

Fact Sheet # 3 Poliomyelitis Fact Sheet

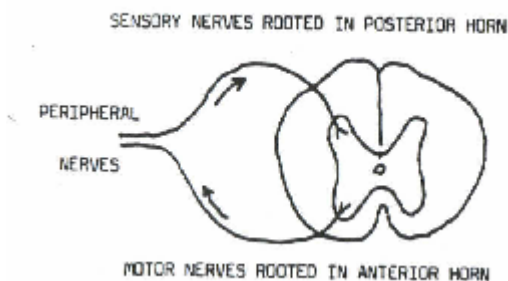
An Overview of Polio and its Late Effects

There are four generally recognized forms of poliomyelitis: the Asymptomatic Carrier, the Abortive, the Non-Paralytic, and the Paralytic. The first two have no known lasting effects and will not be dealt with in this reference.

The non-paralytic form of poliomyelitis is usually indicated by nausea, headache, sore throat, back and neck pain, and stiffness. In addition, there are changes in reflexes and an elevated spinal fluid cell count. It is estimated that 65 percent of recognizable cases during the polio epidemics were non-paralytic. It is possible that there may be some unrecognized muscle involvement.

Paralytic poliomyelitis shows the same symptoms as the non-paralytic plus weakness in one or more muscle group. It is commonly classified in the following manner: **SPINAL:** this type is most frequent and is associated with involvement of the trunk or extremities, more often the lower extremities. Weakness does not fit any pattern. **BULBAR:** symptoms can include difficulty in swallowing, loss of voice quality, and sometimes tongue and facial paralysis. **BULBOSPINAL:** this type of involvement is usually severe and is associated with respiratory impairment. Ten to twenty-five percent of the paralytic cases seen during the polio epidemics were of the bulbar or bulbospinal type.

The polio virus affects the body by attacking the central nervous system, specifically the anterior horn cells. These motor neurons are located in the front part of the spinal cord and are essential for any muscle activity.



This simplified diagram shows a cross section of the spinal cord. The motor neurons rooted in the anterior horn travel outward through the peripheral nerves to innervate muscle fiber. Depending on the location of the muscles they supply, these motor neurons can be a few inches or several feet long. Sensory nerves travel from their specialized receptors to the spinal cord and enter the posterior horn. Sensory nerves are rarely affected by the polio virus.

Many individuals lost considerable function during the acute stage of polio but regained a large part of that function. It appears, however, that a percentage of these individuals are experiencing renewed weakness, sometimes accompanied by fatigue or pain. Definitive studies are incomplete, but the best medical evidence at this time would indicate that a combination of factors associated with overuse is responsible.

If we take a closer look at the recovery process, we can see why this is so. The polio virus attacks randomly. Sometimes motor neuron damage is not severe and the cells can recover much of their function. Other neurons may sustain more complete and irreversible damage. Even if this is the case, however, function can often be restored by "sprouting". Motor neuron cells have the ability to send out new axons that can innervate neighboring muscle fibers whose own neurons have been destroyed. Motor neurons normally innervate between 200 and 500 individual muscle fibers. If a percentage of motor neurons are destroyed, and sprouting takes place, the remaining motor neurons may be innervating as much as four times the normal amount of muscle fiber. It is assumed that the additional load that this places on motor neuron metabolism will, over the years, cause a failure of impulse strength. This seems to begin about 20 to 30 years after polio onset, and is probably a contributing factor for the renewal of weakness.

Another possible cause for this renewed weakness, especially in older individuals, is the normal loss of motor neurons. This is a natural part of aging. It is estimated that a person will begin to lose about one percent of their motor neurons per year after the age of 60. This is not very significant if an individual starts with 100% of their motor neurons, and all are intact and undamaged. Unfortunately, this is not the case with many older polio survivors. Their supply was depleted by the polio virus, and this gradual loss will have a much greater impact.

Some individuals may have gained a degree of recovery by building up the strength of their remaining musculature by exercise and intense use, similar to athletic training; a term called hypertrophy. These individuals, however, used this strength in their day-to-day activities and thus the muscles have been performing continually at a level that is no longer tolerated.

In addition, many affected muscles that were believed to be "good" or "normal" with manual testing, have been found to be less than this when electromyography (EMG) and other studies were done. In normal activities these muscles have also been working harder than was once believed.

Muscle weakness due to polio is often asymmetrical. This can put added stress on the entire neuromuscular system, as well as adding strain to joints and supporting ligaments. The result may be an increase in arthritis-like pain.

The question now arises, what can be done to alleviate this condition or prevent the further degradation of muscle strength?

First, an individual should seek medical advice to rule out other possible causes for their symptoms. Just because a person has had polio does not make them immune from other physical ailments. Second, it is highly recommended that a complete physical evaluation be done. This should include examination by an orthopedic specialist, and complete pulmonary function tests. Ideally, these should be done by physicians who are familiar with polio. You should ask for these test results in writing. Even if no immediate problem exists, this will provide a baseline for measuring your future status.

Lifestyle modification is the most important therapy for new weakness. This will reduce the strain placed on the body. Learning to listen to the body's signals is vital to any plan designed to reduce further degradation or muscle strength. If you are tired, rest. If you hurt, stop. They used to say, "Use it or lose it!" Now we say, "Conserve it to preserve it!" An orthopedic specialist may recommend braces, or other assistive devices, to help relieve the stress that is being placed upon weakened muscles and joints. In some cases this is sufficient to halt the progression of weakness. Selective surgery can sometimes redistribute the residual control so that strain is reduced.

Using assistive devices (electric wheelchairs, scooters, etc.) is resisted by some individuals. They feel that they are "giving in" to their new symptoms. What they assume to be a burden can actually be very liberating. Using these aids will allow them to conserve their energy for those activities that they feel are most important.

Because pulmonary function has such an important bearing on an individual's general health, this area deserves special emphasis. Standard tables for vital capacities list variables for age and height. These may not have much relevance for many of us. Actual volume, measured in liters or milliliters, is a better indicator of pulmonary status. This test, usually done with a spirometer, is simple and non-invasive. It is a good idea to have your vital capacity measured lying down, as well as sitting. For anyone with a volume of less than two liters a follow up should be made at least yearly.

Arterial blood gas measurements for CO₂ may be warranted. Generally, CO₂ levels between 35 and 45 are considered normal. The CO₂ level in your blood can become elevated, gradually, without one being aware of the change. If the level becomes high enough, the blood's ability to carry oxygen will be impaired. This could result in headaches or interrupted sleep patterns and may be an indicator of respiratory insufficiency. Respiratory function can also be affected by scoliosis or a reduction in rib cage flexibility that often occurs as a person ages.

Many individuals have asked about the role of exercise for those experiencing the late effects of polio. Unfortunately, the jury is still out on this question. There have been studies that indicate a ten percent increase in muscle strength following closely monitored exercise programs. But the number of participants was too small to come to any definite conclusion. If a person feels they may benefit from additional exercise then an aerobic type of exercise is probably best. A twenty minute program consisting of two to three minutes of activity followed by a minute of rest could be tried. If this makes you feel better continue, but if pain or fatigue results, reduce the exercise until you find a level

that can be tolerated. Stopping completely may be best. A significant percentage of polio survivors get all the exercise they can tolerate in their activities of daily living. And, if it is true that overuse is a contributing cause of renewed muscle weakness then strenuous exercise regimens should be approached with caution.

The United States Department of Health estimates that there are about 1.6 million polio survivors. This would make polio the second largest cause of disability in the U.S. Only stroke survivors constitute a larger group. Although a significant percentage of these polio survivors are experiencing some late effects there is no reason to expect that all individuals will be affected.

If you would like more information on this and related topics we recommend you read the various publications of the Gazette International Networking Institute (G.I.N.I.). The Rehabilitation Gazette, and its predecessor the Toomey J. Gazette, has been published since 1958. It comes out twice a year and a subscription is \$ 12.00 for individuals. The Polio Network News is published quarterly and a subscription is \$ 20.00 for individuals. International Ventilator Users Network (IVUN) News is also published quarterly and is \$17.00 per year for individuals, and is an excellent resource for those with pulmonary impairment. The "Handbook on the Late Effects of Poliomyelitis for Physicians and Survivors", copyright 1999, contains useful information on polio and related subjects. This 120 page booklet is \$ 15.00 plus \$ 3.50 S&H. Inquiries relating to these publications should be directed to G.I.N.I. at 4207 Lindell Boulevard, #110, St. Louis, MO 63108. Telephone (314) 534-0475, fax (314) 534-5070, or email gini_intl@msn.com.

This Poliomyelitis Fact Sheet© is published by the Polio Survivors Association, a non-profit corporation. The Association is dedicated to improving the lives of disabled polio survivors, and helping to educate survivors and physicians about the problems associated with polio. Inquiries should be addressed to: Polio Survivors Association, 12720 La Reina Avenue, Downey, CA 90242.