

# Beets May Help Prevent Alzheimer's Disease

Analysis by [Dr. Joseph Mercola](#)

✓ Fact Checked

August 01, 2023

## STORY AT-A-GLANCE

- › Research suggests beets may be a powerful ally in the fight against Alzheimer's disease, decreasing damaging oxidation of neurons by as much as 90%
- › Beets also fight inflammation, lower blood pressure, help you detoxify, lower your risk for heart failure and stroke, and improve brain neuroplasticity
- › Turmeric supplementation has also been shown to improve memory and focus in seniors already suffering mild memory lapses, and to reduce amyloid and tau deposits associated with Alzheimer's
- › One of the most influential dietary factors is the amount of net carbs you consume on a regular basis. A high-sugar diet triggers insulin resistance, which is strongly linked to Alzheimer's
- › Research shows high-carb diets increase your risk of dementia by 89% while high-fat diets lower it by 44%

***Editor's Note: This article is a reprint. It was originally published April 12, 2018.***

Beets have been shown to fight inflammation, lower blood pressure<sup>1,2</sup> and aid detoxification. Studies also suggest they can help lower your risk for heart failure and stroke, and provide powerful benefits for your brain, largely due to their high nitrate content. Your body transforms nitrates into nitric oxide,<sup>3</sup> which enhances oxygenation and has beneficial impacts on your circulatory and immune systems.

Nitric oxide<sup>4</sup> is a soluble gas continually produced from the amino acid L-arginine inside your cells, where it supports endothelial function and protects your mitochondria. Nitric oxide also serves as a signaling or messenger molecule in every cell of your body. Many competitive athletes actually use beet juice for its nitric oxide-boosting benefits. Research shows raw beets may increase stamina during exercise by as much as 16%,<sup>5</sup> courtesy of its nitric oxide boost.

## **Beets May Protect Against Development of Alzheimer's Disease**

Now, research shows beets may also be a powerful ally in the fight against Alzheimer's disease,<sup>6,7</sup> the most severe and lethal form of dementia. As reported by The Atlanta Journal-Constitution:<sup>8</sup>

*"First they examined the possible cause of the condition. Although it's unknown, doctors have previously pinpointed beta-amyloid, a sticky protein that can disrupt communication between the brain cells and neurons. When it clings to metals, such as copper or iron, the beta-amyloid peptides misfold and clump together, causing inflammation and oxidation.*

*Therefore, the scientists targeted foods known to improve oxygen flow and cognitive functions, including beets. The purple veggie has a compound called betanin that binds to metals, which could prevent the misfold of the peptides.*

*To test their hypothesis, the scientists measured oxidation levels of the beta-amyloid when it was mixed with a betanin mixture, and they found that oxidation decreased by up to 90% exposed to the beet compound."*

## **Preventing Oxidation Stunts Beta-Amyloid Clustering**

When clusters of beta-amyloid form, it triggers brain inflammation and oxidation of neurons, and researchers believe this oxidation is what causes irreparable damage to the brain cells. Oxidation is particularly severe when the beta-amyloid is bound to

copper. In this experiment, oxidation was largely prevented when betanin from beets were added to the mix.

As noted by coauthor Darrell Cole Cerrato,<sup>9</sup> "We can't say that betanin stops the misfolding [of amyloid beta] completely, but we can say that it reduces oxidation. Less oxidation could prevent misfolding to a certain degree, perhaps even to the point that it slows the aggregation of beta-amyloid peptides ..."

While the researchers hope their finding will lead to the development of better Alzheimer's drugs, there's really no reason to wait for such developments, seeing how Alzheimer's is primarily a disease predicated on diet and lifestyle. Indeed, in his presentation of the findings (see featured video), Cerrato notes that this is yet another piece of information people can use to improve their eating habits and lower their risk of disease:

*"In an age where people are trying to look more at what they're consuming and what they're eating ... this is another source of data people can use ... [W]e're trying to get you to do the same thing your mother was trying to get you to do when you were a kid, which is eat your vegetables ... I think this will be a good step forward in looking at how we can preventatively treat Alzheimer's."*

## **Beets Improve Neuroplasticity**

Previous research<sup>10</sup> has shown raw beet juice helps improve neuroplasticity, primarily by increasing blood flow and tissue oxygenation. Nitric oxide, in its capacity as a signaling molecule, also allows your brain cells to communicate with each other better. Importantly, the beets boosted oxygenation of the somatomotor cortex, a brain area that is often affected in the early stages of dementia.

Here, the beet juice was used in combination with exercise, which also improves blood flow and oxygenation on its own. The participants – middle-aged individuals diagnosed with high blood pressure – were given either beet juice or a placebo to drink three times

a week, an hour before exercise, for six weeks.<sup>11,12,13</sup> Exercise consisted of a 50-minute walk on a treadmill.

The results showed adding beet juice to your exercise regimen can be a simple yet powerful way to augment the benefits of exercise to your brain. Fermented beet juice powder might even be better as it still has the beneficial nutrients, and the carbs have been predigested by fermentation process. As noted by study co-author W. Jack Rejeski, a health and exercise science professor at Wake Forest University in North Carolina:<sup>14,15</sup>

*"Nitric oxide ... goes to the areas of the body which are hypoxic, or needing oxygen, and the brain is a heavy feeder of oxygen in your body ... [W]hat we showed in this brief training study ... was that, as compared to exercise alone, adding a beet root juice supplement to exercise resulted in brain connectivity that closely resembles what you see in younger adults."*

Two caveats are worthy of mention. First, avoid using harsh mouthwashes, as this will reduce the conversion of nitric oxide by killing off necessary microbes. Also avoid fluoridated water, as fluoride converts nitric oxide into harmful nitric acid.<sup>16</sup> Fluoride also has other brain-harming influences, and has been shown to impair neurological functioning all on its own. It is, after all, classified as a neurotoxin.

## **Turmeric – Another Food Shown to Lower Alzheimer's Risk**

Another food that can bolster your neurological health is curcumin, an active ingredient found in the spice turmeric. Research shows turmeric supplementation helped improve memory and focus in seniors already suffering mild memory lapses, and reduced amyloid and tau deposits associated with Alzheimer's.<sup>17</sup>

The double-blind, placebo-controlled study, published in the American Journal of Geriatric Psychiatry,<sup>18</sup> included 40 adults between the ages of 50 and 90. None had a diagnosis of dementia at the time of their enrollment. Participants randomly received either 90 milligrams of curcumin twice a day for 18 months, or a placebo.

A standardized cognitive assessment was administered at the start of the study and at six-month intervals thereafter, and the level of curcumin in their blood was measured at the beginning and end of the study. Thirty of the participants also underwent positron emission tomography (PET) scans to assess their level of amyloid and tau deposits before and after treatment.

Those who received curcumin saw significant improvements in memory and concentration, while the control group experienced no improvement. Overall, the curcumin group improved their memory by 28% over the year-and-a-half-long treatment period. PET scans also confirmed the treatment group had significantly less amyloid and tau buildup in areas of the brain that control memory, compared to controls.

Curcumin has also been shown to increase levels of brain-derived neurotrophic factor (BDNF),<sup>19</sup> and reduced levels of BDNF have been linked to Alzheimer's disease. Yet another way curcumin may benefit your brain and lower your risk of dementia is by affecting pathways that help reverse insulin resistance, hyperlipidemia and other symptoms associated with metabolic syndrome and obesity.<sup>20</sup>

## **High-Sugar Diet Significantly Raises Your Risk of Dementia**

Perhaps the most important dietary factor that impacts your Alzheimer's risk is the amount of net carbs (total carbs minus fiber) you consume on a regular basis. A high-sugar diet triggers insulin resistance – thought to affect as many as 8 in 10 Americans<sup>21</sup> – and there's a very strong link between insulin resistance and Alzheimer's.<sup>22</sup>

For example, a longitudinal study<sup>23</sup> published in the journal *Diabetologia* in January 2018, which followed nearly 5,190 individuals for over a decade, found that the higher an individual's blood sugar, the faster their rate of cognitive decline. Even mild elevation of blood sugar and mild insulin resistance are associated with an elevated risk for dementia.<sup>24,25</sup> Diabetes and heart disease<sup>26</sup> are also known to elevate your risk, and both are rooted in insulin resistance.

One of the most striking studies<sup>27</sup> on carbohydrates and brain health revealed high-carb diets increase your risk of dementia by 89%, while high-fat diets lower it by 44%. According to the authors, "A dietary pattern with relatively high caloric intake from carbohydrates and low caloric intake from fat and proteins may increase the risk of mild cognitive impairment or dementia in elderly persons."

## **Sugar Atrophies Your Hippocampus, Impairing Memory**

Research<sup>28</sup> published in 2013 showed that sugar and other carbohydrates can disrupt your brain function even if you're not diabetic or have any signs of dementia. Here, short- and long-term glucose markers were evaluated in healthy, nondiabetic, nondemented seniors. Memory tests and brain imaging were also used to assess brain function and the actual structure of their hippocampus.

The findings revealed that the higher the two blood glucose measures, the smaller the hippocampus, the more compromised its structure, and the worse the individual's memory was. According to the authors, the structural changes in the hippocampus alone can partially account for the statistical link we see between glucose and memory, as your hippocampus is involved with the formation, organization and storage of memories.

The results suggest glucose directly contributes to atrophy of the hippocampus, which means that even if you're not insulin-resistant or diabetic, excess sugar may still be negatively affecting your memory. The authors suggest that "strategies aimed at lowering glucose levels even in the normal range may beneficially influence cognition in the older population."

A similar study<sup>29</sup> published in 2014 found that Type 2 diabetics lose more gray matter with age than expected, and this brain atrophy also helps explain why diabetics have a higher risk for dementia, and have earlier onset of dementia than nondiabetics.

As noted by Dr. Sam Gandy, director of the Center for Cognitive Health at Mount Sinai Hospital in New York City, these findings "suggest that chronic high levels of insulin and

sugar may be directly toxic to brain cells" adding that "This would definitely be a potential cause of dementia."<sup>30</sup>

## **Early Detection Could Save Trillions**

Alzheimer's is proving to be stubbornly resistant to conventional remedies. According to Bloomberg,<sup>31</sup> more than 190 human drug trials have ended in failure, and despite a burgeoning epidemic, the best drugs on the market only ameliorate symptoms while adding other risks. This is why dietary prevention is so crucial. We simply cannot afford to ignore the importance of real food any longer. At present, the best conventional medicine can hope for is improved diagnosis.

According to a 2018 report by the Alzheimer's Association,<sup>32</sup> the U.S. was spending \$277 billion on dementia care each year,<sup>33,34</sup> and that doesn't include care by unpaid caregivers. About 70% of these costs are paid by the families through out-of-pocket expenses.

On average, the out-of-pocket expenses for caregivers of someone with dementia is \$10,697 per year, and 40% of caregivers have an annual household income below \$50,000. By 2050, we may be looking at a health care bill of \$1.1 trillion per year to take care of our demented seniors. As reported by Bloomberg:

*"... [S]ignificant cost savings can be achieved, according to the new report, by the simple act of early diagnosis. Currently, individuals are typically diagnosed in the dementia stage, rather than when they have developed only mild cognitive impairment. Identifying the disease early can allow it to be better managed, in part with existing drugs that treat its symptoms.*

*In doing so, the study postulates, America could save \$7.9 trillion over the lifetimes of everyone alive right now ... [M]anaged dementia is less expensive to treat because it reduces the chances of missing medication or incurring avoidable costs ... It's more costly to be diagnosed in the later stages because that's likely to occur only after an expensive trip to the hospital."*

## Early Detection Still Not as Good as Prevention

Considering that in 2018, 5.7 million Americans had Alzheimer's and prevalence was projected to rise nearly 29% in the next seven years alone, it would behoove everyone to take prevention seriously, and begin taking proactive steps sooner rather than later. For while the financial costs may be steep, no price can be placed on the emotional and psychological costs associated with this tragic disease.

Early detection would surely be helpful, and strides are being made in the development of a blood test to detect Alzheimer's.<sup>35</sup> (In a 2018 trial,<sup>36</sup> the test was 90% accurate in detecting the disease in a pool of 370 participants.)

One of the most comprehensive assessments of Alzheimer's risk is Dr. Dale Bredesen's ReCODE protocol, which evaluates 150 factors known to contribute to the disease. This protocol also identifies your disease subtype or combination of subtypes so that an effective treatment protocol can be devised.

The full protocol is described in Bredesen's book, "The End of Alzheimer's: The First Program to Prevent and Reverse Cognitive Decline."<sup>37</sup> However, if you're diagnosed with early warning signs, that still means you're on your way toward oblivion, and it didn't need to get to that point in the first place.

As with cancer, early detection should not be confused with prevention, as diagnosing does not prevent you from having to figure out how to reverse the damage.

## Your Diet Is a Key Consideration

Based on what we know, it seems foolish in the extreme to ignore dietary factors. As mentioned earlier, a key consideration is to reduce your net carb consumption and increase healthy fats. I believe the [cyclical ketogenic diet](#) I describe in my book "[Fat for Fuel](#)" can go a long way toward avoiding neurological degeneration by optimizing your mitochondrial function and biological regeneration.



Aside from eating real foods, paying careful attention to minimize net carbs, adding certain brain-boosting foods and supplements such as beets and curcumin can be helpful. Just don't think you can continue eating junk food and just taking some beet juice and curcumin supplements.

With regard to beets, I recommend buying organic beets, or grow your own from heirloom beet seeds. While table beets are not genetically engineered (GE), they're frequently grown in close proximity to sugar beets, most of which are GE, so there's the potential for contamination via cross-pollination. While beets have the highest sugar content of all vegetables, most people can safely eat beet roots a few times a week. Beet root juice, however, should be consumed in moderation.

One way to circumvent the sugar issue is to ferment your beets. Not only does the fermentation process eliminate a majority of the sugars, it also makes the nutrients more bioavailable. Aside from pickled beets, other fermented beet products include beet-infused sauerkraut<sup>38</sup> and kvass.

There are also convenient fermented beet powders which I take and put in my breakfast smoothie nearly every day. By supplying beneficial bacteria, beet kvass can also have a very beneficial impact on diabetes and many other health problems, particularly those rooted in gut dysfunction.<sup>39</sup>

Because of its detoxifying properties, avoid drinking too much when first starting out. As a general recommendation, start out with 1 ounce per day, gradually increasing the amount to an 8-ounce glass per day. If you're highly toxic, you may need to start out with as little as a tablespoon.

## **Alzheimer's Prevention Strategies You Need to Know About**

According to Dr. David Perlmutter, a neurologist and author of "Grain Brain" and "Brain Maker," anything that promotes insulin resistance will ultimately also raise your risk of Alzheimer's. To this I would add that any strategy that enhances your mitochondrial

function will lower your risk. In 2014, Bredesen published a paper that demonstrates the power of lifestyle choices for the prevention and treatment of Alzheimer's.

By leveraging 36 healthy lifestyle parameters, he was able to reverse Alzheimer's in 9 out of 10 patients. This included the use of exercise, ketogenic diet, optimizing vitamin D and other hormones, increasing sleep, meditation, detoxification and eliminating gluten, and processed food. You can download Bredesen's full-text case paper online, which details the full program.<sup>40</sup> Following are some of the lifestyle strategies I believe to be the most helpful and important:

**Eat real food, ideally organic** – Avoid processed foods of all kinds, as they contain a number of ingredients harmful to your brain, including refined sugar, processed fructose, grains (particularly gluten), vegetable oils, genetically engineered ingredients and pesticides. Ideally, keep your added sugar to a minimum and your total fructose below 25 grams per day, or as low as 15 grams per day if you already have insulin/leptin resistance or any related disorders.

Opting for organic produce will help you avoid synthetic pesticides and herbicides. Most will also benefit from a gluten-free diet, as gluten makes your gut more permeable, which allows proteins to get into your bloodstream where they sensitize your immune system and promote inflammation and autoimmunity, both of which play a role in the development of Alzheimer's.

---

**Replace refined carbs with healthy fats** – Diet is paramount, and the beauty of following my optimized nutrition plan is that it helps prevent and treat virtually all chronic degenerative diseases, including Alzheimer's. It's important to realize that your brain actually does not need carbs and sugars; healthy fats such as saturated animal fats and animal-based omega-3 are far more critical for optimal brain function.

A cyclical ketogenic diet has the double advantage of both improving your insulin sensitivity and lowering your Alzheimer's risk. As noted by Perlmutter, lifestyle

strategies such as a ketogenic diet can even offset the risk associated with genetic predisposition.

When your body burns fat as its primary fuel, ketones are created, which not only burn very efficiently and are a superior fuel for your brain, but also generate fewer reactive oxygen species and less free radical damage.

A ketone called beta hydroxybutyrate is also a major epigenetic player, stimulating beneficial changes in DNA expression, thereby reducing inflammation and increasing detoxification and antioxidant production. I explain the ins and outs of implementing this kind of diet, and its many health benefits, in my book, "Fat for Fuel."

In it, I also explain why cycling through stages of feast and famine, opposed to continuously remaining in nutritional ketosis, is so important. Pay close attention to the kinds of fats you eat – avoid all trans fats or hydrogenated fats that have been modified in such a way to extend their longevity on the grocery store shelf.

This includes margarine, vegetable oils and various butter-like spreads. Healthy fats to add to your diet include avocados, butter, organic pastured egg yolks, coconuts and coconut oil, grass fed meats, and raw nuts such as pecans and macadamia. MCT oil is also a great source of ketone bodies.

---

**Keep your fasting insulin levels below 3** – Lowering your insulin will also help lower leptin levels, which is another factor for Alzheimer's. If your insulin is high, you're likely consuming too much sugar and need to cut back.

---

**Optimize your omega-3 level** – Also make sure you're getting enough animal-based omega-3 fats. High intake of the omega-3 fats EPA and DHA help by preventing cell damage caused by Alzheimer's disease, thereby slowing down its progression and lowering your risk of developing the disorder.

Ideally, get an omega-3 index test done once a year to make sure you're in a healthy range. Your omega-3 index should be above 8% and your omega 6-to-3 ratio between 0.5 and 3.0.

---

---

**Optimize your gut flora** – To do this, avoid processed foods, antibiotics and antibacterial products, fluoridated and chlorinated water, and be sure to eat traditionally fermented and cultured foods, along with a high-quality probiotic if needed. Dr. Steven Gundry does an excellent job of expanding on this in his book "The Plant Paradox."

---

**Intermittently fast** – Intermittent fasting is a powerful tool to jumpstart your body into remembering how to burn fat and repair the insulin/leptin resistance that is a primary contributing factor for Alzheimer's. Once you have worked your way up to where you've been doing 20-hour daily intermittent fasting for a month, are metabolically flexible and can burn fat as your primary fuel, you can progress to the far more powerful five-day water fasts.

---

**Move regularly and consistently throughout the day** – It's been suggested that exercise can trigger a change in the way the amyloid precursor protein is metabolized,<sup>41</sup> thus, slowing down the onset and progression of Alzheimer's.

Exercise also increases levels of the protein PGC-1 alpha. Research has shown that people with Alzheimer's have less PGC-1 alpha in their brains and cells that contain more of the protein produce less of the toxic amyloid protein associated with Alzheimer's.

---

**Optimize your magnesium levels** – Preliminary research strongly suggests a decrease in Alzheimer symptoms with increased levels of magnesium in the brain. Keep in mind that the only magnesium supplement that appears to be able to cross the blood-brain barrier is magnesium threonate.

---

**Optimize your vitamin D, ideally through sensible sun exposure** – Sufficient vitamin D is imperative for proper functioning of your immune system to combat inflammation associated with Alzheimer's and, indeed, research shows people living in northern latitudes have higher rates of death from dementia and Alzheimer's than those living in sunnier areas, suggesting vitamin D and/or sun exposure are important factors.

If you are unable to get sufficient amounts of sun exposure, take daily supplemental vitamin D3 to reach and maintain a blood level of 60 to 80 ng/ml. That said, it's important to recognize that sun exposure is important for reasons unrelated to vitamin D.

Your brain responds to the near-infrared light in sunlight in a process called photobiomodulation. Research shows near-infrared stimulation of the brain boosts cognition and reduces symptoms of Alzheimer's, including more advanced stages of the disease.

Delivering near-infrared light to the compromised mitochondria synthesizes gene transcription factors that trigger cellular repair, and your brain is one of the most mitochondrial-dense organs in your body.

---

**Avoid and eliminate mercury from your body** – Dental amalgam fillings are one of the major sources of heavy metal toxicity, however you should be healthy prior to having them removed. Once you have adjusted to following the diet described in my optimized nutrition plan, you can follow the mercury detox protocol and then find a biological dentist to have your amalgams removed.

---

**Avoid and eliminate aluminum from your body** – Common sources of aluminum include antiperspirants, nonstick cookware and vaccine adjuvants. There is some suggestion that certain mineral waters high in silicic acid may help your body eliminate aluminum.

---

**Avoid flu vaccinations** – Most flu vaccines contain both mercury and aluminum.

---

**Avoid statins and anticholinergic drugs** – Drugs that block acetylcholine, a nervous system neurotransmitter, have been shown to increase your risk of dementia. These drugs include certain nighttime pain relievers, antihistamines, sleep aids, certain antidepressants, medications to control incontinence and certain narcotic pain relievers.

Statin drugs are particularly problematic because they suppress the synthesis of cholesterol, deplete your brain of coenzyme Q10, vitamin K2 and neurotransmitter precursors, and prevent adequate delivery of essential fatty acids and fat-soluble antioxidants to your brain by inhibiting the production of the indispensable carrier biomolecule known as low-density lipoprotein.

---

**Limit your exposure to dangerous EMFs (cellphones, Wi-Fi routers and modems) –** **Radiation from cellphones and other wireless technologies** trigger excessive production of peroxynitrites,<sup>42</sup> a highly damaging reactive nitrogen species. Increased peroxynitrites from cellphone exposure will damage your mitochondria,<sup>43,44</sup> and your brain is the most mitochondrial-dense organ in your body.

Increased peroxynitrite generation has also been associated with increased levels of systemic inflammation by triggering cytokine storms and autonomic hormonal dysfunction.

---

**Optimize your sleep** – Sleep is necessary for maintaining metabolic homeostasis in your brain. Without sufficient sleep, neuron degeneration sets in, and catching up on sleep during weekends will not prevent this damage.<sup>45,46,47</sup> Sleep deprivation causes disruption of certain synaptic connections that can impair your brain's ability for learning, memory formation and other cognitive functions. Poor sleep also accelerates the onset of Alzheimer's disease.<sup>48</sup>

Most adults need seven to nine hours of uninterrupted sleep each night. Deep sleep is the most important, as this is when your brain's glymphatic system performs its cleanout functions, eliminating toxic waste from your brain, including amyloid beta.

---

**Challenge your mind daily** – Mental stimulation, especially learning something new, such as learning to play an instrument or a new language, is associated with a decreased risk of dementia and Alzheimer's. Researchers suspect that mental challenge helps to build up your brain, making it less susceptible to the lesions associated with Alzheimer's disease.

---

## Sources and References

---

- <sup>1</sup> Nutr J. 2012 Dec 11;11:106
- <sup>2</sup> Seattle Times April 16, 2017
- <sup>3</sup> Essentialstuff.org April 28, 2014
- <sup>4</sup> Science Direct. Nitric Oxide. 2014
- <sup>5</sup> J Appl Physiol (1985). 2009 Oct;107(4):1144-55
- <sup>6</sup> Science Daily March 20, 2018
- <sup>7</sup> ACS. March 20, 2018
- <sup>8</sup> AJC.com March 22, 2018
- <sup>9</sup> Medical News Today March 22, 2018
- <sup>10</sup> Journals of Gerontology November 9, 2016, glw219
- <sup>11</sup> Mens Fitness April, 2017
- <sup>12</sup> Yahoo.com April 19, 2017
- <sup>13</sup> Neuroscience News April 19, 2017
- <sup>14</sup> New York Daily News April 20, 2017
- <sup>15</sup> Express.co.uk April 20, 2017
- <sup>16</sup> Oxid Med Cell Longev. 2018; 2018: 8379123. August 27, 2018
- <sup>17</sup> Deccan Chronicle January 24, 2018
- <sup>18</sup> The American Journal of Geriatric Psychiatry March 2018; 26(3): 266-277
- <sup>19</sup> Brain Research 2006;1122(1):56-64
- <sup>20</sup> European Journal of Nutrition 2011; 50(3):151-161
- <sup>21</sup> The Fat Emperor May 10, 2015
- <sup>22</sup> JAMA Neurology July 27, 2015. DOI: 10.1001/jamaneurol.2015.0613v
- <sup>23</sup> Diabetologia (2018) DOI: 10.1007/s00125-017-4541-7
- <sup>24</sup> NEJM August 8, 2013; 369:540-548
- <sup>25</sup> Journal of Alzheimer's Disease 2017; 57(2)
- <sup>26</sup> Harvard Health Publishing. July 12, 2021
- <sup>27</sup> J Alzheimers Dis. 2012; 32(2):329-339
- <sup>28</sup> Neurology November 12, 2013: 81(20); 1746-1752
- <sup>29</sup> Radiology July 2014; 272(1): 210–216
- <sup>30</sup> Mount Sinai Health April 29, 2014
- <sup>31</sup> Bloomberg March 20, 2018
- <sup>32</sup> ALZ.org 2018 Alzheimer's Disease Facts and Figures
- <sup>33</sup> Alzheimer's Association Fact Sheet March 2018
- <sup>34</sup> CBS News March 20, 2018
- <sup>35</sup> Reuters February 1, 2018
- <sup>36</sup> Nature.com February 2018; 534: 249-273 (PDF)
- <sup>37</sup> Amazon.com, The End of Alzheimer's: The First Program to Prevent and Reverse Cognitive Decline, by Dr. Dale Bredesen

- <sup>38</sup> Mother Earth News, Beet Kraut Recipe
- <sup>39</sup> Nutrients 2015 Jul; 7(7): 5905–5915
- <sup>40</sup> Aging September 27, 2014; 6(9): 707-717
- <sup>41</sup> Journal of Neuroscience, April 27, 2005: 25(17); 4217-4221
- <sup>42</sup> BioRxiv May 19, 2016
- <sup>43</sup> Journal of Cellular and Molecular Medicine 2013; 17(8):958
- <sup>44</sup> The Root Cause in the Dramatic Rise of Chronic Disease, May 2016
- <sup>45</sup> Journal of Neuroscience 19 March 2014, 34(12): 4418-4431
- <sup>46</sup> Penn Medicine Press Release March 18, 2014
- <sup>47</sup> Medical News Today March 20, 2014
- <sup>48</sup> Neurobiology of Aging August 2014; 35(8): 1813-1820