Remember Your Niacin: Hope for Alzheimer’s Disease

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Advanced General Psychology
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Niacin: A Real Hope for Alzheimer’s Disease?
2009 Alzheimer’s Disease Facts and Figures

(Photo: Alzheimer’s Association, 2009)
Causes of Dementia in People 71+

Figure 9:
Causes of Dementia in People Aged 71+, ADAMS, 2002

13% Other Dementia
17% Vascular Dementia
70% Alzheimer’s

Created from data from Plassman et al. 2

(Photo: Alzheimer’s Association, 2009)
The Co$t of Alzheimer’$ Di$ea$e

Alzheimer’s disease triples healthcare costs for Americans aged 65 or older

- 5.3 million people have Alzheimer’s
- 148 billion dollars in annual costs
- 9.9 million unpaid caregivers
- A new case every 70 seconds
- 6th leading cause of death

(Photo: Alzheimer’s Association, 2009)
“No treatment is available to slow or stop the deterioration of brain cells in Alzheimer’s disease. The U.S. Food and Drug Administration has approved five drugs that temporarily slow worsening of symptoms for about six to 12 months, on average, for about half of the individuals who take them. Based on deepening insight into the underlying biology of Alzheimer’s and emerging conceptual frameworks for understanding the disease, researchers have identified treatment strategies that may have the potential to change its course. A number of experimental therapies are in clinical testing in human volunteers” (Alzheimer’s Association, 2009, p. 8).
The Ominous “They” Say . . .

AD=
- High Cholesterol
- High Blood Pressure
- Type 2 Diabetes & Body Weight
A Mere *Mention* of Prevention?

“Many scientists consider the emerging field of prevention one of the most exciting recent developments in the dementia research arena. A growing body of evidence suggests that the health of the brain—one of the body’s most highly vascular organs—is closely linked to the overall health of the heart and blood vessels. Some data indicate that management of cardiovascular risk factors, such as high cholesterol, Type 2 diabetes, high blood pressure and overweight, may help avoid or delay cognitive decline. Additional evidence points to a significant role for regular physical exercise in maintaining lifelong cognitive health. More limited data suggest that a low-fat diet rich in fruits and vegetables may support brain health, as may a robust social network and a lifetime of intellectual curiosity and mental stimulation” (Alzheimer’s Association, 2009, p. 8).
Healthy Cognition to Dementia Continuum

Figure 16:
Healthy Cognition–to–Dementia Continuum

An individual’s movement from healthy cognition to dementia is a continuum. The transition from healthy or normal cognition to cognitive impairment is not distinct, but blurred, as represented by the blurred coloring between various stages of cognitive function in the illustration. Similar transitions occur between cognitive impairment and dementia. When individuals experience declines in cognitive function that are severe enough to be noticeable to others and show up on cognitive tests, but not severe enough to interfere with daily life, they may have mild cognitive impairment (MCI). Individuals with MCI are at greater risk of developing Alzheimer’s disease.

(Photo: Alzheimer’s Association, 2009)
Cognitive Impairment by State (alphabetical)

Alabama - Iowa:

<table>
<thead>
<tr>
<th>State</th>
<th>Total Nursing Home Residents</th>
<th>Level of Cognitive Impairment (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>None</td>
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<tr>
<td>Alabama</td>
<td>50,282</td>
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<td>Alaska</td>
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<td>Arizona</td>
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<td>Arkansas</td>
<td>33,474</td>
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<tr>
<td>California</td>
<td>254,790</td>
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<tr>
<td>Colorado</td>
<td>38,404</td>
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<tr>
<td>Connecticut</td>
<td>62,423</td>
<td>37</td>
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<tr>
<td>Delaware</td>
<td>9,220</td>
<td>35</td>
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<tr>
<td>District of Columbia</td>
<td>5,398</td>
<td>39</td>
</tr>
<tr>
<td>Florida</td>
<td>204,842</td>
<td>40</td>
</tr>
<tr>
<td>Georgia</td>
<td>65,142</td>
<td>15</td>
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<tr>
<td>Hawaii</td>
<td>8,331</td>
<td>25</td>
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<tr>
<td>Idaho</td>
<td>12,176</td>
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<tr>
<td>Illinois</td>
<td>167,966</td>
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<td>Indiana</td>
<td>84,181</td>
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<tr>
<td>Iowa</td>
<td>48,104</td>
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(Photo: Alzheimer’s Association, 2009)
### Kansas to Missouri:

<table>
<thead>
<tr>
<th>State</th>
<th>2008</th>
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<th>2011</th>
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<tbody>
<tr>
<td>Kansas</td>
<td>35,814</td>
<td>23</td>
<td>31</td>
<td>46</td>
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<td>Kentucky</td>
<td>49,537</td>
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<tr>
<td>Louisiana</td>
<td>42,425</td>
<td>24</td>
<td>28</td>
<td>49</td>
</tr>
<tr>
<td>Maine</td>
<td>18,313</td>
<td>35</td>
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<td>41</td>
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<tr>
<td>Maryland</td>
<td>64,611</td>
<td>39</td>
<td>23</td>
<td>39</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>103,029</td>
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</tr>
<tr>
<td>Michigan</td>
<td>98,066</td>
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<tr>
<td>Minnesota</td>
<td>70,112</td>
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<td>Mississippi</td>
<td>27,884</td>
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<td>Missouri</td>
<td>77,797</td>
<td>29</td>
<td>31</td>
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(Photo: Alzheimer’s Association, 2009)
Montana to South Dakota:

Table 14 (Continued):
Cognitive Impairment in Nursing Home Residents by State, 2007

<table>
<thead>
<tr>
<th>State</th>
<th>Home Residents*</th>
<th>None</th>
<th>Very Mild/Mild</th>
<th>Severe</th>
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<tbody>
<tr>
<td>Montana</td>
<td>11,510</td>
<td>27</td>
<td>30</td>
<td>43</td>
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<tr>
<td>Nebraska</td>
<td>27,110</td>
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<tr>
<td>Nevada</td>
<td>12,206</td>
<td>39</td>
<td>25</td>
<td>36</td>
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<tr>
<td>New Hampshire</td>
<td>15,532</td>
<td>31</td>
<td>25</td>
<td>44</td>
</tr>
<tr>
<td>New Jersey</td>
<td>116,062</td>
<td>42</td>
<td>25</td>
<td>34</td>
</tr>
<tr>
<td>New Mexico</td>
<td>13,115</td>
<td>28</td>
<td>29</td>
<td>43</td>
</tr>
<tr>
<td>New York</td>
<td>227,231</td>
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<td>25</td>
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<tr>
<td>North Carolina</td>
<td>87,247</td>
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<tr>
<td>North Dakota</td>
<td>10,648</td>
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<td>48</td>
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<tr>
<td>Ohio</td>
<td>186,032</td>
<td>28</td>
<td>27</td>
<td>45</td>
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<td>Oklahoma</td>
<td>37,504</td>
<td>29</td>
<td>31</td>
<td>41</td>
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<tr>
<td>Oregon</td>
<td>26,688</td>
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<td>36</td>
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<tr>
<td>Pennsylvania</td>
<td>180,306</td>
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<td>27</td>
<td>41</td>
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<td>Rhode Island</td>
<td>16,935</td>
<td>30</td>
<td>28</td>
<td>42</td>
</tr>
<tr>
<td>South Carolina</td>
<td>37,117</td>
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<td>50</td>
</tr>
<tr>
<td>South Dakota</td>
<td>11,317</td>
<td>22</td>
<td>30</td>
<td>49</td>
</tr>
</tbody>
</table>

(Photo: Alzheimer’s Association, 2009)
Tennessee to Wyoming:

<table>
<thead>
<tr>
<th>State</th>
<th>Count</th>
<th>Percentages</th>
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<tbody>
<tr>
<td>Tennessee</td>
<td>70,375</td>
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<tr>
<td>Texas</td>
<td>183,562</td>
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<tr>
<td>Utah</td>
<td>17,377</td>
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<tr>
<td>Vermont</td>
<td>6,881</td>
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<tr>
<td>Virginia</td>
<td>69,221</td>
<td>26</td>
</tr>
<tr>
<td>Washington</td>
<td>57,001</td>
<td>28</td>
</tr>
<tr>
<td>West Virginia</td>
<td>21,855</td>
<td>21</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>73,121</td>
<td>28</td>
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<tr>
<td>Wyoming</td>
<td>4,925</td>
<td>34</td>
</tr>
<tr>
<td><strong>U.S. Total</strong></td>
<td><strong>3,196,923</strong></td>
<td><strong>31</strong></td>
</tr>
</tbody>
</table>

*These figures include all individuals who spent any time in a nursing home in 2007. Percentages for each state may not sum to 100 percent because of rounding. Created from data from *Nursing Home Data Compendium 2008 Edition*. |

(Photo: Alzheimer’s Association, 2009)
The Problem of AD - a.

- “Alzheimer’s disease is the most common cause of dementia in elderly people. Research into Alzheimer’s disease therapy has been at least partly successful in terms of developing symptomatic treatments, but has also had several failures in terms of developing disease-modifying therapies” (Mangialasche, 2010).

- “These successes and failures have led to debate about the potential deficiencies in our understanding of the pathogenesis of Alzheimer’s disease and potential pitfalls in diagnosis, choice of therapeutic targets, development of drug candidates, and design of clinical trials [...] We need to acknowledge that a single cure for Alzheimer’s disease is unlikely to be found and that the approach to drug development for this disorder needs to be reconsidered” (Mangialasche, 2010).
The Problem of AD - b.

• This (Monte, 2012) article claims that we have spent a long and hard thirty-plus years trying to get to the bottom of AD and that AD is the most common cause of dementia in North America. It also claims that AD is a metabolic disease kin or similar to diabetes.

• This article, like the Mangialasche, 2010 article, seems to point to others to further elaborate on untying the knots of the causation and therapeutic remedies due to AD.

• A strength is that it does bring up information regarding the connection of *hyperphosphorylated tau* and AD.
The Problem of AD - c.

- “Growing evidence supports the concept that AD is fundamentally a metabolic disease with substantial and progressive derangements in brain glucose utilization and responsiveness to insulin and insulin-like growth factor [IGF] stimulation” (Monte, 2012).
- “AD is now recognized to be heterogeneous in nature, and not solely the end-product of aberrantly processed, misfolded, and aggregated oligomeric amyloid-beta peptides and hyperphosphorylated tau” (Monte, 2012).
- “Other factors, including impairments in energy metabolism, increased oxidative stress, inflammation, insulin and IGF resistance, and insulin/IGF deficiency in the brain should be incorporated into all equations used to develop diagnostic and therapeutic approaches to AD” (Monte, 2012).
- “The contributions of impaired insulin and IGF signaling to AD-associated neuronal loss, synaptic disconnection, tau hyperphosphorylation, amyloid-beta accumulation, and impaired energy metabolism are reviewed” (Monte, 2012).
- “It is imperative that future therapeutic strategies for AD abandon the concept of uni-modal therapy in favor of multi-modal treatments that target distinct impairments at different levels within the brain insulin/IGF signaling cascades” (Monte, 2012).

Figure 8:
Estimated Number of People with Alzheimer's by State, 2000

(created from data from Hobert et al. [4, 17])

(Photo: Alzheimer's Association, 2009)
AD Population Predicted for 2025 . . .

Figure 7: Estimated Number of People with Alzheimer’s by State, 2025

Created from data from Hebert et al., 1998

(Photo: Alzheimer’s Association, 2009)
Projected Changes in Prevalence 2000-2025

Figure 8:
Projected Changes Between 2000 and 2025 in Alzheimer Prevalence by State

(created from data by Hebert et al., 2009)

(Photo: Alzheimer’s Association, 2009)
Greatness Happens When You Take Niacin

WHAT HAPPENS WHEN YOU TAKE NIACIN (VIT B3)

1 Detox
A combination of niacin, exercise and sauna is a powerful way to detox your body from heavy metals and toxins stored in fat cells.

2 Energy
Niacin is essential in the production of energy in the body. 50 - 500 mg daily

3 Arthritis
Studies confirm niacin is better than NSAIDS for arthritis. 1,000 - 1,500 mg daily

4 Heart Disease
Better than statins at lowering cholesterol and clears up plaque. 1,000 - 3,000 mg daily

5 Memory Loss
Can improve memory, and correct some memory problems. 3,000 mg daily

6 Hair Loss
Increases blood flow to scalp stimulates hair growth and lowers DHT linked to balding.

20-30 MINS
Your blood vessels dilate, a warming sensation spreads over your body. This is known as the ‘niacin flush’, a sign it’s working it’s magic.

Insomnia
Niacinamide activates benzodiazepine receptors in the brain, which affects sleep. 50 - 500 mg daily

Severe Depression & Schizophrenia
The usual dose range is 3,000 to 9,000 milligrams daily divided into three doses.

Cancer
Has the potential to influence DNA repair, genomic stability and the immune system.

Acne
Many reports show Niacin can get rid of acne. 400 - 500 mg daily

Alzheimers
Protects against Alzheimers and other age related brain disorders.

Read the full article here: www.therenegadepharmacist.com/benefitsofniacin
Niacin & The Blood/Brain Barrier [BBB]

- Dyslipidemia—high cholesterol or triglycerides [TG] that lead to atherosclerosis—was the focus of a study (Bowman, Kaye, & Quinn, 2012) that involved following thirty-six subjects for a year. This has great significance as it relates to the blood brain barrier [BBB].
- They suggest that including niacin along with omega-3 in the diet could offer aid in bringing down harmful TG and cholesterol which in turn can aid in precluding AD.
- “Dyslipidemia is more prevalent in AD subjects with BBB impairment. Plasma triglyceride and HDL cholesterol may have a role in maintaining BBB integrity in mild-to-moderate Alzheimer’s disease. Extended-release niacin alters the metabolism of plasma apolipoprotein (Apo) A-I and ApoB-containing lipoproteins. The possibility that dyslipidemia is causally related to BBB impairment may be clinically significant since dyslipidemia is treatable” (Bowman, Kaye, & Quinn, 2012).
- “While it is true that statin therapy has been unsuccessful in altering the course of AD, these current findings place emphasis on modifying triglyceride and HDL cholesterol, ideally in subjects selected on the basis of BBB impairment at baseline. Perhaps a dietary pattern or supplementation with omega-3PUFAs and niacin would offer one strategy, since they favorably modify triglyceride and HDL cholesterol metabolism, respectively” (Bowman, Kaye, & Quinn, 2012).
- “Blood-brain barrier dysfunction may have a significant role in the pathogenesis of Alzheimer’s disease” (Bowman, Kaye, & Quinn, 2012).
- “Dyslipidemia is more prevalent in AD subjects with BBB impairment. Plasma triglyceride and HDL cholesterol may have a role in maintaining BBB integrity in mild-to-moderate Alzheimer’s disease” (Bowman, Kaye, & Quinn, 2012).

- “Niacin, an old drug, has new effects on central nervous system disease” (Chen & Chopp, 2010) promised more information...and it gave more information regarding niacin and its activity with regards to the hope of aiding with AD.

- It explained what niacin is in its elemental biological form that the body can use and how it is chief cousin to what we know to be nicotine—another short-term memory hero. It also connects the dizzying dots in great detail regarding how and why niacin plays an important role in preventing cognitive decline and AD more so than the Bowman, Kaye, & Quinn, 2012 article above.

- It sheds light on the specific differences between nicotinamide and niacin as well.

- “Dietary niacin has been implicated as a protective factor against cognitive decline and Alzheimer’s disease” (Chen & Chopp, 2010).

- “LXR agonists facilitate the clearance of Abeta42 and represent a novel therapeutic approach to Alzheimer’s disease. Niacin up-regulates LXR-alpha and peroxisome proliferator-activated receptor gamma (P-PARgamma) mRNA expression and promotes the HDL-induced cholesterol efflux” (Chen & Chopp, 2010).

- “Niacin is converted to niacinamide—also known as nicotinamide [...] Delayed treatment with nicotinamide inhibited brain energy depletion, improved cerebral microperfusion and protected hypertensive and hyperglycemic rats as well as wild type rats against a robust model of stroke” (Chen & Chopp, 2010).

- “Nicotinamide also stimulates long-term survival and neuronal differentiation of chick embryo C cells. Nicotinamide offers multiple protective mechanisms in stroke as a poly (ADP-ribose) polymerase (PARP) inhibitor and by partial restoration of mitochondrial function” (Chen & Chopp, 2010).

- Niacin not only regulates cholesterol levels but is also converted to nicotinamide, which encourage the possible use of niacin and nicotinamide as a therapeutic neuroprotective and neurorestorative agent in the clinical treatment of ischemic stroke” (Chen & Chopp, 2010).

- “Niacin and nicotinamide are water-soluble B complex vitamins. Niacin is converted to nicotinamide, a constituent of nicotinamide adenine dinucleotide (NAD) and nicotinamide adenine dinucleotide phosphate (NADP) in vivo, which are coenzymes involved in glycogenolysis, tissue respiration and lipid metabolism. Niacin is metabolized in the liver to nicotinamide” (Chen & Chopp, 2010).
• “Nicotinamide is widely distributed in the body. Nicotinic acid and nicotinamide can penetrate the blood brain barrier” (Chen & Chopp, 2010).

• “Nicotinamide, the amide form of Niacin, is the precursor for the coenzyme beta-nicotinamide adenine dinucleotide (NAD+) and is considered to be necessary for cellular function and metabolism. Nicotinamide also plays an important role on regulation of both neuronal and vascular cell populations in the brain injury” (Chen & Chopp, 2010).

• “Niacin decreases serum and cellular cholesterol levels, which may play a role on protection of Alzheimer's disease. Dietary niacin regulates learning performance, and prevents or reverses cognitive decline, protects against Alzheimer Disease and age related cognitive decline” (Chen & Chopp, 2010).
Another interesting article (Chowdhury & Kumar, 2017) focused on spices and niacin being an excitor in the way of keeping neurons alive and active. It lists niacin as a spice.

It tries to introduce using spices as an alternative method for keeping synaptic plasticity and neuronal survival in tact.

Its focus on phytocompounds found in spices and niacin prove to show potent antagonist properties when it comes to NMDA. This, they believe is promising with regards to preventing AD.

The pharmaceutical industry is not positing enough results when it comes to solving the puzzle of preventing or slowing AD.
• “N-methyl-d-aspartate receptor (NMDAR) play key role in glutamatergic neurotransmission which is critical for synaptic plasticity and survival of neurons. However, ‘slow excitotoxicity’ at post-synaptic neurons promotes gradual neurodegeneration as occurred in Alzheimer’s disease” (Chowdhury & Kumar, 2017).

• “In view of this natural and synthetic compounds that act as antagonist against NMDA receptor considered as potential target in AD. The present study explores various spices phytoconstituents such as Piper nigrum, Cinnamomum zeylanicum, Eugenia caryophyllus, Cuminum cyminum and Eletteria cardamom as a potential source of novel NMDA receptor antagonist” (Chowdhury & Kumar, 2017).

• “Out of 240 compounds analyzed Caffeic acid, Cinnamic acid, Octanoic acid, Capric acid, Valeric acid, Palmitic acid, Sotolone, Niacin, Butanoic acid and Dehydrodieugenol were the top 10 leads” (Chowdhury & Kumar, 2017).

• “Due to side-effects of drugs, phyto-constituents have gained enormous consideration as an alternative. The phytocompounds from spices showed potent NMDA antagonist property and provides a lead towards finding more potent anti-Alzheimer’s drug” (Chowdhury & Kumar, 2017).
In another (Fu, Doreswamy, & Prakash, 2014) article, we look into the deficiency of niacin leading to neural degeneration in the central nervous system [CNS]. It speaks of how biochemical pathways might be involved in neural degeneration and it boasts that this is a fact supported in many substantive studies. It claims that niacin is a necessity in a number of biochemical pathways.

It distinguishes between plain degeneration due to environmental factors, i.e., diet, and primary neurodegenerative disorders such as AD perhaps being partially caused by genetic pathogens.

They claim that much is unknown and they repeat such with seeming intent to bolster our faith in their trial that aims to distinguish between normal niacin deficiency and the pathogenic genetic component. Its strength is how it breaks down how niacin works as well as differentiating the differences between niacin and nicotinamide as does the Chen & Chopp, 2010 article above.
• “Over past few years, some prominent biochemical pathways which are disturbed in niacin deficiency and possibly contribute to the neurodegenerative events have been identified. However, we could not find any literature where these pathways have been reviewed together” (Fu, Doreswamy, & Prakash, 2014).

• “Neural degeneration is a very complicated process. In spite of all the advancements in the molecular chemistry, there are many unknown aspects of the phenomena of neurodegeneration which need to be put together. It is a common sequela of the conditions of niacin deficiency [...] There is a gross lack of understanding of biochemical mechanisms of neurodegeneration in niacin deficiency states” (Fu, Doreswamy, & Prakash, 2014).

• “Because of the necessity of niacin or its amide derivative NAD in a number of biochemical pathways, it is understandable that several of these pathways may be involved in the common outcome of neural degeneration. Here, we highlight five pathways that could be involved in the neural degeneration for which evidence has accumulated through several studies. These pathways are: 1) the tryptophan-kynurenic acid pathway, 2) the mitochondrial ATP generation related pathways, 3) the poly (ADP-ibose) polymerase (PARP) pathway, 4) the BDNF-TRKB Axis abnormalities, 5) the genetic influences of niacin deficiency” (Fu, Doreswamy, & Prakash, 2014).
• “Niacin is chemically synonymous with nicotinic acid although the term is also used for its amide derivative (nicotinamide). Nicotinamide is the form of the vitamin, which does not have the pharmacological action of the acid. It is the amide form that exists within the redox-active co-enzymes, nicotinamide adenine dinucleotide (NAD) and its phosphate (NADP), which function in dehydrogenase-reductase systems requiring transfer of a hydride ion” (Fu, Doreswamy, & Prakash, 2014).

• “In the chemical form of NAD, niacin is involved in a number of biochemical processes, including energy metabolism (redox reactions), protein modification by mono and poly (ADP-ribose) polymerases and synthesis of intracellular calcium signaling molecules” (Fu, Doreswamy, & Prakash, 2014).

• “NAD is also required for non-redox adenosine diphosphate-ribose transfer reactions involved in DNA repair and calcium mobilization. It also participates in intracellular respiration along with enzymes involved in the oxidation of fuel substrates such as glyceraldehyde 3-phosphate, lactate, alcohol, 3-hydroxybutyrate, and pyruvate. NADP mainly functions in reductive biosynthesis such as fatty acid and steroid synthesis and in the oxidation of glucose-6-phosphate to ribose-5-phosphate in the pentose phosphate pathway” (Fu, Doreswamy, & Prakash, 2014).

• “Neurodegenerative pathology in niacin deficiency is well-known” (Fu, Doreswamy, & Prakash, 2014).
Adaptation of Neurons to Stress

- In the (Kapogiannis & Mattson, 2010) article, the researchers dive into energy metabolism disruption and neuronal circuitry dysfunction with respect to the cognitive impairment of those with AD.
- This piece focuses on the adaptation of neurons to stress.
- “Ageing and Alzheimer’s disease cause perturbations in cellular energy metabolism, level of excitation or inhibition, and neurotrophic factor release, which overwhelm compensatory mechanisms and result in dysfunction of neuronal microcircuits and brain networks” (Kapogiannis & Mattson, 2010).
- “A prolonged positive energy balance impairs the ability of neurons to adapt to oxidative and metabolic stress. Results from experimental studies in animals show how disruptions caused by chronic positive energy balance, such as diabetes, lead to accelerated cognitive ageing and Alzheimer’s disease” (Kapogiannis & Mattson, 2010).
- “Therapeutic interventions to allay cognitive dysfunction that target energy metabolism and adaptive stress responses (such as neurotrophin signalling) have been effective in animal models and in preliminary studies in humans” (Kapogiannis & Mattson, 2010).
The Testing of Niacin - a.

• Like the research done by UHN Staff, 2017 and the Sealey, 2017 articles below herein, this article (Morris et al., 2004) specifies the testing of niacin and its effects on AD and cognitive decline prevention.

• Like the final articles that follow, it braves the waters with specificity in the realm of this subject matter.

• Additionally, in the way of strengths, it seems that the researchers went to great lengths to be fair in their testing variables in order to achieve valid results. This article’s confidence in its results is reassuring with regards to taking niacin for brain/body health and its association with niacin’s positive effects.
• “The protective association was specific to niacin intake as opposed to other related B vitamins [...] We also found a specific protective effect of niacin intake from food against 6-year cognitive decline among 3718 participants in the larger cohort that was only strengthened in sensitivity analyses excluding participants with low initial cognitive scores or with less than a high school education, and with control for dietary and other potential confounders” (Morris et al., 2004).

• “In this prospective population based study, we observed inverse associations between AD and dietary intakes of total niacin (foods and supplements), niacin from foods only, and tryptophan. Although participants in the lowest fifth of intake had the greatest risk of AD, a statistically significant log linear inverse association remained when we restricted the analyses to participants with higher intake levels” (Morris et al., 2004).

• “Higher intake of niacin from food sources was also linearly associated with lower cognitive decline in the study population. The protective association of niacin against AD was observed after controlling for the important risk factors for dementia (age, education, race, ApoE e4) as well as many other dietary and non-dietary factors that could potentially account for the results [...] Niacin intake from foods was also inversely associated with AD” (Morris et al., 2004).
Niacin & Cognition - a.

- This (Qin et al., 2017) article highlights specific kinds of memory testing and for this it is strong.
- Its specificity regarding what the researchers found with regards to niacin intake and cognition proves winsome and on target.
- They examine diet history and run a barrage of different cognitive tests and show the positive effects of niacin.
- The medical jargon makes it difficult to truly absorb regarding their findings, unless of course, one is adept to interpreting works within the medical field.
Niacin & Cognition - b.

- “Epidemiologic evidence regarding niacin, folate, vitamin B-6, and vitamin B-12 intake in relation to cognitive function is limited, especially in midlife. Objective: We hypothesize that higher intake of these B vitamins in young adulthood is associated with better cognition later in life” (Qin et al., 2017).

- “We examined participants’ CARDIA diet history at years 0, 7, and 20 to assess nutrient intake, including dietary and supplemental B vitamins. We measured cognitive function at year 25 (mean ± SD age: 50 ± 4 y) through the use of the Rey Auditory Verbal Learning Test (RAVLT) for verbal memory, the Digit Symbol Substitution Test (DSST) for psychomotor speed, and a modified Stroop interference test for executive function” (Qin et al., 2017).

- “Higher RAVLT and DSST scores and a lower Stroop score indicated better cognitive function. We used multivariable-adjusted linear regressions to estimate mean differences in cognitive scores and 95% CIs. Results: Comparing the highest quintile with the lowest (quintile 5 compared with quintile 1), cumulative total intake of niacin was significantly associated with 3.92 more digits on the DSST” (Qin et al., 2017).
• The (Reitz, 2012) article would be helpful for a doctor or those in the epidemiological fields, but it, like the UHN Staff, 2017 article, pinpoints the glory of nicotinamide and notes its stabilizing factors.

• Like the Monte, 2012 article, it whispers about the important connection between phosphorylated tau and AD again. It makes note of its safe use in clinical studies and especially those that target outcomes for people with neurodegenerative disorders such as AD.

• Its hyper-focus on nicotinamide makes it a sound resource with regards to providing true hope in the dismal muddy search for promise of some kind of honest cure for AD.
• “Nicotinamide is the biologically active form of niacin (vitamin B3) and the precursor of coenzyme NAD+. Orally administered nicotinamide can prevent cognitive deficits in a mouse model of AD and can reduce brain concentrations of a species of phosphorylated tau (Thr231) that inhibits microtubule polymerization” (Reitz, 2012).

• “Furthermore, nicotinamide inhibits brain sirtuin deacetylase and upregulates acetyl-α-tubulin, protein p25, and MAP2c; all these interactions are associated with increased microtubule stabilization” (Reitz, 2012).

• “Nicotinamide has been used in several clinical studies, including RCTs in patients with neurodegenerative disorders, and is generally safe and well tolerated” (Reitz, 2012).
• This (Sealey, 2017) is an article about a book that wants the public to know about the immense success that a certain Dr. Hoffer had with treating thousands of patients with niacin.

• The fact that he treated thousands of patients with niacin and it seemed to better their conditions (long before Big Pharma ransacked the health scene) is plain and simple promise indeed! It is a niacin cheerleader resource.

• It claims that niacin helped his patients to live longer and enjoy a better way of life. It tries to justify the clinical use of niacin via recovery stories and testimonies.
“Abram Hoffer, Andrew Saul and Harold Foster wrote *Niacin: The Real Story* to inform the public that niacin (vitamin B3) has a broad spectrum of healing properties. Decades of research and clinical practice taught Dr. Hoffer that optimum doses of niacin can treat mental, cardiovascular, arthritic and other illnesses. When he prescribed vitamins, many patients recovered” (Sealey, 2017).

“Hoffer, Saul and Foster’s book explains what niacin is, when niacin therapy began, how niacin works, why we need more niacin, how to take niacin and why niacin is safe. It introduces doctors who prescribe niacin and other vitamins and references their books” (Sealey, 2017).

“During his 60-year career, Dr. Hoffer gave niacin to thousands of patients. His finding? Niacin helped patients feel better and live longer. This book provides research reports and recovery stories which justify the clinical use of niacin for mental illness and cardiovascular problems and niacinamide for AD” (Sealey, 2017).

“A long chapter outlines how patients with 25 other health problems also respond well to vitamin B3 therapy. The only cautionary note concerns niacin’s harmless and noticeable but short-lived flush effect” (Sealey, 2017).
Metabolic Action of Niacin & Arterial Thickness

• “Niacin is an agent that significantly increases high-density lipoprotein cholesterol (HDL-C), but its effects on surrogate markers of atherosclerosis and inflammatory markers are less clear. We studied the effects of niacin on carotid intimal media thickness (IMT), brachial artery reactivity as well as markers of inflammation and the metabolic profile of patients with metabolic syndrome” (Thoenes et al., 2007).
• “Fifty patients with the metabolic syndrome (Adult Treatment Panel (ATP) III criteria) were randomized to either extended-release niacin (1000 mg/day) or placebo. After 52 weeks of treatment, there was a change of carotid IMT of +0.009 ± 0.003 mm in the placebo group and −0.005 ± 0.002 mm in the niacin group (p = 0.021 between groups). Endothelial function improved by 22% in the group treated with niacin” (Thoenes et al., 2007).
• “Among the many supplements and vitamins for memory protection are the B-vitamins, including B12, B6, B9, and B3, or niacin. While the first two are more commonly associated with dementia and cognitive function, niacin benefits the brain as well, and it may play an important role in protecting against Alzheimer’s disease” (UHN Staff, 2017).

• “B Vitamins for Memory Loss and Dementia Most attention on B vitamins for dementia focuses on vitamin B12, B6, and B9. This isn’t surprising; studies show that deficiencies in these vitamins are common in the elderly and can contribute to cognitive decline. Treatment with a complex of B-vitamins helps to prevent neurodegeneration” (UHN Staff, 2017).

• “One study showed that over two years, vitamin B treatment slowed shrinkage of the whole brain, and further study showed that B vitamins reduced gray matter atrophy in regions of the brain specifically susceptible to Alzheimer’s-related degeneration. Niacin Helps Prevent Alzheimer’s” (UHN Staff, 2017).

• “Niacin treatments have led to improvements in cognitive test scores and overall function, while a deficiency in niacin (called pellagra) can cause symptoms of mental confusion and dementia, along with scaly skin, muscle weakness, and diarrhea. One study found that lower blood levels of niacin were more common among elderly patients with dementia than controls” (UHN Staff, 2017).

• “A large study in the Journal of Neurology, Neurosurgery, and Psychiatry looked at niacin intake and Alzheimer’s disease incidence in more than 6,000 people. The researchers found that those with the highest total intake of niacin were much less likely to get Alzheimer’s disease. Niacin intake through food sources was also inversely associated with Alzheimer’s risk” (UHN Staff, 2017).
• “The study also showed that high food intake of niacin was associated with slower rate of cognitive decline. The authors conclude that dietary niacin may protect against Alzheimer’s disease and age related cognitive decline” (UHN Staff, 2017).

• “Niacin is important for DNA synthesis and repair, the growth and formation of nerve cells, cell signaling, and antioxidant functions in the brain, all of which likely contribute to the niacin benefits for dementia” (UHN Staff, 2017).

• “Niacin is also one of the more effective ways to lower bad cholesterol and raise good cholesterol. It turns out that cholesterol levels are linked to Alzheimer’s disease, so another way niacin may prevent Alzheimer’s is through keeping cholesterol in check” (UHN Staff, 2017).
Finally, the (Williams, Plassman, Burke, Holsinger, & Benjamin, 2010) article contrasts the B vitamins and their roles, functions, power, and lack of power to prevent AD.

Niacin is made a winner of the Bs specifically for preventing AD as their results show that a higher intake of niacin proves to lower the risk of getting AD.

The strength of this article is that it differentiates between the B vitamins and crowns niacin as the necessary one in the prevention of AD.
More Niacin Tests & Praise . . .

• “Results from the two studies that measured folate serum levels showed that low baseline folate levels were consistently associated with increased risk of AD (or dementia). In comparison, B12 levels were typically not associated with risk of AD. The three studies that used estimated dietary intake of folate and B vitamins based on self-reported information reported conflicting results. One reported an association between higher intake of folate and reduced risk of AD, while another did not find a significant reduction in AD risk associated with folate intake. Neither study found an association between vitamins B6 or B12 and risk of AD. Direct comparisons of the two studies to identify reasons for these inconsistent results are difficult, but based on the information provided in the studies, the average rate of folate intake may differ between the two studies” (Williams, Plassman, Burke, Holsinger, & Benjamin, 2010).

• “One study examined niacin (B3) intake and found a lower risk for AD associated with higher intake of niacin. In conclusion, based on folate levels measured in serum, there is preliminary evidence from two studies that low folate levels are associated with increased risk of AD. The two studies estimating folate level from self-report dietary information did not find a consistent association with risk of AD. The evidence does not suggest an association between B12 and risk of AD. The one study assessing estimated niacin intake showed an association between higher niacin intake and lower risk of AD” (Williams, Plassman, Burke, Holsinger, & Benjamin, 2010).

• “One study examined the association between niacin (B3) and cognitive change over time. Investigators reported that higher dietary intake of niacin was generally associated with a modest protective effect on cognition; however, the results were only significant in subgroups of individuals without stroke or myocardial infarction or individuals with baseline cognitive scores in the upper 85 percent of the sample” (Williams, Plassman, Burke, Holsinger, & Benjamin, 2010).
For All With AD: Please . . . *Remember Your Niacin!*
References