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Preserve your Memory, Preserve your Life

DISCLAIMER: the following is not meant to treat anyone with advice or tell you what you should do, such as relative to use of medication, exercise, or changing your diet. The information in this handout is merely offering what has been published in the research literature, as well as based on my professional experience. Talk to a doctor or other appropriate professionals as to what is best for your own specific needs.

It should also be appreciated that everyone has their own perspective on how to improve health. Nutritionists do it through food. Physicians do it through medicine. Psychologists do it through changing thoughts, feelings, and behaviors. Consequently, what is offered here is a reflection of my own bias and perspective.

"Leave your drugs in the chemist's pot if you can cure the patient with food."
--Hippocrates, 420 BC

Memory is a central part of our lives. We need to learn and retain information throughout our lifetime, be it academic skills like reading and math or the professional skills we need to work at our jobs and do them well. Or to maintain our personal lives, such as remembering doctors' appointments, family responsibilities, and our own autobiographical details such as what we have shared with family, friends and neighbors that give a lot of meaning and purpose to us.

Yet for all the importance that memory has to us, it can be lost all too readily. We can write sticky notes, or backup photos of people important to us on to computer hard drives and the Cloud. But the actual capacity to learn and retain various kinds of information inside our brain has no backup. Lose that and you lose much of yourself, and discover that life is far more difficult to negotiate and enjoy. If you have ever seen someone with dementia, such as from Alzheimer's, where the person may no longer recognize their spouse to whom they have been married for a long time you can appreciate how devastating memory impairment can be.

<u>What causes memory impairment?</u>
The number one form of dementia (which means a group of symptoms that can include difficulties with memory, language, problem solving, and other cognitive skills that affect a person's ability to perform every day activities) in the U.S. is Alzheimer's. It is the sixth leading cause of death in the U.S., and fifth for those over age 65. More than 5 million Americans have it now, and every 66 seconds another American develops it. As of 2017 the CDC said that deaths from Alzheimer's increased by 55% between 1999-2014. It accounts for 60-80% of dementias. The process of Alzheimer's is thought to start about 25 years before it is diagnosed, so perhaps in one's forties or fifties. That is, pathological changes in the brain begin very early, so changing risk factors as soon as possible is advised.

Beyond memory loss, Alzheimer's symptoms over time typically include apathy, depression, impaired communication, disorientation, confusion, behavioral changes, and ultimately speaking, swallowing, and walking. Two of the hallmark symptoms of the disease are beta-amyloid plaques, and protein tau tangles both of which occur inside brain nerve cells. There is a genetic risk factor for Alzheimer's called APOE-4. The APOE gene is involved with transporting cholesterol in the bloodstream. If you get the E4 gene from one parent the risk of getting Alzheimer's is increased three fold. If you get the E4 from both of your parents risk goes up by about 10-15 times. Even if you have the gene it does not necessarily mean that you will get Alzheimer's, and lifestyle & dietary interventions can help over ride it. Genes do not have to predetermine our fate. e.g. Thirty percent of people have the E4 gene – and are not afflicted by Alzheimer's. And there are plenty of Alzheimer's patients who do not have it. So genes determine our risk for a disease, but lifestyle and environment can trigger or suppress such risks. The best diet to help prevent Alzheimer's include whole foods such as greens, legumes, berries, whole grains, and being very low in animal fats, saturated fats, and salt. Moreover, the earlier Alzheimer's appears in life the more it is due to genetics. And the later it appears the more it is due to lifestyle, which means that modifications such as in diet and exercise can have a preventative role.

The biggest risk factor for Alzheimer's is age, with a rate of about 3% at age 65, and a rough doubling for every five years after that so that by age 85 the odds are about 50% that a person will have the disease.

Another risk factor for Alzheimer's is poor quality sleep. A meta-analysis of 27 studies found that individuals with sleep problems including short and long sleep duration, poor sleep quality, circadian rhythm abnormality, insomnia, and obstructive sleep apnea (OSA) had a 1.68 times higher risk for the combined outcome of cognitive decline and AD compared to individuals without sleep problems. Broken apart, OSA increased risk by 2.37 fold, sleep duration by 1.86, and sleep quality by 1.62 times. Sleep apnea appears to be a strong risk factor because hypoxia plays a vital role in beta amyloid production. Duration of sleep may be a confounded factor as to it being more relevant to a person's age rather than the actual hours slept.

Long before Alzheimer's may become a concern, sleep impairment can impact memory in those much younger. Everyone knows that we are not as sharp if we do not get enough sleep, such as for school or work. Lack of sleep impacts our ability to focus and learn efficiently. Sleep also consolidates memory (makes it stick) so that it can be recalled later. Just how sleep enhances memory is not clear, but it is thought that the hippocampus which is basically 'memory central' replays the events of the day for the cortex of the brain and in so reviewing it helps them last long term. Some memories become more stable during REM (rapid eye movement) sleep, which is when you are dreaming. Other studies find that certain memories are most often secured during slow wave, deep sleep.

Another possible cause of Alzheimer's is pesticides, and Roundup in particular which is the most heavily used agricultural chemical in the history of the world. There is some rat research that has found that Roundup causes the same type of oxidative stress and neural cell death as that observed in Alzheimer's. (Roundup may also cause problems with ADHD, autism, cancer, birth defects, depression, kidney disease, diabetes, liver disease, Lou Gehrig's disease, IBS, MS, Parkinson's, and other problems too. You can try to avoid, or at least reduce your potential exposure to the

chemical by avoiding non-organic corn, soybeans, oats, and wheat in particular, along with grapes and beets.)

Research also has suggested that blood sugar is related to Alzheimer's and some have suggested that there be a Type 3 diabetes to reflect this. The risk of Alzheimer's is doubled by being diabetic. Reasons for this occurring include elevated blood sugar levels causing inflammation in the body and brain, and inflammation has been linked to the formation of plaques and tangles of Alzheimer's. Insulin resistance also can impair blood flow to the brain so the cells lack adequate oxygen and nutrition. Plus, there can be insulin resistance in the brain itself so brain cells cannot utilize glucose properly. When the brain can not handle glucose properly it leads to oxidative stress and the accumulation of beta amyloid plaque in the brain. Consequently, it has been suggested that type 3 diabetes may be treatable, preventable or curable through diabetes drugs. Other ways to control diabetes and its impact on the brain include through exercise, eating healthy, and managing body weight especially fat around the abdomen.

Diabetes affects about 30 million Americans, and another 70 million are pre-diabetic. High cholesterol affects 95 million Americans. High blood pressure affects an estimated 103 million American adults. Having one, two or three of these is obviously very common in people in this country, and consequently vascular dementia can result.

Japanese researchers in 1988 tested over 1000 people for their blood sugar levels, and followed them for another fifteen years. Those with pre-diabetic blood sugar but not at true diabetic levels were found to have a 35% greater chance to develop any kind of dementia. At diabetic levels the risk was 74% greater for developing dementia.

Also, the risk of having a heart attack – which has implications for memory impairment resulting – begins to rise as blood sugar levels are around the top of the normal range. And heart attack risk doubles for when blood sugar is in the pre-diabetic range.

Yet another factor that can predict cognitive decline are 'advanced glycation end products' (AGEs, also known as glycotoxins), which is a type of metabolic waste product of the food we eat. Research has found that older adults with the highest levels of glycotoxins went on to have the greatest cognitive decline over the next nine years. Research out of Australia linked AGEs to brain atrophy so limiting these may have a large impact on one's brain health as to the aging process. AGEs are particularly prevalent in foods high in fat and protein and are also influenced by how they are processed (e.g. steamed, boiled, fried, baked, etc.). Chicken, pork, beef and fish are among the worst for having higher levels of AGEs. This may explain why people who eat meat in the present four or more times a week have triple the risk of developing dementia vs. those who have been vegetarian for at least thirty years. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3704564/ offers a table of AGEs for over 500 foods.

The second most common neurodegenerative disease is Parkinson's. It affects about 1 million Americans. It usually surfaces after the age of 60, but some people can be hit with it by the age of 35 or 40. And Michael J. Fox, the movie actor, was diagnosed with the disease at the age of 29. Parkinson's is primarily a movement disorder, such as having tremors and stiffness. But memory can be impaired by it too, and 25-30% of Parkinson's patients develop dementia. Medication

exists, most notably L-dopa, which helps with motor difficulties to a decent extent but some people become resistant to its effects over time.

Other reasons for suffering memory problems include vascular dementia (obstructive and/or hemorrhagic strokes) that affects about 10% of people as a sole diagnosis, although about half of Alzheimer's patients have evidence of silent strokes. With vascular problems to the brain oxygen and nutrients go wanting. Leading causes of strokes include high blood pressure and/or diabetes. High cholesterol that can plug up large arteries such as for the heart can also block the tiny capillaries, which are smaller in diameter than a human hair, that feed individual brain cells and lead to what is called small vessel ischemic disease.

Memory impairment can result from high blood pressure even before a stroke occurs. One study looked at 37 people with high b/p, and 59 with normal b/p, and evaluated for what are called verbal and spatial memory. PET scans were done during memory testing. People with high b/p had less blood flow to the parts of the brain involved with memory, and more blood flow to other brain regions, compared to those with normal b/p. Interestingly, memory tests for both groups were the same. It is theorized that the hypertensive group was able to compensate by use of other brain regions to help them with memory – but eventually untreated high b/p will overwhelm that coping mechanism and memory impairment will then result.

Another study called REGARDS looked at almost 20,000 people age 45 and older from across the country, and who never had had strokes or mini-strokes. A total of 1,505 had cognitive problems. Findings included that for every 10 point increase in b/p the odds of a person having cognitive problems was 7% higher (after adjusting for age, smoking, exercise level, education, diabetes, and cholesterol level). This study is one of the largest population based on risk factors for stroke.

Research coming from the Framingham Heart Study found that individuals with persistent elevations in b/p measured over about ten years had poorer cognitive function 12-14 years later compared to those with lower b/p. Plus, in the Western Collaborative Group Study, the researchers found that elevations in both systolic and diastolic b/p assessed over about 10 years during middle age predicted cognitive impairment twenty-five years later.

Vascular dementia and its underlying causes are to a large extent preventable, by changing diet, avoiding smoking, and getting exercise. One source of educational material on these diseases is www.nutritionfacts.org which offers short videos summarizing current medical research literature on how to control, reverse and sometimes fully eliminate such diseases without drugs and just by changing one's diet and nutritional intake.

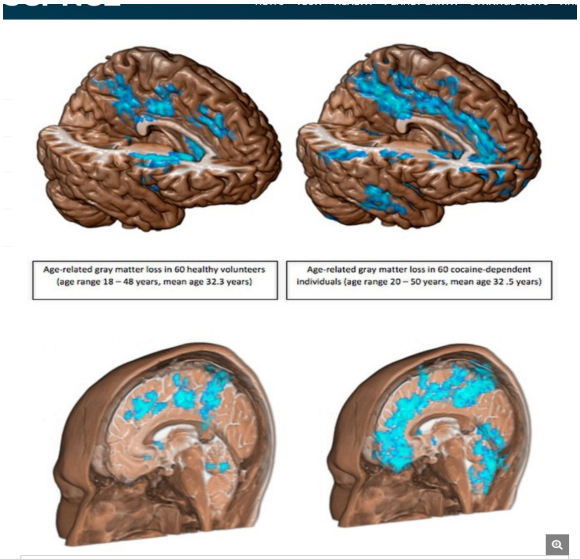
Chronic alcohol abuse can also cause problems. According to NIAAA (National Institute on Alcohol Abuse & Alcoholism) "most heavy long-term alcohol users will experience a mild to moderate impairment of intellectual functioning as well as diminished brain size. The most common impairments are relative to the ability to think abstractly as well" as in visual-spatial memory. Other effects of alcohol abuse obviously still occur, such as with the liver.

There also has been research that as many as 80% of chronic alcoholics have a deficiency in thiamine (vitamin B1), which causes Wernicke-Korsakoff's syndrome involving serious problems with memory and learning. Giving high doses of thiamine to such patients who are being treated

is standard practice. I have seen it effective just once in my professional career of forty years, meaning that doctors - or the alcoholics - are 'closing the barn door after the horse is out.'

Abuse of illegal drugs is another potential source of impaired memory. Getting accurate details as to how much of a drug has been used is very hard, and therefore figuring out whether some substance is causing cognitive problems such as with memory is much more difficult. e.g. It is easy to say 'I drink a fifth of Jim Beam every night.' It is very hard to know what purity cocaine or some other drug is. Or, what it has been 'cut' with as to adulterants. Milk powder? Floor wax? Urine? (Don't laugh, these all have been used.) Or how much is being done as to grams of the pure chemical, and instead it is voiced as 'a line' or '$100. worth.'

This map is taken from anonymous health data of nearly a million people who use employer-based health insurance. NC Policy Watch, "NC is home to the #1 worst city for opioid abuse – and four in the top 20" Joe Killian, July 7, 2017



Age-related gray matter loss in healthy volunteers (right) versus cocaine-addicted volunteers of the same age (left).

Credit: Dr. Karen Ersche, University of Cambridge

Cocaine may speed up the aging of the brain, according to new research that finds that people who are addicted to the drug lose twice the brain volume each year as non-drug users.

The second set of pictures are mislabeled and reversed as to what they show.

That said as a caveat, cocaine is one drug that I have seen where surprisingly brief use of it such as just a month or so may cause permanent brain damage including memory impairment. One factor involved with how much recovery results with abstinence may be that severity of harm may depend on when the drug is first used, meaning greater damage is done when it is started younger.

Doing human research on this issue is not possible, but animal studies suggest that brain atrophy due to cocaine abuse may be related to oxidative stress. Greater than normal age related declines are shown in gray matter (brain cells) of the prefrontal & temporal regions. (The prefrontal cortex is heavily involved with what makes us 'human' and separates us from 'lower' animals, such as judgment, reasoning, morals, etc. The temporal lobes are heavily involved with memory, language, and emotional control.) Mortality rates are estimated up to eight times higher than in the healthy population. Estimates are that 1% of the U.S. population over the age of 12 uses cocaine (vs. 67% who drink), according to the Office of National Drug Control Policy. And the Baby Boomer generation is obviously a prime group who are suffering the effects since they used more drugs than prior generations.

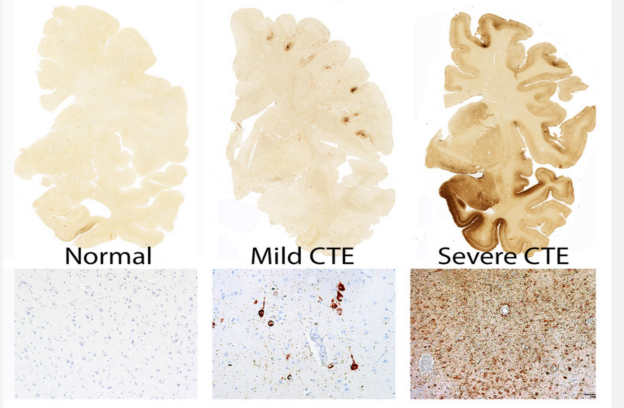
Opiates are another drug that has been in the news of late, and Wilmington, NC is said to be #1 in the country for such abuse. Some opiate abusers, such as of the drug Fentanyl, are being found to have severe short term memory loss. Brain imaging scans have revealed lesions in the hippocampus, a prime spot that is involved with learning and memory. Heroin hits the hippocampus too (because there are opioid receptors there) and over-stimulation of them can cause cell death. Memory impairment from opiates may include problems with new learning, loss of short term memory efficiency, disappearance of long term memory, struggling to remember basic facts (e.g. your phone number, address, etc.), inability to recognize faces, blackouts and memory gaps.

Traumatic brain damage such as from car accidents, sports-related concussions, falls, or injuries suffered in war are another way of harming memory. Estimates vary but as of 2013 the CDC said there were around 1.7 million TBIs in the U.S. every year. I have been evaluating TBIs in people since 1980. What is unique about them is that they always entail a split second. And the person's life is changed forever, including all too often from impaired memory. Most people have what are called mild TBIs (mTBI), but any amount of lost cognitive function can take a significant toll on the quality of a person's life. There is also some concern that TBIs might lead to Alzheimer's or Parkinson's.

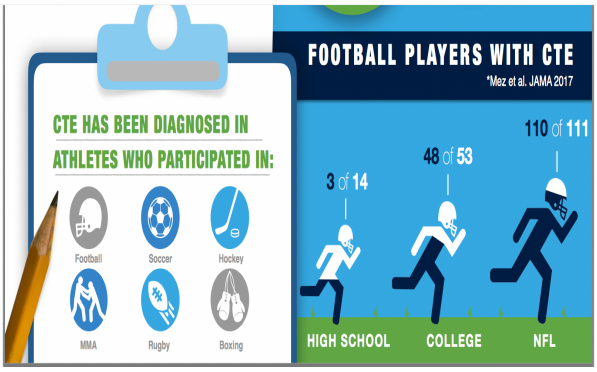
Blows to the head can be cumulative, so two or more little ones may equal one larger one. There has been recent attention to concussions causing permanent brain damage, due to NFL football players being diagnosed with TBI and in some cases dying very early deaths from what is called chronic traumatic encephalopathy (CTE). CTE is caused by repeated impacts, and can be found in athletes, those with head trauma from other occupations such as the military, and people with seizures and/or head banging behavior. It entails problems with memory, executive skills, mood and behavioral disturbances that can include depression, apathy, impulsivity, anger, irritability, suicidal behavior, and aggressiveness. Problems with movement that look like Parkinson's can also occur, and eventually there is a progression to dementia. The neuro degeneration is slow and mean survival time is eighteen years from the onset of symptoms.

CTE was initially named dementia pugilistica because of it being found in people who boxed. Muhammad Ali is probably the best known person who suffered from it. (It is estimated that he suffered 150,000 blows to his head over his boxing career.)

The APO-E4 gene may be associated with it too. At what age a person starts experiencing head injury, and the amount of time between concussions may play a role in the development of CTE as well.



A sample of normal brain tissue (left), alongside samples showing mild and severe CTE. The brown stain indicates tangles of tau protein. Defective tau is associated with CTE, as well as Alzheimer's disease and Parkinson's disease. The bottom row shows microscopic images of tau, stained red, embedded in brain tissue. Photo by Ann McKee



This research on football players as to the above graphic, like all, is not without flaws. It was based on people donating their brain to science after their deaths. i.e. Donations may have been skewed by those players, or their families, who thought they were showing signs of CTE vs. football players who died without CTE symptoms perhaps being less likely to donate their brains to be autopsied after the fact. So that could throw off the percentages and make it look worse than it might be.

www.BU.edu.research "CTE found in 99% of former NFL football players studied" Barbara Moran

That said, this particular research is still considered to be major and landmark in its findings in that it was the largest and most methodologically rigorous CTE case series ever published. Factors that might be related to CTE risk could include: age of first exposure to football, duration of play, what position was played, cumulative hits, and what is called linear or rotational acceleration of hits (did the brain spin on its axis, or just go front and back?).

There also has been research that even without a concussion being sustained, permanent brain damage can occur with cumulative hits such as from sports like football affecting memory and attention skills. Some of the damage that is done from sub-concussive impact is to the wiring of the brain meaning that different regions can not communicate as well with each other. In such cases people may notice their thinking is 'slow' or 'foggy.' There is also a concern that more sub-concussive hits may lead to problems later in life such as mood and behavior issues. But there has been insufficient time to do such research yet, given how recently this concern has been raised.

Another potential source of memory impairment is surgery, especially for those over the age of sixty. Post-operative cognitive dysfunction (POCD) has been recognized as an issue. Some number of people – just how many is not well established and estimates vary widely (ranging from perhaps 10 to 70%) – find that after surgery they are having greater difficulty functioning. This may include memory impairment, being able to multi-task, learn new stuff, follow multiple steps in a procedure, or set priorities. Some people may find that such issues disappear after a few weeks. Or a few months. Or it may take a year. Or be permanent. POCD has been associated with increased mortality, risk of not being able to work any longer, and becoming disabled. People over the age of 60 are estimated to be twice as likely to develop it as those younger.

Some risk factors for POCD may include carrying the APOE-4 gene, use of one or more highly anticholinergic or sedative drugs at home prior to surgery, and receiving an anesthetic with the trade name Ultane (sevoflurane). Ultane can increase beta amyloid protein levels in mice which suggests that it may promote Alzheimer's. Other possible risk factors include inadequate blood

flow and/or oxygen to the brain during surgery. Micro emboli (clots, fat, atherosclerotic plaques during surgery on the aorta, or air bubbles) are another potential cause of POCD. MRI studies have suggested that 50% of patients undergoing coronary artery bypass grafts (CABG) develop discrete lesions suggesting micro emboli infarcts. Operations requiring a heart-lung machine also increases the risk of cerebral micro emboli.

No one really knows how to treat POCD and reverse the damage other than to wait and see if it goes away over time, and to treat the symptoms such as insuring good oxygenation and blood flow after the surgery is over.

What can one do to preserve memory?

Most of this paper is focused more on the 'ounce of prevention' rather than 'the pound of cure' although some of the approaches to prevent memory loss may be curative or restorative as well. e.g. Over 73,000 research papers have been written on Alzheimer's in the last twenty or so years, and there is still no cure for it such as through drugs.

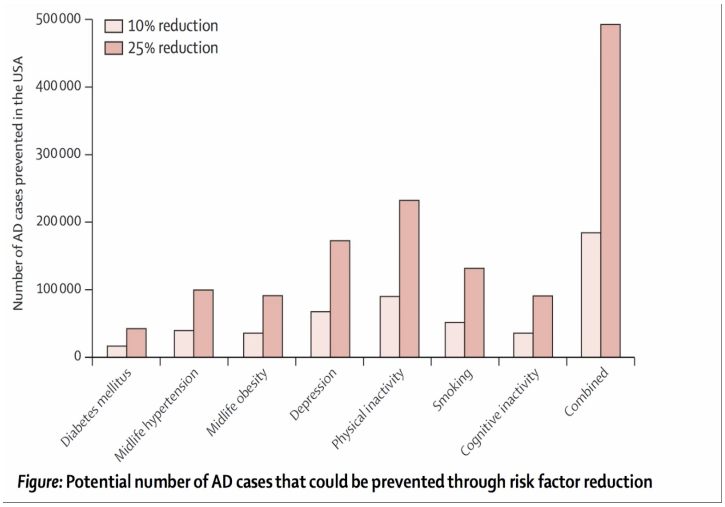


Figure: Potential number of AD cases that could be prevented through risk factor reduction

This is a graph showing how many potential cases of Alzheimer's could be prevented by having either a 10% or 25% reduction of occurrence for various contributing factors.

There are an estimated 500,000 new cases of Alzheimer's in the U.S. every year. So if we as a nation could cut all of the seven risk factors by 25% that would in theory eliminate it hitting anyone else.

"The projected impact of risk factor reduction on Alzheimer's disease prevalence" Lancet Neurology, Sept. 2011, 10(9), 819-828, Deborah Barnes et al

More specifically:

Nutrients that can be harmful

Certain metals can be toxic to the brain and have turned up in Alzheimer's patients. This includes copper, zinc, and iron all of which are clearly present in beta amyloid plaques. All three of these metals are important to our lives. But too much can be damaging, and the difference between a safe amount and a damaging one is small. Iron and copper can oxidize (e.g. obvious examples being rust, and copper statues turning green), and these cause free radicals to form which can then attack brain cells. One study done at UC San Diego looking at 1,451 people found that lower levels of copper in the blood had such people being mentally clearer compared to those with excessive copper. They also had fewer problems with long and short term memory. The same held true for iron, with people who had lower levels having less memory problems.

Table 1. Top Food Sources of Saturated Fat[a] Among U.S. Population, 2005-2006 NHANES[b]

Ranking	Food item	Contribution to intake (%)	Cumulative contribution (%)
1	Regular cheese	8.5	8.5
2	Pizza	5.9	14.4
3	Grain-based desserts	5.8	20.2
4	Dairy desserts	5.6	25.8
5	Chicken and chicken mixed dishes	5.5	31.2
6	Sausage, franks, bacon, and ribs	4.9	36.2
7	Burgers	4.4	40.5
8	Mexican mixed dishes	4.1	44.6
9	Beef and beef mixed dishes	4.1	48.7
10	Reduced fat milk	3.9	52.6
11	Pasta and pasta dishes	3.7	56.3
12	Whole milk	3.4	59.7
13	Eggs and egg mixed dishes	3.2	62.9
14	Candy	3.1	66.0
15	Butter	2.9	68.9
16	Potato/corn/other chips	2.4	71.3
17	Nuts/seeds and nut/seed mixed dishes	2.1	73.4
18	Fried white potatoes	2.0	75.4

a: Specific foods contributing at least 1% of saturated fat in descending order: Cold cuts, yeast breads, salad dressing, pork and pork mixed dishes, soups, other white potatoes, reduced fat cheese, cream, quickbreads.
b: NHANES = National Health and Nutrition Examination Survey.

One study, the Chicago Health & Aging Project looked at aging, and entailed over 10,000 people. They carefully recorded what people ate, and then kept in touch with people over the years to see how well they aged. A particular combination was especially harmful, being copper and saturated fats (such as found in junk food and animal sources). People with this combination showed a loss of mental function equal to nineteen years of aging. The difference in copper intake between those who did well vs. poorly was small, being about 1 mg vs. 2.8 mg per day. (A copper penny weighs about 2500 mg).

National Cancer Institute, Epidemiology & Genomics Research Program

People who avoided these fats, regardless of how much copper was in their diet, tended to stay mentally sharp. So copper was dangerous only when a lot of saturated fat was present in the diet too. In the American diet the biggest source of saturated fat is from dairy products (e.g. cheese, butter, milk, ice cream). Meat, poultry, sausage, and roast beef are a close second.

The Chicago research found that over a four year period people who had at least 25 grams of saturated fat per day had at least two times higher risk of developing Alzheimer's compared to those with half that sat fat intake. Trans fat (e.g. margarine, and used in pastries, French fries, etc.) is also bad, which more than doubles the risk of Alzheimer's too. Risk of Alzheimer's is reduced for people with lower sat fat even if they had the E4 gene.

Add up your typical day's food and see how many grams of sat fat you ingest. It does not take much to get past 25 grams. High fat levels jack up cholesterol, which can then form plaques in the heart and arteries leading to the brain. Compared to a cholesterol below 200, those with a level of 220 have a 25% higher risk of Alzheimer's. With a cholesterol level around 250 or above the likelihood of developing Alzheimer's is about 50% higher, based on research done on 9,844 Kaiser-Permanente patients in California who had cholesterol levels checked in their early 40s. A high level at that earlier age predicted the risk of Alzheimer's 20-30 years later.

In the past cholesterol levels were advised to be below 200. Some doctors now recommend levels below 150, given that many people still run into serious health consequences for levels between 150-200.

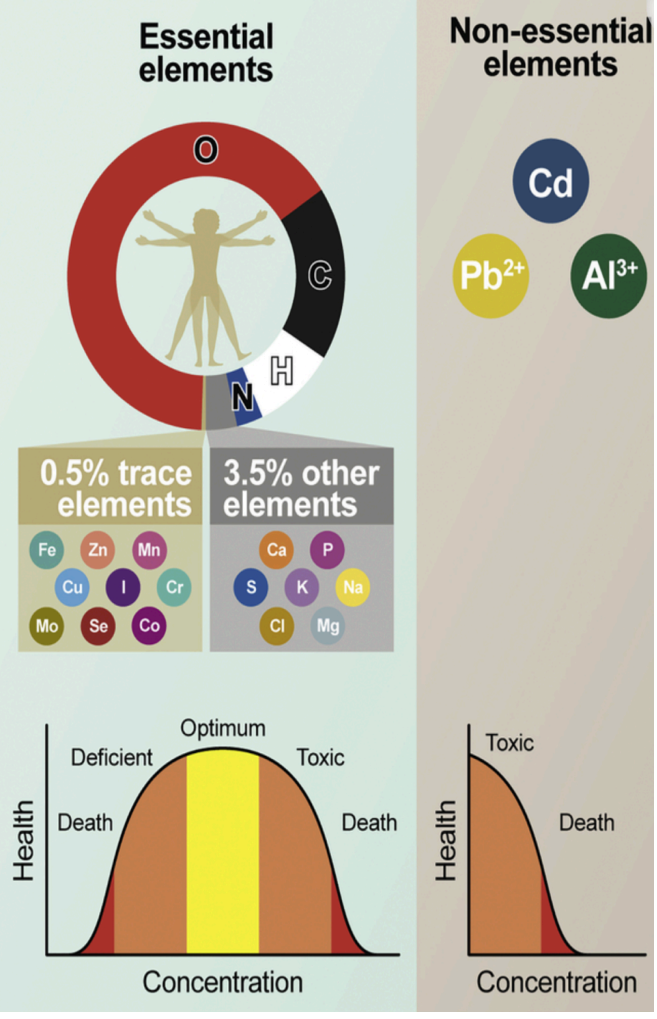
The E4 gene makes a protein that transports cholesterol within the brain, and with this gene cholesterol is more easily absorbed from the digestive tract, which leads to higher cholesterol levels, and thus heart attacks and strokes. Cholesterol also increases production of beta amyloid which can lead to Alzheimer's.

Two studies that gave statin drugs to people over age 70 showed no drop at all in Alzheimer's risk. Maybe they intervened too late. But, such drugs also do not lower blood pressure, or trim your weight. So, what is advised here is to change your diet vs. trying to solve a problem by popping pills and continuing to eat in unhealthy ways.

Iron can be problematic too. A study done in the Netherlands researched blood levels of iron, and evaluated memory, reaction speed, and other cognitive abilities, and found results like those of copper. Those who were slowest on cognitive tests had the most iron in their blood. Iron is important for our health, such as being involved with hemoglobin that carries oxygen in blood. However, a 2009 study found that having low or high levels of hemoglobin can cause problems with memory. High levels can cause problems with verbal memory like recalling words. This study followed individuals for another three years, and found people with healthy hemoglobin levels continued to do well. And those with low or high hemoglobin had a more rapid cognitive decline. And people with high hemoglobin were more than three times more likely to develop Alzheimer's compared to healthy hemoglobin levels (the safest being 13.7 g/dl), and going very below or above that level was linked to brain problems in subsequent years.

Zinc seems to encourage beta amyloid proteins to clump together and form plaques. Copper and iron can cause this clumping too, but zinc is worse.

Where do these metals come from? Consider just your kitchen for a moment. Iron or copper plumbing pipes? Iron or copper cookware? They can leach these metals out into your water or food. Use a multivitamin? These metals can be in it, and may have more than the recommended (RDA) amounts.



Journal of Molecular Biology, "Metal toxicity links to Alzheimer's disease and neuroinflammation" Tee Jong Huat et al, April 2019

There are other essential elements that are important for health including manganese, iodine, chromium, molybdenum, selenium, and cobalt, along with appropriate amounts of iron, zinc and copper. Still others are calcium, phosphorous, sulfur, potassium, sodium, chloride, and magnesium.

Toxic ones impacting brain health include cadmium, lead, and aluminum. This research study offers that "evidence suggests that dysregulation in the homeostasis of essential metals and exposure to non-essential metals have significant impact on the pathogenesis of Alzheimer's disease." They note that early life exposure to lead can persist into adulthood and is possible contributor to Alzheimer's developing.

Aluminum "affects the cholinergic system which has been shown to degenerate in Alzheimer's disease pathogenesis. Thus… aluminum chelation has been studied as a potential therapy for Alzheimer's disease."

Cadmium is concentrated in the food chain. Some plants like tobacco show cadmium tolerance and so smoking increases the risk of cadmium taking a toll on health. It is known to cross the blood-brain barrier and this leads to neurotoxicity, inflammation, oxidative stress, and cell death. There is also evidence that cadmium is involved with amyloid beta plaques accumulating, and is thought to be one factor that could be involved with Alzheimer's developing.

And then there is food. Eat breakfast cereal? Many have added these metals to fortify them. Drinking alcohol increases absorption of iron. A single serving of liver (about 3½ oz.) has about fourteen times the RDA of copper, plus zinc, iron, and lots of cholesterol. Not into liver? Red meat in general has a lot of metals too. Plants like vegetables have iron too, but in a form called non-heme which the body can more easily regulate (absorbing it easily if you are low in iron, and not absorbing it if you don't need it). Meat contains a lot of heme iron, and it is a form that is harder to regulate. It is very absorbable and can push you into iron overload. Plants have phytic acid which tends to limit zinc and iron absorption, and this too contributes to such metals not becoming excessive in the blood while still not having too little.

A study done at Loma Linda U. did research on people living around the school. Participants numbering 272 were vegetarian, vegan, or followed typical American diets. Those who skipped eating meat had only one-third the risk of developing Alzheimer's.

Aluminum is the most widely distributed metal on the planet, used in cookware, beverage cans, aluminum foil. It can be found in some antacids, tea, vaccines, antiperspirants, and even flour. People do not need aluminum in their diet. And it accumulates in the kidneys, brain, lungs, liver and thyroid where it competes with calcium for absorption and can affect skeletal mineralization.

There has been concern for decades about aluminum being a possible culprit in Alzheimer's. The research has not found that, such as studying factory workers at an aluminum smelting plant. But the concern has not gone away. There is research that aluminum causes inflammation in the brain, and Alzheimer's is often associated with inflammation. Research that came out in 2019 in the Journal of Alzheimer's Disease & Parkinsonism has found an a "statistically significant trend for aluminum to be increased" in Alzheimer's (along with dialysis dementia syndrome and Down's Syndrome). As such aluminum "may contribute to the neuropathology of these neurological diseases." Other research published in January 2020 in the Journal of Alzheimer's Disease has found "significantly higher levels of aluminum in brain tissues in donors" with familial Alzheimer's. They postulate that people who have the disease arising relatively early in life due to genetic predisposition may have aluminum underlying this relationship.

Artificial sweeteners are bad for you, and Aspartame (Nutrasweet) in particular may be the most controversial. It has been linked to brain tumors, seizures, memory impairment, and dementia. One metabolite of it is methanol (wood grain alcohol) which is highly poisonous to people. And that gets metabolized into formaldehyde (embalming fluid) which is beyond poisonous too. (Other health effects of it have included there being an association between total aspartame consumption and multiple myeloma, fibromyalgia, high blood pressure, non-Hodgkin's lymphoma, and leukemia. Irritability, depression and "decreased brain function" were also found in people consuming aspartame. Plus, other artificial sweeteners have been linked to greater rates of depression for those people who have mood problems to start with.) A fairly brief YouTube video can be found at: https://youtu.be/TB6L9S_jc5E
For more details about this chart, go to: www.alzheimers.net/foods-that-induce-memory-loss/

Then there is 'ultra-processed food' (as defined by one researcher as "industrial formulations made mostly or entirely with substances extracted from foods, often chemically modified, and from additives, with little if any whole food added. Sequences of processes are and must be used to obtain, alter, and combine the ingredients and to formulate the final products." (Carlos Monteiro.) Some research found that those who eat the highest amount of ultra-processed foods like soft drinks, chips and cookies have a higher risk of developing dementia. Replacing those foods with unprocessed or minimally processed was associated with a lower risk. The study found that for every 10% increase in daily intake of ultra-processed food there was a 25% higher risk of dementia. For a 10% reduction of such ultra-processed foods to unprocessed or minimal (e.g. fruit, veggies, legumes, milk, meat) there was a 19% lower risk of dementia. Making small improvements such as increasing the healthier foods by just 50 grams/day (e.g. half an apple, a bowl of bran cereal, a serving of corn) and decreasing unhealthy foods by 50 g/day (e.g. a chocolate bar, a serving of fish sticks) is associated with a 3% decreased risk of dementia. (Science Daily, "Eating more ultra-processed foods associated with increased risk of dementia" Li Huiping et al, 7/27/22). Other research has found that Americans get more than 50% of their daily calories from ultra-processed foods. Adults who had about 70% of their calories from such food were half as likely to have 'ideal' cardiovascular health compared to those who ate 40% or less from such foods (American Heart Association, "Too much ultra-processed food linked to lower heart health" 11/11/2019).

A nationally representative study (NHANES, 1999-2018) looked at consumption of ultra-processed foods for kids ages 2-19 and found that they increased from 61.4% to 67% over those years. Unprocessed or minimally processed foods decreased from 28.8% to 23.5% during that time. (JAMA, "Trends in consumption of ultra-processed foods among US youths aged 2-19 years 1999-2018" Lu Wang et al, 8/10/21.)

One newer theory about Alzheimer's is that it is can be due to leaky blood vessels in the brain. Factors that can cause leaky brain blood vessels include: brain inflammation, head trauma, toxins, and brain infections such as the herpes virus (not the sexually transmitted form, but a more common one that as many as 75% of people harbor). A new theory is that brain infection and/or inflammation are causing excess amyloid in the brain in that it is lethal to viruses and bacteria. i.e. It is an immune response and the idea that it causes Alzheimer's itself is losing steam. One fact that supports this idea is that amyloid is found in all vertebrates including fish and lizards, suggesting it evolved 400 million years ago. Anything that nature has selected to keep for so long must be good. However, too much amyloid causes tau protein to form tangles, and that further

harms cells. And then all this excess protein increases the immune response leading to inflammation, and it is this that does the most damage to an Alzheimer's patient.

Fluoridation of water against dental cavities also may be involved with memory impairment. Rat research done by Charles University in the Czech Republic found that rats exposed to the amount found in public drinking water resulted in the formation of amyloid, the plaque found in Alzheimer's brains. Harvard did a meta-analysis of studies which is cited at www.ncbi.nlm.nih.gov/pmc/articles/PMC3491930/ funded by NIH that concluded that kids who live in areas with highly fluoridated water have "significantly lower" IQ than those who live in low fluoride areas. Reported effects of fluoride on the brain include damage to the hippocampus, formation of beta-amyloid plaques, impairment of antioxidant systems, and increased uptake of aluminum to name a few. Diacetyl (which can be used for popcorn flavoring) has been shown to produce amyloid. MSG also increases the risk of Alzheimer's.

Anticholinergic drugs

Acetylcholine is a neurotransmitter in the brain heavily involved with memory. It is the one that is impacted by Alzheimer's. There are many drugs on the market that block acetylcholine to accomplish some purpose. These are referred to as being anticholinergic. Such drugs are thought to contribute to dementia.

A study in JAMA Internal Medicine in June 2019 involved a British study of over 284K people. They found that taking more than about 1100 doses (roughly a 3 year supply on a daily basis of the minimum level of an anticholinergic drug) led to approximately a 50% increase in dementia within a 10 year period. The worst offenders compared to non-use were:

Class of drugs	Increased risk
Antipsychotics	70%
Bladder antimuscarinics	65%
Antiparkinson	52%
Antiseizure	39%
Antidepressant	29%

Some classes of anticholinergic meds (e.g. antihistamines like Benadryl) had too few people using them to get good statistical results. Another study out of the same journal from March 2015 used computerized pharmacy records to look backward ten years as to prescriptions filled (rather than relying on a person's memory for how much they might have taken). The most common anticholinergic meds used were antidepressants, antihistamines, and bladder control drugs which accounted for more than 90% of all anticholinergic exposure. The most common drugs among these classes were Doxepin (Sinequan), chlorpheniramine (e.g. Chlor-Trimeton), and oxybutynin (Ditropan). Results included that in effect taking a daily dose for three years increased the risk of dementia by 54% and Alzheimer's by 63%.

Another finding of this first study is that risk generally went up more for vascular dementia from such drugs over Alzheimer's. This finding is novel and raises questions if anticholinergic drugs

are doing more than just interfering with acetylcholine and may be inducing vascular or inflammatory problems.

These JAMA studies do not prove causation, and only offers association. However, if the relationship is causal it would mean that about 10% of dementia diagnoses would be attributable to use of anticholinergic drugs.

Another study (British Medical Journal, "Anticholinergic drugs and risk of dementia: case-control study" Kathryn Richardson et al, 10/31/2019) looked at almost 41,000 people ages 65-99 with a dementia diagnosis between 2006-2015 and compared them with almost 284,000 controls without dementia. 'Anticholinergic cognitive burden' (ACB) was ranked on a 1-3 scale (1=possibly anticholinergic; 2=definitely anticholinergic; 3=definitely anticholinergic and also with reported associations with delirium). Antidepressant, anti-Parkinson, and urological drugs with a '3' rating were significantly associated with dementia. Class 3 drugs that were antispasmodic, antipsychotic, antihistamine or others were not associated. Class 2 anti-Parkinson drugs had some evidence for association with dementia. Antidepressant class 1 drugs had some association with increased risk of dementia but not with any other drugs in that class.

When the drugs were taken was also looked at (4-10 years before dementia was diagnosed, 10-15 years before, or 15-20 years prior). Class 3 drugs had "consistent" issues across all three time periods but the strongest association was for 15-20 years prior to the diagnosis of dementia. Class 1 and 2 drugs had stronger associations nearer to when the diagnosis was made, especially for antidepressants in class 1.

As to which drugs are in which class, the ones investigated are shown below.

Drugs with ACB Score of 1

Generic Name	Brand Name
Alimemazine	Theralen™
Alverine	Spasmonal™
Alprazolam	Xanax™
Aripiprazole	Abilify™
Asenapine	Saphris™
Atenolol	Tenormin™
Bupropion	Wellbutrin™, Zyban™
Captopril	Capoten™
Cetirizine	Zyrtec™
Chlorthalidone	Diuril™, Hygroton™
Cimetidine	Tagamet™
Clidinium	Librax™
Clorazepate	Tranxene™
Codeine	Contin™
Colchicine	Colcrys™
Desloratadine	Clarinex™
Diazepam	Valium™
Digoxin	Lanoxin™
Dipyridamole	Persantine™
Disopyramide	Norpace™
Fentanyl	Duragesic™, Actiq™
Furosemide	Lasix™
Fluvoxamine	Luvox™
Haloperidol	Haldol™
Hydralazine	Apresoline™
Hydrocortisone	Cortef™, Cortaid™
Iloperidone	Fanapt™
Isosorbide	Isordil™, Ismo™
Levocetirizine	Xyzal™
Loperamide	Immodium™, others
Loratadine	Claritin™
Metoprolol	Lopressor™, Toprol™
Morphine	MS Contin™, Avinza™
Nifedipine	Procardia™, Adalat™
Paliperidone	Invega™
Prednisone	Deltasone™, Sterapred™
Quinidine	Quinaglute™
Ranitidine	Zantac™
Risperidone	Risperdal™
Theophylline	Theodur™, Uniphyl™
Trazodone	Desyrel™
Triamterene	Dyrenium™
Venlafaxine	Effexor™
Warfarin	Coumadin™

Drugs with ACB Score of 2

Generic Name	Brand Name
Amantadine	Symmetrel™
Belladonna	Multiple
Carbamazepine	Tegretol™
Cyclobenzaprine	Flexeril™
Cyproheptadine	Periactin™
Loxapine	Loxitane™
Meperidine	Demerol™
Methotrimeprazine	Levoprome™
Molindone	Moban™
Nefopam	Nefogesic™
Oxcarbazepine	Trileptal™
Pimozide	Orap™

Each one-point increase in the total score has been correlated with a 26% increase in the risk of death at two years, with a dose-response effect on the score. 20% of those with scores of 4 or higher had died during the 2 year follow-up vs. 7% not taking such drugs. (Journal of the American Geriatric Society, "Anticholinergic medication use and cognitive impairment in the older population: the Medical Research Council Cognitive Function and Ageing Study" Chris Fox et al, 2011)

www.agingbraincare.com

Drugs with ACB Score of 3

Generic Name	Brand Name
Amitriptyline	Elavil™
Amoxapine	Asendin™
Atropine	Sal-Tropine™
Benztropine	Cogentin™
Brompheniramine	Dimetapp™
Carbinoxamine	Histex™, Carbihist™
Chlorpheniramine	Chlor-Trimeton™
Chlorpromazine	Thorazine™
Clemastine	Tavist™
Clomipramine	Anafranil™
Clozapine	Clozaril™
Darifenacin	Enablex™
Desipramine	Norpramin™
Dicyclomine	Bentyl™
Dimenhydrinate	Dramamine™, others
Diphenhydramine	Benadryl™, others
Doxepin	Sinequan™
Doxylamine	Unisom™, others
Fesoterodine	Toviaz™
Flavoxate	Urispas™
Hydroxyzine	Atarax™, Vistaril™
Hyoscyamine	Anaspaz™, Levsin™
Imipramine	Tofranil™
Meclizine	Antivert™
Methocarbamol	Robaxin™
Nortriptyline	Pamelor™
Olanzapine	Zyprexa™
Orphenadrine	Norflex™
Oxybutynin	Ditropan™
Paroxetine	Paxil™
Perphenazine	Trilafon™
Promethazine	Phenergan™
Propantheline	Pro-Banthine™
Propiverine	Detrunorm™
Quetiapine	Seroquel™
Scopolamine	Transderm Scop™
Solifenacin	Vesicare™
Thioridazine	Mellaril™
Tolterodine	Detrol™
Trifluoperazine	Stelazine™
Trihexyphenidyl	Artane™
Trimipramine	Surmontil™
Trospium	Sanctura™

Other drugs that have been added to this list are:

Medications Reviewed in 2012 Update

Medications Added with Score of 1:
Aripiprazole (Abilify™)
Asenapine (Saphris™)
Cetirizine (Zyrtec™)
Clidinium (Librax™)
Desloratadine (Clarinex™)
Iloperidone (Fanapt™)
Levocetirizine (Xyzal™)
Loratadine (Claritin™)
Paliperidone (Invega™)
Venlafaxine (Effexor™)

Medications Added with Score of 2:
Nefopam (Nefogesic™)

Medications Added with Score of 3:
Doxylamine (Unisom™, others)
Fesoterodine (Toviaz™)
Propiverine (Detrunorm™)
Solifenacin (Vesicare™)
Trospium (Sanctura™)

Medications Reviewed But NOT Added:
Fexofenadine (Allegra™)
Gabapentin (Neurontin™)
Topiramate (Topamax™)
Levetiracetam (Keppra™)
Tamoxifen (Nolvadex™)
Nizatidine (Axid™)
Duloxetine (Cymbalta™)

Another study in Neurology that came out in September 2020 looked at 688 cognitively normal people (with an average age of about 73, and nearly split equally between female and male) at the start of the study and followed them for a decade, with neuropsychological testing done to assess for skills like language, attention, executive function and memory. They looked at the 'anticholinergic burden' each person had by seeing how many such drugs they were on and how strong they were in that regard. The conclusions were "that use of anticholinergic medication is cognitively normal, highly educated, and healthy older adults is associated with increased risk of mild cognitive impairment and accelerated cognitive decline, which are exacerbated in the presence of Alzheimer's disease biomarkers." Those with genetic risk factors for Alzheimer's were 2-4 times more likely to start noticing memory and language problems. They also offered "Whether cumulative use of multiple 'weaker' anticholinergics is tantamount to use of one 'strong' anticholinergic remains unknown. However, it is clear from our results that use of anticholinergics in general has detrimental consequences on cognitive functioning in older adults."

Other research has found that anticholinergics are associated with a 30-50% increased risk of dementia in future years. Anticholinergics might be additive, so two 'lower activity drugs' could be as bad as one medium or high activity drug. When you take such a drug, such as today or ten years ago, is not important. That you have ever used such drugs is the issue. And if you ever used them in the past vs. doing so now carries the same risk relative to dementia. It is unclear if dementia is reversible even if the drug is stopped. The list below is not exhaustive and other anticholinergic drugs not offered here can have similar effects. If you are taking an anticholinergic drug, or might be prescribed one by your doctor, have a good talk about such a risk factor, and consider looking for an alternative approach to treating the issue.

Drugs with Potential Anticholinergic Activity		
Drug Class	**MEDIUM/HIGH Activity**[1,3,4,5,8]	**LOW Activity**[1,3,4,8]
Analgesics	Meperidine Tramadol (*Ultram*)	Celecoxib Codeine Fentanyl Morphine Oxycodone
Antibiotics	None	Ampicillin Cefoxitin Clindamycin Cycloserine (*Seromycin*)-U.S. only Gentamicin Piperacillin Vancomycin
Anticonvulsants	Carbamazepine (*Tegretol*) Oxcarbazepine (*Trileptal*)	Valproic Acid

Drugs with Potential Anticholinergic Activity		
Drug Class	**MEDIUM/HIGH Activity[1,3,4,5,8]**	**LOW Activity[1,3,4,8]**
Antidepressants	Amitriptyline Amoxapine-U.S. only Clomipramine (*Anafranil*) Desipramine (*Norpramin* -U.S.) Doxepin >6 mg Imipramine (*Tofranil*-U.S.) Nortriptyline (*Pamelor*-U.S., *Aventyl*-Canada) Paroxetine (*Paxil*) Protriptyline-U.S. only Trimipramine (*Surmontil*-U.S.)	Bupropion (*Wellbutrin*, etc) Citalopram Escitalopram Fluoxetine Fluvoxamine (*Luvox*) Mirtazapine (*Remeron*) Sertraline Trazodone Venlafaxine (*Effexor*)
Antihistamines	Brompheniramine Carbinoxamine-U.S. only Cetirizine (controversial) Chlorpheniramine Clemastine Cyproheptadine Dexbrompheniramine Diphenhydramine Doxylamine Fexofenadine (controversial) Hydroxyzine Pyrilamine Triprolidine	Desloratadine Levocetirizine Loratadine
Antimuscarinics (Overactive Bladder Agents)	Darifenacin (*Enablex*) Fesoterodine (*Toviaz*) Flavoxate Oxybutynin (*Ditropan*) Solifenacin (*Vesicare*) Tolterodine (*Detrol*) Trospium	None The extent of anticholinergic side effects seen with these agents will vary depending on the formulation used (e.g., immediate-release vs long-acting or topical). CNS effects depend on the extent of CNS penetration and the drug's affinity to M1 receptors in the brain. See our chart, *Medications for Overactive Bladder*, for a comparison of these drugs (U.S. subscribers; Canadian subscribers).

Drugs with Potential Anticholinergic Activity		
Drug Class	**MEDIUM/HIGH Activity[1,3,4,5,8]**	**LOW Activity[1,3,4,8]**
Anti-Parkinson Agents	Amantadine Benztropine (*Cogentin*) Trihexyphenidyl	Bromocriptine Carbidopa/Levodopa Entacapone (*Comtan*) Pramipexole (*Mirapex*) Phenelzine (*Nardil*) Selegiline (*Eldepryl*)
Antipsychotics	Clomipramine (*Anafranil*) Chlorpromazine Clozapine (*Clozaril*) Fluphenazine Haloperidol Loxapine Methotrimeprazine (Canada) Olanzapine (*Zyprexa*) Perphenazine Pimozide (*Orap*) Quetiapine (*Seroquel*) Thioridazine-U.S. only Thiothixene (*Navane*) Trifluoperazine	Aripiprazole Asenapine (*Saphris*) Iloperidone Paliperidone Risperidone (*Risperdal*) Ziprasidone (*Geodon*-U.S., *Zeldox*-Canada)
Benzodiazepines	None	Alprazolam (*Xanax*) Chlordiazepoxide Clonazepam (*Klonopin*-U.S., *Clonapam*-Canada) Clorazepate Diazepam (*Valium*) Estazolam-U.S. only Flurazepam Lorazepam Midazolam Oxazepam Temazepam (*Restoril*) Triazolam

Drugs with Potential Anticholinergic Activity		
Drug Class	**MEDIUM/HIGH Activity[1,3,4,5,8]**	**LOW Activity[1,3,4,8]**
Cardiovascular Agents	Disopyramide (*Norpace*-U.S., *Rythmodan*-Canada)	Atenolol Captopril Chlorthalidone Digoxin Diltiazem Dipyridamole Furosemide Hydralazine Isosorbide Metoprolol Nifedipine Quinidine Triamterene Warfarin
Gastrointestinal Agents	Atropine Belladonna Dicyclomine Dimenhydrinate Homatropine Hyoscyamine Loperamide Meclizine-U.S. only Prochlorperazine Promethazine Propantheline-U.S. only Ranitidine Scopolamine	Bisacodyl Cimetidine Clidinium Domperidone-Canada only Famotidine Metoclopramide Nizatidine
Immunosuppressants	None	Azathioprine (*Imuran*) Cyclosporine Hydrocortisone Methylprednisolone Prednisone
Muscle Relaxants	Baclofen Carisoprodol (*Soma*)-U.S. only Cyclobenzaprine Methocarbamol (*Robaxin*) Orphenadrine Tizanidine	Pancuronium
Respiratory Meds	Pseudoephedrine Theophylline	Fluticasone/Salmeterol (*Advair*)
Other	None	Colchicine (*Colcrys*-U.S.) Ketotifen Ophthalmic Lithium Metformin Methotrexate Naratriptan Sumatriptan Zolmitriptan

Therapeutic Research Center, Pharmacist's letter, "Drugs with anticholingergic activity" August 2017

Some research has looked at antidepressant use among the elderly and the risk of dementia resulting. A meta-analysis involving just under 54,000 people (published in Behavioral Neurology, 2018 by Yao-Chin Wang et al) found that there was a 75% increased risk with SSRIs (e.g. Prozac) and more than a doubling for use with tricyclic antidepressants (e.g. Sinequan, Elavil, Pamelor.) Possible explanations include increased inflammation, cell death (apoptosis), cerebrovascular disease, and causing more cognitive decline through oxidation.

Other drugs that may be implicated in memory loss include statins for lowering cholesterol. Lipitor, before it lost its patent protection, was the most profitable drug in the world. Because the statins are so widely prescribed some people feel they must be safe. One issue is that cholesterol does have its purpose, including it being used in the brain as to involvement with formation of connections between nerve cells – and this is what underlies memory & learning. Research done

in 2009 and published in Pharmacotherapy found that three-fourths of statin users experienced cognitive effects "probably or definitely related" to the drug. In 90% of cases stopping the drug fixed the problem, often within days. In 2012 the FDA ordered drug manufacturers to add a warning label about possible memory problems arising from statin use.

Beyond the above, statins are like all other drugs as to their having side effects, that may include risk of diabetes. For more information, look at https://universityhealthnews.com/daily/heart-health/900-studies-show-cholesterol-lowering-statin-drugs-are-dangerous/

Antiseizure drugs (e.g. Tegretol/Carbamazepine; Neurontin/Gabapentin; Lamictal/Lamotrigine; Trileptal/Oxcarbazepine, Topamax/Topiramate; Depakote/Valproic Acid to name some of them) can also impair memory. Plus, antiseizure drugs can be used off label, such as for nerve pain, bipolar disorder, migraines, or mood disorders. There needs to be due caution obviously, because not using such meds may result in a worsening of seizures, but other drugs might be considered that are not so harmful as to memory. As to other approaches of dealing with off-label use, like pain or mood problems, look at websites such as www.nutritionfacts.org for some ideas.

Others that can cause problems include Lyrica/Pregabalin, along with the sleeping agents ('Z drugs) being Zolpidem (Ambien), Zopiclone (Zimovane, Imovane), and Zaleplon (Sonata).

Narcotics (such as but not limited to: Fentanyl/Duragesic; Vicodin/Hydrocodone; Dilaudid/Hydromorphone, Oxycontin/Oxycodone) are another class of drugs that can cause memory problems. For people using pain meds for issues like fibromyalgia, rheumatoid arthritis, or migraines, a different approach to managing could be changing your diet. Consider looking at the book "Foods that fight pain" by Neil Barnard, MD for dietary ideas. Many people find that these painful conditions are triggered by specific foods. Not everyone finds a dietary trigger for pain, but if one is found, it may eliminate the need for pain meds.

Drugs for Parkinson's (such as Mirapex/Pramipexole, Apokyn/Apomorphine, and Requip/Ropinirole), can also cause memory loss. Such drugs can be used off label too such as for restless leg syndrome. Beta-blockers for high blood pressure can also cause difficulty (e.g. Tenormin/Atenolol, Coreg/Carvedilol, Lopressor/Metoprolol, Inderal/Propranolol, and others that end in –olol. Beta blockers are blocking a certain form of epinephrine and norepinephrine – and these chemicals are involved with memory.

Researchers at the U. of Toronto found about half of women who undergo chemo for breast cancer report having "chemo brain" as to their memory and language skills becoming impaired. Their memory problems were not psychological, as to their anxiety or depression causing it. i.e. Chemo, as we all know, is terribly toxic, and poisoning cancer cells poisons brain cells too.

Drugs for acid reflux or heartburn (PPI's, proton pump inhibitors such as Prilosec, Prevacid, or Nexium and their generics) are also being found to cause dementia including Alzheimer's. One German study published in JAMA Neurology in April 2016 was done on over 73,000 people over the age of 75 and found those taking PPI's were at significantly greater risk compared to those not taking the meds. A Swedish study (published in Alzheimer's & Dementia, 5/8/2020) found that PPI's inhibit an enzyme that is crucial to make acetylcholine, the neurotransmitter that is key to memory function and which is hard hit by Alzheimer's. (There is also some research on PPI's

being linked to heart attacks, kidney damage, and liver cancer so there are even more reasons to be careful about long term use of this class of drugs.

Another study looked at 5,712 people over the age of 45 (average age of 75) without dementia symptoms. They were split into 4 groups: nonusers, short-term users of PPI's (around 3 years), a medium group of 2.8-4.4 years, and long-term users (4.4+ years). Over the course of 5 ½ years 10% developed dementia. After adjusting for factors like age, sex, race, blood pressure and diabetes, those using for 4.4+ year had a 33% higher risk of dementia vs. nonusers. Short-term use was not as increasing risk - in this study (Neurology, "Cumulative use of proton pump inhibitors and risk of dementia: the atherosclerosis risk in communities study" Carin Northius et al, 8/9/23). A different study using just 60 people found risk of such drugs after just a week's worth of use. (Alzheimer's Research and Therapy, "Cognitive impact after short-term exposure to different proton pump inhibitors: assessment using CANTAB software" Sanjida Akter, et al, Dec. 2015). Results included "statistically and clinically significant impairment in visual memory, attention, executive function, and working and planning function" among PPI users vs. the control group. The researchers say that the adverse effects may not go noticed initially, over a longer term they may contribute to Alzheimer's development. Depletion of various vitamins and minerals like B12, C, calcium, iron, and magnesium can take a toll on brain function.

Going off such drugs suddenly is never a good idea because 'rebound' may occur and acid reflux can become worse than ever. So, talk to a doctor if you want to stop using the drug so that you can be tapered off more gradually.)

Nutrients that can be beneficial

This concept involves the use of specific foods to shield the brain from toxins, feed the brain healthy fats it needs, and add other nutrients that can shield the brain from free radicals that can hurt it.

There are good fats such as omega 3's (EPA, and DHA in particular which are especially important for the brain. Omega 3's can be found such as in flax, broccoli, walnuts, and seeds. Beware: omega 6's, which are found in various cooking oils like safflower, cotton seed, corn, soy, and grape seed, can block omega 3's from being metabolized as needed. Omega 6's are important to our health, but we typically get way too much of them.) A French study in 2003 found that people who had greater amounts of omega 3 in their blood were more likely to maintain cognitive functions. Some research has shown that taking omega 3 supplements are not effective in protecting memory function, compared to simply eating foods rich in this fat.

Vitamin E can be helpful in protecting the brain, by protecting against free radicals such as those formed by copper and iron. Dutch researchers looked at the diets of 5,395 over the age of 55, and tracked how much vitamin E was gotten from their food, and looked at them for a decade. Those with the most vitamin E cut their risk of Alzheimer's and other dementias by 25%. The Chicago researchers followed older people over four years, and found those with the least vitamin E vs. the most had 14.3% vs. 5.9% rate of Alzheimer's. Every 5 mg of vitamin E per day in the diet reduced the risk of Alzheimer's by 26%. The Dutch study did not find the E4 gene making a difference, although the Chicago researchers found that it did. Beware: most vitamin supplements of E only have a single form of it (alpha) while foods have multiple forms, and in general have been found

to be more effective as a result. (It can be found in broccoli, spinach, sweet potatoes, mangoes, avocados, walnuts, pistachios, pecans, hazelnuts, sesame and flax seeds.)

The Alzheimer's Disease Cooperative Study in 1997 did find that for those who already had the disease vitamin E seemed to slow it down, by taking 1000 IU twice a day. The decline was delayed by two years. Other studies have not replicated this finding.

Chicago study participants who got 3-4 servings of veggies a day slowed the rate of decline by 40% compared to those getting just one serving/day.

Two primary recommendations that have proven effective in preventing Alzheimer's or in inhibiting the deterioration that occurs in the early stages is aerobic activity (at least 30 minutes/day 3-4 days/week), and the Mediterranean diet (fresh fruit, veggies, nuts, grains, olive oil, fish and dairy, moderate amounts of poultry and red wine, and little meat).

Fruits and veggies also help prevent stroke, and strokes all too often impair memory. Some Dutch researchers looked at which foods in particular may be helpful, by analyzing data from over 20,000 people and following them for ten years. Orange fruits and veggies (e.g. carrots, sweet potatoes, butternut squash, cantaloupe) had the most heart protecting power. Stroke prevention saw apples and pears being best with an apple a day cutting stroke risk by 50% or more.

Research that came out in January 2021 (The American Journal of Clinical Nutrition, Changzheng Yuan et al) looked at carotenoids from fruits and veggies and the incidence of Alzheimer's over time. They took 927 people from the Rush Memory & Aging Project who were free from Alzheimer's at the outset and followed them for an average of seven years. Autopsies on 508 were done after death. What was found was higher intake of compounds like beta-carotene, lycopene, lutein-zeaxanthin, and beta-cryptoxanthin from foods like pumpkin, squash, carrots, collards, tomatoes, tangerines, peas, kale, watermelon, corn, nectarines and cantaloupe led to a 48% reduction in incidence of Alzheimer's. They controlled for age, sex, education, cognitively stimulating activities, and physical activity levels.

Homocysteine (which raises the risk of heart attacks, strokes, and blood clots) can impact the brain by possibly working with cholesterol and copper to damage cells. It is created by building protein in the body. Vitamin B6, B12 and folate work as a team to eliminate it. A study in the Netherlands looked at such supplements in people age 50-70 who were healthy and free of any memory problems, but all had high homocysteine levels. Compared to placebos, folate helped with reducing homocysteine and improving memory. Research done at Oxford U. looked at older people who were having memory problems, and looked at these three vitamins together. High homocysteine levels fell sharply, and memory improved significantly. Scans also showed that the vitamins helped protect against brain shrinkage. Whether they can prevent Alzheimer's is not clear. But Alzheimer's patients often have high homocysteine levels. One study done in the U.S. found that these three vitamins were not helpful for those who already have been diagnosed with mild to moderate Alzheimer's.

Good sources of folate in food include: broccoli, spinach, asparagus and other green leafies, peas, citrus fruits, cantaloupe, and beans. Bread, breakfast cereals, flour, rice and pasta are fortified with it.

B6 rich foods include whole grains, green veggies, bananas, sweet potatoes, and nuts.

B12 rich foods include fortified products like soy milk and fortified cereals, & animal derived products, and supplements which actually have been found to have better absorption.

People lose the ability to absorb B12 as they age, and some recommend that those over the age of 50 start taking B12 supplements. (Some estimate that about 40% of people have a deficiency of this vitamin. One factor that creates a deficiency is that it is released through stomach acid, and acid production declines with age. Acid blocking drugs like Nexium can also hinder B12 absorption. Vegetarians in particular are typically deficient in it, because plant foods are devoid of it unless they are fortified.) Singapore researchers in 2009 found that people with higher levels of B12 in the blood had better memory function and ability to pay attention. Plus, it was especially critical in those with the E4 gene, with low B12 levels doing worse on memory, and those with the gene but high B12 doing much better. B12 can also be depleted by Metformin, a drug used for diabetes, because it alters the ability to absorb it through the gut. In that case B12 shots will be needed.

The brain is subject to a lot of stress from oxidation due to it being heavily comprised of fat and consuming a large percentage of the overall metabolic activity of the body. One antioxidant that protects the brain is lutein. The macula in the back of the eye happens to utilize a lot of lutein, and levels in it correspond to those in the brain. So the eyes' health relative to lutein can be a window into brain health such as for cognitive functioning, along with another antioxidant zeaxanthin. Alzheimer's patients have less lutein and zeaxanthin in their eyes and blood. Some research on humans has found that these antioxidants can have a protective role during early and middle adulthood, decades prior to cognitive decline such as from Alzheimer's in later life. The effects of macular lutein actually can be traced back to childhood, with higher levels found in kids who have better performance on academic skills especially math and written language.

Why is this all being mentioned? Because macular lutein levels can be modified by one's diet. Foods that are high in these chemicals include:

Lutein/zeaxanthin content of foods

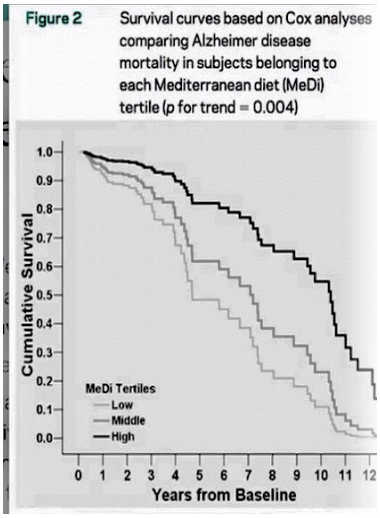
Food	**Serving**	**Milligrams**
Avocado	½ fruit	0.3
Broccoli, cooked	½ c (78 g)	1.7
Brussels sprouts, cooked	½ c (78 g)	1.0
Corn, sweet, cooked	½ c (75 g)	1.4
Egg, hard boiled	1 large	0.2
Kale, cooked	½ c (65 g)	10.3
Lettuce, raw, romaine	½ c (38 g)	1.1
Peas, green, cooked	½ c (80 g)	1.1
Spinach, cooked	½ c (95 g)	6.7
Spinach, raw	½ c (38 g)	4.5

https://nutritionfacts.org/video/brain-healthy-foods-to-fight-aging/

Some other research being the Nurses Health Study which followed over 16,000 women from 1995-2001, has found that higher long-term consumption of berries (blueberries and strawberries, which have high levels of an antioxidant called anthocyanidin) were related to significantly slower rates of cognitive decline in older women. This was true even when making allowances for

confounding factors such as of socioeconomic status. The berries delayed cognitive aging by as much as 2.5 years. Concord grape juice also had a beneficial effect (although this research was sponsored by the maker of the juice). Treating someone who already has Alzheimer's with such a nutritional approach has not worked to date, meaning that prevention by reducing oxidation and inflammation at an earlier stage holds more promise. Taking a supplement with such chemicals did not work, and lutein pills are actually thought to increase the risk of cancer.

Oats can lower cholesterol (as heard on tv commercials, it's true!). Barley is good too for lowering cholesterol too. Soy products (soy milk, edamame beans, tofu, tempeh) seem to have a cholesterol lowering effect too. Various nuts like almonds and walnuts tend to result in lower cholesterol levels. Given their caloric load, consider using them as an ingredient in recipes rather than as a snack.



This graph is a summary of a research study in NY on 192 people who had been diagnosed with Alzheimer's, and who were then followed every 1.5 years afterward. They looked at how well they complied with a Mediterranean diet plan (based on a 9 point scale with higher scores indicating better adherence. An adjustment was made for period of recruitment, age, gender, ethnicity, education, APOE genotype, caloric intake, smoking, and BMI.) Eighty-five patients died over the next 13.6 years. Findings were that tighter adherence to the diet led to significantly slower rates of death (e.g. at 5 years half of low adherents were dead from the disease vs. only 20% of high adherents.) By 12 years only high adherents (at least some of them) were still alive. ("Mediterranean diet & Alzheimer disease mortality" Neurology, 2007, 69, 1084-1093, Nicholas Scarmeas et al.

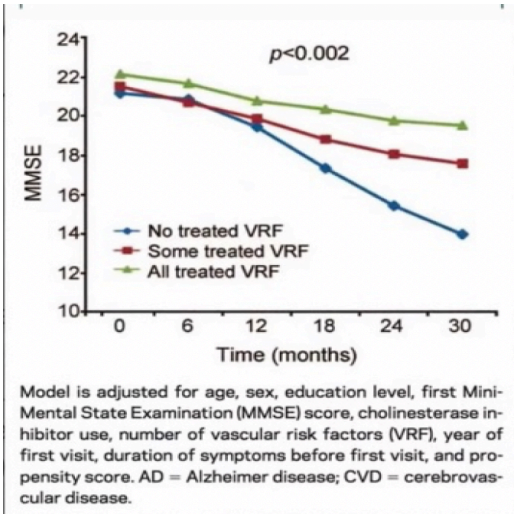
Another study on the Mediterranean diet on more than 60,000 men and women published in BMC Medicine in 2023 found that following the diet led to a 23% lower risk of dementia over the nine years of the study.

A brief YouTube TED talk on Alzheimer's can be found at https://youtu.be/TB6L9S_jc5E

The MMSE is a cognitive screening test with scores of 0-30. Scores above 24 are normal. Mild dementia is 20-24, moderate is 13-20, severe below 12 (per the Alzheimer's Association). www.nutritionfacts.org

These graphs show the relationship between blocked blood flow to the brain and the rate of cognitive decline and reduced ability to handle 'activities of daily living.' Grade 1 had the least atherosclerosis, 2 & 3 had more and the most blockage

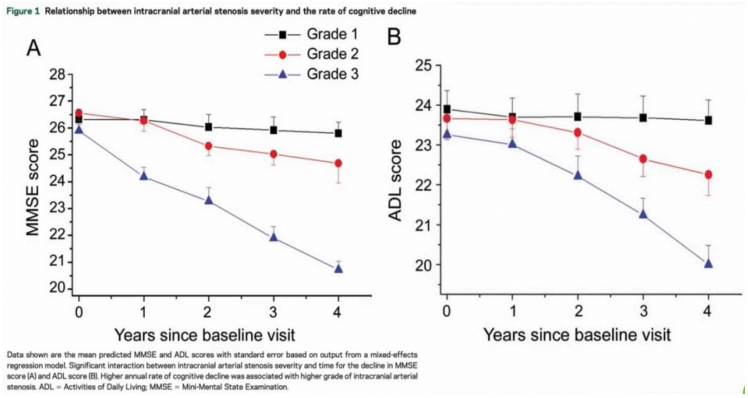
The graph to the right shows the decline in MMSE cognitive screening scores over 2½ years for 300 patients, based on whether or not vascular risk factors such as high blood pressure and cholesterol were being treated.



Model is adjusted for age, sex, education level, first Mini-Mental State Examination (MMSE) score, cholinesterase inhibitor use, number of vascular risk factors (VRF), year of first visit, duration of symptoms before first visit, and propensity score. AD = Alzheimer disease; CVD = cerebrovascular disease.

There has been a little research on aromatherapy in dementia including Alzheimer's. One study took 28 people including 17 with Alzheimer's and gave them aromatherapy for 28 days, using rosemary and lemon essential oils in the morning, and orange and lavender in the evening. All showed improvement in. personal orientation related to cognitive function, with no side effects (Psychogeriatrics, "Effect of aromatherapy on patients with Alzheimer's disease" Nov. 30, 2009, D. Jimbo et al).

Another study with 72 people evenly split between an aromatherapy and control group used lemon balm applied to a base oil and applied twice a day to the faces and arms. They found significant improvement in shouting, physical aggression, and agitation, along with being less socially withdrawn, more engagement and constructive activity. They concluded that it is "safe, well tolerated, and highly efficacious, with additional benefits on key quality of life parameters." (Journal of Clinical Psychiatry, July 2002, "Aromatherapy as a safe and effective treatment for the management of agitation in severe dementia: the results of a double-blind, placebo-controlled trial with Melissa" Clive Ballard, et al).



Research also has been done on the DASH diet (dietary approaches to stop hypertension) and MIND diet (Mediterranean-DASH intervention for neurodegenerative delay). The study was done at Rush U. in Chicago involving 581 older people and autopsies were later done. They received higher scores for adhering to the Med Diet such as by eating whole grains, fruits, veggies, legumes, olive oil, fish, and potatoes. They were given lower scores if they ate red meat, poultry, and full-fat diary. Higher scores were earned for MIND foods such as leafy greens, other veggies, nuts, berries, beans, whole grains, fish, poultry, olive oil, and wine. Lower scores were earned for red meats, butter and margarine, cheese, pastries and sweets, and fried and fast food.

People who adhered to the Med diet had the plaques and tangles in the brain that are the hallmark of Alzheimer's in amounts similar to those 18 years younger than those who scored the lowest. People who adhered to the MIND diet had average plaques and tangles similar to being 12 years. younger than those who scored the lowest. Those who ate 7 or more servings of leafy green a week looked nearly 19 years younger vs. those who at a serving or less per week. (Neurology, "

Association of Mediterranean-DASH intervention for neurodegenerative delay and Mediterranean Diets with Alzheimer Disease Pathology" Puja Agarwal et al, 3/8/23). RUSH U. in Chicago found that those who adhered most closely to the MIND diet had a 53% lower risk of developing Alzheimer's. Even those who followed the diet moderately well saw a 35% reduced risk.

There was also a study (BMC Medicine, "Western diet is associated with smaller hippocampus: a longitudinal investigation," Felice Jacka et al, Sept. 2015) that looked at what they called 'higher intakes of unhealthy foods and lower intakes of nutrient-dense foods" and its effects on a structure in the brain being the left hippocampus (which is more subject to aging than the right hippocampus such as from Alzheimer's). The hippocampus is the seat for memory and learning and is also implicated in depression. It is one of two areas of the brain that can grow in adulthood such as through exercise increasing it. Foods rich in omega-3 fats along with others that have a lot of antioxidants such as fruits like berries, vegetables, salads, grilled fish are beneficial for the hippocampus. High fat, high sugar foods (aka: 'the Western diet' such as sausages, hamburgers, steak, potato chips, and soft drinks) impair the hippocampus. Eating a Western diet for longer periods of time take more of a toll, but there has been research that effects on memory impairment can be found in as little as 5 days of such a poor quality diet.

As to Parkinson's and preventing it in the first place, nutrition seems to be directly involved especially relative to high dietary intake of animal fats and dairy products. Another cause of Parkinson's is pesticide poisoning. One large study in 2006 followed patients for nine years and found those exposed to pesticides had a 70% higher incidence of Parkinson's. Other chemical poisons have been implicated in Parkinson's as well, most notably in this region through research done at Camp Lejeune where well water in the '80s was contaminated with a variety of chemicals including benzene, which has now caused Parkinson's in some people exposed to it back then.

As to treating the disease once it is present, one approach is fiber consumption, which naturally boosts L-dopa levels. So a plant based diet, especially veganism, is expected to bring some advantages to the management of the disease, through increased consumption of foods like legumes and nuts. Other advice is that food should be neuro protective, anti-inflammatory, and rich in anti-oxidants. Nuts such as walnuts, Brazil nuts, and pistachios are neuro protective. Anti-inflammatory foods include leafy greens and soy products. Antioxidants are found in the most colorful plant foods, like berries. Green tea is also recommended for Parkinson's patients in that it is antioxidant rich, and contains caffeine which can be helpful with the disease.

People who smoke tobacco have only about half the risk of getting Parkinson's. No one would advocate taking up the habit given the major health effects of smoking. But there is an alternative that has been proposed, namely getting nicotine from non-tobacco sources. Tobacco is a nightshade plant – as are tomatoes, peppers, potatoes and eggplants, and they all contain nicotine too. Bell peppers have the most nicotine among these vegetables. A study from the U. of Washington found that pepper consumption was inversely related to Parkinson's, but whether it is nicotine or other elements of the vegetable that is offering protective benefit is not clear. Research done at Harvard's School of Public Health found that people eating anthocyanin-rich foods like blueberries and black raspberries had a 40% reduction in the likelihood of getting the disease. Physical exercise also helps PD patients as to improving functional capacity, gait, balance and strength, along with executive functions, attention, and overall cognition.

Certain spices may be protective of memory such as by reducing inflammation. Rosemary, sage, and lemon balm have been shown to improve memory in one study on people under the age of 63. A review of eight clinical trials on sage also suggested that it may be helpful. Ginger has some research on use of it for controlling blood sugar in type 2 diabetics, and by doing so, helping to maintain memory given that diabetes is a major contributor to strokes.

Still other alternative approaches to maintain if not improve memory function

There is research dating back to 1974 that people who have dementia have a higher incidence of the herpes virus (HSV1) that causes cold sores. It has been found to infect most people in infancy and then remains dormant in the nervous system outside of the brain. The virus can become reactivated through factors like stress, and can then cause cold sores.

This line of research got dismissed for the most part over the ensuing decades. However, in 1997 it was shown that herpes confers a strong risk of Alzheimer's when the APOE4 gene is present, with a 12 fold increase vs. when the gene and HSV1 are both absent.

Swedish researchers in particular have been pursuing this line of inquiry. They tracked over 3,400 people for eleven years and found that reactivated herpes infection was linked to twice the risk of Alzheimer's compared to those without the virus.

A study from Taiwan in 2018 found that people with a herpes virus infection are at 2.5 times higher risk for dementia than those without such an infection. And those treated with anti-herpes drugs were ten times less likely to develop dementia than those whose infections were left untreated. This research is the first to show a causal link, and not just an association or correlation between herpes and dementia.

Some researchers now believe that HSV1 is a major contributor to Alzheimer's, and that it gets into the brain as older individuals have a weakening immune system. It can become reactivated by stress, or reduced immune system, or inflammation due to infection by other microbes.

L-lysine, an amino acid, is something that has been used for treating herpes as well, and there is some limited amounts of research suggesting that it can be helpful in dealing with the virus. Whether it will prevent Alzheimer's is an unknown at this time.

Of the modifiable lifestyle factors that put one at risk for Alzheimer's, which is greatest?

	Population attributable risk – percent
Diabetes	1.9
Midlife hypertension	7
Midlife obesity	6.6
Depression	8.3
Physical inactivity*	21.8
Smoking	10.6
Lower educational attainment	12.2

*Defined as not doing 20 minutes of vigorous activity for at least 3 days/week, or moderate activity at least 5 days/week.

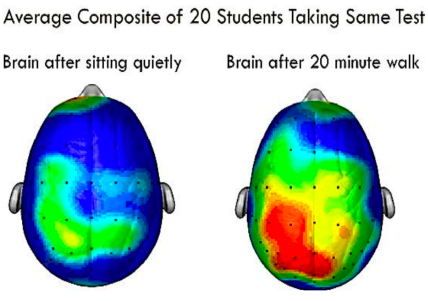
"Potential for primary prevention of Alzheimer's disease: an analysis of population-based data" Lancet Neurology, 13(8), 788-794, S. Norton et al

See it? Lack of exercise has more than double the risk than any other health factors. i.e. Physical inactivity may be the single biggest modifiable risk factor for the onset of dementia. Exercise has a multitude of benefits, such as helping to keep weight off, lower blood pressure, and control blood sugar and hence risk of diabetes. But there are other reasons too. Read on.

Physical exercise can also help reduce the shrinking of the brain that occurs with aging as shown through scans. The hippocampus – a key structure for memory - is enhanced through any exercise that gets your heart going, regardless of your age. People who exercise are much less likely to develop Alzheimer's, or have a stroke compared to those that are sedentary. One study done at Columbia U. took people who were 21-45 years old and were out of shape, and they got a choice of exercise device such as treadmill, stair master, elliptical, or bicycle. They were asked to exercise four times a week for forty minutes/day, and do so over twelve weeks. They then had a MRI scan of their brain, which showed development of new blood vessels and brain cells specifically in the hippocampus. The more physically fit they became, the more brain changes occurred, and the better they did on cognitive tests.

Exercise may actually reverse the normal shrinkage that occurs in the brain from age. One research study at the U. of Illinois recruited 59 people who were over the age of 60 and were sedentary, and told to do exercise 3 times a week involving aerobics like running or stepping. After 6 months MRI scans measured their brain's 'gray matter' as well as the nerve connections ('white matter') and compared them to the MRI done before the exercise program started. Gray matter increased especially in the frontal lobes which has implications for memory and attention skills. White matter also increased, including the thick bundle of nerve fibers that allow the left and right half of the brain to communicate with each other.

The hippocampus, which typically shrinks 1-2%/year was studied too, in research looking at walking done three times/week. The participants got up to 40 minutes/day, and MRIs showed that the hippocampus reversed such shrinkage. A NY study done over 5 years that had people exercise and follow a healthy diet cut their risk of Alzheimer's by as much as 60%. A Swedish study yielded the same finding, as to a 60% reduction in Alzheimer's with more physical activity, and it was especially noticeable with those who had the E4 gene.



Research/scan Dr. Chuck Hillman University of Illinois, 2009

This was research done on 20 elementary school students, with 10 sitting quietly, and the other 10 walking for 20 minutes. All then took the same test. These are the brain scan results from a single bout of walking. Brighter colors indicate more brain activity. The conclusion was that moderately intense aerobic exercise, being walking improves attention and academic performance.

"The effect of acute treadmill walking on cognitive control & academic achievement in preadolescent children" Neuroscience, 159(3), 1044-1054, Chuck Hillman et al

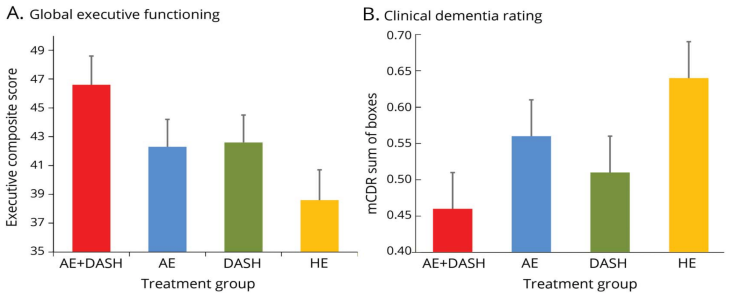
It is helpful to engage in three different types of exercise: cardio which can help boost brain size, improve memory, and our health in other ways like lowering blood pressure, blood sugar, and cancer risk. A second form of exercise is resistance training, such as through weight lifting, pushups, deep knee bends, etc. This builds muscle and bone. The third form of recommended exercise is flexibility training, which can help keep you limber, and eliminate pain. This includes stuff like yoga, Pilates, and stretching.

Other research published in Neurology in 2019 studied 454 older people for as long as twenty years, with cognitive and motor performance tests, and annual physicals. Their brains were also donated upon their deaths. Some of them had dementia. They wore an accelerometer for a week during the study, and it measured all movements be it walking between rooms or doing vigorous exercise.

Those with dementia made an average of 130,000 movements per day. Those in better cognitive shape averaged 180,000 movements/daily. And the people with better motor skills scored better on measures of memory and thinking. Brain autopsies showed that even those with Alzheimer's "did better than expected if they maintained strong physical activity to the end of their lives."

Another study called ENLIGHTEN and published in Neurology in 2018 took 160 people with an average age of 65, and looked at aerobic exercise, a DASH diet, a combination of these two, or a health education class. The participants had cognitive impairments but were not demented when the research was started. Cognitive testing was administered looking at executive skills such as organization, planning and judgment.

Those who exercised for 45 minutes/day three times a week for six months made significant gains in executive functions. Adding the DASH diet helped even more, and was equal to dropping nine years from their age. Those getting the health education classes got worse over time.



Values for the global composite are presented as mean postintervention ranks adjusted for preintervention rank, age, education, sex, ethnicity, baseline Montreal Cognitive Assessment (MoCA) score, *APOE* genotype, Framingham Stroke Risk Profile (FSRP), and anti-inflammatory and cardiovascular disease (CVD) medications. Higher scores represent better performance. For the modified Clinical Dementia Rating (mCDR), values are presented as mean post-intervention mCDR Sum of Boxes scores adjusted for preintervention scores, age, education, sex, ethnicity, pretreatment MoCA score, *APOE* genotype, FSRP, anti-inflammatory, and CVD medications. Lower scores represent greater improvement. AE = aerobic exercise; DASH = Dietary Approaches to Stop Hypertension; HE = health education.

"Lifestyle and neurocognition in older adults with cognitive impairment: a randomized trial" James Blumenthal, et al, Neurology, 12/19/2018

Other research from 2018 on 36 healthy adults showed that "even ten minutes of moderate physical activity can have measurable benefits for the brain." They used fMRI imaging to look at the brain activity before and after short exercise periods. After the workout there were stronger connections between the hippocampus and cortex areas that is important for processing memory.

Why is physical exercise beneficial? It is good for cardiovascular fitness, which has implications for supplying the brain. It also stimulates growth and greater connections between brain cells. It also prepares the brain to receive and retain additional information. It can help reduce blood pressure and help control blood sugar, and hence risk of diabetes, or if it is already present control and reduce it.

www.pcrm.org

Exercise may help clear out toxins that can lead to loss of brain cells. There was a Canadian study done on 155 women ages 65-75 using hour long classes of resistance training once or twice a week (with 40 minutes of activity, and warm-up and cool-down sections of ten minutes apiece), and a control group doing balance and tone exercise. One of their results was that brain volume shrunk over the course of the year. They speculate and caution not to jump to conclusions but think it might be a reflection of fewer beta-amyloid plaques remaining in the brain, and say more research is needed on the issue. Archives of Internal Medicine, "Resistance training and executive functions: a 12-month randomized controlled trial" Teresa Liu-Ambrose et al, Jan 2010).

Aerobic exercise is also the best way to grow something called BDNF (brain derived neurotrophic factor). In years past it was thought that we were born with all of our brain cells, and that was it, no new ones could be made. That is now known not to be true. BDNF takes brain stem cells and creates new neurons. The brain's volume or weight declines by about 5% per decade starting at age 40, due to cell death. Deterioration of the white matter (the nerves that connect cells together) also plays a role in declining mental function that occurs with age. Dopamine and serotonin that are heavily associated with aging, along with BDNF decline by about 10% per decade starting in early adulthood. Menopause also takes a toll on BDNF. Estrogen increases BDNF. Cortisol decreases it. In perimenopause cortisol levels rise, estrogen drops, and BDNF therefore can take a hit.

One of the key sites in the brain that BDNF is found is the hippocampus which is one of the first if not the first brain region that is impacted by Alzheimer's. BDNF is also found in other areas of the brain central to learning, memory and higher thinking.

BDNF has been termed 'Miracle-Gro for the brain' acting like fertilizer, to help brain cells function and grow, as well as maintaining circuits. It is involved in neuroplasticity, meaning that brain cells can compensate for being injured, as well as adopt to new situations or changes in the environment (i.e. being intelligent). It also helps to protect them against premature cell death, and improves signal strength between neurons. (In the process it may also help protect against cell death that leads to macular degeneration, according to some research done on mice on a treadmill vs. those that did not, and published in 2014 in the Journal of Neuroscience.)

BDNF also fosters synaptic growth. The connections between nerve cells through synapses are what allows learning to occur. One study from 2013 in the Journal of Clinical & Diagnostic Research found that a single session of a half hour moderate intensity exercise could improve

memory, planning, and reasoning, and reduce the amount of time needed to finish cognitive tests. Another study done on 21 young adults found that there was an increase in memory accuracy and speed of recall after a half hour workout, regardless if it was cardio or strength training. Research done at King's College London looked at more than 9,000 people and found those that exercised at least once a week did better on cognitive tests at age 50 than those who did not.

There was research done in 2016 on 535 older people, and they had annual cognitive assessments along with brain autopsy upon their death. Those with higher levels (at the 90th percentile) of BDNF showed cognitive decline at about half the rate of those with low levels (at the 10th percentile) of the chemical. Those who had Alzheimer's showed a 40% slower rate of cognitive decline as to this high vs. low level of BDNF.

Another study published in JAMA Neurology in January 2014 studied more than 2,100 adults 60 years or older from the Framingham Heart Study who were free of dementia when the research began. They measured BDNF levels at the start of the study and then followed the people for about ten years. Those with the highest levels of BDNF at the beginning had a risk of developing Alzheimer's at about half the level of those with low levels.

Rat research has found that daily exercise ramps up BDNF more rapidly than doing it on alternate days although after a month they were at the same level. When rats stopped exercising regardless if it had been daily or every other day, it took only two weeks for BDNF levels to drop back to the baseline. When the rats were allowed access to exercise again, BDNF levels increased back up in just two days. It was also found that exercise in old rats made the brain function almost as good as young rats. Overall, exercise is considered to be the most surefire and fastest way to increase BDNF levels. So, if you have been exercising regularly the hippocampus can regain the benefit of BDNF very quickly after a temporary break. The researcher concluded that daily exercise is best, but doing it every other day is still very good.

Exposure to the sun for perhaps 10-20 minutes increases BDNF, but taking supplemental vitamin D pills do not. Dietary approaches that may increase BDNF probiotics include (yogurt, kefir, etc.), blueberries, cocoa flavonoids, and soy. Intermittent fasting or caloric restriction may also boost BDNF. Omega 3's also can raise BDNF, and natural sources such as fish rather than supplements may be better. Meditation may be beneficial. Research done at UCLA and the Buck Institute for Research on Aging found that meditating twice a day for stress relief can help reverse some memory loss in Alzheimer's patients.

Vitamin D may still be helpful based on a prospective study. Another study (American Journal of Clinical Nutrition, "The associations of serum vitamin D status and vitamin D supplements use with all-cause dementia, Alzheimer's disease, and vascular disease: a UK Biobank based prospective cohort study" Li-u Chen et al, Jan. 2024) looked at over 269,000 people between ages 55-69 and vitamin D levels. Deficiency was defined as <12 ng/ml, and insufficiency as 12-20 ng/ml. With a fourteen year follow-up, there was an increased risk of

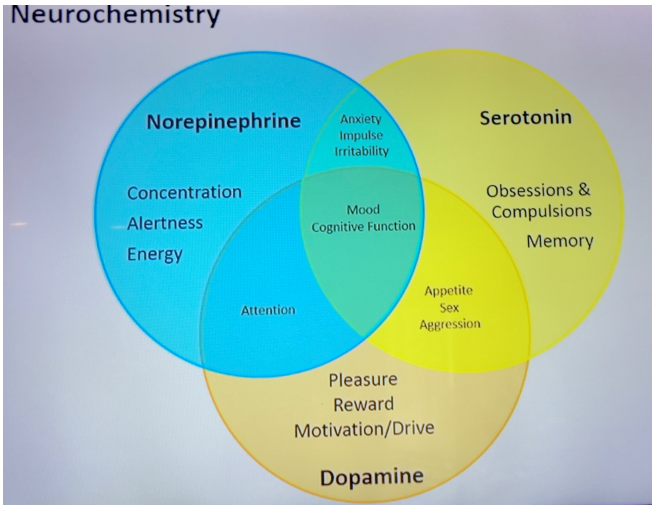
	Insufficient	Deficient
All-cause dementia	11%	25%
Alzheimer's	10%	19%
Vascular dementia	15%	24%

Among these study participants although 5% reported regular use of vitamin D and about 20% used a multi-vitamin, the majority were still either insufficient or deficient in the vitamin. Vitamin users had a lower rate of insufficiency or deficiency compared to those who were not taking a vitamin supplement.

The standard American diet (SAD) that is high in saturated fat, sugar and high fructose corn syrup is harmful to BDNF and brain function (e.g. Hippocampus, 2008, 18(11)). There was some rat research done in 2012 where animals that had no bacteria in their gut had lower levels of BDNF. When probiotic bacteria were introduced into the guts of these rats their BDNF levels returned. Moral: we have to pay attention to what is going on in our guts and how it can impact our brains. Insomnia lowers BDNF levels. Acute, and even more so chronic stress decrease BDNF. Without enough BDNF there is decreased learning, and increased risk of Alzheimer's, epilepsy, anorexia, schizophrenia and OCD (obsessive-compulsive disorder). Levels also fall in women who are overweight. There is a genetic mutation that makes BDNF levels fall faster than average and this is present in one-third of people. A study (offered in Translational Psychiatry in October 2011) took 144 airplane pilots ages 40-69 and gave them a flight simulator exam over three years. The pilots with the genetic mutation impacting BDNF had their simulator scores drop twice as fast as those without the mutation. The moral is that without and especially with this mutation one needs to do everything possible to keep BDNF levels up as we age.

Other research published in JAMA Neurology in 2023 found that getting just 20% of calories from highly processed food (with its high fructose corn syrup, emulsifiers, added sugar, sodium, colors, flavors, and preservatives, was linked to a 28% faster rate of cognitive decline compared with eating less of such foods. This came from a study involving more than 10K men and women ages 35-74. Another study published in Neurology found that those over age 55 who ate a highly processed diet were about 25% more likely to develop dementia compared to those who ate little of such food. Reducing their intake of such food by 10% over the ten years of the study were 19% less likely to get dementia.

Research (in Progressive Neurobiology Jan. 2013) was done on rats which were genetically modified so they lacked BDNF receptors in the heart. They found that they quickly developed heart failure. Depression is also a common cause of heart disease – and it is known that the depressed tend to have much lower BDNF levels. A question can therefore be raised if depression causing heart attacks in people might be due to depressed BDNF levels. If so, there is yet another reason to keep BDNF levels raised.



Three of the major neurotransmitters are norepinephrine, serotonin, and dopamine. All three of these are boosted by exercise. Look at the Venn diagram and see where all three of these chemicals intersect. Improving 'mood' is a broad concept. But factors that can take a toll on memory function include elevated levels of anxiety and/or depression. Look at some of the other benefits from boosting one or more of these neurotransmitters, and 'attention,' 'memory,' 'alertness,' 'concentration' are apparent.

YouTube: "Exercise is the best medicine for our brain" John Ratey, MD

How much exercise? One way of knowing if you are getting enough is keeping your pulse at 60-80% of maximum heart rate (MHR=220 minus your age. So for someone age 60 that would be a pulse range of 96-128. BEWARE: don't push yourself too hard, especially if you are out of shape and/or have health issues like a heart or respiratory condition.) As to how long one should exercise, there are various recommendations, but as of now they are in the 20-40 minute range. Another researcher has suggested that for 80% or higher of cardio max thirty minutes/day is appropriate, and that in the moderate range closer to an hour is advised. More research is needed to determine if such figures are correct.

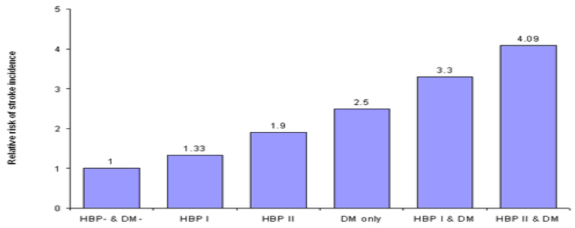


Figure 1. Hazard ratios for stroke incidence according to the history of hypertension and diabetes at baseline. Hypertension I was defined as blood pressure 140-159/90-94 mmHg and without any antihypertensive drugs treatment at baseline; hypertension II was defined as blood pressure ?160/95 mmHg, or using antihypertensive drugs at baseline; the normotensive reference group was defined as blood pressure <140/90 mmHg and without any antihypertensive drugs treatment at baseline; adjusted for age, sex, study year, BMI, cholesterol, education, smoking, alcohol drinking, and physical activity.

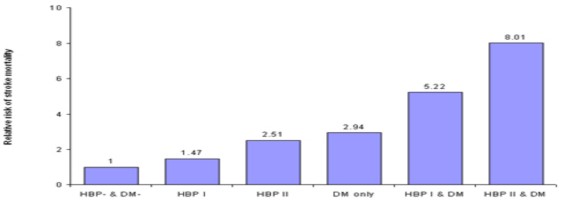


Figure 2. Hazard ratios for stroke mortality according to the history of hypertension and diabetes at baseline. Hypertension I was defined as blood pressure 140-159/90-94 mmHg and without any antihypertensive drugs treatment at baseline; hypertension II was defined as blood pressure ?160/95 mmHg, or using antihypertensive drugs at baseline; the normotensive reference group was defined as blood pressure <140/90 mmHg and without any antihypertensive drugs treatment at baseline; adjusted for age, sex, study year, BMI, cholesterol, education, smoking, alcohol drinking, and physical activity.

The content of this article reflects the personal opinion of the author/s and is not necessarily the official position of the European Society of Cardiology.

"Hypertension combined with type 2 diabetes increases the risk of stroke" Jaako Tuomilheto, et al, European Society of Cardiology, 4(27), March 2006.

This was a study done on 49,582 Finnish participants ages 25-74 years old who were free of stroke and coronary artery disease at baseline, and followed up for an average of 19 years. Over that time 2,978 strokes occurred, and 924 were fatal.

There is also some research by Dr. David Perlmutter that five strains of probiotics [1) L. plantarum, 2) L. acidophilus, 3) L. brevis, 4) bifiodobacterium lactis, and 5) B. longus] can increase BDNF. (These can be found in foods such as for 1) sauerkraut, pickles, kimchi, sourdough, & some cheeses like cheddar. 2) yogurt, kefir, miso, tempeh. 3) pickles, sauerkraut, and beer hops. 4) yogurt, miso, tempeh, pickles, kimchi, & other fermented fruits/vegetables that have not gone through a manufacturing process. 5) yogurt, milk, fermented dairy, sauerkraut, and soy-based products).

What else can we do to strengthen memory? Body exercise strengthens muscles. Cognitive exercises can help with the brain. The Chicago study found that doing simple stuff, such as reading the newspaper or a book, playing cards, going to a museum, playing checkers, or doing a crossword puzzle can be good for stimulating the brain. Those who did this kind of stuff cut their risk of Alzheimer's by about two-thirds compared to those who got very little mental stimulation. Different types of mental stimulation are advised. That is, crossword puzzles may help retain vocabulary, but won't do anything for the reasoning skills such as chess players utilize. So, engaging in a variety of brain stimulating activities is better.

Being bilingual or multi-lingual also can help with retaining memory, if you use them. Learning a foreign language back in your high school years and never using it again is not going to make any difference years or decades later. For those who speak a foreign language, when problems surface they tend to do so five years later than those who speak just one language.

There was another study titled "Reversal of cognitive decline: a novel therapeutic program" Aging, Sept. 2014, by Dale Bredesen). It took ten people, one of whom was diagnosed with early Alzheimer's, another with Alzheimer's, two more with either the precursor to Alzheimer's ('mild cognitive impairment'), and one in the later stages of the disease. The balance had impaired memory. Treatment in simple terms involved exercise, nutrition, improving sleep, and reducing stress. All but the late stage Alzheimer's patient improved. "Six of the patients had had to discontinue working or were struggling with their jobs, and all were able to return to work or continue working with improved performance. Improvements have been sustained, at this time the longest patient follow-up is 2 ½ years from initial treatment, with sustained and marked improvement. [This suggests] that at least early in the course, cognitive decline may be driven in large part by metabolic processes. …[Results suggest that] memory loss in patients with mild cognitive impairment, and at least the early phase of Alzheimer's disease, may be reversed. This is the first such demonstration. However, at the current the results are anecdotal."

Then there is what is known as the Nun Study. It took 678 nuns who were age 75 or older in 1986 and followed them until their death. As of 2017 three were still alive. They looked at documents that the nuns had amassed throughout their lives and also did annual cognitive and physical exams after they entered the study. One of the major findings was that lifestyle and education may deter Alzheimer's symptoms. Those with higher levels of education such as Bachelor's degree or above were less likely to develop the disease. Autobiographical essays that were written by the nuns when they joined the sisterhood were reviewed too. Those that had less 'linguistic density' (e.g. less complex, fluent, vivacious) had higher rates of Alzheimer's (roughly 80% getting the disease with low density writing vs. 10% for the high density writers). Plus, those who were most positive in their writing ('half full' rather than 'half empty') did better too. Some of the nuns were found to have the plaques and tangles of Alzheimer's upon autopsy but had never shown symptoms of the disease while they were alive. Some of the conclusions were that "age and disease do not always guarantee impaired cognitive ability and that traits in early, mid, and late life have strong relationships with the risk of Alzheimer's disease, as well las the mental and cognitive disabilities of old age."

What can be done about reversing or curing TBIs? There is no cure as of now. Maybe in the future stem cell technology will allow people to recover all lost function. But as of now, options that are truly helpful are limited. Everyone wants the easy fix, the magic pill, the rehab that restores all that

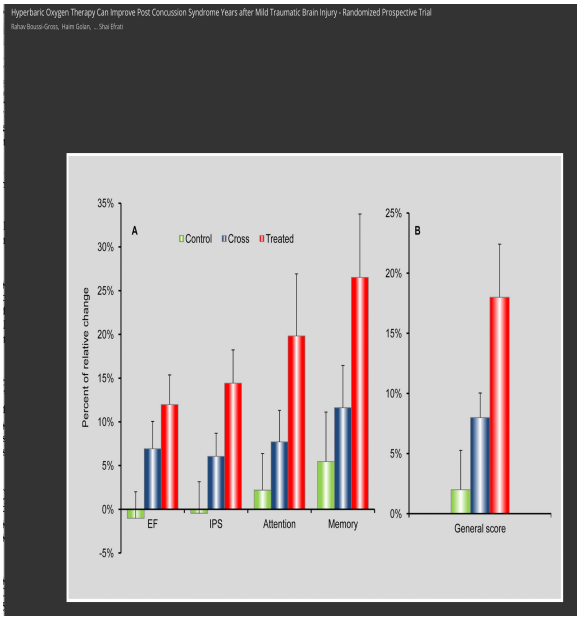
has been lost. People with minimal TBIs make full recovery. Mild TBIs are a mixed bag. Some people will have persistent but subtle problems that may diminish but not fully disappear over time, and they end up with permanent deficits. Other mTBIs can make a full recovery if the damage was not that great. If brain impairment has persisted for awhile, such as more than about six months in adults, you should expect that it has become permanent. What then?

You can try meds to treat symptoms. But my experience is that they are not very helpful, if at all. And people with TBIs are generally far more sensitive to side effects and cannot tolerate them like those without a TBI can.

Cognitive rehab consists of advice like 'Write sticky notes, and stick reminders in your cell phone.' That helps some people some of the time. Not everyone writes stuff down. Or looks at them. Or remembers where it has been written, and so loses track.

Other possible approaches consist of neurofeedback. The most striking piece of research in my opinion about neurofeedback being helpful in brain injuries is that it was done on thirty-two patients who had been in a deep coma for two or more months. Twenty-five of them came out of the coma after just 1-2 sessions of neurofeedback, and two others needed some additional sessions to come out of the coma; five did not respond.

There is also some research on treating TBIs and other brain impairments like Alzheimer's and stroke through hyperbaric oxygen treatment (HBOT, which is a scaled down version of decompression chambers that scuba divers need if they get 'the bends'). Basically, brain cells can exist in one of three states: normal, dead and they are not coming back, and 'hanging on by a thread' where they are nominally alive but no longer at a functional level. Some people refer to the third category, as 'dormant' and they can arise from problems like TBIs and strokes. HBOT can help such patients by repairing and creating new blood vessels in the injured areas of the brain.



EF=executive function.
IPS=information processing speed.

An Israeli study on HBOT had 56 patients with prolonged post-concussion syndrome (PCS, in effect a milder mTBI) and found that many showed significant improvement in function and overall quality of life, and SPECT brain imaging revealed elevated brain activity in good agreement with the cognitive changes.

Another Israeli study looked at 15 people with PCS who received HBOT. Using brain imaging it was found that the patients had increased blood flow in the areas of the brain that had been previously dormant. Tests showed improved memory and processing speed. 2 short YouTube videos are at: https://youtu.be/wCwIZ4uutrs and www.youtube.com/watch?v=ESeP8_eJyJ8&feature=youtu.be

"Hyperbaric oxygen therapy can improve post concussion syndrome years after mTBI – randomized prospective trial" PLOS 1, 11/15/2013, Rahav Boussi-Gross et al

Most of the VA has not found HBOT effective for PCS types of issues, although they are still looking at it a little. However, the Israeli researchers have publicly criticized the poor design of the VA research protocols and said that could be why they found it did not help.

Another study took 50 stroke patients with an average age of 62 who were no longer making any recovery and with an average of 28 months since the incident. They were given HBOT for 90 minutes a day, 6 days/week for 60 treatments, plus physical therapy and neurofeedback 5 days/week. Results included 95.83% of the patients or their family members saying there was improvement in one more areas such as motor ability, sensitivity to touch and temperature, bladder and bowel control, cognition, memory, speech, sight and hearting. The physical therapist evaluation had 100% of the patients showing improvements in one or more areas, with 18% having a mild gain, 48% a good gain, and 34% an excellent gain. No side effects were encountered.

Another study done at Tel Aviv University worked on 74 post-stroke patients, with 2 months of HBOT used. Brain scans showed improvements compared to the non-treatment controls. Visible improvements in the patients included paralysis reversal, increased sensation, and renewed language use.

Another Israeli study ("Hyperbaric oxygen therapy improves neurocognitive functions of post-stroke patients – a retrospective analysis", Restorative Neurology & Neuroscience, 2020, 38(1), 93-107, by Amir Hadanny et al) took 162 ischemic and hemorrhagic patients with an average age of about 61 (but ranging from 23-83), and with an average time from stroke of about 3 years. It is the largest cohort study of post-stroke patients treated with HBOT in the late chronic stage to date. Findings included significant clinical improvement in 86% of patients in all the cognitive function domains, along with improved motor functions.

In summing up HBOT and use on TBIs and stroke patients, two Israeli researchers have said,

> "Since hyperbaric oxygen therapy is the only treatment proven to significantly benefit post-stroke and mTBI patients without limiting side effects, it is reasonable to allow the millions of these patients to benefit from it right away and not wait for rigorous studies. The classical candidate for HBOT is a patient with unrecovered brain injury where tissue hypoxia is the limiting factor for the regeneration process." ("Reflections on the neurotherapeutic effects of hyperbaric oxygen" in Expert Review of Neurotherapeutics, 1/29/2014, 14(30, 233-236, Shai Efrati & Eshel Ben-Jacob)

Tel Aviv University did another study on HBOT and Alzheimer's using mice in the research in 2017. After one hour of HBOT per day for two weeks treatment was found to reduce behavioral problems, including both plaque pathology and neurological inflammation by about 40%. "We have shown for the first time that hyperbaric oxygen therapy can actually improve the pathology of Alzheimer's disease and correct behavioral deficits" said Prof. Uri Ashery who led the research (reported on in "Hyperbaric oxygen therapy could ease Alzheimer's symptoms" 12/14/2017, www.Israel21c.org). It has been offered that HBOT would be best for someone in the early stages of the disease before it is fully developed and too much brain tissue is lost.

Other research (published in Current Neuropharmacology in December 2011) using models of Alzheimer's in rats and primates found that increasing BDNF "reversed neuronal atrophy and

ameliorated age-related cognitive impairment" and this could be scaled up to deliver BDNF to people.

Israeli researchers did another study (Aging, Nov. 18, 2020, Yafit Hachmo et al) on 35 healthy adults ages 64 and up, using 60 2-hour HBOT sessions, five days/week for 90 days. Results showed that telomeres were lengthened up to 38%, and senescent cells reduced up to 37%. (Telomeres are little 'caps' at the end of DNA that protect it, and which shorten with age that leads to aging of cells. When telomeres are too short the cell can no longer divide and the cell becomes inactive, becomes too damaged, or it dies.) No one is immortal, and so when HBOT ends the normal aging process continues. How fast it progresses again depends on a person's DNA and lifestyle factors like diet, health and stress. But overall HBOT can still improve the function of brain tissue and blood vessels that have been damaged due to the aging process. And HBOT helps trigger regenerative capabilities of the body.

Dr. Harch at LSU's school of medicine has used HBOT and has PET scan documented improvement in brain metabolism in a 58 year old Alzheimer's patient. "We demonstrated the largest improvement in brain metabolism of any therapy for Alzheimer's disease" Dr. Harch has said. "HBOT in this patient may be the first treatment not only to halt, but temporarily reverse disease progression in Alzheimer's disease." ("Hyperbaric oxygen therapy for Alzheimer's disease" Science Daily, 1/24/2019)

Other Israeli research was done of healthy older individuals ("Cognitive enhancement of healthy older adults using hyperbaric oxygen: a randomized controlled trial" Aging, 6/26/2020, 12(13), 13740-13761, Hadanny Amir et al). They took sixty-three healthy people age 65+ and took MRI scans and tested their cognitive abilities. They then had a 60 day course of HBOT five days/week breathing pure oxygen for some of the time. Those who did not receive HBOT stayed the same as to MRI and cognitive test results. Those who got the treatment improved on the cognitive tests and MRI function such as better brain blood flow, and it held up in tests six months later. This included better attention, information processing speed, and executive functions. "The occlusion of small blood vessels is a dominant element in the human aging process" said Dr. Efrati, the director of the HBOT center which is one of the largest in the world. In that as people age blood vessels carry less oxygen to the brain HBOT may be a way to compensate for this.

The Israelis say that "a recent study [demonstrates] that HBOT can ameliorate Alzheimer's disease related pathologies" in a mouse model. (Neural regeneration research, "Hyperbaric oxygen therapy as a new treatment approach for Alzheimer's disease" Ronit Shapira et al, May 2018).

Other research done by Michal Schwartz of the Weizmann Institute has reversed Alzheimer's in rats. She found that there is a problem with immune cells not being able to enter the brain and so are not able to do their role. A protein has been found to inhibit them and neutralizing it allowed the immune cells entry and reversed the Alzheimer's and the animals' cognitive abilities were rehabilitated. She has said "We expect it will be possible to arrive at clinical application of our treatment relatively easily. Our treatment mobilizes the immune system, which not only removes the amyloid plaques. It's also responsible for removing dead cells, healing damage and for additional maintenance matters of the brain. We are using the brain's natural healing system. I think that a medicine for Alzheimer's is a matter of the coming decade." (Cited in "To Cure Alzheimer's, We Have to Forget What We Know About It So Far" Smadar Reisfeld, 12/27/2018, Haaretz.Com)

Use of omega 3s, and exercise can also be helpful with TBIs. There may be some noticeable improvement through use of them.

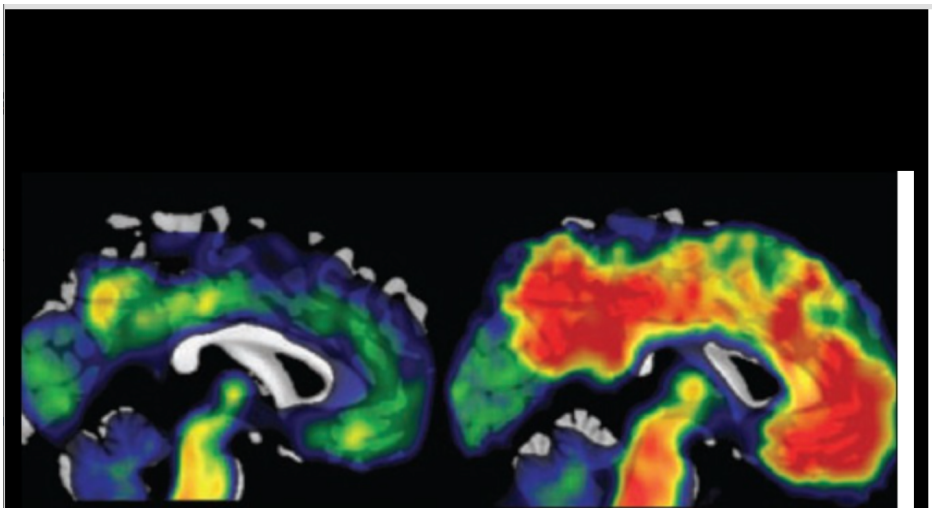
On a post-menopausal level there is also at what age hormone therapy is begun. There was a large study named WHIMS (Women's Health Initiative Memory Study) that was done at several centers, was double-blind, randomized, and placebo-controlled. It took 4,532 post-menopausal women and gave them conjugated equine estrogen along with a progesterone, or a placebo. And another group of 2,947 women who had had a hysterectomy were given estrogen alone or a placebo. All were over the age of 65. Hormone therapy with or without progestreone did not help prevent dementia or cognitive decline but did increase substantially the risk of dementia or such decline. (Lancet Neurology, "The Women's Health Initiative Memory Study: findings and implications for treatment" Michael Craig et al, March 2005).

Sleep. Memories are consolidated while we sleep. If sleep is disturbed memory will be more impaired. Research suggests that the first half of the night's sleep is when we consolidate facts and events, and the second half when dreams and rapid eye movement (REM) occurs, is when we integrate memories related to new skills and related to emotions.

One approach for improving sleep or reducing impairment is the use of light. This includes appreciating the effects of blue light (electronic screens) vs. red light on sleep. We are a product of evolution. If you go back a few million years to when people were living in caves, at dusk the cave would grow dark, and the sky turned its pretty sunset colors. In the morning, the cave would get brighter and the sky would become increasingly blue. Guess what color turns on melatonin (the sleep hormone)? Guess what color turns off melatonin production in the body in the morning hours somewhere around sunrise, and makes us more alert? We've gotten very far away from such natural lighting given all the indoor lights we now use, plus the electronic blue light of gadgets that we tend to use at night, such as computers and cell phones. Use of sunset-like colors ('red light') prior to bedtime can help trigger natural melatonin production. There is lots on the net about this, such as https://www.nestmaven.com/sleep/how-to-sleep-better/

As people age they have less slow wave sleep. One study found that by artificially improving slow-wave sleep in older adults there was an improvement in performance on memory tests before and after the sleep period. Neurofeedback is one means to improve slow wave sleep.

Treating sleep apnea is also important. Research done by New York University studied nearly 2,500 people between the ages of 55-90 who had Alzheimer's. Those with breathing problems were diagnosed with 'mild cognitive impairment' (MCI) on average ten years earlier than those without sleep breathing problems. (MCI is in effect a stage prior to Alzheimer's. It reflects that memory impairment is noticeable to others but not at a level great enough to interfere with daily functioning.) More than 18 million Americans have sleep apnea, and about half who snore loudly have it. One of the more common approaches to treating sleep apnea is through a CPAP (constant pressure airway machine, where air is forced through a mask into the nose and mouth and it aids in keeping the airway open while sleeping), and those who use it were diagnosed with memory and thinking problems about ten years later than those not treated.



HEAVY DEPOSITS OF amyloid-beta, shown in red in the brain on the right, are linked to poor sleep and may be paving the way for Alzheimer's disease. A brain benefiting from deep sleep brain waves and an absence of amyloid-beta is shown on the left.

Source

Disturbed Sleep Is Associated with Increased Amyloid-Beta and Long-Term Memory Impairment, Study Suggests

Neurology Today15(13):22-23, July 2, 2015.

This was a study done on 26 non-demented people, using PET scans, EEG to monitor brain wave activity during sleep, and fMRI after sleep to test sleep-dependent memory consolidation. Results included that the amyloid burden in the medial prefrontal cortex (the cortex in the center forefront of the brain) significantly correlated with the severity of non-REM slow wave sleep. And reduced non-REM slow wave activity generation was associated with poorer overnight memory consolidation. The older adults that showed the most impaired memory transformation were those with the most beta amyloid and the most disrupted deep sleep. This is the first study on humans to look at this chain of events. Similar findings have been seen in mouse models.

Now how are you going to remember all the information provided in this article? Dr. Daniel Amen, a psychiatrist has come up with a mnemonic 'Bright Minds' as a way to help prevent and/or treat memory impairment such as Alzheimer's by dealing with eleven major risk factors. It stands for:

Blood flow: "low blood flow is the #1 brain imaging predictor of Alzheimer's" he has said. Factors that can cause low blood flow to the brain include caffeine, nicotine, or high blood pressure. Lack of exercise, or having erectile dysfunction which is a reflection of impaired blood flow are other issues to consider. Amen says that 40% of 40 year old men have ED which means "40% of 40 year old men have brain dysfunction."

Retirement and aging: the Chicago study shows the importance of keeping one's mind active such as through crossword puzzles, learning a language, etc. Amen says "When you stop learning your brain starts dying."

Inflammation: there are different ways to recognize inflammation, such as muscle or joint pain, or through a blood test that measures c-reactive protein, or low levels of omega 3. Amen says "Inflammation is a disaster for every organ in your body, including your brain." Mental health problems such as ADHD, depression, and autism may be reflective of inflammation in the brain. Taking omega-3 may help, Amen says. If you have gut problems (e.g. leaky gut) this can cause brain inflammation. Sugar such as in processed foods is inflammatory and can cause problems for the brain such as over the long run leading to neuronal death. That Alzheimer's is sometimes called type 3 diabetes is an example of how sugar harms the brain.

Genetics: the E4 gene for Alzheimer's is an obvious example of this risk factor. But it has been said that 'Genetics cock the gun, and lifestyle pulls the trigger.' Again, the Chicago study shows the importance of healthier living such as by avoiding high levels of saturated fat and certain minerals in excess. There is some very early and limited research suggesting that the spice turmeric might be helpful in preventing Alzheimer's and even in helping improve some symptoms once it is present (e.g. see "Effects of turmeric on Alzheimer's disease with behavioral and psychological symptoms of dementia" Ayu, Oct-Dec. 2012, 33(4), 499-504)by N. Hishikawa, et al).

Head trauma: the research on soccer and football players suffering brain damage is an obvious example of what can happen from seemingly minor blows to the head adding up over time. Big concussive events, such as from car accidents or being in combat and exposed to blast pressure also takes a toll. Amen says that 80% of sports players his clinic sees get better in as little as two months by being put on this BRIGHT MINDS program.

Toxins: alcohol, cocaine, narcotics, exposure to Roundup, or people absorbing a plethora of toxic chemicals through make-up, sunscreen, and personal care products are all examples of toxins that need to be avoided. Sixty percent of lipstick sold in the U.S. is said to contain lead and there is **no safe exposure** for that metal. Bionsen, a deodorant maker has done research finding that the average woman puts on her body about 515 different synthetic chemicals each day. They are not necessarily known to be safe, and the European Union has banned over 1300 chemicals found in cosmetics while the FDA has banned about a dozen. And it has been estimated that the average woman absorbs 5 pounds of makeup each year. (Organics, "Women put on 515 synthetic chemicals on their bodies every day", 3/29/2017). (http://www.safecosmetics.org/get-the-facts/regulations/us-laws/lead-in-lipstick/). Mold and mercury (such as from seafood) are other examples of other toxins.

Mental health: problems like ADHD, anxiety, depression, PTSD, etc. can take a toll on us and can cause memory impairment. Get such issues treated and this does not necessarily mean take drugs. Good nutrition and exercise are obvious examples of how to treat some of these issues.

Immunity/infections: problems like herpes or Lyme disease can cause memory impairment, and assuming 'I'm old, my memory is off, it must be Alzheimer's' can be a premature assumption to make.

Neurohormone deficiencies: thyroid, testosterone, estrogen, etc. are obvious examples of hormone imbalances having a profound effect on our ability to function well.

Diabesity: (diabetes and/or obesity). That there is a suggestion of a type 3 diabetes causing Alzheimer's is an obvious example of the harm this does to our brains.

Sleep: "less than 7 hours of sleep at night is associated with low blood flow to the brain. It turns off 700 health promoting genes" Dr. Amen has said.

In summary, we all age and there is no fountain of youth. But there are choices we can make that help to preserve our memory to a greater degree and for a longer period of time and helps reduce the likelihood of our suffering the ravages of disease that rob us of who we are. Make the right choices for better health. Improve your health through food, exercise, sleep, and avoiding exposure to toxic chemicals.