

# NUTRITION AND BRAIN HEALTH

## Feed your brain, nourish your mind

Written by Doug Cook, RD  
Nutrition and Brain Health Expert

Considerable research has shown the important role of nutrition on brain and mental health. There is a growing understanding of nutrition's role in reducing the risk for brain diseases such as dementia, including Alzheimer's, as well as mood disorders. This paper provides an overview of the brain, its nutritional requirements, and highlights the importance of choosing nutrient-dense foods that provide easily-absorbed key nutrients needed for good brain health. Based on the nutrient needs of the brain, there is a strong case for including animal-based foods for optimizing brain and mental health.

### OVERVIEW OF THE BRAIN'S ANATOMY

The structure of the brain is extremely intricate. It's an incredible organ that only weighs about 1.5 kg (3.3 pounds) or about the size of two closed fists. Despite its relatively small size, the brain is a powerhouse when it comes to function. The brain requires a lot of energy to perform all its duties such as processing information, creating consciousness, mood regulation, memory formation, memory retrieval and transmitting information to the rest of the body via the nervous system. In fact, the brain accounts for about 20-25% of the body's total energy use each day.<sup>1</sup>

The functional unit (cell) of the brain is the neuron. There are approximately 85 billion neurons, each with multiple points of contact to allow communication with neighbouring neurons.<sup>2</sup> These points of contact are called synapses and there are about 100 trillion of them. It's no surprise that the brain is considered the most complex structure in the known universe.

### IN THIS NUTRITION REPORT:

- Overview of the brain's anatomy
- Nutritional requirements of the brain
- Nutrition, brain and mental health
- Nourishing the mind with food



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## NUTRITIONAL REQUIREMENTS OF THE BRAIN

The brain, like the rest of the body, needs over 40 nutrients everyday - including essential amino acids from protein, essential fatty acids, carbohydrates, vitamins, minerals, and water.<sup>3,4</sup>

Based on the brain's demanding nutrient needs, it is difficult to meet its requirements unless you are consuming a wide range of nutrient-dense, whole foods each day.

### STRUCTURE

What we eat and drink impacts the brain's structure and, in turn, structure influences function. In short, when it comes to brain and mental health, food does matter. Here are some of the key nutrients that need to be considered for brain health.

### FAT

About 60% of the brain's weight is fat.<sup>6</sup> Ideally, about 20% of brain's fat content should be comprised of omega-3 fatty acids, specifically DHA omega-3, provided adequate amounts of the longer-chain omega-3s (EPA, DPA & DHA) are being consumed in the diet. The most important sources of these essential fats are fish and seafood, omega-3 enriched eggs, and supplements derived from fish, seal, and squid oil or algae.

### PROTEIN

Like fat, protein is a major structural component of the brain and nerves. Protein provides amino acids which are converted into a variety of neurotransmitters. In this sense, dietary protein provides a reservoir of the building blocks for neurotransmitters. This is why it's important to consume enough total, good quality protein each day so that the amino acids are available where

and when they are needed for the repair and maintenance of the brain's billions of neurons.

### CHOLINE

Choline is another fat essential for cell membrane structure. Best food sources of choline include: liver (beef/veal/chicken), eggs, beef, poultry, fish, soybeans, potatoes, wheat germ, milk, quinoa, and kidney beans.

### ENERGY

Under normal circumstances, the brain uses glucose for energy, accounting for about 20% of the body's total daily glucose consumption.<sup>7</sup> While any source of carbohydrate will ultimately provide glucose to fuel the brain, the brain will benefit most from quality sources of carbohydrate such as fruits, vegetables, whole grains, milk, yogurt, and legumes. These whole foods will also provide essential vitamins and minerals, and phytonutrients (health-promoting compounds found in plant foods).

### COFACTOR NUTRIENTS

What is often overlooked is what happens if there are deficiencies in key nutrients known as cofactors. All eight of the B vitamins, iron, magnesium, manganese, zinc, copper, selenium and vitamins D and E, are cofactor nutrients that are especially important to brain function. Consuming a combination of high-quality plant and animal foods is the best way to ensure you are getting all of these.<sup>8</sup>

Without a steady supply of these cofactor vitamins and minerals, neuronal energy production and output is negatively impacted. This contributes to poor cognitive function, mood instability, and long term, can increase the risk for brain disorders such as dementia and Alzheimer's disease.<sup>8</sup>

There are many barriers to getting the nutrients the brain needs every day, not the least of which is that about 45% of the calories Canadians consume come from white flour, added sugars and vegetable oils that are found abundantly in our processed food supply.<sup>5</sup>

## PROTECTIVE NUTRIENTS

Like all tissues, the brain needs to defend itself against oxidation, which is the inevitable output from the metabolism of glucose for energy. Without protection, our cells and tissues could be damaged in the same way an apple core turns brown when exposed to the air. There are plant compounds and certain vitamins (vitamins C, E, etc.) that act as antioxidants, but most of the protection comes from enzyme antioxidants (superoxide dismutase, glutathione peroxidase and catalase) that the body produces on its own using key minerals including copper, iron, manganese, selenium, and zinc.

## NUTRITION, BRAIN, AND MENTAL HEALTH

Where nutrition and brain health are concerned, a lot of research has been done in dementia, including Alzheimer's disease and mood disorders. Food provides nutrients that have a protective and supporting role in brain health, and food can be leveraged to address many of the modifiable risk factors that contribute to brain diseases and disorders such as metabolic dysfunction, overweight and obesity.

Many dietary patterns have been studied for their role in brain and mental health including the Mediterranean, DASH, and MIND diets. While there are some differences between them, the main feature of all of them is a focus on minimally-processed, nutrient-dense foods. These diets stress high quality carbohydrate foods like fruit, vegetables and legumes, are low in sugar and refined carbohydrates, and contain more omega-3 fats and fibre than typical Western diets.

These diets also typically include mineral rich unprocessed animal foods like red meat (beef, pork, lamb, etc.) and poultry.

**Consuming a combination of nutrient-dense minimally processed plant and animal sourced foods is the best way to ensure you are getting the nutrients your brain requires to function properly.**

## NOURISHING THE MIND WITH FOOD

Choosing healthful foods more often is the best approach when it comes to brain and mental health. There are many paths to the same destination and there's no one dietary pattern that's the best so long as you follow a few guiding principles. These include:

- **eating a variety of foods that are nutrient-dense**
- **including sources of the omega-3 fats EPA, DPA and DHA**
- **minimizing the intake of highly processed foods; these tend to be high in calories, sugar, and refined oils**

While dietary patterns are what matters, several foods have been studied and stand out as particularly beneficial to brain health. These include:

- **fatty fish**
- **olive oil**
- **nuts and seeds**
- **dark chocolate**
- **berries**
- **eggs**
- **unprocessed red meat**
- **whole grains**
- **mollusks**
- **leafy green vegetables**
- **coffee and tea (white, oolong, green and black)**

## CONCLUSION

Foods, and the nutrients they contain, have a meaningful impact on brain and mental health. Food, of course, is not the only thing to consider for good mental health, but brain nutrition is something that cannot be dismissed. If you're not getting the nourishment your brain needs, it's just so much harder to feel and be your best.

The brain requires a lot of nutritional support to perform well - and with a focus on minimally processed, nutrient-dense foods, including both plant and animal-sourced foods, the brain and its intricate network of neurons can be at its best.

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## REFERENCES

1. Clark D, D. and Sokoloff, L. (1999) in Basic Neurochemistry: Molecular, Cellular and Medical Aspects, eds. Siegel, G, J., Agranoff, B. W., Albers, R, W., Fisher, S. K. & Uhler, M. D. (Lippincott, Philadelphia), pp. 637-670.
2. Azevedo, F. A., Ludmila, R. B., Carvalho, L. T., et al. (2009, Apr 10). Equal numbers of neuronal and nonneuronal cells make the human brain an isometrically scaled-up primate brain. *J Comp Neurol.* 513(5):532-541.
3. Bourre, J. M., (2006 Sep-Oct). Effects of nutrients (in food) on the structure and function of the nervous system: update on dietary requirements for brain. Part 1: micronutrients. *J Nutr Health Aging.* 10(5):377-385.
4. Bourre, J. M., (2006 Sep-Oct). Effects of nutrients (in food) on the structure and function of the nervous system: update on dietary requirements for brain. Par 2: macronutrients. *J Nutr Health Aging.* 10(5):386-399.
5. Nardocci, M., Leclerc, BS., Louzada, ML., et al. (2018 Feb). Consumption of ultra-processed foods and obesity in Canada. *Can J Public Health.* 110(1):4-14.
6. Chang, YM., Ke, DS., and Chen, JY. (2009 Dec). Essential fatty acids and human brain. *Acta Neurol Taiwan.* 18(4): 231-241.
7. Mergenthaler, P., Lindauer, Ute., Dienel, Gerald A., and Meisel, A. (2013, October). Sugar for the brain: the role of glucose in physiological and pathological brain function. *Trends Neurosci,* 36(10):587-597.
8. Cognitive function in depth. Linus Pauling Institute. Oregon State University. (Retrieved from <https://lpi.oregonstate.edu/mic/health-disease/cognitive-function#summary>)