YORKSCIENCE

Muscular Dystrophy: plague and puzzle

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As the boy grows he becomes progressively weaker and weaker.

The experience of learning to walk is of no use to the adolescent, for now he is lame, and before adulthood he'll be confined to a wheel chair.

Soon after, he'll be dead.

This is the standard scenario for those having an hereditary disease generally known as Duchene's disease, a form of muscular dystrophy; a crippler of millions.

Meanwhile, somewhere in a mudpond, or on a seashore, a salamander has just had his leg chewed off. He limps away, but after a period of time a new limb begins to appear. Soon the new leg fully replaces the lost limb and the salamander is back to his old self, happily walking away.

What does the loss of a leg have to do with a dangerous killer disease? A lot, or so Dr. David Logan believes.

Logan is a professor and research biochemist with the York Biology Department. Along with his group of graduate students and researchers from various disciplines at Yale, Case Western Reserve and McMaster Universities, Dr. Logan is out to beat hereditary diseases such as muscular dystrophy.

Studying the regeneration of amphibian appendages is only one novel way of looking at this problem, and at the present seems one of the most successful.

Not Much Hope

For many diseases, we know the cause; a virus, some bacteria, a defective molecule, or an enzyme in the body is missing. However, there is a group of illnesses having known symptoms, but unknown causes. These are often tragic genetic diseases such as muscular dystrophy, and others. "It is difficult to be hopeful, for parents of a stricken child," states Dr. Logan.

The origin of muscular dystrophy is not known to scientists, however, they can predict the probablility of its occurance in an offspring of a family having a history of this disease. The disease progressively attacks the body's muscles and causes them to degenerate over a long period of time.

Cells Grown to Study Disease

The difficulty of knowing the primary defect in muscular dystrophy makes it very hard to attack the disease. There are numerous ways that you could look at the problem. One viewpoint says that there is actually nothing wrong with the muscles and the problem has to do with defective nerves. According to this theory, something has gone wrong in the transmission between tissues and nerves.

To study this, Logan's group is looking at the nerve and tissue interaction of amphibians such as salamanders and newts, which are able to regenerate lost limbs. The problem for the scientist is to find something specific to measure, that is, an "assay".

Cells from the scab of an amputated newt or salamander can be grown in culture dishes and tested with chemicals obtained from the nerves. Dr. Logan was the first to develop an *in vitro* measurement procedure for substances, produced only by nerves, called neurotrophic factors, which stimulate growth and differentiation in cultured cells.

Logan indicates the excitement and significance of this knowledge, "We now know that the nerve provides for the regulation of growth; this is the *what* of research; next we need to know the *how*."

To study the *how*, Dr. Logan is growing individual tissue cells to be used in muscular dystrophy experiments. He can develop a miniature nerve muscle system to the point where it can be stimulated to twitch. These cells can then be used to test how regulatory factors work." Unfortunately, talking over cocktails, you invent wondrous solutions, but on Monday mornings they don't look quite as snappy as they did Saturday at midnight," admits Dr. Logan.

Complex Disease

Other approaches are also being followed. We know that the membrances (external surfaces) of muscles and other tissues in muscular dystrophy patients are somehow "different" from those in normal patients. For example, certain chemicals "leak out" of the muscles of stricken patients and may be detected in the blood. As well, their red blood cells are found to be physically weaker and defective when compared to normal cells. the problem is to explain this change.

Dr. Logan does this with an allegory: "If you bought Saran Wrap which broke when you blew on it instead of stretching, how could you go back to analyze what had originally gone in making it? This would be a hell of a problem. In biological systems you have the same problem and you have to back up to find out what caused it."

Two groups of molecules have been identified for study: free cholesterol and esterified cholesterol. Dr. Logan has shown that for both animals and people having muscular dystrophy, the proportion of these substances are all "screwy". The patterns change and no chemical link has yet been definitely established. "Some concentrations are up, some are down...it's as if someone threw in a wrench," explained Dr. Logan.

Long Road to Cure

The problem remains to find the primary defect in muscular dystrophy. For such genetic diseases there is only one genetic mistake in the system. However, what can happen as a result often cannot be anticipated.

In the future, much work remains to be done. Logan belives that in the event that there is a major breakthrough and we are successful in identifying the basic problem, we may still not be able to prevent the disease. The technology is not yet available for genetic control which may be required to completely beat muscular dystrophy.

However, in this rapidly developing field new ideas and developments are appearing daily. It is possible that the cure for muscular dystrophy is being discovered at this very moment.