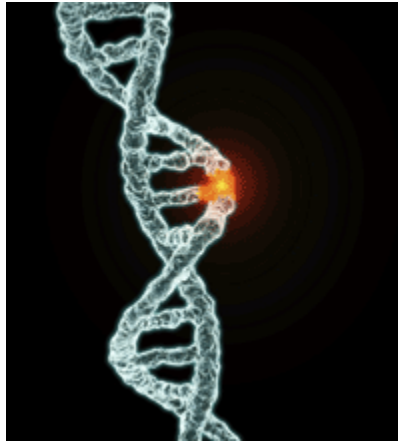


Genetics in Special Education Series

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Huntington Disease

What do we know about heredity and Huntington's disease?

Huntington's disease (HD) is an inherited neurological illness causing involuntary movements, severe emotional disturbance and cognitive decline. In the United States alone, about 30,000 people have HD. In addition, 35,000 people exhibit some symptoms and 75,000 people carry the abnormal gene that will cause them to develop the disease. There is no cure for this fatal disease.

A single abnormal gene produces HD. In 1993, scientists finally isolated the HD gene on chromosome 4. The gene codes for production of a protein called "huntingtin," whose function is still unknown. But the defective version of the gene has excessive repeats of a three-base sequence, "CAG." In the normal huntingtin gene, this sequence is repeated between 11 and 29 times. In the mutant gene, the repeat occurs over and over again, from 40 times to more than 80.

This defect causes the resulting huntingtin protein to be malformed, prone to clumping in the brain and causing the death of nearby nerve cells. Cells of the basal ganglia, a brain area responsible for coordinating movement, and of the cortex, which controls thought, perception and memory, are most often affected.

Since the gene that causes HD is dominant, each child of an HD parent has a 50-50 chance of inheriting the HD gene. The child needs only one copy of the gene from either parent to develop the disease. A person who inherits the HD gene, and survives long enough, will sooner or later develop the disease. If the child does not inherit the defective gene, the child will not get the disease nor pass the gene on to subsequent generations. Symptoms of HD generally appear in mid-life.

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Myotonic Dystrophy

What is myotonic dystrophy?

Myotonic dystrophy is an inherited type of muscular dystrophy that affects the muscles and other body systems. People who have myotonic dystrophy have muscle wasting and weakness in their lower legs, hands, neck and face that get worse over time. Signs and symptoms of myotonic dystrophy usually develop when a person is in his or her twenties or thirties. The severity of myotonic dystrophy varies widely among those who have it, even among family members.

The weakness and muscle wasting that occurs slowly progress to the point of disability. Usually, disability does not become severe until fifteen to twenty years after the symptoms appear. The progression of muscle weakness is slower and is less serious in people who are older when the muscle weakness is first noticed.

There are two types of myotonic dystrophy: Type 1 and Type 2. The two types are caused by alterations (mutations) in two different genes. The symptoms of Type 2 myotonic dystrophy are usually milder than those of Type 1. A severe type of Type 1 myotonic dystrophy can be seen at birth. This form of Type 1 is called congenital myotonic dystrophy. Congenital myotonic dystrophy has only been seen in Type 1 myotonic dystrophy and not in Type 2.

Myotonic dystrophy is the most common form of muscular dystrophy that begins in adulthood. It affects about 1 in 8,000 people worldwide. Type 1 myotonic dystrophy is the most common form in most countries. The commonness of the two types depends upon a person's ethnic background. For example, Type 2 myotonic dystrophy is as common as Type 1 in people who have German ancestry.

What are the symptoms of myotonic dystrophy?

People who have myotonic dystrophy have progressive muscle wasting and weakness beginning in their 20's or 30's. The muscle wasting and weakness develop in their lower legs, hands, neck and face. They also have stiffness and tightness of their muscles (called myotonia), so they are slow to relax certain muscles after using them. Not being able to release their grip on in a handshake or a doorknob is one example of this problem.

In addition to muscle weakness and wasting, people who have myotonic dystrophy have clouding of the lens in their eyes (cataracts), and irregularities in the electrical control of their heartbeat (cardiac conduction defects).

Men who have myotonic dystrophy have changes in their hormones that can cause balding and sometimes the inability to father a child (infertility).

Babies who are born with signs and symptoms of myotonic dystrophy have congenital myotonic dystrophy. They have weakness of all their muscles, breathing problems, and developmental delays including mental retardation. Sometimes these medical conditions are so severe they may cause death.

Myotonic dystrophy is diagnosed by doing a physical exam. A physical exam can identify the typical pattern of muscle wasting and weakness and the presence of myotonia. A person with myotonic dystrophy may have a characteristic facial appearance of wasting and weakness of the jaw and neck muscles. Men may have frontal balding.

There are several laboratory tests that can be used to clarify the clinical diagnosis of myotonic dystrophy. One test, called electromyography (EMG), involves inserting a small needle into the muscle. The electrical activity of the muscle is studied and usually shows characteristic patterns of muscle electrical discharge.

The definitive test for myotonic dystrophy is a genetic test. For this test, a blood sample is taken to identify the altered gene (mutation) within the chromosomes which are contained within the white blood cells. Gene alterations in two genes - [CNBP](#) and [DMPK](#) - cause myotonic dystrophy. Myotonic dystrophy Type 1 is caused by a mutation in the *DMPK* gene. Type 2 myotonic dystrophy is caused by a mutation in the *CNBP* gene. Mutations in each of these genes involve a short segment of DNA that is abnormally repeated many times. This abnormal repetition forms an unstable region of the gene. These changes keep cells in the muscles and other body tissues from functioning normally, leading to signs and symptoms of myotonic dystrophy.

What is the treatment for myotonic dystrophy?

There is currently no cure or specific treatment for myotonic dystrophy. Ankle supports and leg braces can help when muscle weakness gets worse. There are also medications that can lessen the myotonia. Other symptoms of myotonic dystrophy such as the heart problems, and eye problems (cataracts) can also be treated.

Is myotonic dystrophy inherited?

Both Type 1 and Type 2 myotonic dystrophy are inherited in families in an autosomal dominant pattern. In autosomal dominant inheritance, having one copy of the altered (mutated) gene in each cell will cause the disorder. Usually a person who has myotonic dystrophy also has a one parent who has myotonic dystrophy.

In families that have myotonic dystrophy, the altered gene is passed down from one generation to the next. The disorder may begin earlier in life and signs and symptoms become more severe. This is called anticipation. In Type 1 myotonic dystrophy, anticipation happens because there is an increase in the length of the unstable region in the *DMPK* gene (expansion). The cause of anticipation seen in families who have Type 2 myotonic dystrophy is not yet known.

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