electron microscope. Some look like half-moons, others like fingerprints. These deposits are what doctors look for when they examine a skin sample to diagnose Batten disease.

The biochemical defects that underlie several NCLs have recently been discovered. An enzyme called palmitoyl-protein thioesterase has been shown to be insufficiently active in the infantile form of Batten disease (this condition is now referred to as CLN1). In the late infantile form (CLN2), a deficiency of an acid protease, an enzyme that hydrolyzes proteins, has been found as the cause of this condition. A mutated gene has been identified in juvenile Batten disease (CLN3), but the protein for which this gene codes has not been identified.

How Are These Diseases Diagnosed? Because vision loss is often an early sign, Batten disease may be first suspected during an eye exam. An eye doctor can detect a loss of cells within the

eye that occurs in the three childhood forms of NCL. However, because such cell loss occurs in other eye diseases, the disorder cannot be diagnosed by this sign alone. Often an eye specialist or other physician who suspects NCL may refer the child to a neurologist, a doctor who specializes in diseases of the brain and nervous system.

In order to diagnose NCL, the neurologist needs the patient's medical history and information from various laboratory tests. Diagnostic tests used for NCLs include:

- Blood or urine tests. These tests can detect abnormalities that may indicate Batten disease. For example, elevated levels of a chemical called dolichol are found in the urine of many NCL patients.
- Skin or tissue sampling. The doctor can examine a small piece of tissue under an electron microscope. The powerful magnification of the microscope helps the doctor spot typical NCL deposits. These deposits are common in skin cells, especially those from sweat glands.
- Electroencephalogram or EEG. An EEG uses special patches placed on the scalp to record electrical currents inside the brain. This helps doctors see telltale patterns in the brain's electrical activity that suggest a patient has seizures.
- Electrical studies of the eyes. These tests, which include visual-evoked responses and electroretinograms, can detect various eye problems common in childhood NCLs.
- Brain scans. Imaging can help doctors look for changes in the brain's appearance. A commonly used imaging technique is computed tomography, or CT, which uses x-rays and a computer to create a sophisticated picture of the brain's tissues and structures. A CT scan may reveal brain areas that are decaying in NCL patients. Another imaging technique that is becoming increasingly common is magnetic resonance imaging, or MRI. MRI uses a combination of magnetic fields and radio waves, instead of radiation, to create a picture of the brain.
- Measurement of enzyme activity. Measurement of the activity of palmitoyl-protein thioesterase involved in CLN1 and the acid protease involved in CLN2 in white blood cells or cultured skin fibroblasts can be used to confirm these diagnoses.
- DNA analysis. In families where the mutation in the gene for CLN3 is known, DNA analysis can be used to confirm the diagnosis or for the prenatal diagnosis of this form of Batten disease. When the mutation is known, DNA analysis can also be used to detect unaffected carriers of this condition for genetic counseling.

Is there any treatment? As yet, no specific treatment is known that can halt or reverse the symptoms of Batten disease or other NCLs. However, seizures can sometimes be reduced or controlled with anticonvulsant drugs, and other medical problems can be treated appropriately as they arise. Physical and occupational therapy may help patients retain function as long as possible.

Some reports have described a slowing of the disease in children with Batten disease who were treated with vitamins C and E and with diets low in vitamin A. However, these treatments did not prevent the fatal outcome of the disease.

Support and encouragement can help patients and families cope with the profound disability and dementia caused by NCLs. Often, support groups enable affected children, adults, and families to share common concerns and experiences.

Support and Research Resources

Where can I get more information?

For more information on neurological disorders or research programs funded by the National Institute of Neurological Disorders and Stroke, contact the Institute's Brain Resources and Information Network (BRAIN) at:

BRAIN
P.O. Box 5801
Bethesda, MD 20824
(800) 352-9424

<http://www.ninds.nih.gov>

Information also is available from the following organizations:

Batten Disease Support and Research Association
166 Humphries Drive, Reynoldsburg, OH 43068
Tel: 800-448-4570 740-927-4298 Fax: 740-927-7683

Children's Brain Disease Foundation
Parnassus Heights Medical Building, Suite 900, San Francisco, CA 94117

Nathan's Battle Foundation [For Batten Disease Research]
459 State Road 135 South, Greenwood, IN 46142
Tel: 317-888-7396, Fax: 317-888-0504

<http://www.nathansbattle.com>

Hide and Seek Foundation for Lysosomal Storage Disease Research
6475 East Pacific Coast Highway, Suite 466, Long Beach, CA 90803
info@hideandseek.org; <http://www.hideandseek.org>

For more information about the CO Services for Children and Youth with Combined Vision and Hearing Loss Project contact:

Tanni Anthony
Phone: 303-866-6681
Email: anthony_t@cde.state.co.us

Gina Quintana
Phone: 303-866-6605
Email: quintana_g@cde.state.co.us

Colorado Department of Education
Exceptional Student Leadership Unit
1560 Broadway, Suite 1175, Denver, CO 80202

Fax: 303-866-6767
Web Page Address:
www.cde.state.co.us/cdesped/Deafblind.asp

Fact Sheets from the Colorado Services to Children and Youth with Combined Vision and Hearing Loss Project are to be used by both families and professionals serving individuals with vision and hearing loss. The information applies to children, birth through 21 years of age. The purpose of the Fact Sheet is to give general information on a specific topic. More specific information for an individual student can be provided through personalized technical assistance available from the project. For more information call (303) 866-6681 or (303) 866-6605. Updated: 9/11