

The Scientific Evidence for Diet and Mental Health

Prevalence of Mental Health

According to the latest statistics, over 970 million people are estimated to have a mental health disorder worldwide. Approximately 65% of this is attributed to depressive and anxiety disorders. [GBD Study 2017]

In Australia, it is estimated that over 5 million people have depression, anxiety or related feelings, with 1 in 10 people experiencing depression. And these numbers are increasing. [ABS National Health Survey 2018]

Interest of Diet and Mental Health

The relationship between diet and mental health has become a recent hot topic, possibly partially due to the increasing prevalence of poor mental health and today's current climate due to the COVID-19 pandemic. Research in this area is growing rapidly, although the majority of studies are done with animals and are observational in humans – which means we don't have strong conclusive evidence (yet) to determine which diet is most beneficial for reducing mental health symptoms or preventing mental health disorders. But there are some promising areas of research that point us in the right direction.

Pathology of Diet and Mental Health Symptoms

The mechanisms underlying the relationship between diet and mental health are complex and yet to be fully understood. However, more research in the area is emerging and we are starting to get a clearer understanding.

Some of the key theories around the mechanisms that relate diet to depression (which may also be relevant to some other mental health disorders due to common pathophysiology) include inflammation, oxidative stress, mitochondrial dysfunction, gut microbiota, tryptophan-kynurenine metabolism, HPA Axis dysfunction, epigenetic changes and neurogenesis. Many of these mechanisms crossover and are interconnected. However, it is important to note that the majority of the studies supporting these theories are preclinical animal studies, meaning that no firm conclusions can be drawn yet. However, we have some interesting areas to consider and continue to study. [Marx et al. 2020]

INFLAMMATION

Studies have found that some individuals with mental health disorders (e.g. depression), may also have increased levels of inflammation. Psychosocial stress (e.g. experience of trauma) and lifestyle sources of stress (e.g. smoking, poor quality diets and physical inactivity) have been proposed to initiate an inflammatory response in the body, which produces certain inflammatory molecules (e.g. cytokines) that can affect certain physiological pathways related to mood disorders. [Marx et al. 2020]

Mediterranean and anti-inflammatory styled dietary patterns have been investigated for their effect on mental health, due to their potentially anti-inflammatory components (e.g. omega-3 fatty acids and polyphenols) or displacement of pro-inflammatory foods (e.g. highly processed foods, alcohol, trans fat). [Marx et al. 2020]

OXIDATIVE STRESS

Some studies have reported markers of oxidative stress to be higher and markers of antioxidants to be lower in individuals with depression. And it has been suggested that oxidative stress may also lead to mitochondrial dysfunction, inflammation and altered metabolism (all of which may have a further impact on mental health outcomes). [Marx et al. 2020]

Consuming foods with antioxidant properties (e.g. vitamins, minerals and polyphenols) may be associated with reduced oxidative stress. [Marx et al. 2020]

GUT MICROBIOTA

Our gut contains trillions of microorganisms (gut bugs), collectively termed as our gut microbiota. Our gut microbiota plays a role in many of our normal biological processes such as digestion and immunity. The gut microbiota has also been associated with several diseases, including infections, chronic disease, and autoimmune diseases. Some individuals with depression and other psychological disorders, have been found to have altered gut microbiota. [Wang et al. 2017]

Research around the gut microbiome, diet and mental health is emerging rapidly. A lot of this research has looked at the role the gut microbiota has in the regulation of different physiological processes of mental health disorders via the gut-brain axis (the communication between the gut and the brain). [Marx et al. 2020]

Animal studies have supported the idea that depression pathophysiology (including inflammation, neurogenesis, epigenetic change and tryptophan-kynurenine metabolism) might be partially controlled and regulated by the gut microbiome. [Marx et al. 2020]

Because the gut microbiome is involved with the digestion process of food and can be modified by our diet, it could be an important mediator in the relationship between diet and mental health. [Marx et al. 2020]

Eating a wide range of foods that help support gut microbiota diversity (fibre, prebiotics, probiotic, polyphenols), may help support a healthy gut, body and brain.

MITOCHONDRIAL DYSFUNCTION

Mitochondria are the powerhouse of our cells – they generate energy for many of our biochemical reactions. It has been suggested that some of the core symptoms of depression, such as fatigue and reduced cognition, may be related to mitochondrial dysfunction. [Marx et al. 2020]

Some studies have shown that westernised dietary patterns may be associated with mitochondrial dysfunction. [Marx et al. 2020]

TRYPTOPHAN-KYNURENINE METABOLISM

The Tryptophan–kynurenine pathway leads to the production of metabolites that are neurobiological mediators in psychiatric disorders, such as depression. This pathway can be activated by stress, immune responses and inflammatory responses. [Marx et al. 2020]

Understanding the availability and metabolism of tryptophan (an essential amino acid) may be important when considering dietary interventions for mental health. Although studies around this are quite conflicting. [Marx et al. 2020]

HPA AXIS DYSFUNCTION

The HPA axis consists of the hypothalamus, pituitary glands and adrenal glands. Studies have shown that some individuals with depression have disturbances to the HPA axis, particularly excessive cortisol production (our long-term stress hormone), which may be related to the pathophysiology of depression. [Marx et al. 2020]

Certain nutrients have been investigated for its effect on the reduction of cortisol levels, particularly vitamin C, omega-3 fatty acids, polyphenols and probiotics. [Marx et al. 2020]

EPIGENETIC CHANGES

Environmental influences (e.g. nutrition) of epigenetic states during development in early life (e.g. prenatal or adolescent development) has been associated with chronic diseases, that share similar pathways to depression. [Marx et al. 2020]

Some studies have found that some nutrients (vitamins, omega-3 fatty acids and polyphenols) and butyrate may influence epigenetic state. [Marx et al. 2020]

HIPPOCAMPUS NEUROGENESIS AND BDNF

Brain-derived neurotrophic factor (BDNF) is a protein that supports neurogenesis (the formation of neurons, a type of brain cell), and is highly expressed in the hippocampus of the brain, which plays a strong role in learning, memory and mood. It is suggested that the level of neurogenesis in the hippocampus is related to mood, and that individuals with major depression have lower levels of serum BDNF. [Marx et al. 2020]

Animal studies have found that westernised dietary patterns can impair neurogenesis and lower BDNF levels in the hippocampus, which may have an effect on mood. Studies have also suggested that some nutrients may benefit neurogenesis of the hippocampus, such as omega-3 fatty acids, vitamins, polyphenols and probiotics. [Marx et al. 2020]

Some studies have also shown that there is a link between the quality of our diet and the size of our hippocampus. Neurogenesis may also be affected by other related mechanisms including inflammatory pathways and gut microbiota. [Marx et al. 2020]

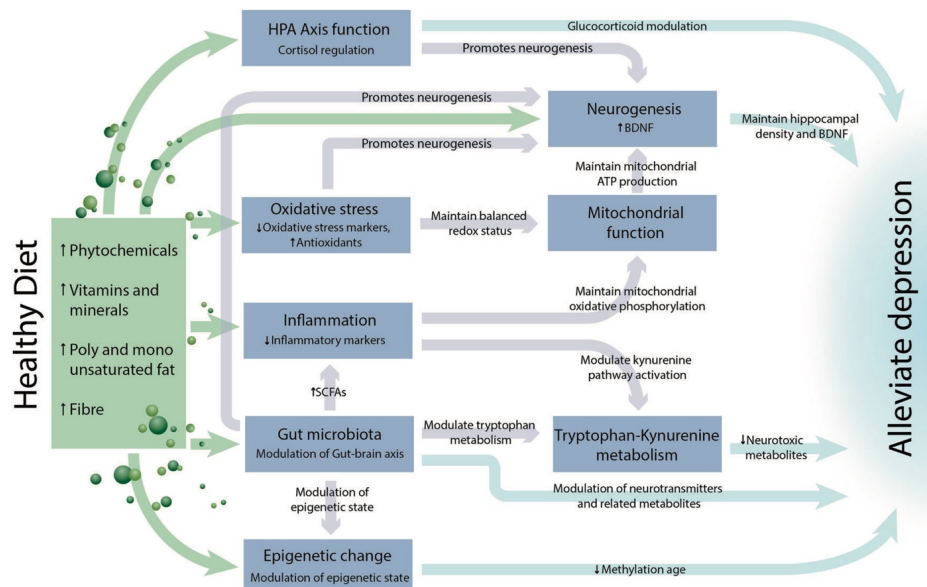


Image: The interconnected mechanisms of the pathology between diet and depression outcomes [Marx et al. 2020]

Dietary Patterns and Mental Health

There is now a good body of evidence to suggest that the quality of our diets is associated with our risk of depression, where high quality diets are associated with a lower risk of depression and poorer quality diets are associated with a higher risk of depression. There is also enough evidence to suggest that dietary interventions do have the potential to improve depression (reduce depressive symptoms) and are most successful when led by a qualified dietitian. Therefore, improving our diet quality with the help from a dietitian may be a beneficial option for improving depressive symptoms. [Firth et al. Apr 2019, Lassale et al. 2018, Opie et al. 2015]

However, there is still conflicting evidence around the particular dietary pattern that proves to be most beneficial in improving depression, if it extends further to other mental health disorders such as anxiety, and whether it is equally beneficial for clinically diagnosed mental health disorders and nonclinical mental health conditions.

Some of the different dietary patterns that have been researched on their potential to improve depression include Mediterranean-style diets, general healthy eating, and anti-inflammatory diets.

MEDITERRANEAN-STYLE DIET

Mediterranean-style dietary patterns are generally characterised by fruit, vegetables, wholegrains, legumes, nuts, olive oil, and fish. Some observational studies have found this dietary pattern to be associated with a reduced risk of depressive symptoms, and a lower adherence to this dietary pattern (higher intakes of meat, dairy and processed foods) to be associated with a higher risk of developing depression. [Altun et al. 2019, Lassale et al. 2018]

Recently, clinical trials investigating the relationship between the Mediterranean diet and mental health have become of increasing interest. An Australian study, called the SMILES Trial, found that participants who received dietary support (adherence to a Mediterranean-style diet supported by a dietitian) had significant reductions in moderate-severe depressive symptoms (32% achieved remission criteria) compared to the control group that received social support. [Jacka et al. 2017] Another Australian study, called the HELFIMED Trial, also found similar results. [Parletta et al. 2017]

GENERAL HEALTHY EATING

Some studies have looked at general healthy dietary patterns and its association with the risk of depression. These dietary patterns are similar to National Dietary Guidelines, and generally consist of mostly vegetables, wholegrains, fruits, soy, olive oil, fish, poultry, and low-fat dairy; and lower intakes of discretionary foods commonly found in the westernised diet. [Li et al. 2017]

Observational studies have found that healthy dietary patterns may be associated with lower odds and risk of depression, whereas a higher adherence to westernised diets is associated with an increased risk of depression. [Li et al. 2017]

ANTI-INFLAMMATORY DIET

Observational studies have looked at diets that consider the inflammatory potential of foods using the Dietary Inflammatory Index (DII). Anti-inflammatory diets consist of mostly foods that have a low DII, which are generally high in plant foods (e.g. vegetables). Pro-inflammatory diets consist of mostly foods with a high DII, such as highly processed meats, trans fats and alcohol. [Lassale et al. 2018, Tolkein et al. 2018]

Some observational studies have found that a low adherence to a pro-inflammatory diet (high DII), may be associated with a reduced risk of non-clinical depressive symptoms. [Lassale et al. 2018, Tolkein et al. 2018]

COMPARISON BETWEEN DIETARY PATTERNS

These dietary patterns differ slightly, however all promote improving diet quality by reducing intake of discretionary foods (commonly found in a westernised diet) and replacing these foods with high-fibre, nutrient rich whole foods with an emphasis on plants.

Particular Nutrients/Foods and Mental Health

OMEGA-3 SUPPLEMENTATION

Omega-3 fatty acid supplementation is the most widely studied single nutrient for its effects on improving mental health. Some good quality, statistically significant evidence has been found for the use of omega-3 supplementation as an adjunctive therapy for depression with pharmacological therapy (antidepressants). It is suggested that high EPA formulas may deliver the most beneficial effect, although formulas and dosage vary greatly across studies. There is little evidence for the use of omega-3 as a monotherapy for depression. [Firth et al. Oct 2019]

Therefore, there is not enough evidence (yet) to warrant recommending omega-3 supplementation for the treatment of depression. It could potentially be trialled for individuals taking antidepressants (most beneficial type and dosage is inconclusive). A food first approach may be appropriate, although there is not much research around food sources of omega 3 and mental health outcomes.

VITAMIN D SUPPLEMENTATION

Research around vitamin D supplementation and depression is emerging, although there is limited good quality evidence at this stage to warrant supplementation for the improvement of depression. [Firth et al. Oct 2019]

Safe sun exposure for vitamin D, may be most appropriate recommendation at this stage and supplementation if they are deficient.

OTHER NUTRIENT SUPPLEMENTATION

Other nutrients have been investigated (Zinc, Magnesium, B Vitamins, Inositol), although there is limited/no evidence to support the use of these nutrient supplements in the improvement of depression. [Firth et al. Oct 2019]

PROBIOTICS AND PREBIOTICS

Probiotics are live microorganisms that can help maintain a healthy gut microbiota. Prebiotics serve as food for our gut microbiota, which when they digest produces a number of beneficial metabolites (e.g. butyrate) and supports the growth of our gut microbiota.

There is emerging research around the supplementation of probiotics for improvement in depression. Some probiotic strains have been found beneficial for depressive symptoms, although research is still inconclusive. [Vaghef-Mehrabany et al. 2019]

There is limited research on supplementation of prebiotics and synbiotics (combination of prebiotics and probiotics) in depression and other mental health conditions. [Vaghef-Mehrabany et al. 2019]

Therefore, the use of supplementation of probiotics, prebiotics and synbiotics is not (yet) warranted. However, food sources could potentially be explored as part of a healthy dietary pattern, because of its role with the gut microbiome and the potential relationship with mediating mental health pathophysiology. Although, food sources of probiotics and prebiotics for mental health are not well explored.

POLYPHENOLS

Polyphenols are phytochemicals found in a diverse range of foods but are particularly high in plant foods (e.g. fruit, vegetables, tea, cocoa, soy, spices, nuts, coffee). Some studies have suggested that consuming higher amounts of polyphenols may have a protective effect against depression risk. This may be due to the anti-inflammatory, antioxidant, and prebiotic properties of polyphenols and the possible associated mechanisms these properties have on

mental health. Polyphenols are an emerging area of research, and more studies need to be conducted to confirm the positive affects it may have for depression and other mental health conditions. [Bayes et al. 2020]

Conclusion & Summary

The research around diet and mental health is growing rapidly. There is now enough evidence to suggest that diet quality does influence mental health, particularly depression, although the exact underlying biological mechanisms remain unknown.

Higher quality diets are associated with a lower risk of depression and reduced depressive symptoms, whereas poorer quality diets are associated with an increased risk of depression. Particular dietary patterns that promote positive mental health outcomes remain inconclusive, although promising research is emerging for a Mediterranean-style diet. In general, a high-quality dietary pattern is one that is rich in a variety of plant foods, and low in discretionary foods.

Dietary supplements have been investigated for their effect on mental health, but research is conflicting and inconclusive. Omega-3, vitamin D and probiotics may be beneficial, although more research is still required.

The gut microbiome is another emerging area of research, where a diet supporting healthy and diverse gut microbiota may have an association with positive mental health outcomes. Although more research is needed to confirm this association and identify the underlying mechanisms.

Practical Application

Working with a dietitian one-on-one to improve overall diet quality may result in positive mental health outcomes, which extends further to the prevention of other chronic diseases.

A dietitian can support you to achieve a diet rich in wholefoods that provides you with the energy and nutrients you need to support your mental health and overall health, based on the latest research. This support would include nutrition education and counselling to equip you with the practical tools and skills to make improving your diet quality easier and to fit this within your lifestyle, while overcoming your biggest barriers.

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