

Good Mood Food and Health

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Food plays a very essential role in our life. Diet has an effect on mood and cognitive function. Hippocrates was the first to suggest the healing power of food; however, it was not until the medieval ages that food was considered a tool to modify temperament and mood, although scientific methods as we know them today were not in use at the time.

The food we eat can have a huge impact on our mood (Leathwood and Pollet, 1983). According to the World Health Organization (WHO) almost 500 million people suffer from stress worldwide. In food, certain nutrient and bioactive factors which can have important influence on cognitive functioning and mood (Prashad, 1998).

Diet and its role in stress and mental health

Diet has the potential to affect mental health and well-being at every stage of life. Problems in mental health have been increasing, with depression predicted to become the second highest cause of global disease (Murey *et al.*, 2001). The acute stress leads include behavioral, autonomic and endocrinological changes promoting heightened vigilance, decreased libido, increased heart rate and blood pressure, and are direction of blood flow to fuel the muscles, heart and the brain (Majzoub, 2006). The physical manifestations of stress are major contributors to several leading causes of death including heart disease, cancer, etc. (Sommer and Snydermann, 1999).

Nutrient and bioactive factors in mood foods and stress management

Various nutrients and bioactive factors found in food have important effect in influencing cognitive functioning and mood. For example, more than

20 different nutrients and bioactive factors have positive effects on mood when they are given as a dietary supplement in clinical trials (Chaudhari, 2010).

Neurotransmitters

Neurotransmitters are basic substances required for chemical communication of nerve impulse/ nerve signals and messages throughout the brain and within the nervous system. The deficiency in these neurotransmitters can lead to such condition as depression, anger, anxiety, sleeplessness and other serious conditions (Fleming, 2007).

Various neurotransmitters are present inside the body, these include a variety of phenethylamines and their derivatives (dopamine, norepinephrine, epinephrine, tyramine, octopamine, and tetrahydroisoquinolines), indoleamines (serotonin, melatonin, and tryptamine), cholinergics (acetylcholine and choline), amino acids and their derivatives (glutamate, aspartate, glycine, taurine, histamine and gamma-aminobutyric acid), nucleosides (adenosine and inosine), hormones (prostaglandins, corticosteroids, estrogen, testosterone, thyroidhormone and many others), and peptides (enkephalin, endorphin, substance P, cholecystokinin, somatostatin, cyclo (His-Pro), thyrotropin releasing hormone and many others). Most of these are synthesized *de novo* using precursors provided by the food we eat, thus under the direct influence of diet (Prasad, 1998). Various transmitters and neurotransmitters that help in proper functioning of brain and directly correlated with mood are as follows:

Serotonin

It is a monoamine neurotransmitter, derived from tryptophan. The brain chemical serotonin is a natural



tranquiliser. It is well known contributor to feeling of well-being; also known as ‘Happiness hormone’, despite of not being a hormone (Young, 2007).

Theanine

Theanine is able to cross the blood–brain barrier and theanine has psychoactive properties (Gomez-Ramirez *et al.*, 2007). Theanine relaxes the brain, thereby reducing stress and anxiety with transquizing effects. It also helps in relaxation by stimulating the body to produce other calming amino acids such as dopamine and tryptophane (Chaudhary, 2010).

Tryptophane

The amino acid tryptophan is the precursor to the neurotransmitter serotonin. When tryptophan is administered as a supplement or is derived from a meal, it increases the amount of tryptophan available to serotonin neurons (Wurtman *et al.*, 1983).

Dopamine

Dopamine is one of the most intensively studied neurotransmitters in the brain due to its involvement in several mental and neurological disorders. Genetic or chemically induced hypodopamine (low dopamine) in the brain’s vital mesolimbic ‘pleasure reward’ (PR) pathway leads to irritability, anxiety, depression and a craving for a variety of different substances and those can lead to addiction (Borawska, 2006).

Phenylalanine and tyrosine

Brain neurones synthesize catecholamines (i.e. norepinephrine, dopamine and epinephrine) from tyrosine. L-phenylalanine, an essential amino acid, is the direct precursor of tyrosine, but both are contributed to the body through a normal diet. Tyrosine forms dihydroxyphenylalanine (DOPA), which is then converted to dopamine, and this, in turn, forms norepinephrine and then epinephrine (Parker and Brotchie, 2011).

Cyclo (His-Pro)

Cyclo (His-Pro) or CHP has profound effects on satiety, hunger and behaviour. Chemical substances

like CHP are common in fermented foods or foods containing hydrolyzed proteins and fish. These include nutritional supplements (e.g., Ensure Plus and Two Cal HN), shrimp, tuna, milk, yogurt and buttermilk (Prasad, 1989).

Exorphins

Exorphins (exo = exogenous or from outside, orphin = morphin, an opium), the opposite of endorphins, are a family of food derived peptides that act on brain receptors. Dr. Werner Klee of the National Institutes of Health has shown that whe npepsin, an enzyme found in stomach, acts on casein (a milk protein), it generates many peptides, some of which interact with opium receptors in the brain; he called these peptides casomorphins. (Teschmacher *et al.*, 1997).

It is a natural anti-depressant. The brain needs omega 3 fatty acids to form healthy nerve cells. It has also been reported that omega 3 fatty acids are associated with a lower risk of depression. Salmon, Mackerel, Sardines, Pilchards, Trout and fresh Tuna contain sufficient amount of omega 3 fatty acids (Chaudhri, 2010).

Gamma amino butyric acid (GABA)

Gamma-amino butyric acid (GABA) is a major neurotransmitter widely distributed throughout the central nervous system (CNS). Both synthetics and natural GABA are available as dietary supplements in the United States. Natural GABA is produced via a fermentation process that utilizes *Lactobacillus hilgardii*– the bacteria used to ferment vegetables in the preparation of the traditional Korean dish known as kimchi (Anon, 2007).

Other components

Other nutrients that should be considered under good mood food are vitamin B complex which includes B₁, B₂, B₆, B₁₂; Selenium, Magnesium, Phosphotidylserine (PS), Acetylcholine, Ginseng, Cholecystokinin, Seadenysyls methionine (SAME), Acetyl L-carnitine, Choline etc. Besides eating foods there are other factors that increase serotonin, which is responsible for getting ones mood up like exercise, natural sunlight to get enough vitamin D, laughing, enough sleep etc. (Borawska, 2006).



Example of Good mood food

There are few examples of good mood foods that can be very easily incorporated in daily diets to fight against the stress.

Chocolate

Chocolate consumption has long been associated with enjoyment and pleasure. Someone quoted that '*Chocolate is cheaper than therapy and you don't need an appointment*' (Parker *et al.*, 2006). Chocolate may interact with a number of neuro transmitter systems (including dopamine, serotonin and endorphins) that contribute to appetite, reward and mood regulation. Chocolate contains two analogues similar to the cannabinoid responsible for euphoria from cannabis (Parker *et al.*, 2006). Chocolate also contains amino acid gamma-aminobutyric acid (GABA) that is said to reduce anxiety (White and Reeves, 2008).

Milk

Milk can affect processes outside the human gut, a proven example is the hypotensive effect of milk bioactive peptides through angiotensin-I-converting enzyme (ACE) inhibition. Milk also contains some opioid peptides having pharmacological similarity to opium. The caseins (α_{s1} , α_{s2} , β and κ) and whey proteins are potential sources of such opioid peptides. These opioid peptides have antihypertensive and antidepressant activities. Milk also contains DHA, α -Lactalbumin and phospholipids, which affect mood and reduce stress (Mills *et al.*, 2011, Young, 2007, Schubert *et al.*, 2011).

Coffee

Epidemiological and experimental studies have shown positive effects of regular coffee-drinkers on various aspects of health, such as psychoactive responses (alertness, mood change etc.). The improvement of mood is among the effects attributed to caffeine in coffee drinkers (Quinlan *et al.*, 1997).

Banana

Banana (*Musa paradisiaca*) is considered as good mood super food. It offers serious mood lifting

power, with a combination of vitamins B₆, A and C; fiber, tryptophan, potassium, phosphorus, iron, carbohydrate and protein (Jong, 2010).

Walnuts

The combination of omega 3 fatty acids and uridine found in walnut is reportedly having natural antidepressant effect in human (Carlezon, 2005). Walnuts also contain some other compounds like vitamin B₆, tryptophan, protein, and folic acid which contribute to a good mood (Perinbis *et al.*, 2012).

Tea

Green tea contains L-theanine. Consumption of 50 mg of L-theanine (equivalent to two-three cups of tea) has been shown to stimulate the alpha brain waves. By increasing the frequency of these brain waves, the beta brain waves which are associated with tension are decreased (Nobre *et al.*, 2008).

Eggs

Eggs are full of high quality protein and omega 3 fatty acids (from the hens eating an omega 3 fatty acid rich diet). They are also an excellent source of vitamin B₁₂ and a good source of vitamin B₂, B₅ and Vitamin D (Jong, 2010).

Ice cream

Of all foods, perhaps, ice cream produces the most soothing effect. Ice creams that are rich in protein increase the odds of boosting tyrosine levels in your brain. Tyrosine is a neurotransmitter that raises your dopamine and norepinephrine levels (Ray, 2011).

Blueberries

Blueberries are full of antioxidants and anthocyanins. These nutrients are said to be great stress busters. The antioxidants fight the free radicals which adversely affect the memory (Krikorian, 2010).

Broccoli

One of the good mood foods is broccoli which has stress relieving vitamin B₆. It also contains folic



acid which is important in fighting depression (Souza *et al.*, 1999).

Flaxseeds

Flaxseeds are rich in alpha linolenic acid (ALA), an omega 3 fatty acid that is a precursor to the form of omega 3 fatty acids found in fish oils called eicosapentaenoic acid or EPA. Omega 3 fatty acids found in flax seeds are good brain foods (Cunnane, 1995).

Industrial applications

Mood food continues to garner attention from manufacturers. In 2002, Scottish ice cream maker Mackie's launched a mood enhancing low calorie ice cream that was flavoured with the essence of native Alaskan orchid, claiming to make people happy. In 2006, Nestle announced an investment of about 4 million US dollar a year over a five year period to research into the relationship between nutrition and the brain. Coca-Cola introduced the omega-3 fatty acid docosahexaenoic acid (DHA) to its soy milk product Odwalla, with claims to support healthy brain development. Yakult and Unilever are also using ingredients such as GABA, phosphatidyl serene (PS), or L-theanine for their cognitive benefits. In UK, Unilever has introduced a marketing campaign that promotes the benefits of its green tea as a mood food. One of the most successful mood food products has been Ezaki stress-reducing 'Mental Balance Chocolate GABA' with first year sales of 50 million US dollar surpassing all forecasts (www.foodnavigator.com).

Conclusion

In this competitive era people are suffering from stress and other brain related diseases. So, the demand of stress relieving foods of the society is increasing day by day. The functional food along with mood health market has tremendous potential for the growth in the future, as consumers prefer product that can safely and naturally improve health. With the flourishing growth of the functional foods sector for the past three decade, there is a still demand for the niche application in this sector. While mood food is an emerging trend, this segment could be another passing fad unless

these product pass the health claims as today's consumer wants food that boosts energy level, counteract stress, helps to relax and aids in sleep.

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