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What we also need to know about the post-polio-syndrome (PPS)

Is it a recurrence of polio – is it starting all over again?

Why?

What can we do?

by

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Everything seemed so simple – poliomyelitis, mostly called "polio" or vernacularly as "infantile paralysis" – was, or seemed to be a disease of the past.

True – some people were struck more or less seriously. Apart from these few exceptions, most of them recovered quite well, their physical strength and endurance remained stable over many years, and with plenty of physical exercise and driven by the ambition, i.e. striving to be like the others or even better, they mastered their lives and may possibly have achieved more than they would have done if they had not had polio.

In our western hemisphere, polio is no longer existent. Extensive vaccination programs have eliminated the disease. Due to its eradication, medical knowledge about the disease was stunted because it was no longer needed.

And then – decades later – new symptoms began to crop-up, similar to those experienced during the acute stage of the infection. These symptoms are:

- New weaknesses in muscles already affected on the first infection but also in those, which previously seemed to have been unaffected,
- considerable diminishing of strength and endurance and therefore
- difficulties in walking and climbing stairs,
- abnormal conditions of exhaustion (so-called fatigue),
- pains in muscles and joints,
- abnormal sensitivity to cold – unknown before – high or increased sensitivity to cold as well as low or decreased reactivity to cold
- difficulties of breathing and even swallowing, and
- sleep problems, such as "sleep apnea".

Should the patient consult his doctor about these symptoms he will normally receive such frustrating comments as: "Well, we're not getting any younger, are we!" or "Normal signs of aging!" or "Increased wear and tear by permanent misuse!" or "Don't make a fuss!" or "Pull yourself together, then everything will be alright!" or "Laboratory tests don't show anything whatsoever!" or even be classified as being a "malingerer".

What's it all about?

We now know that a whole range of fatal processes take place during the acute state of a polio infection. These processes were formerly unknown or remained unnoticed. I would therefore like to stress here the three most important:

1. Most poliomyelitis infections remain completely unrecognized because the symptoms appear only on an extremely small number of affected persons. So many infected with poliomyelitis viruses don't know at any time of their lives that they have ever gone through a polio infection.
2. During each polio infection quite a lot of nerve cells for muscle movement are destroyed or damaged. These cells are called α -motor neurons. They are located in the so-called fore horns of the spine (therefore also called "motor fore horn cells"). It is important to know that motor cells are not only destroyed or damaged in the spinal cord but also in control centres of the brain (the so-called – central nervous system – CNS). Therefore, the virus always causes damage, no matter whether the patient has fallen ill with light flu-like symptoms or with paralysis or whether he seems apparently symptomless and in principle as fit as a fiddle.
3. We now know that symptoms only appear if more than 50% of the nerve cells in an associated motor unit are unable to function. Like other vital organs (e.g. the liver, the kidneys, the lungs, etc), the nervous system is also laid out with large cell reserves which are able to compensate any possible damages. In practice that means that the infected patient who shows no symptoms only appears to be healthy, in reality however, the virus has caused damage to the nerve cells even if it's only under 50%. The same is true for those muscle areas that seem to be unaffected in people who actually have had paralysis.

Depending on the degree of damage – the organism, which has gone through a polio infection, is capable of coping more or less with the remaining, apparently unaffected motor neuron cells.

In cases where the virus caused serious damage, such as paralysis, the few cells that remained functional must take over the work of all the other cells that have died. As a result, the so-called "motor units" enlarge. In some cases the per-

formance requirements on the remaining cells increase quite considerably. Many people with polio who have paralysis live and work to their utmost limits – or even beyond. Such a condition cannot continue indefinitely. At a certain stage – mostly after tens of years – the totally overworked nerve cells stop their activities and start dying. Again previous symptoms well-known before (see above) re-appear – the late effects of polio – the post-polio-syndrome (PPS).

We have come to realize that our nervous system unfortunately has not kept with the times and has not founded a "trade union of neuronal conscience", perhaps named ONCA ("overworked nerve cells association"). This "trade union" would have prohibited us long ago to work under such camel-driven and strength-depleting conditions and indeed would have gone on a recovering, nerve-protecting strike much earlier.

In medical terms, this condition of nerve cells failing to function or dying is called "neuron degeneration". The acute poliomyelitis and its late complications in the form of the post-polio-syndrome, belong to the numerous "neuron degenerative" diseases. The causes for neuron degeneration are practically unlimited and follow us throughout our lives. Each of us know the term "aging", which amongst other causes, is determined by the process of neuron degeneration (a decreasing ability of mental and physical strength in old age).

Now, we ask ourselves the question: which causes of this neuron degeneration are particularly important for us:

- **Aging process**

The aging process is partially determined by the genes we inherit from our parents and ancestors, is partially determined by our life style, the food we eat, the environment we live in, the diseases we have had, etc.

- **Neuron toxic substances**

Alcohol, smoking, medication, toxic agents (environmental poisons, food additives, etc.)

- **Circulatory problems.**

Polio mostly affects children and young people and due to the paralysis impairs growth – the blood vessels are underdeveloped and blood circulation is slowed down in the affected areas of the body. Circulatory problems are also caused by long-term high-blood pressure resulting from the permanent overstrain of the remaining functional muscle system. Another reason for circulation problems is the lack of physical activity.

- **Free radicals and oxidative stress**

We need oxygen to live, but unfortunately it is also an agent, which during the cell metabolism produces dangerous cell toxics – the so-called free radicals or oxidants. These can attack our body cells, can damage or even destroy them. They also get into our body from outside (through the food). Our environmental pollution favours the formation of these toxics (as e.g. does ultra-violet radiation). Free radicals, which are formed in the breathing chain of cell metabolism, but also free radicals of our environment are, in chemical terms, instable molecules with one or more "free" electrons. This tends to make them very aggressive as they are continuously trying to draw electrons from other sources, causing the donator molecule to de-stabilize. The free radicals, which are formed most frequently in the body and that in great numbers, are: the singulette oxygen (O^{\cdot}), the superoxide anion ($O_2^{\cdot-}$), hydrogen peroxide (H_2O_2) and the hydroxylradical (OH^{\cdot}).

On the other hand, we must point out that the free radicals are also essential for the human being, and that a deficiency could lead to infections and to malfunctioning of several metabolic processes. Therefore we must try to keep a balance between the so-called (Pro)oxidants and the antioxidants (so-called radical catchers). The antioxidants must be obtained through the normal food chain because our body is not able to produce them itself. Important antioxidants in our food are:

- ◇ Vitamin C and E as well as pro-vitamin A (beta-carotene),
- ◇ over the chemical detour of enzymes the trace elements selenium, zinc, copper and iron,
- ◇ vitamins B_2 and B_3 ,
- ◇ as well as secondary plant substances like flavonoides (red substances in tomatoes, red wine etc).

- **Excitatory Neurotransmitters (glutamate NMDA, AMPA...)**

Neurotransmitters are messengers, which pass on information from one nerve cell to another via contact points called synapses. After their release they get deactivated and / or removed through various pathways. The most frequently excitatory transmitter in the central nervous system is glutamate. The most frequently inhibitory transmitters in the nervous system are the gamma-amino-butyric-acids (GABA) and glycine. Other well known transmitters are norepinephrine, acetylcholine, dopamine, serotonin or endorphine.

Since a strong increase of excitatory neurotransmitters during excessive strain can already cause a neuron degeneration, a permanent overuse, however, and particularly nervous stress may speed up the onset of a post-polio-syndrome. This knowledge has been gained over the past years. Periods of rest, however, are "balsam" for our nervous system.

- **Programmed cell death** (apoptosis).

The apoptosis is a form of programmed cell death – an active self-destruction of the cell. This destruction is necessary to ensure plasticity in the central nervous system. It renders the organism capable of adjusting to ever changing requirements.

- **Decrease of nerve growth factors**

The nerve growth factor – NGF – is part of the group of neurotrophines and exerts a stabilizing effect on synaptic connections. A deficiency in the NGF will lead to an increasing dying of nerve cells (programmed cell death, apoptosis). The functions of other neurotrophines are like that of the nerve growth factor NGF. They ensure the survival of cells and are involved in memorizing information lifelong.

What is really helpful now in our particular situation as a polio victim or post-polio patient?

All measures suitable for slowing down and delaying the speed of neuron degenerative processes:

- ✓ Avoid excessive physical strain (optimize your personal lifestyle – plan your daily and weekly work schedule – set priorities – plan the way you do your work – make a work chart [Do I have to do the work myself? Do I have to do it the way I have always done it up to now? Do I have to do it now? Can I delegate it?]) – put in breaks and plan more periods of rest, sufficient relaxation and sleep – find time "just for yourself"– early use of aids (such as orthoses, wheelchairs, and whatever helps us in facilitating our life)
- ✓ Avoid or reduce emotional stress – teach yourself optimal stress management and relaxation of body and soul.
- ✓ Make sure you have a balanced diet rich in vitamins (whole-meal food, less fast food or business catering, etc.) with sufficient contents of natural antioxidants as well as moderate consumption of alcohol.
- ✓ Ensure you get sufficient exercise (maintain muscle strength by moderate physiotherapy on a neural physiological basis, swimming, exercise in limits)
- ✓ Avoid environmental toxics (such as tobacco smoke, exhaust fumes, environmental poisons, artificial food additives, etc.)
- ✓ Be careful with medication

Food additives (vitamins, trace elements, L-carnitine, creatine, Q10 (ubichinone) and others) are basically not necessary if a balanced diet with natural food is ensured. They only enrich manufacturers and trade, and needless to say, cost us lots of money.

The neuronal performance in dependence on inheritance, age, life style, diseases, environment etc.

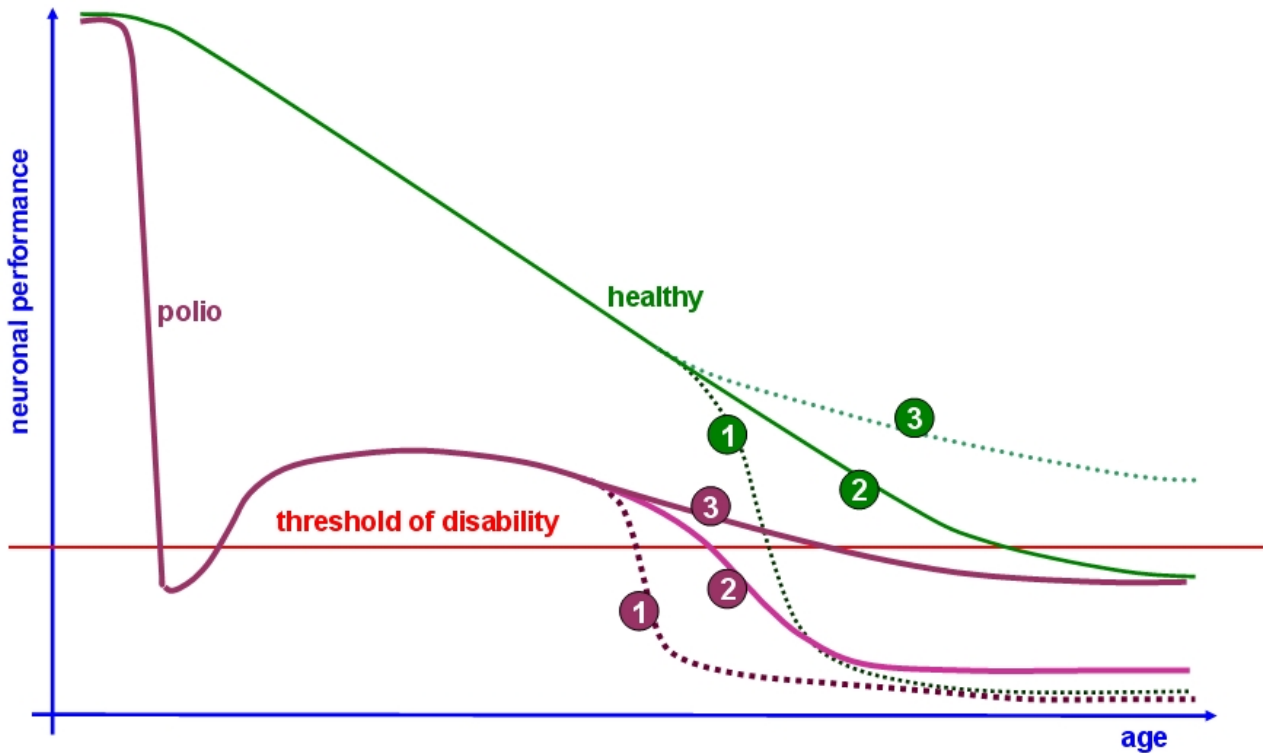


Fig. 1: It is largely a question of time when the threshold of disability is exceeded in dependence on inheritance, age, life style, diseases, environment etc. ❶ = under bad conditions, ❷ = under normal conditions, ❸ = under excellent conditions. Red marks for polio-survivors, green marks for healthy individuals.

One can see, that under excellent conditions (genes for high life expectancy, exemplary lifestyle, a balanced diet rich in vitamins with sufficient contents of natural antioxidants as well as moderate consumption of alcohol and a far-reaching renunciation of toxics such as tobacco smoke, exhaust fumes, environmental poisons, artificial food additives, only few further illnesses, maximum reduction of stress etc.) for polio-survivors it is possible to live above the threshold of disability almost just as long as a healthy person under normal conditions.

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