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BDNF and 'Neurobics': building a 'beautiful mind' against Huntington's

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At Risk for Huntington's Disease

HD is a genetically caused brain disorder that causes uncontrollable bodily movements and robs people's ability to walk, talk, eat, and think. The final result is a slow, ugly death. Children of parents with HD have a 50-50 chance of inheriting the disease. There is no cure or treatment.

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BDNF and 'Neurobics': building a 'beautiful mind' against Huntington's

To avoid the onset of Huntington's disease, whose killer gene I inherited from my mother, I must do all I can to protect my brain.

In 2001, two years after testing positive for HD, I was inspired by the film *A Beautiful Mind* to try to think my way to cerebral health. In that film, starring Russell Crowe and Ed Harris (two of my favorite actors), the true-life figure of Nobel Prize-winning mathematician John Nash used his intelligence to distinguish the hallucinations of his schizophrenia from reality and to regain a normal life.

In effect, Nash tricked his symptoms.

I didn't believe that I could trick HD. Like schizophrenia, HD is a brain disorder, but with far more devastating symptoms – and without a treatment for its root causes. Schizophrenia can be controlled with medication. HD cannot. And, whereas the causes of schizophrenia are thought to be a combination of genetic and environmental factors, HD is completely genetic, with 100 percent of gene-positive individuals eventually becoming symptomatic.

Tricking a gene like that seemed impossible.

Working the brain to exhaustion

But I *did* believe that keeping an active mind, thinking positively, and working for a cure for HD might allow me to delay onset.

My job as a college professor already provided wonderful stimulation for my brain. I read, wrote, traveled, and lectured regularly. Contact with the young, vibrant students kept me feeling young myself.

As a member of the board of directors of the San Diego chapter of the Huntington's Disease Society of America (HDSA-San Diego), I took on the hugely stimulating, and time-consuming, task of writing, editing, and producing the organization's tri-annual newsletter. Using skills gained in my former work as a journalist and my current career as a historian, I delved into the harsh reality of HD as well as the growing body of scientific research towards treatments and a cure.

I ran the newsletter until 2007. During that time, I watched my mother rapidly decline and ultimately die of HD in early 2006, and I rode the emotional roller-coaster of wondering and waiting about the onset of my own symptoms.

I had purposely over-stimulated my brain – many times to the point of exhaustion.

A self-fertilizing garden

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In the mid-2000s, I began reading about a new discovery about HD and the brain that provided me with another tool to build my "beautiful mind" against onset: I could increase the amount of a crucial substance for brain health known as BDNF (brain derived neurotrophic factor) by exercising.

A nutrient, BDNF acts like fertilizer for the brain. It is produced in the cortex, the convoluted, outer hemispheres of the brain, and transported into the striatum, the inner, lower level of the brain. Thus, in the words of researchers, our brains function like "a self-fertilizing garden."

The striatum happens to be the area of the brain most affected in Huntington's disease. Starting in the early 2000s, scientists working with HD mouse models observed that BDNF levels fell dramatically in the striatum. The lower the amount of BDNF in the mouse brains, the earlier and more severe was their HD onset.

"The promising new findings about BDNF can be exploited even today," wrote Dr. Marsha Miller on the Huntington's Disease Lighthouse Family website in 2006 (click here to read more). "There are easy, cheap, reasonably safe ways for people to increase BDNF levels in the brain. Exercise, maintaining a reasonably low weight, and enjoying a stimulating, but not overly stressful, social and mental life all raise BDNF levels. Other BDNF enhancers include the antidepressants known as selective serotonin-reuptake inhibitors (SSRIs), such as sertraline, and a few other drugs."

This was excellent news for all gene-positive and symptomatic HD people. We could actually increase BDNF in our brains and therefore perhaps delay the onset of the disease or slow down the progression of symptoms!

A hot topic

BDNF was a hot topic at the 2011 Sixth Annual HD Therapeutics Conference from February 7-10, 2011, in Palm Springs, California. In addition to keynoting this meeting, I reported on the scientific presentations. The event was sponsored by the CHDI Foundation, Inc., the so-called "cure Huntington's disease initiative," a multi-million-dollar program backed by anonymous donors.

In his presentation on brain receptors that link up with BDNF, Dr. Moses Chao of the New York University School of Medicine observed that research shows that the lack of the substance helps cause the neuropsychiatric symptoms of HD (such as depression).

BDNF, he observed, contributes to a number of important activities in the brain, including the development of the cytoskeleton (the skeleton of the cell) and the ability of the synapses to adjust their strength. BDNF also helps cells survive.

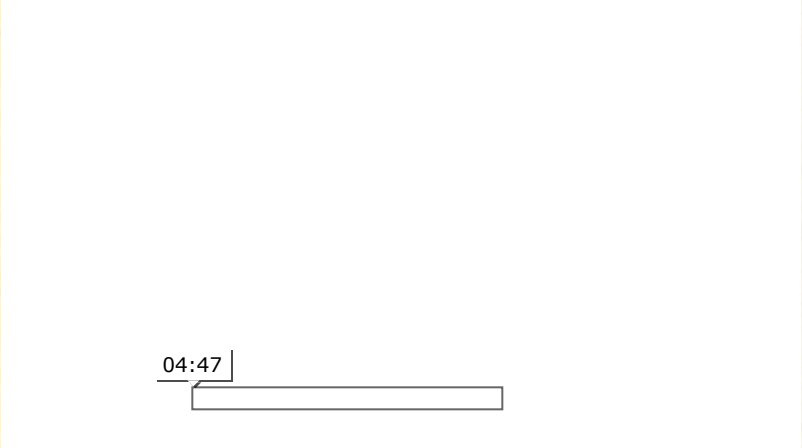
As Dr. Chao pointed out, scientists first thought it might be possible to inject BDNF directly into the brain to help patients. However, in their experiments they encountered difficulties in delivering the BDNF, and it proved to be very "sticky," meaning that it did not move easily in the brain. There were also negative side effects.

More recently, Dr. Chao explained, scientists have sought ways to bypass these problems. That research has focused on the BDNF receptors, molecules in the brain that link to BDNF so that it can carry out its tasks. Scientists are also examining substances that can bind to the receptors and act as a substitute for BDNF.

There may be other ways to raise the amount of BDNF. Dr. Allan Tobin of CHDI, for instance, has conducted a workshop to investigate the use of molecules that could mimic the effect of exercise on the brain and

therefore increase BDNF levels.

For further details on the importance of BDNF and the research efforts towards BDNF-based HD treatments, watch the short video below by Dr. Jody Corey-Bloom of the HDSA Center of Excellence for Family Services and Research at the University of California, San Diego.



For additional background on BDNF, visit the Huntington's Disease Lighthouse Family. Also see the report on the CHDI meeting at HDBuzz.

For the latest in HD stem-cell research and BDNF, watch the video below by Dr. Jan Nolta, Professor in the Department of Cell Biology and Human Anatomy and Director of the Stem-Cell Program at the University of California, Davis.

Thinking about exercise

To increase my own BDNF, I exercise regularly.

In 2009, when my wife and I decided to build a pool in our back yard, I installed a Fastlane swimming device that creates a powerful current against which I swim. Weather and time permitting, I try to swim 30 minutes three to five times per week.

I try to vary my exercise routine at least a bit. A few years ago, I went through a cycling phase. At times I also have used an elliptical machine for cross-training of the arms and legs.

Now I alternate swimming with 30- to 40-minute walks with my dog Lenny, a three-year-old male cockapoo full of love and energy.

I read once that, in order for exercise to provide maximum benefit for the

body, the individual must *think about the exercise* while he or she is performing it.

So, for example, I don't listen to music when walking. And I stopped using the elliptical while watching television.

While swimming in recent months, I have imagined BDNF bathing my brain. In my mind, as I stroke against the current, I sometimes chant a mantra: B-D-N-F.

As I wrote in my blog notes the other day, for me BDNF signifies "beautifully derived neurotrophic factor."

Breaking the routine

After my September 21, 2011, entry titled "Waiting for symptoms: How long can I hang on?", Dr. Chao wrote me an e-mail encouraging me to work on increasing my BDNF levels "through increased exercise or any other kind of novel activity (travel, learning a new language, etc.)."

I asked Dr. Chao to comment on a recent study that had left me puzzled and worried after I read about it during the summer. Investigators at the National Institutes of Health found that a particular kind of transgenic HD mouse, living in a cage where it could use a running wheel, became symptomatic earlier, had more severe impairments, and suffered greater damage to the striatum *because of exercise!*

Dr. Moses Chao at the 2011 CHDI HD Therapeutics Conference (photo by Gene Veritas)

"The article on the detrimental effects of exercise was carried out with a transgenic HD animal model that has not been well studied," Dr. Chao responded. "I suspect it develops some pathology early on that might interfere with exercise. One issue about exercise is it helps if there is novelty. Routine activity ('running wheels') can be brain-deadening."

Dr. Chao's comments drove home two points: I needed to vary my exercise and personal enrichment and to enjoy them fully. I must not view the avoidance of onset as an obligation or chore, but as life-affirming.

Neurobics: a way to increase BDNF

Dr. Chao followed up by mailing me a copy of a book by the late neuroscientist Lawrence C. Katz, Ph.D., and writer Manning Rubin titled *Keep Your Brain Alive: 83 Neurobic Exercises to Help Prevent Memory Loss and Increase Mental Fitness*.

"Neurobics" combines the words "neuron" and "aerobics."

Many people are familiar with the standard recommendations for giving the brain a workout: crossword puzzles, logic puzzles, reading, memory exercises, and engaging with interesting people and "other kinds of challenging activities that exercise brain circuits in different ways," write Katz and Rubin.

They recommend that people continue with such activities.

But they should also practice the very different kind of exercises involved in Neurobics. These simple mental exercises serve as cross-training for the brain.

"Neurobic exercises use the five senses in novel ways to enhance the brain's natural drive to form associations between different types of information," write Katz and Rubin. "Associations (putting a name together with a face, or a smell with a food, for example) are the building blocks of memory and how we learn. Deliberately creating new associative patterns is a central part of the Neurobic program."

And they add a point of the utmost importance for for HD-positive and HD-affected individuals: it's well-established that Neurobic exercises *increase levels of BDNF!*

"In short, with Neurobics you can grow your own brain food – without drugs or diet," Katz and Rubin state. "The more active brain cells are, the more growth-stimulating molecules they produce and the better they respond."

Trying the exercises

Katz and Rubin begin with the example of a simple but powerful stimulant to the brain: when you arrive home at the end of the day, rather than relying on your sense of sight, close your eyes and use your senses of touch, hearing, and smell to guide you into the house.

Another exercise, which I tried yesterday, is to brush your teeth with the opposite hand. For a right-handed individual like me, this stimulates the less-used right hemisphere of the brain.

When I walked Lenny the other day, I followed the book's suggestion of taking a different route. I sensed it was more stimulating for him, too.

Lenny and I leaving on one of our frequent walks

"It's rather astounding when you think about it," Katz and Rubin observe. "A certain kind of sensory experience can permanently change the wiring in part of your brain!"

They conclude: "Neurobics uses an approach based on how the brain works, not simply on how to work the brain."

Everybody in the HD community (and everybody else, for that matter) should read *Keep Your Brain Alive*. It provides a treasure trove of information about how our brains work and how to protect them from disease and aging.

Quality, not just quantity

When I first learned of HD because of my mother's diagnosis in 1995, doctors and researchers told me there was virtually nothing an at-risk or gene-positive person could do. HD symptoms are inevitable.

Since then, scientists plumbing the depths of the brain and diseases such as HD have turned up evidence to the contrary.

I wrote in my notes the other day: "YES!!! There are things we can DO to help our brains stave off HD!"

Neurobics may not prevent me from becoming symptomatic, but it very possibly could delay onset and, when it occurs, reduce the devastation of my brain.

From my contact with Dr. Chao, I have learned that I must focus not only on the quantity of exercise, but its quality. I need to stop frantically overstimulating my brain and instead concentrate on exercise, Neurobics, and other activities that will increase my BNDF.

As Katz and Rubin point out, that includes maintaining a rewarding emotional life based on intimate connections to people.

Living neurobically

For my survival, nothing could be more important than exercise, cross-training my brain, and strengthening ties to family and friends.

Although the hope of treatments has increased dramatically, chances are that a treatment will not become available before my symptoms start.

Through HDSA and this blog, I've fought for the success of the HD movement. Soon the moment may come when I will need to focus just on me and my own brain, living my final days of mental clarity as neurobically as possible.

Posted by Gene Veritas at 10:09 PM

Labels: A Beautiful Mind , BDNF , brain , CHDI , depression , exercise , gene-positive , genetic , HD-positive , Huntington's , medication , mother , Neurobic , onset , psychiatric , stem cell , striatum , symptomatic , symptoms

3 comments:

GMeds said...

This comment has been removed by the author.

5:14 AM, October 18, 2011

Anonymous said...

Thank you for this blog. It helps many of us who read but don't comment so much and I hope you know that.
It gives me hope for my at-risk boyfriend.
I wish you all the best and my hunch is there is good treatment that becomes available before you develop symptoms- which my guess wouldn't even being until well into your 60s with all of the preventative care you take.
Thank you for all you write.

6:12 PM, October 30, 2011

Mickie T. said...

This blog offers hope and encouragement to many!!! Your insight, strong will, determination, and overall intelligence just might allow you the capability to delay the onset of this devastating disease for many more years!!!! Keep on, keeping on!!! Always in my prayers!!!!

6:19 AM, January 03, 2012

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