

# Food for Thought...Literally

## The Link Between Diet and Depressive Disorders

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If you watch the news, it's hard to ignore the fact that depression and psychological disorders are affecting people around the country and the globe at increasing rates. According to the 2016 National Survey on Drug Use and Health (NSDUH), an estimated 10.3 million U.S. adults aged 18 or older had at least one major depressive episode with severe impairment. This number represented 4.3% of all U.S. adults while an estimated 2.2 million adolescents aged 12 to 17 in the United States had at least one major depressive episode with severe impairment, which represented 9.0% of the U.S. population aged 12 to 17. Approximately 37% of adults with major depressive episode did not receive treatment and approximately 60% of adolescents with major depressive episode did not receive treatment. ("NIMH » Major Depression" 2017)



There is also a noticeable trend of people seeking complimentary therapies for depression, anxiety, and other mood related disorders. While the use of complementary and alternative therapies is growing in the United States, according to the National Center for Health Statistics, depression and anxiety currently only make up about 3% of the diseases or conditions for which people are seeking alternative therapies such as special diets and natural products (Black et al. 2015).

Over the past decade we have learned a lot about the connections between what we eat and how our brain functions. Before we explore a few dietary strategies found to help with depression and anxiety disorders, let us consider a few factors on how diet impacts our bodies entire ability to function optimally.

- The digestive system has the important job of processing every single morsel of food we eat. That being said, this system is also where 75% of our neurotransmitters are produced. **Neurotransmitters** are basically chemical messengers that our brain and nervous system use in order to direct every single process and decision your body and brain make. Neurotransmitters allow us to feel, think, react, and interact with the rest of the world.
- The digestive system is also where 95% of our **serotonin** is produced. Serotonin is a particular type of neurotransmitter most known for its effects on feelings of happiness and wellbeing. Serotonin also effects overall mood, sleep patterns, and appetite. Many prescription antidepressants work by manipulating serotonin pathways.

Considering these facts alone, it is no wonder that what eat has profound effects on how we feel and interpret the world around us, ultimately partially contributing to our likelihood of suffering from depression and other related disorders. Let's explore a few of the dietary factors we now know of that can play a role in depressive disorders.

**Dietary Omega-3 Fatty Acids:** Omega 3 fatty acids are polyunsaturated fats found heavily in fish, nuts, and seeds. These fatty acids act as "anti-inflammatory" agents. Inflammation disrupts the normal functioning of your immune system which in turn decreases certain neurotransmitter activity in the brain. Studies have found that people who consume more dietary sources of omega 3 fatty acids had a lower chance of suffering from depression (Grosso et al. 2014). Particular omega-3 fatty acids which come in the form of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are found in cold water fish such as salmon, mackerel, herring, tuna, and sardines. Plant based sources of omega 3 come in the form of alpha-linolenic acid (ALA) and include chia and flax seeds, walnuts, and pumpkin seeds. While all omega 3 fatty acids are considered beneficial, the beneficial effects of EPA and DHA surpass those of ALA. You need a lot more ALA to get the same benefits as EPA and DHA. As the typical American diet becomes one is more reliant on convenience foods and fast foods over fresh foods, it is easy to see how a growing proportion of the population does not get omega-3 fatty acid containing foods in their diet. The Mediterranean diet; which has been highly regarded in the medical community for its health promoting attributes, is higher in omega-3 fatty acids than most other diets due to its increased recommendations for oils, nuts, and fish. A recent randomized controlled trial actually demonstrated that adults who suffered from moderate to severe depression were able to improve their depressive symptoms significantly simply by following a "modified Mediterranean diet" which was based on the Australian Dietary guidelines and the Dietary Guidelines for Adults in Greece (Jacka et al. 2017).

**Vitamin D:** Vitamin D is what many like to call the “sunshine vitamin” as we get vitamin D naturally from the sun. With the advances in technology and increasing trend to spend more time indoors, vitamin D deficiency is becoming somewhat of an epidemic in the United States. Research has been able to show us that there is a connection between vitamin D deficiency and depression. However, in studies that looked at vitamin D supplementation for treatment of depression results have been mixed (Penckofer et al. 2010). A meta-analysis seeking to find a correlation between vitamin D deficiency and depression found that people who were vitamin D deficient were also more likely to be depressed (Anglin et al. 2013). However, evidence still remains to be seen if vitamin D deficiency actually causes depression or if there is just a correlation. Another study found vitamin D receptors in the same areas of the brain associated with depression (Eyles et al. 2005). Despite these impressive findings, more studies are needed in order to determine the etiological connection between vitamin D and depression. Perhaps that answer is more complex than simply a nutrient deficiency.



While focusing on vitamin D as a “dietary factor” of depression, it is important not to ignore the bigger picture here which is sunshine. Studies looking at seasonal affective disorder (SAD) which is a type of depression related to changes in seasons have shown that the rate of serotonin turnover in the brain is lowest in the winter season, and the rate of serotonin production increases with bright light exposure (Lambert et al. 2002). This is the theory behind the utilization of light therapy for depression (Roecklein and Rohan et al. 2005). People that spend too much time indoors without exposure to light are at risk for low serotonin levels which can lead to depression. According to the World Health Organization (WHO), 5 to 15 minutes of sunlight on your arms, hands, and face without sunscreen 2-3 times a week is enough to enjoy the vitamin D-boosting benefits of the sun. Dietary sources of vitamin D include mushrooms, fortified milk, and fatty fish such as tuna and salmon. It is important to note that dietary sources of vitamin D do not contain enough to make up for exposure to sunlight which is why people diagnosed with vitamin D deficiency are often told to take a vitamin D supplement.



**Vitamin B-12:** Several studies dating back to the 1960s have documented the relationship between vitamin B-12 and folate deficiencies and an elevated level of a molecule produced by the body called “homocysteine”.(Syed et al. 2013) Simply put, high levels of homocysteine cause damage to the tissues in our body, specifically blood vessels which leads to hardening of the arteries. This is why elevated homocysteine levels are also considered to be highly predictive of cardiovascular disease. Homocysteine can be converted to an amino acid called “cysteine” which makes this molecule no longer harmful to the body. However, in order for this to happen, it needs the help of a folate and B-12 particularly. Without these vitamins, homocysteine levels may rise.

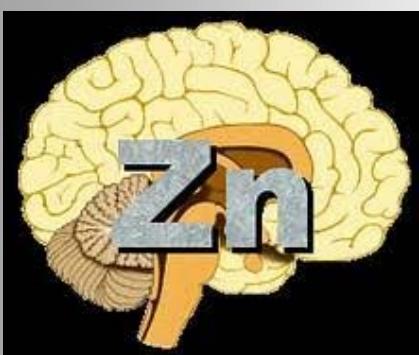
You might be thinking; what does this have to do with depression? We are now finding that in addition to the damage this causes to our cardiovascular system, it could also interfere with our nervous system causing disruption of proper brain functioning leading to depression (Ansari et al. 2014). Vegans in particular are at the highest risk for vitamin B-12 deficiency due to the lack of plant based dietary sources of B-12 (Rizzo et al. 2016)

A study published in 2017 concluded that vegetarian men were more likely than their meat-eating counterparts to be depressed (Hibbeln et al. 2018). This study received a lot of press however it is important to note that this study did not look take into account depression that may have been present before becoming a vegetarian nor did the study look at serum B-12 levels in the subjects. Thus, it may not be reasonable to conclude that vegetarianism causes depression. However, the participants were more likely to be B-12 deficient as a result of their diet, thus making them more susceptible to depression.

One study actually looked at B-12 supplementation in combination with traditional pharmaceutical therapy and found that B-12 supplementation in combination with medication was more effective than medication alone in treating depression in patients with low normal B-12 levels.(Syed et al. 2013)

Dietary sources of vitamin B-12 include fish, meat, poultry, eggs, milk, and milk. Plant based sources of B-12 are scarce however there are many cereals and other foods that are now fortified with vitamin B-12. Otherwise vegetarians and vegans are encouraged to supplement with B-12 to ensure adequate intake. A physician or registered dietitian would be able to assess the need for such supplementation and make recommendations accordingly.

**Folate:** Though the exact mechanism of how folate deficiency and depression are related still requires more research, we do know that folate is also involved in homocysteine regulation and low folate levels leading elevated homocysteine can lead to elevated risk of depression (Bottiglieri et al. 2000). Individuals with depression have been found to have lower serum levels of folate and lower dietary folate intake than individuals without depression (Bender, Hagan, and Kingston 2017). Low folate consumption or decreased ability to metabolize folate is also correlated with low serotonin levels (Botez et al. 1982). As previously discussed in this article, serotonin is an important neurotransmitter involved in mood regulation. Studies have shown us that people who have a difficulty metabolizing folate as is seen in a disorder called 5,10-methylenetetrahydrofolate reductase (MTHFR) deficiency require significantly more dietary folate or supplemental folic acid in order to raise folate levels in the blood, putting them at an increased risk for folate deficiency. Hence, this population is more susceptible to depression (Almeida et al. 2005). Folate is found naturally in cooked legumes such as peas, kidney beans, and lentils, spinach, broccoli, brussels sprouts, cantaloupe, banana, peanut butter, and sunflower seeds. Supplemental folic acid can also be found in our food supply.



**Zinc:** Zinc in the human body is actually found in the highest concentrations in our brains, particularly in an area called the hippocampus. The hippocampus is part of largely misunderstood system in our body called the limbic system which plays a role in memory and mood. Research has revealed that people suffering from major depressive disorder (MDD) often have lower levels of zinc in their blood (Styczeń et al. 2017; Maes et al. 1997). Amongst the many roles that zinc plays in the body, zinc is required for proper functioning of the nervous system and immune system. One study published in 2013 found that zinc supplementation together with antidepressant drug therapy (SSRI's) improved symptoms in patients with major depressive disorder (Ranjbar et al. 2013). Oysters contain the highest amounts of zinc. Poultry and red meat are also good sources of zinc. Plant based sources

are not absorbed as efficiently as meat based so vegetarians need to consume more. Decent plant based sources of zinc include cooked legumes, wheat germ and sesame seeds.

**Refined Sugars:** Research has helped us to better understand the complex relationship between inflammatory pathways and our brains ability to function optimally. In particular, research has shown us that there is a relationship between inflammation, our immune system, and depression (Miller and Raison et al. 2016). Additional research is still needed in order to better understand these mechanisms. Chronic intake of refined sugars sets off a cascade of inflammatory responses in the body which disrupts the normal functioning of your immune system which in turn may increase your risk for depression. A study published in 2017 concluded that men who consumed 67 grams or more of sugar per day were 23% more likely to be diagnosed with depression in a five-year period than men who ate 40 grams or less (Knüppel et al. 2017). The current recommendation for daily added sugar consumption is to stay under 50 grams per day. We are finding that dietary predictors of depression such as a high sugar diet are similar to the predictors for heart disease, diabetes, and other chronic diseases considered to preventable through lifestyle. One of the hallmarks of these diseases is chronic inflammation. Numerous studies have identified correlations between refined carbohydrates and sugar and inflammatory biomarkers (Aeberli et al. 2011; Dickinson et al. 2008). Therefor it is reasonable to conclude that excessive amounts of refined sugar can truly set off an avalanche of negative health events — both physical and mental.

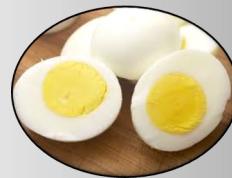


## **Conclusions-Dietary Strategies to Fight Depression:**

### **Conclusions-Dietary Strategies to Fight Depression:**

- Try to consume EPA and DHA rich sources of omega 3 fatty acids such as salmon, tuna, and herring at least 2 to 3 times per week. If fish is not a part of your diet or you are just not that into eating fish, adding a good fish oil supplement once a day may be a beneficial strategy.
- Increase your exposure to sunlight by spending more time outside or trying to work near more open windows. If your serum vitamin D is low, including a vitamin D supplement may be beneficial.
- Include good sources of vitamin B12 in your diet on a daily basis such as milk, eggs, lean red meat, fish, and poultry. If you are vegan or do not regularly include these foods in your diet, a B-12 supplement may be appropriate to boost vitamin B-12 levels.
- Try to incorporate multiple sources of folate in your diet on a regular basis. Most leafy greens are good sources of folate, therefore try to have leafy greens with at least one to two meals per day.
- If you are a meat eater, zinc deficiency may be less likely. If you are a vegetarian, including decent sources of zinc such as cashews and chickpeas is beneficial.
- Try to eat foods from whole sources rather than packaged or processed foods. This will help to control the amount of refined sugars you consume in a day.

Your physician or registered dietitian will be able to help decide which nutritional measures may be beneficial for your particular case by evaluating your individual serum labs, medical history, and diet history.



### **Top Four Foods for Your Best Brain**

**Salmon:** Four ounces of cooked wild-caught salmon (about the size of deck of cards) is a rich source of the omega 3 fatty acids-EPA and DHA. This same serving also contains more than half your daily needs for vitamin B-12, and a smaller amount of zinc (about 8% of your daily needs). These facts make salmon #1 on our “Foods for Your Best Brain List”!

**Edamame:** One cup of shelled edamame contains about 17 grams of protein and 8 grams of fiber, making it a filling and nutritious snack or addition to a healthy meal. This amount of edamame also provides 560 mg of omega 3 fatty acids, 121% of your daily needs for folate, and 14% of your daily needs for zinc. Edamame goes great in salads or eaten alone with a pinch of sea salt.

**Eggs:** 1 egg provides 560 mg of omega 3 fatty acids, 25% of your daily needs for vitamin B-12, 15% of your daily needs for folate, and 10% of your daily needs for zinc. A boiled egg makes for a great, portable source of quick protein.

**Wheat Germ:** Wheat germ is often referred to as the “embryo” of the wheat kernel. The germ is the most nutrient dense portion of the wheat kernel and contains several essential nutrients including 202 mg of omega 3 fatty acids, 20% of your daily needs for folate and 23% of your daily needs for zinc. Most wheat processing removes the wheat germ due to the fact that it spoils more quickly. This means that our best bet is to get this precious nutrition gem from unprocessed wheat such as sprouted grain bread or by itself. Wheat germ goes great on top of salads, mixed into oatmeal, or blended with smoothies.

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